3.7 WATER RESOURCES

This section discusses water resources in the North I-25 regional study area. Numerous streams, tributaries, canals, ditches, reservoirs, and lakes in the regional study area watersheds are either adjacent to or cross I-25 and the other major corridors (US 85, Union Pacific Railroad (UPRR), and Burlington Northern Santa Fe Railway (BNSF) in the project area.

What's in Section 3.7?

Surface waters contribute to the quality of life for residents within the regional study area because they provide water supply, recreation opportunities, and aesthetic value. The aquatic and riparian habitats that the surface waters provide are vital for a wide variety of species within the project area. Increased urbanization and mixed land use practices within the regional study area and project area are progressively contributing to degraded water quality. Accordingly, protecting the integrity of water resources within the project area is a critical piece of this project, which is legally mandated by federal, state, and local regulations.

This section provides an overview of the existing conditions of surface water in the project area and assesses impacts that the build packages (Packages A and B) and the No-Action Alternative would have on water quality due to project activities. Impacts to groundwater wells are also addressed in this section. Permanent best management practices (BMPs) have been incorporated into the roadway and rail design for both packages to ensure MS4 compliance and reduce the majority of impacts from stormwater. Consequently, it is anticipated that water quality conditions will improve when compared to the existing conditions in areas where no water quality treatment is currently provided.

3.7.1 Water Resources Regulations

Water resources within the regional study area are managed through federal, state, and local regulations that establish the standards and management actions necessary to protect their physical, chemical, and biological integrity. The primary regulations governing surface water and groundwater resources in the project area are the Clean Water Act (CWA) and Safe Drinking Water Act (SDWA). The Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Commission (WQCC) has the authority to establish and enforce water quality standards within the state.

The primary water quality concern associated with the project results from the discharge of stormwater to receiving waters (See **Section 3.7.3**). As part of the CWA, entities with stormwater discharges are regulated under the National Pollutant Discharge Elimination System (NPDES) permit program.

Municipal Separate Storm Sewer Systems (MS4) that are owned and maintained by municipalities and CDOT are required to obtain Colorado Discharge Permit System (CDPS) permits for stormwater discharges. The permit requires Colorado Department of Transportation (CDOT) to develop and implement a stormwater management program to maintain and protect water quality conditions from their stormwater discharges. A major program element is the development and implementation of Best Management Practices (BMPs), which are defined as activities, procedures, and other practices that prevent or reduce water pollution. As part of the MS4 program, CDOT is required to design, construct, and maintain permanent BMPs to protect aquatic resources. As part of the stormwater management program, CDOT also is required to develop, implement, and enforce a program to reduce pollutants in stormwater runoff for any construction activity that would result in a land disturbance greater than or equal to one acre.

While the entire project must comply with CDPHE-WQCC rules and regulations, the MS4 permit requirements are only applicable in designated MS4 areas. Because of the size of this project, the build packages cross 11 MS4 areas (including municipalities and portions of counties). The CDOT MS4 requirements described above are generally only applicable in these MS4 areas. An analysis was conducted using the 2000 census data to define the permit coverage for portions of Adams, Larimer, and Boulder counties based on population density. Because the regional study area is rapidly growing, the projected 2030 population used in the traffic model was utilized to predict what areas might be within an MS4 area in 2030. The project should also comply with additional requirements of local municipal MS4 programs. The final coordination of these permit issues is typically completed during the design phase of the project. The CDOT MS4 requirements and specifications comply with the FHWA regulation “Erosion and Sediment Control on Highway Construction Projects”. More detailed information on CDOT MS4 permit requirements are provided in the *Water Quality and Floodplains Technical Report* (FHU, 2008b).

3.7.1.1 SURFACE WATER CLASSIFICATIONS

Two main regulations have been established by the CDPHE-WQCC that classify the designated uses and water quality standards that apply to the surface water bodies within the project area.

- Regulation 31 - *Basic Standards and Methodologies for Surface Water*
- Regulation 38 - *Classification and Numeric Standards for South Platte River Basin; Laramie River Basin; Republican River Basin; Smoky Hill River Basin*

Colorado has four designated uses for surface water bodies: agriculture, water supply, recreation, and aquatic life. These designated uses have their own unique water quality standards that are either numeric (quantitative thresholds) or narrative (visual/aesthetic). Surface water classifications do not apply to water that is conveyed in man-made structures such as ditches. Streams that do not meet established water quality standards (“impaired streams”) are placed on the Colorado 303 (d) List and are required to go through a process to help improve water quality. The process results in the development of a Total Maximum Daily Load (TMDL), which is a total amount of pollutant loading that a surface water system can assimilate without exceeding water quality standards. Surface waters that require additional monitoring and evaluation to determine if water quality standards are being met are placed on the Colorado 303(d) Monitoring and Evaluation List.

The watersheds within the project area contain numerous canals and ditches that transport water for irrigation and domestic drinking water supply. However, canals and ditches do not have designated uses as do natural watercourses. According to State of Colorado code (C.R.S. § 25-8-203(2)(f)), “Waters in ditches and other man-made conveyance structures shall not be classified with designated uses, and water quality standards shall not be applied to them but may be utilized for purposes of discharge permits" [CDPHE, 2003]).

The designated uses for the surface water bodies within the project area and impaired segments are listed in **Table 3.7-1**. Impaired stream segments are included in **Figure 3.7-3**. Stream segments on the Monitoring and Evaluation List for potential highway-related constituents are included in **Table 3.7-1** and **Figure 3.7-3**. The TMDL status for impaired streams is included in the *Water Quality and Floodplains Technical Report* (FHU, 2008b).

3.7.1.2 SAFE DRINKING WATER ACT

Public drinking water supplies (systems serving more than 25 people) from both groundwater and surface water sources are regulated by the Safe Drinking Water Act. These sources include lakes, rivers, reservoirs, springs, and groundwater. Under the Safe Drinking Water Act, Environmental Protection Agency (EPA) and the Congress established national health-based standards for drinking water contaminants specified as having known adverse human health effects. As with the Clean Water Act (CWA), EPA has delegated regulatory authority of the Safe Drinking Water Act to the CDPHE Water Quality Control Division (WQCD). **Section 3.7.3** includes information about public water supply wells in the project area.

3.7.1.3 SENATE BILL 40

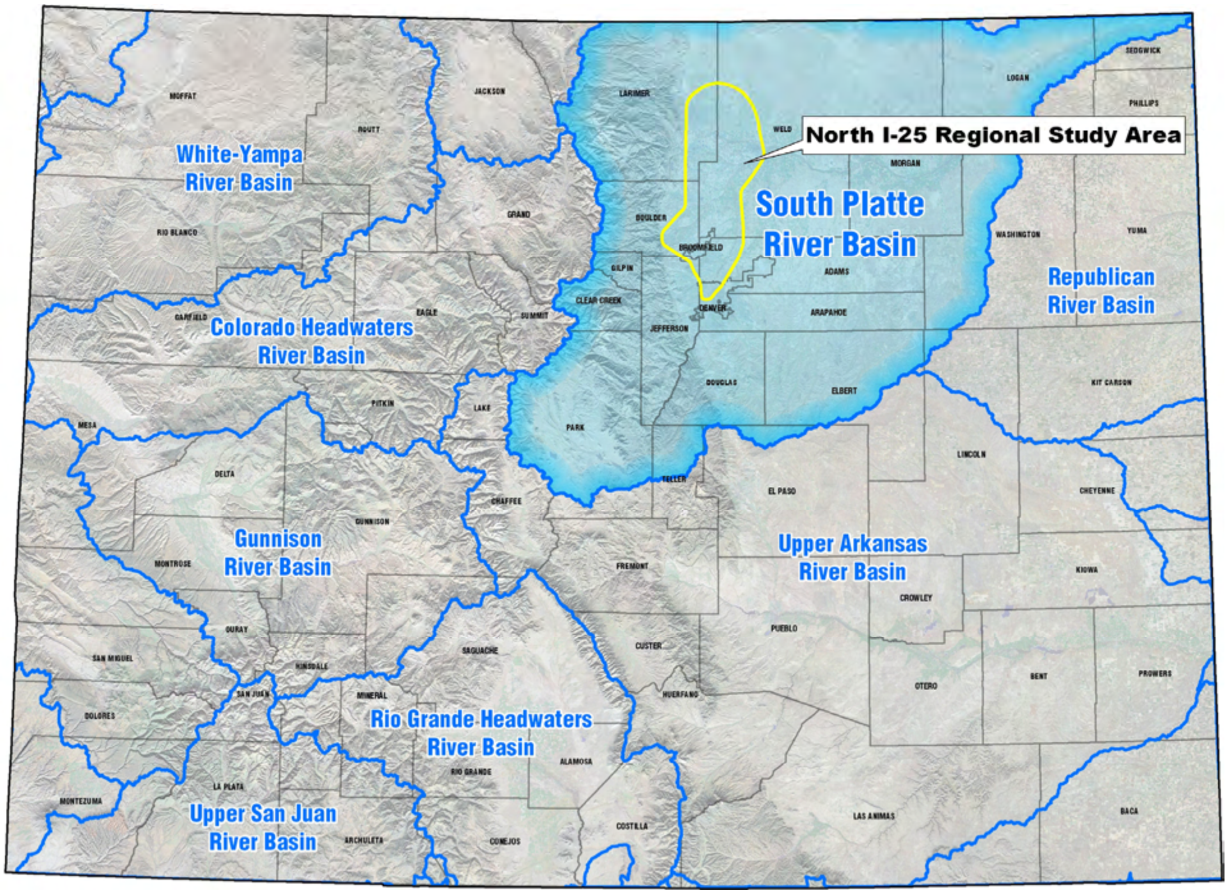
Colorado Senate Bill 40 (SB40) requires that projects that affect waters of the state and their associated riparian areas comply with its provisions. These provisions are aimed at preserving wildlife habitat in streams for fish and aquatic species and terrestrial species that rely upon riparian areas. Compliance with SB40 provisions is documented in a permit obtained through the Colorado Division of Wildlife. **Section 3.7.4** includes information about SB40 guidelines that will be followed in the project area.

3.7.2 Affected Environment

3.7.2.1 SURFACE WATER

The regional study area lies in the transition zone between the Rocky Mountain Front Range in central Colorado and the Great Plains of eastern Colorado and is situated entirely in the South Platte River basin (see **Figure 3.7-1**). The South Platte River basin, which is one of eight major river basins in Colorado, occupies approximately 13 million acres in Colorado, Wyoming, and Nebraska.

Figure 3.7-1 South Platte River Basin

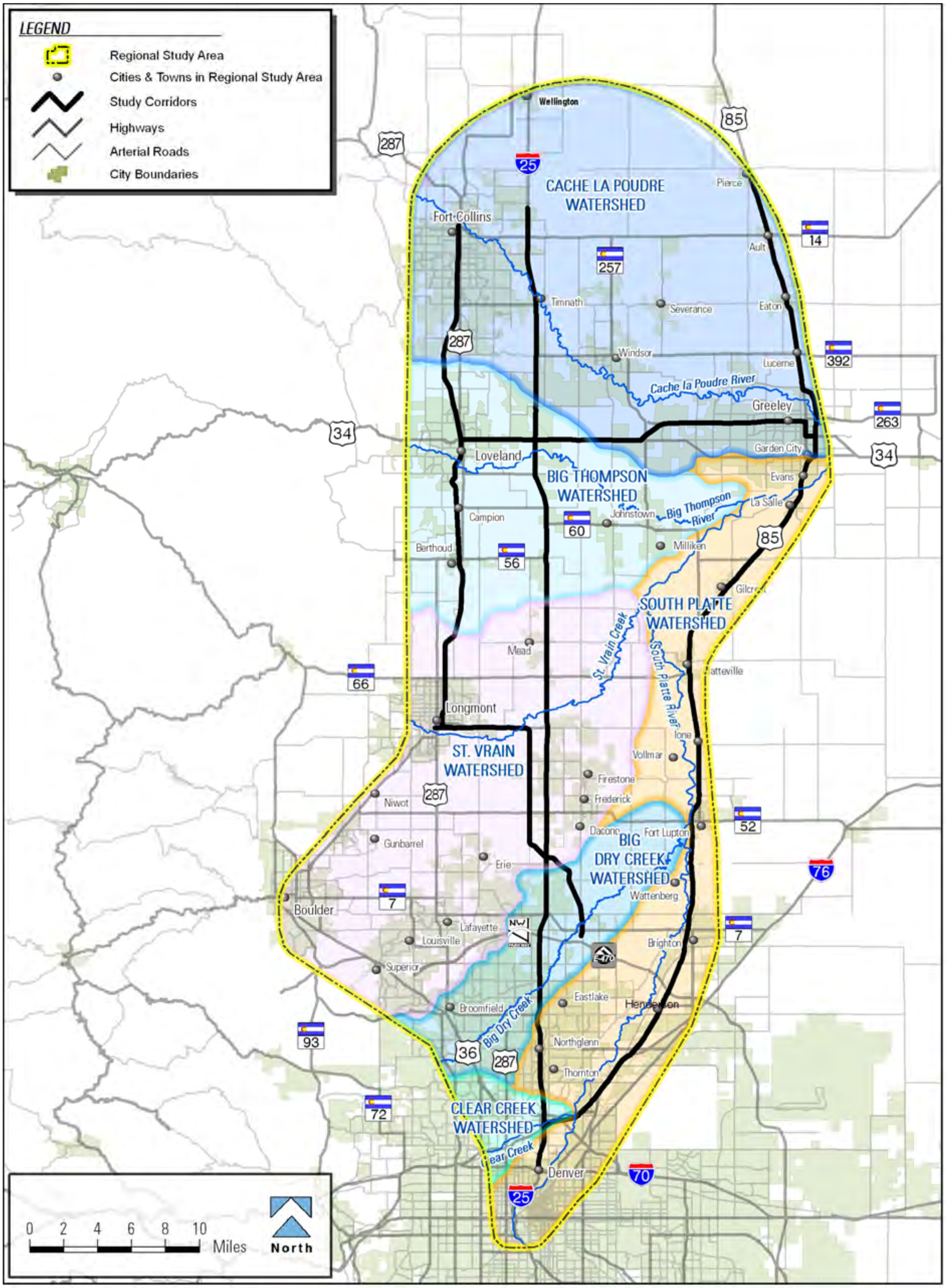


Six main watersheds occur in the regional study area: the South Platte River, Clear Creek, Big Dry Creek, St. Vrain Creek/Boulder Creek, Big Thompson River, and Cache la Poudre River. Numerous streams, tributaries, canals, ditches, reservoirs, and lakes in these watersheds are either adjacent to or cross I-25 and the other major corridors (US 85, UPRR, and BNSF Railway) in the project area (see **Figure 3.7-2**).

Hydrology and stream flow regime characteristics of the six watersheds in the regional study area are very similar. The majority of stream flow originates as snowmelt, creating high-flow conditions from May to July, with peak flows in June, and lower flows from October to March. Natural hydrologic conditions in the basin's watersheds have been altered because of extensive in-basin and trans-basin water diversions, reservoir construction, and discharges from publicly-owned treatment works (POTW) (USGS, 1998).

Numerous man-made surface water drainage features are also present within the project area and include culverts, inlets, and open channels. Most of the existing drainage structures in the project area were built during the 1960s. At that time, the adjacent areas were rural, and flood damage was limited to agricultural land. The sizes of many of these drainage structures were based on limited rainfall data for what was estimated to be a 25- or 50-year storm event. The 100-year storm is now used for drainage design in urbanized areas and for floodplains under the jurisdiction of the Federal Emergency Management Agency (FEMA). Many of the existing drainage structures constrict stormwater flows, cause flooding, and overtopping of the adjacent highways. In order to conform to newer criteria and control flooding, most drainage structures in the project area will be replaced with larger structures.

Figure 3.7-2 Watersheds in the Regional Study Area



3.7.2.2 WATERSHEDS

This section describes the surface water designated uses and water quality impairments within the project area. Stream segments on CDPHE's Monitoring and Evaluation List for potential highway-related constituents are also included in this section. Water bodies that cross or are present within 100 feet of the existing I-25 or US 85 edges-of-pavement or the edge of the rail lines were considered to be within the project area. However, in certain cases, water bodies outside the project area were also included if they are: 1) downstream from the project area, 2) designated water supplies, or 3) impaired and close to the project area.

Existing contaminant loading from the current highway configuration for each watershed was estimated using an FHWA water quality model (Driscoll Model). This model is discussed later in this section. Five contaminants were modeled for the project area (chloride, copper, phosphorus, total suspended solids (TSS), and zinc) because of their water quality implications in the project area. They are assumed to be an indicator of overall contamination in runoff.

South Platte River Watershed

The South Platte River watershed occupies 45,560 acres in the southern portion of the regional study area (see **Figure 3.7-2**). Overall, within this watershed, I-25 accounts for approximately 110 acres of impervious surface within the project area (USGS, 2000). The E-470 to US 36 (H4) component crosses this watershed.

The stream segments within the project area, their designated stream uses, and any impairments are listed in **Table 3-7-1**. The main stem (Segments 15, 1a, and 1b) is also included because it has water supply designations and all streams within the project area eventually discharge into the South Platte River. It is important to consider downstream segments to ensure that upstream project activities do not adversely affect those receiving water bodies. Segment 15 is the only segment with water quality impairments. This portion of the main stem has been placed on the 2006 303(d) List for an *E. Coli* impairment (see **Figure 3.7-3**) (CDPHE, 2006a). *E. coli* is not generally associated with roadway runoff.

Table 3.7-1 Surface Water Segments, Designated Uses, and Impairments within the Project Area

	Designated Uses	Impairments
South Platte River Watershed		
Segment 15	Recreation 1a, Class 2 warm water aquatic life, agriculture, and water supply	*E. Coli*
Segment 16c	Recreation 1a, Class 2 warm water aquatic life, and agriculture	N/A
Segment 1a	Recreation 1a, Class 2 warm water aquatic life, agriculture, and water supply	N/A
Segment 1b	Recreation 1a, Class 2 warm water aquatic life, agriculture, and water supply	N/A
Clear Creek Watershed		
Segment 15	Class 1 warm water aquatic life, recreation 1a, agriculture, and water supply	*E. coli*, aquatic life use, and organic sediment
Big Dry Creek Watershed		
Segment 1	Class 2 warm water aquatic life, recreation 1b, and agriculture	*E. coli* and Selenium; Total Recoverable Iron (M & E List)
St. Vrain/Boulder Creek Watershed		
Segment 3	Class 1 warm water aquatic life, recreation 1a, and agriculture	*E. Coli, aquatic life use*
Segment 6	Class 2 warm water aquatic life, recreation 1a, and agriculture	*E. Coli* (Dry Creek Only), Selenium
Segment 10	Class 1 warm water aquatic life, recreation 1a, agriculture, and water supply.	*E. Coli*
Big Thompson River Watershed		
Segment 4b	Class 2 warm water aquatic life, recreation 1a (from 5/1 to 10/15 annually), and recreation 2 (10/16 to 4/30, annually)	N/A
Segment 4c	Class 2 warm water aquatic life, recreation 1a (from 5/1 to 10/15 annually), and recreation 2 (10/16 to 4/30, annually)	N/A
Segment 5	Class 2 warm water aquatic life, recreation 1b (from 5/1 to 10/15, annually), recreation 2 (10/16 to 4/30, annually), and agriculture	Selenium, Ammonia
Segment 6	Class 2 warm water aquatic life, recreation1a, and agriculture	N/A
Segment 9	Class 2 warm water aquatic life, recreation 1a, and agriculture	Selenium, *E. Coli*
Segment 10	Class 2 warm water aquatic life, recreation 1a, and agriculture	Selenium (Big Hollow)
Cache la Poudre River Watershed		
Segment 11	Class 2 warm water aquatic life, recreation 1a, and agricultural uses	N/A
Segment 12	Class 2 warm water aquatic life, recreation 1a, and agricultural uses	*E. Coli* (below Eaton Draw), Selenium
Segment 13a	Class 2 warm water aquatic life, recreation 1a, and agricultural uses	Selenium
Segment 13b	Class 2 warm water aquatic life, recreation 1b (5/15 to 9/15, annually), recreation 2 (9/16 to 5/14, annually), and agricultural uses	Selenium

Source: CDPHE, 2007

Figure 3.7-3 Impaired Streams in the Project Area

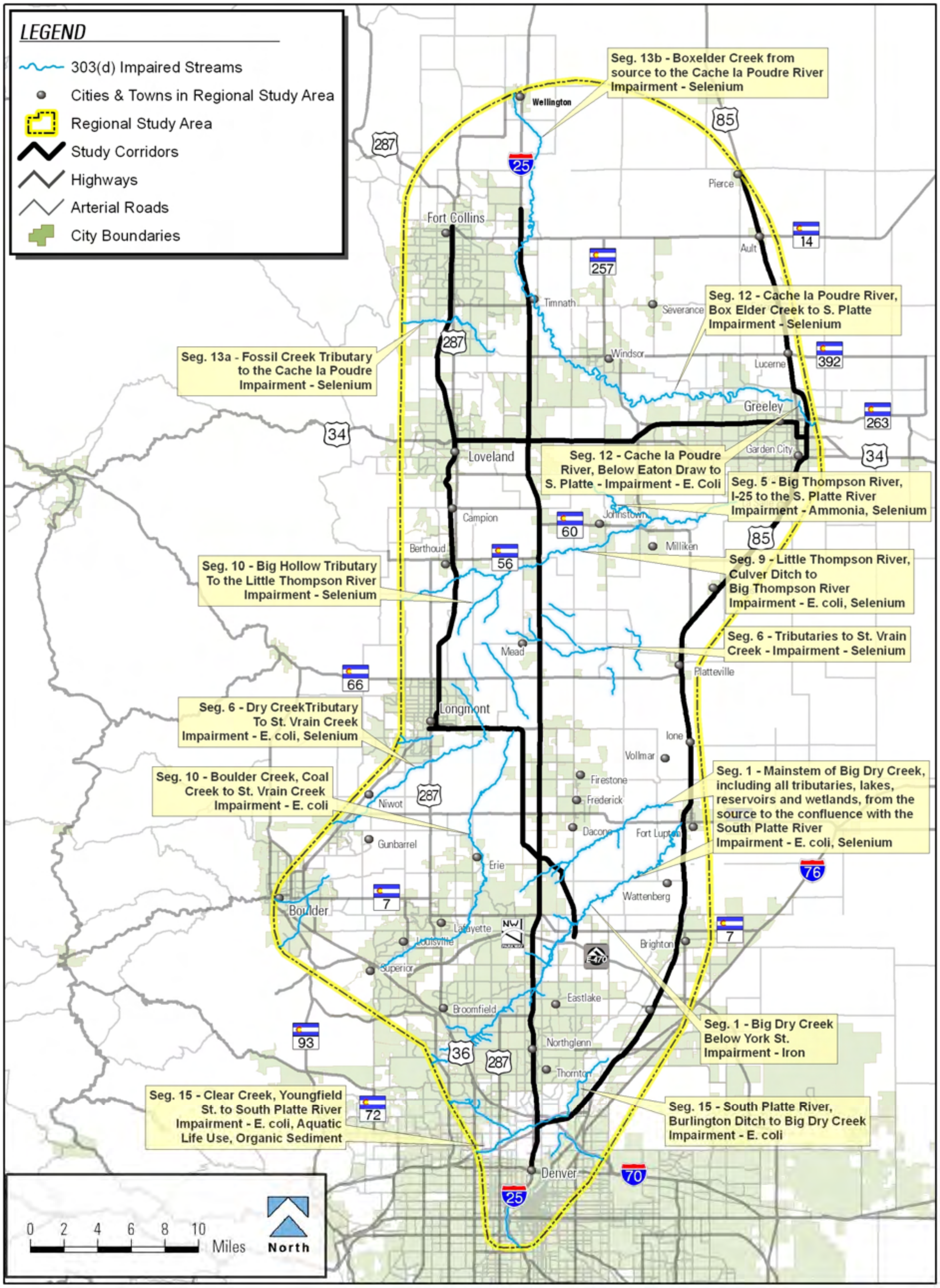


Table 3.7-2 presents the estimated existing contaminant loading from a storm event from the existing I-25 conditions in the South Platte River watershed. These values are compared to the estimated loading for each alternative in the following section.

Table 3.7-2 Mean Contaminant Loading Per Storm Event From The Driscoll Model (Pounds per Event) in the South Platte River Watershed

Watershed	Chloride *(pounds/event)*	Copper *(pounds/event)*	Phosphorus *(pounds/event)*	Total Suspended Solids (TSS) *(pounds/event)*	Zinc *(pounds/event)*
South Platte River	78.4	0.058	3.7	2,600	0.52
Clear Creek	14.5	0.011	0.68	481	0.097
Big Dry Creek	125	0.093	5.8	4,150	0.83
St. Vrain Creek	265	0.20	12.4	8,800	1.8
Big Thompson River	181	0.13	8.4	6,000	1.2
Cache la Poudre River	266	0.20	12.4	8,800	1.8

Clear Creek Watershed

The Clear Creek watershed occupies 14,787 acres in the southern portion of the regional study area (see **Figure 3.7-2**). Overall, within this watershed, I-25 accounts for approximately 20 acres of impervious surface within the project area (USGS, 2000). The E-470 to US 36 (H4) component crosses this watershed.

The stream segments within the project area, their designated stream uses, and any impairments are listed in **Table 3.7-1**. Clear Creek Segment 15 is located downstream of the project area and has been placed on the 2006 303(d) List for *E. coli*, aquatic life use, and organic sediment (CDPHE, 2006a). Constituents causing the stream impairments near the project area are generally not associated with roadway runoff.

Table 3.7-2 presents the estimated existing contaminant loading from a storm event for the existing I-25 conditions in the Clear Creek watershed. These values are compared to the estimated loading for each alternative in the following section.

Big Dry Creek Watershed

The Big Dry Creek watershed occupies 65,055 acres in the southern portion of the regional study area. The watershed lies south of the St. Vrain Creek watershed and north of the South Platte River watershed (see **Figure 3.7-2**). Overall, within this watershed, I-25 accounts for 171 acres of impervious surface area within the project area (USGS, 2000). The E-470 to US 36 (H4) component and the SH 60 to E-470 (H3) component cross this watershed.

The stream segments within the project area, their designated stream uses, and any impairments are listed in **Table 3.7-1**. Big Dry Creek (Segment 1) is within the project area and has been placed on the 2006 303(d) List for *E. Coli* and selenium (CDPHE, 2006a). *E. Coli* and selenium are generally not associated with roadway runoff.

A portion of Segment 1, located approximately 2.5 miles downstream of the project area, has also been placed on the 2006 Monitoring and Evaluation List for total recoverable iron (CDPHE, 2006b). Iron is a constituent that can be associated with roadway runoff due to auto body rust, steel highway structures, and vehicle engine parts.

Table 3.7-2 presents the estimated existing contaminant loading from a storm event for the existing I-25 conditions in the Big Dry Creek watershed. These values are compared to the estimated loading for each alternative in the following section.

St. Vrain Creek Watershed

The St. Vrain Creek watershed occupies 204,664 acres in the middle portion of the regional study area. The watershed lies north of the Big Dry Creek watershed and south of the Big Thompson River watershed (see **Figure 3.7-2**). Overall, within this watershed, I-25 accounts for 350 acres of impervious surface area within the project area (USGS, 2000). The SH 60 to E-470 (H3) component crosses this watershed.

The stream segments within the project area, their designated stream uses, and any impairments are listed in **Table 3.7-1**. Segment 3 has been placed on the 2006 303(d) List for *E. Coli* (CDPHE, 2006a). Segment 6 has been placed on the 2006 303(d) List for selenium and *E. Coli* (CDPHE, 2006a)*.* Boulder Creek (Segment 10) is also included because it is located close to the project area, has a designated water supply designation, and has an impairment for *E. Coli* (CDPHE, 2006a)*. E. coli* and selenium are generally not associated with roadway runoff.

Table 3.7-2 presents the estimated existing contaminant loading from a storm event for the existing I-25 conditions in the St. Vrain Creek watershed. These values are compared to the estimated loading for each alternative in the following section.

Big Thompson River Watershed

The Big Thompson watershed occupies 122,523 acres in the northern portion of the regional study area (see **Figure 3.7-2**). The watershed is located north of the St. Vrain Creek watershed and south of the Cache la Poudre River watershed. Overall, within this watershed, I-25 accounts for approximately 223 acres of impervious surfaces within the project area (USGS, 2000). The SH 14 to SH 60 (H2) component and SH 60 to E-470 (H3) component cross this watershed.

The stream segments within the project area, their designated stream uses, and any impairments are listed in **Table 3.7-1**. Segments 5, 9, and 10 have been placed on the 2006 303(d) List for selenium (all segments), ammonia (Segment 5), and *E. Coli* (Segment 9) (CDPHE, 2006a). Ammonia, *E. coli*, and selenium are generally not associated with roadway runoff.

Table 3.7-2 presents the estimated existing contaminant loading from a storm event for the existing I-25 conditions in the Big Thompson River watershed. These values are compared to the estimated loading for each alternative in the following section.

Cache la Poudre River Watershed

The Cache la Poudre River watershed occupies 264,736 acres in the northern portion of the project area. The watershed lies north of Big Thompson River watershed (see **Figure 3.7-2**). Overall, within this watershed, I-25 accounts for approximately 337 acres of impervious surfaces within the project area (USGS, 2000). The SH 1 to SH 14 (H1) component and SH 14 to SH 60 (H2) component cross this watershed.

The stream segments within the project area, their designated stream uses, and any impairments are listed in **Table 3.7-1**. Segments 12, 13a, and 13b have been placed on the 2006 303(d) List for selenium. Segment 12 has also been placed on the 2006 303(d) List for *E. Coli* (CDPHE, 2006a). *E. coli* and selenium are generally not associated with roadway runoff.

Table 3.7-2 presents the estimated existing contaminant loading from a storm event for the existing I-25 conditions in the Cache la Poudre River watershed. These values are compared to the estimated loading for each alternative in the following section.

3.7.2.3 GROUNDWATER

Numerous groundwater wells are located within the regional study area. The regional study area is situated above the consolidated bedrock aquifers of the Denver basin and Dakota-Cheyenne group (aka South Platte Formation) and the unconsolidated shallow alluvial aquifers associated with the South Platte River and its tributaries (Colorado Geological Survey, 2003). Groundwater from the aquifers can be brought to the surface with wells and provide water supply for multiple uses. The Denver basin aquifers primarily supply domestic and municipal water. The Dakota-Cheyenne group primarily supplies domestic, livestock, and industrial water. The South Platte Valley-Fill alluvial aquifer primarily supplies irrigation and municipal water.

3.7.3 Environmental Consequences

This section describes the potential consequences of the No-Action Alternative, Package A, and Package B with regard to water quality and stormwater drainage for the six watersheds within the project area. Permanent BMPs, consisting of water quality ponds, have been incorporated into the roadway and rail design for both packages to ensure MS4 compliance. Consequently, it is anticipated that water quality conditions will improve when compared to the existing conditions in areas where no water quality treatment is currently provided.

3.7.3.1 WATER QUALITY IMPACTS METHODOLOGY

Surface Water

If stormwater is left untreated, water quality impacts are generally correlated with the addition of paved impervious surfaces that alter the volume, velocity, and quality of stormwater runoff discharged into nearby surface water bodies. The impacts common to all alternatives that affect water quality in the absence of BMPs are listed in **Table 3.7-3**.

Table 3.7-3 Common Highway-Related Surface Water Quality Impacts

	Direct Impacts	Typical Mitigation[1]
Sediment	**Harmful to aquatic life**. Sedimentation directly degrades aquatic habitat. Suspended sediment increases turbidity and reduces aquatic plant life productivity. Suspended sediment can be fatal to aquatic species by reducing dissolved oxygen levels (Trombulak and Frissell, 2000).	o **Water Quality Ponds** o **Riprap** o **Nonstructural BMPs** (continued decreasing use of salt and sanding)
Anti-Icing / De-Icing Chemicals (Salt-Based Deicers)	**Potentially harmful to aquatic species, including plants.** CDOT is conducting research to better understand the aquatic life effects.	o **Nonstructural BMPs** (continued decreasing use of salt and sanding)
Metals	**Toxic to aquatic life. Bio-accumulation.** Metals that bind to suspended solids and decaying organic matter can persist in the environment for long periods of time. **Contamination of drinking water supplies.**	o **Water Quality Ponds** o **Well Abandonment** o **Nonstructural BMPs** (Spill prevention plan during construction)
Nutrients	**Toxic to aquatic life.** Excessive nutrients, primarily nitrogen and phosphorus, can cause extreme algal growth, which is toxic to certain aquatic organisms. Algal blooms and die-off causes large swings in dissolved oxygen levels and in extreme cases fish kills. **Alters aesthetics. Can cause designated use impairments.**	o **Water Quality Ponds**
General Construction Activities	**Erosion. Harmful to aquatic life.** Vegetation removal at construction sites increases stormwater runoff velocity and volume causing accelerated erosion. Riparian vegetation removal reduces stream bank stability, accelerates erosion, alters aquatic habitat and shading, and causes in-stream temperature changes. Construction vehicles deposit sediment onto surrounding roads, which is later mobilized during storm events.	o **Construction BMPs**[2] ▪ Minimize in-stream activities ▪ Stormwater Management Plan (silt fence, inlet protection, containerization of wastes, etc.) ▪ Revegetation and replacement of site, including riparian areas ▪ Spill Prevention Plan ▪ Construction Phasing
Construction of new piers, culverts, etc.	**Erosion. Harmful to aquatic life**. Alters streamflow within channel. Erosion/sedimentation upstream and downstream of structures. Reduces quality and quantity of aquatic habitat.	o **Riprap** o **Construction Phasing**
Increased Stormwater Velocity & Volume	**Erosion. Harmful to aquatic life.** Increased stormwater runoff velocity and volume causes stream channelization (i.e., straightening). Channelization increases surface water velocity and exacerbates erosion and sedimentation. Reduces quality and quantity of aquatic habitat.	o **Water Quality Ponds** o **Riprap**

Notes:
1. See Section 3.7.4.1 for a description of proposed mitigation measures.
2. Activities CDOT currently undertake at construction sites and is required by permit.

If stormwater is left untreated, the project alternatives would cause indirect impacts later in time or at some distance downstream of the project area. These indirect impacts include alterations to natural channel movement processes (i.e. meandering, channel incision) and the continual degradation of aquatic habitat.

For each build alternative and the No-Action Alternative, surface water quality impacts were determined by evaluating the total impervious surface area, estimating the total areas of roadway that will be treated by BMPs, by comparing projected traffic volumes, and applying the Driscoll model.

Impervious Surfaces. The total impervious surface area of each alternative was evaluated as a way to estimate water quality impacts in the absence of BMPs. In addition, the impervious surface area treated by BMPs was also used to estimate overall water quality impacts from each build alternative and the No-Action alternative. Generally, if roadway runoff is passed through a BMP, the post-BMP runoff will have better quality than untreated runoff. This was quantified by comparing the impervious surface area associated with an alternative to the percent of that area being treated, or passed through, a BMP. Therefore, an alternative with a higher percentage of treatment will have a lesser impact to the water quality in the project area when compared to levels of existing BMP treatment (see **Table 3.7-4**). Areas of proposed water quality treatment were estimated based on current and future MS4 areas, the presence of sensitive waters, and the available area for BMPs within the right-of-way.

Table 3.7-4 Summary of Total and Treated Impervious Areas

Alternative	Total Impervious Area *(acres)*	Area Treated *(acres)*	% of Area Treated[1] *(acres)*
Existing	1,212	29	2.4%
No-Action	1,257	141	11.2%
Package A	1,946	1,765	90.7%
Package B	2,001	2,509	125%

[1] - The percent of area treated through BMPs can be greater than 100 percent because the size of the ponds and/or depth of ponds are bigger/deeper to account for unknown constraints that may be identified in final engineering.

Driscoll Model. The Driscoll model (FHWA, 1990), an FHWA-developed method, was applied as part of the impacts evaluation for the highway components. The modeling approach described herein is consistent with FHWA guidance and is used as a screening tool to compare predicted pollutant mass loading for existing conditions and predicted mass loadings from project alternatives (No-Action, Package A, and Package B) before the application of BMPs. The constituents analyzed in the Driscoll model were selected based upon their relation to roadway runoff and/or their sensitivity in the regional study area. Stormwater runoff concentration data for the constituents analyzed using the Driscoll model were obtained from the *I-70 Mountain Corridor Tier 1 Draft Programmatic Environmental Impact Statement* (I-70 PEIS) (CDOT, 2004b) because stormwater runoff data is not available for the project area.

The results of the Driscoll model are presented in **Table 3.7-5** by component. The components typically cross several watersheds; therefore, a watershed could be affected by multiple components. **Figure 3.7-4** and **3.7-5** graphically presents the Driscoll model results by component and by watershed. **Figure 3.7-4** and **Figure 3.7-5** presents predicted dissolved copper loading by component and watershed, respectively, because copper is a common roadway heavy metal pollutant.

1 **Table 3.7-5 Driscoll Model Results for Each I-25 Highway Component**

Contaminant	Alternative	Highway Component				
		SH 1 - SH 14 *(Cache la Poudre River)* *(H1)*	SH 14 - SH 60 *(Cache la Poudre River, Big Thompson River)* *(H2)*	SH 60 - E-470 *(Big Thompson River, St. Vrain Creek, Big Dry Creek)* *(H3)*	E-470 - US 36 *(Big Dry Creek, South Platte River, Clear Creek)* *(H4)*	Total Loading[1]
Chloride (pounds per event)	Existing	107	292	373	157	***930***
	No-Action	107	292	413	157	***970***
	Package A	149	483	522	166	***1,320***
	Package B	149	568	537	183	***1,440***
Dissolved Copper (pounds per event)	Existing	0.079	0.22	0.28	0.12	***0.689***
	No-Action	0.079	0.22	0.31	0.12	***0.718***
	Package A	0.11	0.36	0.39	0.12	***0.978***
	Package B	0.11	0.42	0.40	0.14	***1.07***
Total Phosphorous (pounds per event)	Existing	5.0	13.6	17.4	7.3	***43.4***
	No-Action	5.0	13.6	19.3	7.3	***45.3***
	Package A	6.9	22.5	24.4	7.8	***61.6***
	Package B	7.0	26.5	25.1	8.6	***67.1***
Total Suspended Solids (pounds per event)	Existing	3,550	9,700	12,400	5,220	***30,900***
	No-Action	3,550	9,700	13,700	5,220	***32,200***
	Package A	4,940	16,000	17,300	5,510	***43,800***
	Package B	4,960	18,900	17,800	6,080	***47,700***
Dissolved Zinc (pounds per event)	Existing	0.71	1.95	2.5	1.05	***6.20***
	No-Action	0.71	1.95	2.8	1.05	***6.46***
	Package A	0.99	3.2	3.5	1.11	***8.80***
	Package B	1.0	3.8	3.6	1.22	***9.59***

Note: Results presented in this table indicate modeled total pounds of contaminant discharged per component per event.
[1] - Total loading values have been rounded to three significant figures.

Figure 3.7-4 Driscoll Model Results by I-25 Highway Component for Dissolved Copper

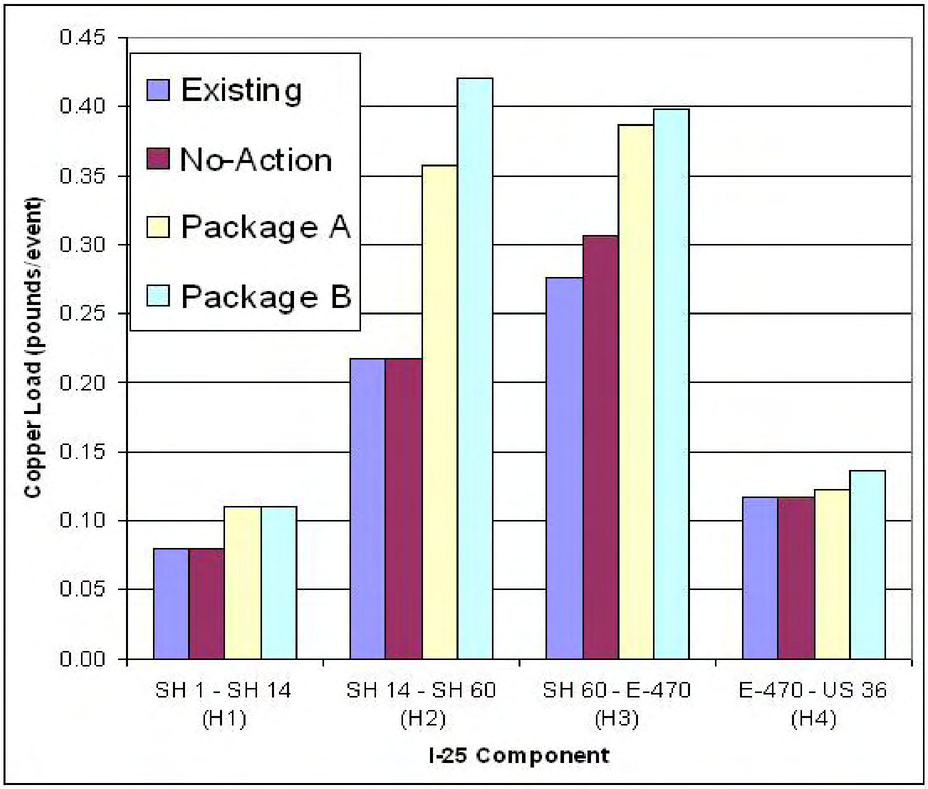
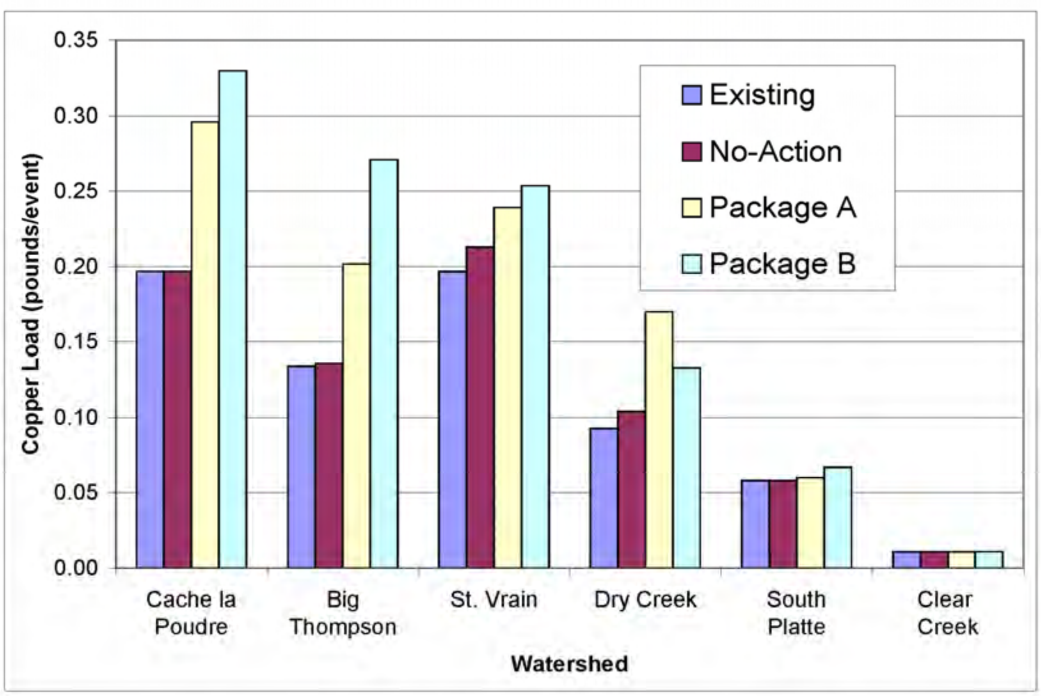


Figure 3.7-5 Driscoll Model Results by Watershed for Dissolved Copper



Constituent loading is measured in pounds of constituent leaving the roadway per a median rainfall event. The relationship between the alternative's loading is the same for every constituent analyzed in the Driscoll model, only the magnitude of the loading changes. The loads for the existing conditions are used as a "baseline" comparison for each build package. The No-Action Alternative has the lowest predicted constituent loading of all of the project alternatives.

Since the Driscoll model is a screening tool that differentiates impacts among alternatives, the results should not be used to determine if water quality standards are expected to be exceeded. The loading information from the Driscoll model is used to comparatively estimate which alternative may have more water quality impacts. It can be assumed that an alternative with a higher predicted load (i.e., a greater quantity of constituent leaving the road) would have more water quality impacts than another alternative. Alternative-specific discussion of the Driscoll model results are presented in the following sections.

Traffic. Water quality impacts were also assessed by comparing the projected annual average daily traffic (AADT) volumes. Several research studies have suggested that a correlation exists between stormwater runoff quality and annual average daily traffic (AADT) volumes (FHWA, 1990; Kayhanian and others, 2003). In general, urban areas with greater than 30,000 AADT have been shown to have higher pollutant concentrations of certain constituents when compared with non-urban areas with AADT less than 30,000. However, the correlation between AADT and pollutant concentrations is not consistent for all pollutants found in highway runoff. Pollutants related to transportation activities, such as zinc and copper, are expected to increase with AADT, while certain pollutants, such as total suspended solids, total dissolved solids, and ammonia, which are commonly found in highway runoff but generally associated with a non-urban setting are not expected to increase with AADT (FHWA, 1990; Kayhanian and others, 2003). Therefore, if left unmitigated, it can be assumed that an alternative with an AADT greater than 30,000 would have higher concentrations of certain constituents in runoff than an alternative with an AADT less than 30,000.

Table 3.7-6 presents the projected traffic volumes for the alternative components on I-25. The majority of the existing traffic volumes and all of the proposed traffic volumes are greater than 30,000 AADT. However, traffic volumes can still be used to compare alternatives from a water quality perspective. For example, an alternative with a higher traffic volume would be expected to have a higher amount of pollutants from vehicles being washed from the roadway; however the magnitude of difference may not be significant. In general, the projected traffic volumes are relatively similar between the project alternatives and range from nearly two to three times the existing traffic volumes. The greatest travel demand is generated in the southern portion of the project area between E-470 to US 36 (H4) followed by SH 60 to E-470 (H3), SH 14 to SH 60 (H2), and SH 1 to SH 14 (H1).

Table 3.7-6 Projected Traffic Volumes (AADT) from the North I-25 Project Alternatives

Package	SH 1 to SH 14 *(H1)*	SH 14 to SH 60 *(H2)*	SH 60 to E-470 *(H3)*	E-470 to US 36 *(H4)*
Existing	19,100 – 40,800	40,800 – 65,100	65,000 – 96,700	87,200 – 180,700
No-Action	34,500 – 80,700	80,700 – 108,400	104,400 – 174,200	153,400 – 232,100
Package A	35,400 – 82,700	82,700 – 132,500	118,100 – 187,300	157,400 – 234,500
Package B	35,800 – 85,500	85,500 – 114,500	105,600 – 185,200	165,300 – 245,600

Construction and Drainage. Water quality impacts from construction activities are discussed qualitatively based upon the current state of practice for construction within CDOT. Impacts to the drainage system are briefly discussed in this section; however, the detailed analysis of the drainage system is presented in the **Section 3.9** *Floodplains*.

Groundwater

Groundwater quality impacts were evaluated by estimating the number of groundwater wells within the proposed right-of-way (see **Table 3.7-7**). The number of groundwater wells located within the proposed right-of-way was evaluated because active groundwater wells would need to be relocated, and existing wells would need to be plugged, sealed, and abandoned. For wells located within the proposed right-of-way, the status of groundwater well use will have to be determined prior to construction activities to identify the necessary course of action. For example, if a well is still active, the relocation would be required, while inactive wells can be abandoned.

Table 3.7-7 Summary of Groundwater Wells within the Project Area

Package		SH 1 to SH 14 *(H1)*	SH 14 to SH 60 (H2)	SH 60 to E-470 (H3)	E-470 to US 36 (H4)	Stations and Maintenance Facilities[1]	Total
Package A	**Wells within Proposed Right-of-way**	13	47	26	19	0	**105**
Package B	**Wells within Proposed Right-of-way**	13	47	28	21	2	**111**

Note: [1] – Includes all transit stations and associated parking lots and CDOT maintenance facilities and associated parking lots.

3.7.3.2 NO-ACTION ALTERNATIVE

The No-Action Alternative includes safety and maintenance improvements that would need to be constructed if the build packages were not implemented. Major and minor structure maintenance activities are expected to occur on I-25 from US 36 to SH 1. Safety improvements are anticipated at selected locations from WCR 34 to SH 1. See **Chapter 2** for additional description of the No-Action Alternative. The No-Action Alternative does not include transit components.

Surface Water

Impervious Surfaces. Direct effects on surface water quality from increases in impervious surface area would be negligible under the No-Action Alternative. This is because the No-Action Alternative has relatively minor contributions of impervious surface area from any structure upgrades, such as interchange improvements or bridge replacements.

The quality of stormwater runoff would be dependent on the implementation of BMPs associated with No-Action Alternative activities within MS4 areas. Projects over one acre in size associated with the No-Action Alternative that are located within MS4 areas will require BMPs, thereby reducing impacts from increased impervious surface area. The percentage of the impervious surface area treated by BMPs for the No-Action Alternative is substantially less than either of the package alternatives. This means that the majority of stormwater runoff from I-25 would continue to not be treated prior to discharging to water bodies.

Under the No-Action Alternative only 11.2% of the impervious surfaces within the project area are currently being treated. This area is within the SH 60 to E-470 (H3) component and the majority of increased pollutants deposited from vehicles would not pass through a BMP prior to discharge to receiving water bodies.

Driscoll Model. As previously mentioned, the results of the Driscoll model are presented as a screening tool to differentiate impacts among alternatives and not to determine if water quality standards are expected to be exceeded. The No-Action Alternative has the lowest estimated contaminant loading of the three alternatives (see **Table 3.7-5**). The only component with an increase in loading greater than the existing conditions is the SH 60 to E-470 (H3) component. This component crosses the Big Thompson River, St. Vrain Creek, and Big Dry Creek watersheds. The remaining components have the same estimated loading as the existing conditions.

Traffic. While the amount of impervious surfaces for the No-Action Alternative is approximately 689 to 744 acres less than the build package alternatives, the increase in future traffic volumes should also considered. Chemicals and other pollutants deposited along I-25 within the project area and mobilized within stormwater runoff would continue to increase as traffic volumes continue to increase along the I-25 highway corridor over time. The largest potential increase in traffic would likely occur in the SH 60 to E-470 (H3) component. This component currently has the greatest impervious surface area (see **Table 3.7-4**) and crosses the Big Thompson River, St. Vrain Creek, and Big Dry Creek watersheds.

Construction. Major and minor structure maintenance activities, such as demolition and construction of bridges and interchange improvements would have construction-related impacts at all stream crossings if left unmitigated. These impacts and the proposed mitigation to minimize these impacts are included in **Table 3.7-3.**

Drainage System. Major drainage impacts that result from cross drainage are addressed in **Section 3.9** *Floodplains*. Minor drainage features includes storm drainage pipes, inlets, open channels, and other facilities that are used to convey local storm drainage.

Drainage improvements associated with the No-Action Alternative would occur in several areas where roadway improvements are currently planned. Anticipated drainage improvements for the No-Action Alternative would include a more efficient storm drainage system of pipes, inlets, open channels, and water quality facilities. There would be no drainage improvements for the E-470 to

US 36 (H4) component in the No-Action Alternative and impacts from an inadequate drainage system would occur in this area.

Groundwater

Groundwater impacts are not expected as a result of major and minor structure maintenance activities associated with the No-Action Alternative.

3.7.3.3 PACKAGE A

Package A contains four highway and four transit components. The package includes construction of additional general purpose and auxiliary lanes on I-25 and implementation of commuter rail and commuter bus service. Construction of associated elements, such as commuter rail and bus stations, carpool lots, bridges, interchanges, and queue jumps, also was considered in this analysis. This package is described in detail in ***Chapter 2*** *Alternatives.*

For purposes of this analysis, impervious surface areas include I-25 and associated interchanges, transit stations, maintenance facilities, and carpool lots. Rail lines were not included as impervious surfaces as part of this analysis because rail ballast material is relatively permeable.

Surface Water

Impervious Surfaces. Direct effects on surface water quality that are common to all Package A components would result from the addition of paved impervious surfaces, primarily from highway widening for additional general purpose lanes and associated interchanges, bridges, and carpool lots. Package A would result in more impervious surface area (1,946 acres) than the existing impervious area (1,212 acres), and the No-Action Alternative (1,257 acres). At the component level, impacts to water quality due to the addition of impervious surface area are expected to be the greatest as a result of highway widening from SH 14 to SH 60 (A-H2) (635 acres). This component crosses the Cache la Poudre River and Big Thompson River watershed.

To fully understand the impacts from impervious surface area for an alternative, it is important to consider the greater area surrounding the project. There are approximately 159,223 acres of total impervious surface area that exists within the regional study area from commercial and residential developments and other infrastructure. This gives context to the total impervious surface of Package A in relation to its surroundings that the impervious surface area associated with Package A is a small fraction (1.2 percent) of the overall impervious areas in the regional study area.

Driscoll Model. As previously mentioned, the results of the Driscoll model are presented as a screening tool to differentiate impacts among alternatives and not whether or not water quality standards are expected to be exceeded. The Package A estimated contaminant load for the northern and southern components (SH 1 to SH 14 [A-H1] and E-470 to US 36 [A-H4], respectively) are slightly greater than the existing conditions. The estimated loadings from the two middle components are considerably greater than the existing conditions. The Cache la Poudre and Big Thompson watersheds have the highest increased load from existing conditions, both approximately a 50 percent increase. These watersheds show the greatest increase in loading because of the SH 14 to SH 60 [A-H2] and SH 60 to E-470 [A-H3] components are within these watersheds. The Package A components estimated loadings are less than the Package B components.

Traffic. In general, the projected traffic volumes are relatively similar between the project alternatives and range from nearly two to three times the existing traffic volumes (See

Table 3.7-6). Therefore, Package A would cause an increase in the amount of pollutants being washed from the roadway due to increased traffic volumes. All of the proposed traffic volumes for the Package A components are greater than 30,000 AADT. The greatest predicted travel demand is generated in the southern portion of the project area between E-470 to US 36 (A-H4) followed by SH 60 to E-470 (A-H3), SH 14 to SH 60 (A-H2), and SH 1 to SH 14 (A-H1). However, the SH 1 to SH 14 (A-H1) component would be expected to have the most significant increase in pollutants because existing traffic in this segment is at times currently less than 30,000 AADT, which is generally characteristic of non-urban areas. Project activities in this segment would cause traffic to increase to levels characteristic of urban areas (i.e., greater than 30,000 AADT), which have higher pollutant concentrations of certain constituents when compared with non-urban areas with AADT less than 30,000 (see **Section 3.7.3.1)**.

If stormwater is left unmitigated, consequences from increased impervious surfaces and traffic would include an increase in water velocities and volumes, and an increase in the type and quantity of chemicals and other pollutants that are deposited along I-25 (see **Table 3.7-4)**. However, the incorporation of BMPs into the design will remove a large amount of the chemicals and sediment that could be deposited within surface water bodies within the project area. Under the Package A Alternative, water quality ponds will provide a volume sufficient to treat approximately 1,765 acres (90.7%) of the impervious surfaces within the project area. This is compared to the existing 2.4% of the impervious surfaces within the project area that are currently being treated. Consequently, it is anticipated that water quality conditions will improve with Package A when compared to the existing or the No-Action Alternative conditions.

Construction. The implementation of the Package A Alternative would result in construction-related impacts at all stream/ditch/canal crossings if left unmitigated. Other water bodies that may not cross I-25, but are within the construction footprint (including staging areas) would also be affected. The majority of construction related impacts results from the demolition and/or construction of structures, rail lines, and highway lanes. Construction-related impacts and the proposed mitigation to minimize these impacts are included in **Table 3.7-3.** The proposed construction mitigation measures are summarized in **Section 3.7.4** and are required by permit and policy on CDOT projects.

Drainage. Major drainage impacts that result from cross drainage are addressed in **Section 3.9** *Floodplains*. General purpose lanes on I-25 for the SH 14 to SH 60 (A-H2) component and for the SH 60 to E-470 (A-H3) component would require that modifications be made to existing drainage systems or that a new drainage conveyance system be installed. By installing new drainage structures (e.g., storm drainage pipes, inlets, open channels and other facilities conveying local storm drainage), no additional impacts to the drainage system are anticipated. These structures could actually improve the drainage system when compared to the current and No-Action Alternative conditions.

Groundwater

The construction of the Package A Alternative could require addressing up to 105 wells that are within the proposed right-of-way (see **Table 3.7-7**). The status of groundwater well use will have to be determined prior to construction activities to identify the necessary course of action for each well. Active wells would need to be relocated, and all active and non-active wells would need to be plugged, sealed, and abandoned.

3.7.3.4 PACKAGE B

Package B contains four highway components and three transit components. The package generally includes the construction of tolled express lanes on I-25 and implementation of bus rapid transit service. Construction of associated elements, such as bus stations, carpool lots, bridges, interchanges, and queue jumps, was also considered in the component-level analysis. This package is described in detail in ***Chapter 2*** *Alternatives.*

For purposes of this analysis, impervious surface areas include I-25 and associated interchanges, transit station, maintenance facilities, and carpool lots.

Surface Water

Impervious Surfaces. Direct effects on surface water quality that are common to all Package B components would result from the addition of paved impervious surfaces, primarily from highway widening for additional tolled express lanes and associated interchanges, bridges, and carpool lots. Package B would result in more impervious surface area (2,001 acres) than the existing impervious area (1,212 acres), and the No-Action Alternative (1,257 acres). At the component level, impacts to water quality due to the addition of impervious surface area are expected to be the greatest from highway widening from SH 14 to SH 60 (B-H2) (773 acres). This component crosses the Cache la Poudre River and Big Thompson River watersheds.

To fully understanding the impacts from impervious surface area for an alternative, it is important to consider the greater area surrounding the project. There are approximately 159,223 acres of total impervious surface area that exist within the regional study area from commercial and residential developments and other infrastructure. This gives context to the total impervious surface of Package B in relation to its surroundings.

Driscoll Model. As previously mentioned, the results of the Driscoll model are presented as a screening tool to differentiate impacts among alternatives and not whether or not water quality standards are expected to be exceeded. The Package B estimated contaminant load for the northern and southern components (SH 1 to SH 14 [B-H1] and E-470 to US 36 [B-H4], respectively) are slightly greater than the existing conditions. The estimated loadings from the two middle components (SH 14 to SH 60 [B-H2] and SH 60 to E-470 [B-H3]) are considerably greater than the existing conditions. The Cache la Poudre River and Big Thompson River watersheds have the highest increased load from existing conditions, approximately a 68 and102 percent increase, respectively.

Package B has the greatest estimated loadings of all alternatives.

Traffic. In general, the projected traffic volumes are relatively similar between the project alternatives and range from nearly two to three times the existing traffic volumes (See **Table 3.7-6**). Therefore, Package B would cause an increase in the amount of pollutants being washed from the roadway due to increased traffic volumes. All of the proposed traffic volumes for the Package B components are greater than 30,000 AADT. The greatest predicted travel demand is generated in the southern portion of the project area between E-470 to US 36 (B-H4) followed by SH 60 to E-470 (B-H3), SH 14 to SH 60 (B-H2), and SH 1 to SH 14 (B-H1).

If stormwater is left unmitigated, consequences from increased impervious surfaces and traffic would include an increase in water velocities and volumes, and an increase in the type and quantity of chemicals and other pollutants, such as sediment, that are deposited within the project area (See **Table 3.7-3**). However, the incorporation of BMPs into the roadway design will remove a large amount of chemicals and sediment deposited within surface water bodies within the project area. Under the Package B Alternative, water quality ponds will provide a volume sufficient to treat approximately 2,509 acres (125%) of the impervious surfaces within the project area. This is compared to the existing 2.4% of the impervious surfaces within the project area that are currently being treated. Consequently, it is anticipated that water quality conditions will improve when compared to the existing and No-Action Alternative conditions.

Construction. The implementation of the Package B Alternative would result in construction-related impacts at all stream/ditch/canal crossings if left unmitigated. Other water bodies that may not cross I-25, but are within the construction footprint (including staging areas) would also be affected. The majority of construction related impacts results from the demolition and/or construction of structures and highway lanes. Construction-related impacts and the typical mitigation to minimize these impacts are included in **Table 3.7-3.** The proposed construction mitigation measures are summarized in **Section 3.7.4**.

Drainage. Major drainage impacts that result from cross drainage are addressed in **Section 3.9** *Floodplains*. The roadway improvements associated with Package B would require existing drainage system modifications or a new drainage conveyance system. By installing new drainage structures (e.g., storm drainage pipes, inlets, open channels and other facilities conveying local storm drainage), no additional impacts to the drainage system are anticipated. These structures could actually improve the drainage system when compared to the No-Action Alternative.

Groundwater

The construction of the Package B Alternative could require the relocation of up to 111 wells that are within the proposed right-of-way (see **Table 3.7-7**). The status of groundwater well use will have to be determined prior to construction activities to identify the necessary course of action. Active wells would need to be relocated, and all active and non-active wells would need to be plugged, sealed, and abandoned.

3.7.4 Mitigation Measures

This section summarizes the BMPs that have been incorporated as water quality mitigation measures into the alternative packages.

3.7.4.1 Surface Water Quality

If stormwater runoff is left unmitigated, the No-Action Alternative and Packages A and B would have water quality impacts due to changes in stormwater characteristics from the addition of impervious surface area and increases in traffic levels. Other impacts would result from the demolition and construction of roadways and structures (e.g., bridges, culverts, piers, retaining walls) near surface water bodies. To reduce the impacts to water resources, a combination of mitigation measures consisting of permanent structural, nonstructural, and temporary construction BMPs will be implemented in the project area, in compliance with the Clean Water Act and CDOT's MS4 permit requirements. BMPs will include water collection and passive treatment of stormwater, which is currently being directly discharged into existing water systems. In addition, the BMPs may also provide protection to receiving waters from chemical spills that could occur in the project area.

Structural BMPs

Permanent structural BMPs have already been identified and sited for major stream systems in the project area. Permanent structural BMPs will be constructed with the project and maintained to ensure their functionality. Water quality ponds and riprap outlet protection are examples of structural BMPs. Consistent with CDOT's MS4 design criteria identified in the New Development and Redevelopment Program (CDOT, 2004a), the performance criteria that have been selected for permanent structural BMPs within the project area are 100 percent water quality capture volume (WQCV) or 80 percent total suspended solids (TSS) removal. The removal efficiencies for these types of BMPs (e.g., extended detention basin) are 50 percent to 70 percent (TSS), 10 percent to 20 percent (total phosphorus), and 30 percent to 60 percent (total zinc) (CDOT, 2004a).

Water Quality Ponds. Extended detention/retention ponds have been identified as the primary structural BMP for this project. Maintenance personnel have requested that water quality ponds be used rather than vaults. This is primarily because water quality ponds are much easier to maintain, whereas vaults often require extra time to clean out. Also, maintenance personnel are required to obtain Occupational Safety and Health Administration (OSHA) confined space entry certification for vault maintenance activities.

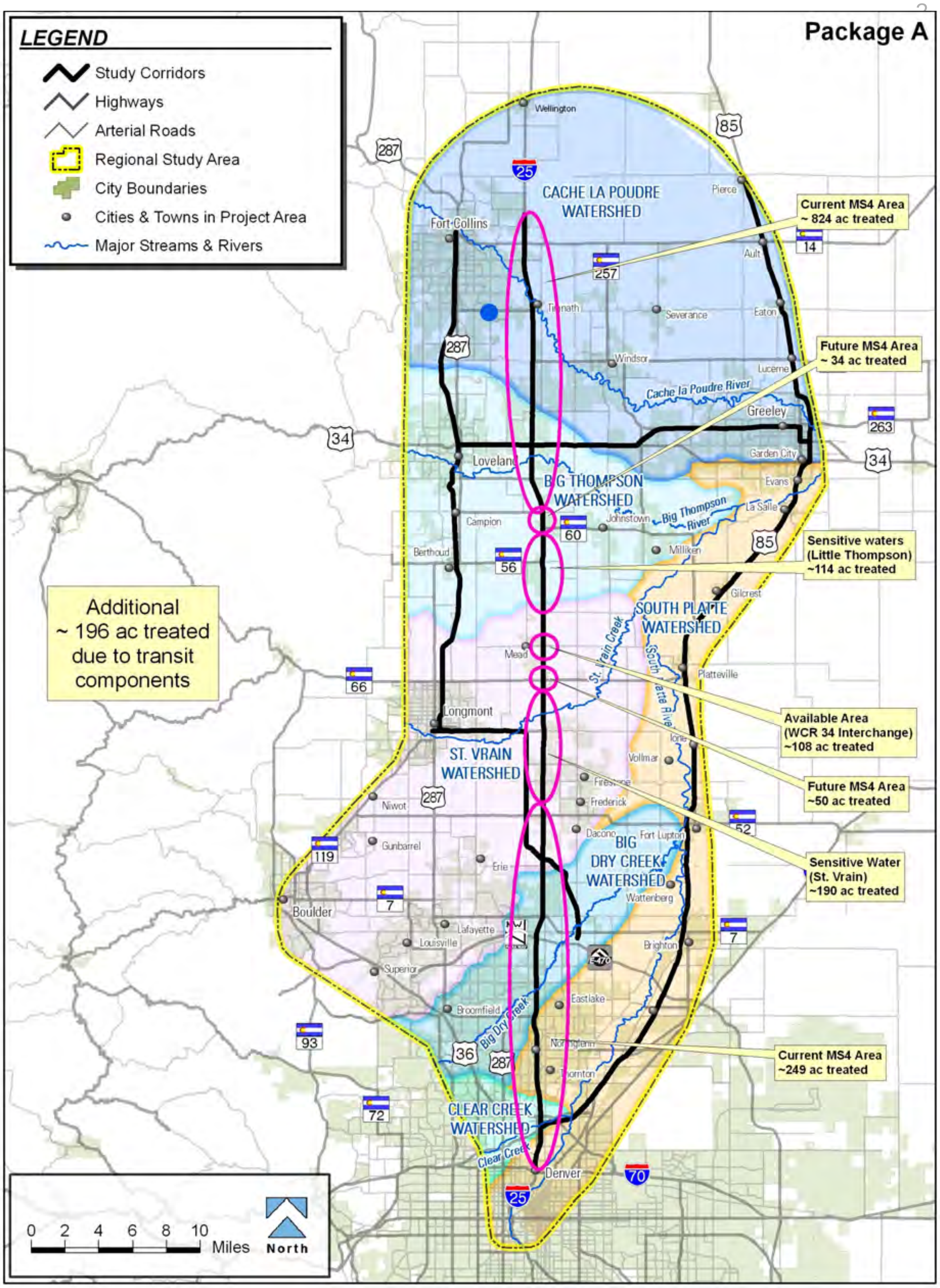
The No-Action Alternative has only 2 areas with BMPs (water quality ponds), which are associated with the No-Action improvements. Additional water quality ponds have been incorporated into the design of Packages A and B. Physical design constraints, adjacent property uses, and right-of-way requirements were analyzed and considered during the design process. It is anticipated that types and sizes of BMPs could be modified in the future. When possible, passive BMPs (e.g., grass swales or natural infiltration) will be used for ephemeral streams along the corridor that could reasonably discharge pollutants into perennial stream systems. The preliminary drainage design for Packages A and B is based on the CDOT *Drainage Design Manual* (CDOT, 2004a) and Volume 3 of the Urban Drainage and Flood Control District (UDFCD) *Urban Storm Drainage Criteria Manual* (UDFCD, 2001).

The locations for water quality ponds have been identified throughout the project area for Packages A and B. The placement of these BMPs was determined using a rating system that was based on existing and likely future MS4 areas, locations of sensitive surface water systems and/or irrigation canals, and physical design opportunities. More detailed information on BMP placement is provided in the *Water Quality and Floodplains Technical Report* (FHU, 2008b).

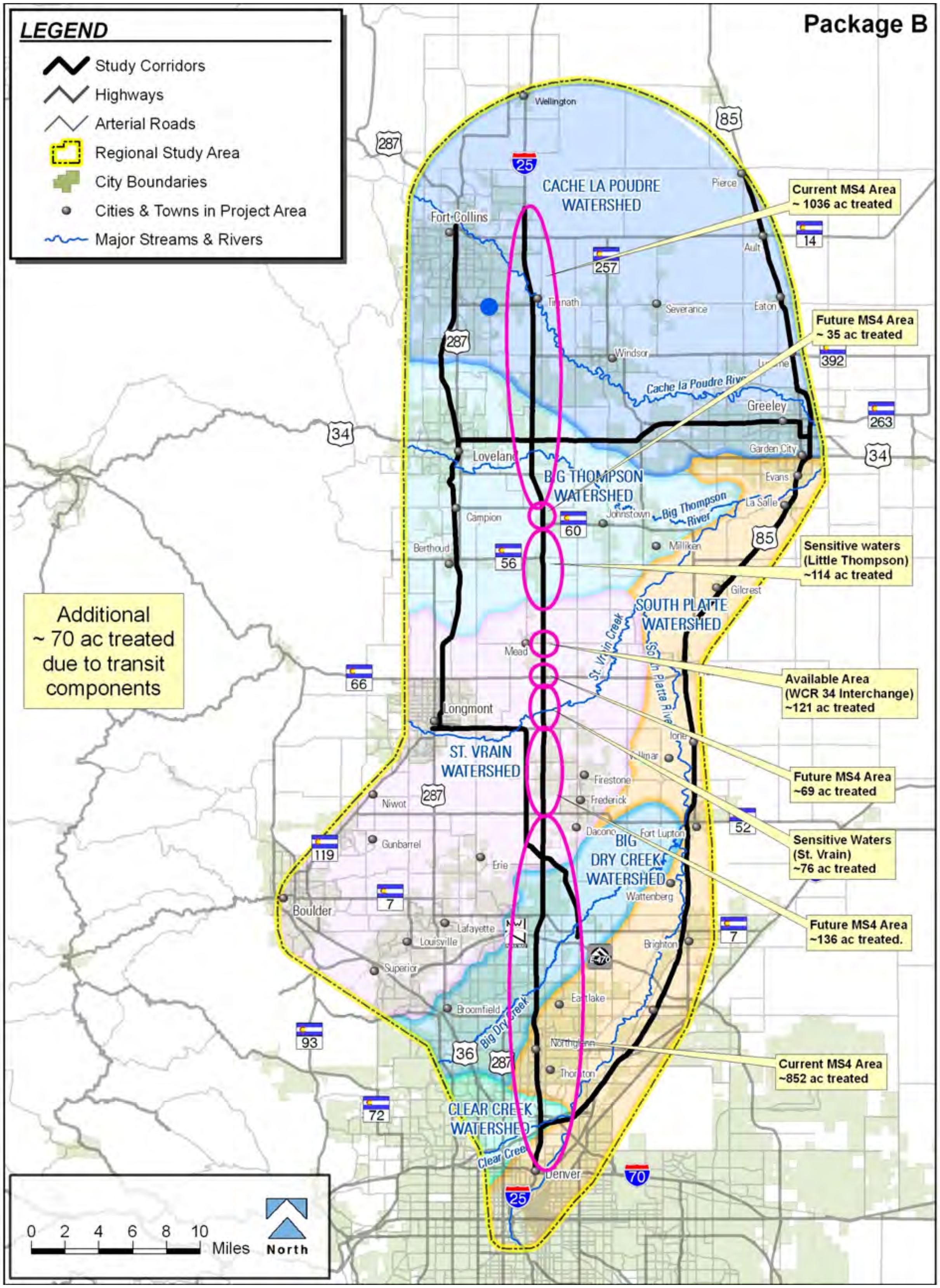
Figures 3.7-6 and 3.7-7 show the areas along the I-25 corridor where water quality ponds are proposed. They also show the reason why ponds were included in each particular stretch of the corridor. As previously discussed, Package A would provide ponds with a capacity to treat 90.7 percent of the total impervious surface area, while Package B would provide ponds with a capacity to treat 125 percent of the total impervious surface area. A percentage greater than 100 indicates that the volume provided is greater than the defined water quality capture volume, which is equal to one-half inch of rainfall times the impervious area. Capture volumes greater than 100 percent can sometimes be used to offset other locations on the highway system where 100 percent capture cannot be achieved. These are dramatically greater than the existing conditions (2.4 percent) and the No-Action Alternative (11.2 percent).

Water quality ponds are only proposed along the I-25 corridor. No roadway improvements are proposed along the US 85 corridor, except for the addition of five very small impervious areas for bus queue jumps at select intersections. The Water Quality Capture Volume (WQCV) for these queue jumps is less than 0.1 acre-feet. To ensure 100 percent WQCV, the queue volume impervious surfaces area has been accounted for in the ponds along I-25. It is not practical to place water quality ponds along the US 85 corridor because a new drainage system would be required to carry the water to a BMP.

Figure 3.7-6 Package A - Areas of Future Water Quality Treatments



1 **Figure 3.7-7 Package B - Areas of Future Water Quality Treatments**



The application of water quality ponds as part of Package B is expected to reduce the amount of iron discharged from the roadway to Segment 1 of Big Dry Creek, which is on CDPHE's Monitoring and Evaluation list for Iron, by approximately 50 to 60 percent (FDEP, 1999). The improvements in the E-470 to US 36 (B-H4) segment of Package B, where Segment 1 of Big Dry Creek lies, are expected to increase all pollutant loadings—including iron—by approximately 30 percent (see **Table 3.7-10**). This demonstrates that the water quality ponds can improve the water quality conditions at Big Dry Creek over the existing conditions. However, Package A does not have any roadway improvements in the E-470 to US 36 (A-H4) component and therefore no water quality ponds would be provided to reduce the current iron loadings from the No-Action conditions.

Dissolved copper removal in water quality ponds is less than that of iron. Dissolved copper in Packages A and B are estimated to increase by 42 and 59 percent, respectively, over the existing conditions. Data from the USEPA shows that dissolved copper in extended dry detention basins ranges from 1.4 to 38 percent removal (USEPA 2008). While this is a wide range, it does show that there is potential for the proposed water quality ponds to remove dissolved copper to a level close to existing conditions.

As previously stated, removal efficiencies of 50 to 70 percent for Total Suspended Solids (TSS), 10 to 20 percent for total phosphorus, and 50 to 60 percent for iron are expected for the proposed water quality ponds.

Riprap. Riprap will be placed at bridge abutments, piers, and at critical portions of a channel or floodplain to avoid progressive or catastrophic failure of a structure. Riprap reduces water quality impacts by protecting stream systems from accelerated erosion and sedimentation processes that could occur from structures (see **Table 3.7-8**). The most effective method of stabilization at bridge abutments and piers is the use of riprap. Riprap that is correctly sized, is angular, and placed on a granular material or fabric, has a better record for erosion and scour protection than other methods such as vegetative cover. Despite its reliability, riprap must still be monitored and maintained. More detailed information on riprap layout and aesthetics is provided in the *Water Quality and Floodplains Technical Report* (FHU, 2008b).

Energy dissipation devices or materials, such as riprap, will control post-construction erosion near the bridge. According to SB40 Guidelines, riprap used above the ordinary high water level of the river that is not directly under a bridge must be covered with topsoil and vegetated.

Nonstructural BMPs (Construction and Post-Construction)

Nonstructural BMPs reduce or eliminate pollutant mobilization within stormwater runoff. Street sweeping, snow storage, and spill containment measures are examples of post-construction nonstructural BMPs. Project construction phasing is another nonstructural BMP to be implemented to minimize water quality impacts. Phasing construction activities minimizes the effects associated with large areas of exposed ground and with soil compaction from heavy machinery use, both of which are commonly associated with transportation projects. Construction nonstructural BMPs include mulch/mulch tackifier, soil retention blankets, vegetated buffer strips, and preservation of mature vegetation.

Temporary Structural BMPs (Construction)

There is also potential for impacts to surface water bodies during the demolition and construction of roadways and structures (e.g., bridges, culverts, piers, retaining walls). A Stormwater Management Plan and Notebook will be prepared in accordance with the current CDOT practices to ensure that temporary construction impacts are avoided or minimized. Temporary structural BMPs are implemented to reduce erosion associated with areas of ground disturbance while construction activities take place. These measures remain in place until CDOT determines they are no longer needed at the construction sites, such as when soil stabilizing vegetation has been reestablished. Silt fences, straw bale barriers, and temporary check dams are examples of temporary structural BMPs used during construction.

CDOT's specifications for managing stormwater at a construction site (currently specifications 107.25, 208, 212, 213, and 216) will be followed. When put into practice, the actions identified below will help avoid construction impacts:

- If lead paint is present, this material must not be allowed to flake off and enter receiving waters. (Section 402, Clean Water Act, CDPHE Regulation 61).
- If cranes and other equipment are used for bridge demolition within a river or streambank area, the equipment will be kept out of the river, and all work shall minimize temporary impacts to the river. The creation of a crane pad is necessary if cranes or other equipment cannot be kept out of the river.
- There is a potential for sediment to enter streams from land disruption and subsequent erosion. Therefore, BMPs such as protecting existing vegetation, placing structural BMPs, and limiting access areas will be implemented in compliance with the CDPHE general construction permit. Stormwater management plans must be developed during design and implemented during construction, and updated as needed to keep the project in compliance with the CDPS-SCP permit for the site.
- Caissons used to create bridge piers could require groundwater dewatering. A discharge permit and a treatment strategy will be needed before dewatering activities can occur.
- If other regulated materials are present within or on structures, they must be removed and appropriately recycled or disposed of prior to demolition activities. Typical materials include containerized regulated liquids such as paints, solvents, oil, grease, chemicals, pesticides, and herbicides, and chlorofluorocarbon (CFC) containing equipment (equipment must be emptied before equipment is removed) [Colorado Hazardous Waste Regulations (6 Colorado Code of Regulations [CCR] 1007-3)].
- A Senate Bill 40 (SB40) permit from the CDOW is required when construction occurs in "any streams or its banks or tributaries". This permit will include measures to protect existing riparian areas, such as mitigating stormwater runoff or replacing riparian vegetation (on a 1:1 basis for trees and a square footage basis for shrubs).

Permanent structural BMPs, nonstructural BMPs, and temporary construction BMPs must be regularly inspected and maintained to ensure functionality and efficiency. This includes inspections of proper BMP operation, outfall discharges and erosion protection, and detention pond sediment removal.

3.7.4.2 GROUNDWATER QUALITY

The status of groundwater well use will have to be determined prior to construction activities to identify if active wells are present. Active wells in the final right-of-way will need to be relocated and non-active wells would need to be plugged, sealed, and abandoned.

All wells that lie within the proposed right-of-way will be included in all project specifications and plan drawings. If any of these wells are affected by project activities, coordination with the Colorado Department of Labor and Employment, Division of Oil and Public Safety will be required. If necessary, wells must be plugged, sealed, and abandoned according to CDOT Section 202.02 Standard Specifications for Road and Bridge Construction and in conformance with the State Engineer well abandonment procedures.

If groundwater is encountered during activities associated with excavations for caisson/retaining walls, the discharge of groundwater is authorized if the following conditions are met.

- the source is groundwater and/or groundwater combined with stormwater that does not contain pollutants in concentrations exceeding the State groundwater standards in Regulations 5 CCR 1002-41 and 42;
- the source is identified in the Stormwater Management Plan (SWMP);
- dewatering BMPs are included in the Stormwater Management Plan (SWMP), and
- these discharges do not leave the site as surface runoff or to surface waters.

If these conditions are not met, then a separate Clean Water Act Section 402 Construction Dewatering Permit or Individual Construction Dewatering Permit will be required to be obtained from the CDPHE - WQCD. In addition, if dewatering is necessary, groundwater brought to the surface will be managed according to Section 107.25 of the CDOT *Standard Specifications for Road and Bridge Construction* (CDOT, 2005).

3.7.4.3 DRAINAGE

Approximate locations of water quality ponds are shown in the DEIS design plans. Higher flows will be allowed to pass off of the right-of–way and into a drainageway. Storm drainage should be separated from irrigation facilities, wetlands, and sensitive areas. Drainage at bridges, super elevation transitions, ramp gores, and low areas will be analyzed and coordinated into the design. Detailed storm drainage for the Preferred Alternative will be determined during final design.

The implementation of commuter rail or bus service will require similar drainage improvements. The CDOT *Drainage Design Manual*, the CDOT *Erosion Control and Stormwater Quality Guide* (CDOT, 2002), and the Urban Drainage and Flood Control District *Urban Storm Drainage Criteria Manual* will be consulted for guidance during design.