Technical Report:
Water Resources and Water Quality

WATER RESOURCES EXISTING CONDITIONS

Water resources and water quality in the study area were addressed through site visits, review of Clean Water Act provisions (including a review of both the 303(d) and 305(b) lists prepared by the Colorado Department of Public Health and Environment), and evaluation of regional watershed planning documents.

The study area is located within the Fountain Creek Watershed of the Arkansas River Basin. The Fountain Creek watershed consists of approximately 930 square miles bounded by: Pikes Peak, the Rampart Range, and Ute Pass to the west; Monument Hill and the Palmer Divide to the north; and a divide between Fountain Creek and the Chico Creek basin to the east. The watershed elevation ranges from 14,100 feet at the summit of Pikes Peak to 4,600 feet in Pueblo.

Surface Water
Surface water resources within the study area include Fountain Creek, Crews Gulch, Clover Ditch and Willow Springs Ponds 1 and 2.

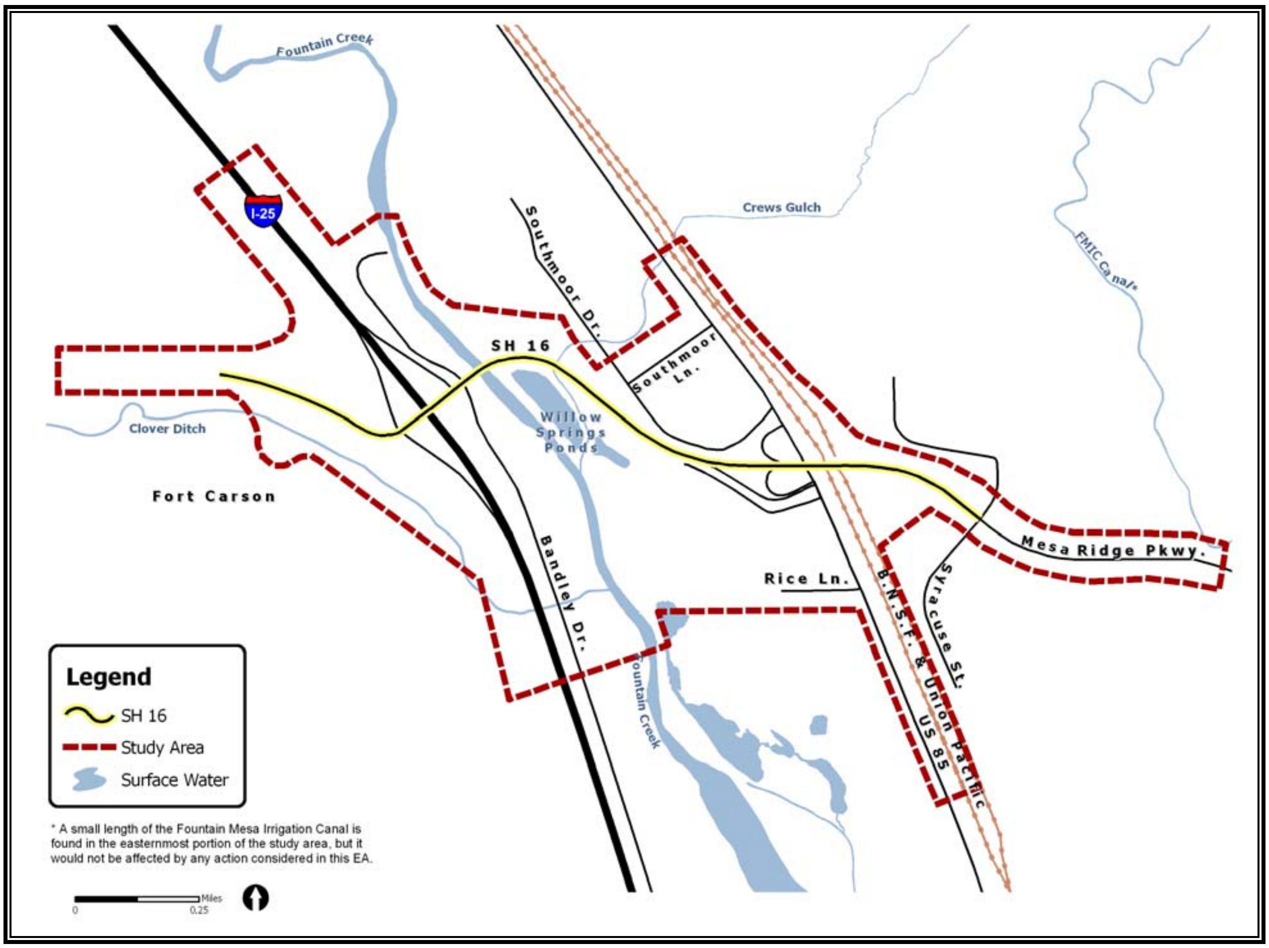
Fountain Creek, a perennial stream with a mean annual flow of 230 cubic feet per second, is the principal waterway of the Fountain Creek watershed and study area. The creek originates in the mountains in the northwest portion of El Paso County, flows south through Colorado Springs, and joins the Arkansas River at Pueblo, Colorado. High flow events associated with Fountain Creek have greatly increased since 1977, most likely due to the increase in impervious surface area in the Colorado Springs area. In the study area, downcutting, bank scour, and sparsely vegetated gravel bars are evident from the April 30, 1999 flash flood. During the flash flood, the estimated instantaneous peak flow immediately upstream from the study area was 17,600 cubic feet per second, and the flood elevation was 9.5 feet. Fountain Creek is a "waters of the United States" as defined in Section 404 of the Clean Water Act of 1977.

Crews Gulch is a minor intermittent tributary to Fountain Creek. This stream flows through Fountain Creek Regional Park from east of the SH 16 bridge to the confluence with Fountain Creek southwest of the Willow Springs Ponds.

Clover Ditch is a canal that flows into Fountain Creek about one-half mile south of the SH 16 Bridge over Fountain Creek.

Willow Springs Ponds 1 and 2 in Fountain Creek Regional Park were created by past gravel mining operations. Willow Springs Pond 1 is closest to SH 16 and covers approximately five acres. Pond 2, located southeast of Pond 1, covers approximately one acre. Surface water resources in and adjacent to the study area are shown by location in **Figure 1**.

Figure 1
Surface Water Resources in and Adjacent to the Study Area



Groundwater

Large quantities of groundwater are stored in the four primary aquifers of the Denver Basin which underlies much of the northeast to north-central region of El Paso County.

Available water varies from location to location because of previous use, present rates of pumping activity and the permeability of the subsurface. Much of the water contained in the upper layers and outer boundaries within these formations is considered to be tributary to surface water resources.

The City of Fountain currently obtains 78 percent of its water from the Fryingpan-Arkansas (Fry-Ark) Project (water diversion project). Mountain water melts into the Arkansas River, which flows into the Pueblo Reservoir. The water is then carried through the Fountain Valley Authority Pipeline into Fountain's Southwest & Goldfield Tank Sites. Fountain's remaining water (22 percent) comes from four wells located within and owned by the City of Fountain.

Municipal water wells located in and adjacent to the study area are shown in **Figure 2**. According to the *2002 Fountain Water System Master Plan* prepared by Black and Vetch, Fountain is moving toward a greater reliance on groundwater resources. The study estimates the source of future water supply will be 80 percent groundwater. The city's wells are currently positioned along the rechargeable Fountain Creek Alluvium. Future wells will also be located within this alluvium and should provide a reliable, renewable source of groundwater.

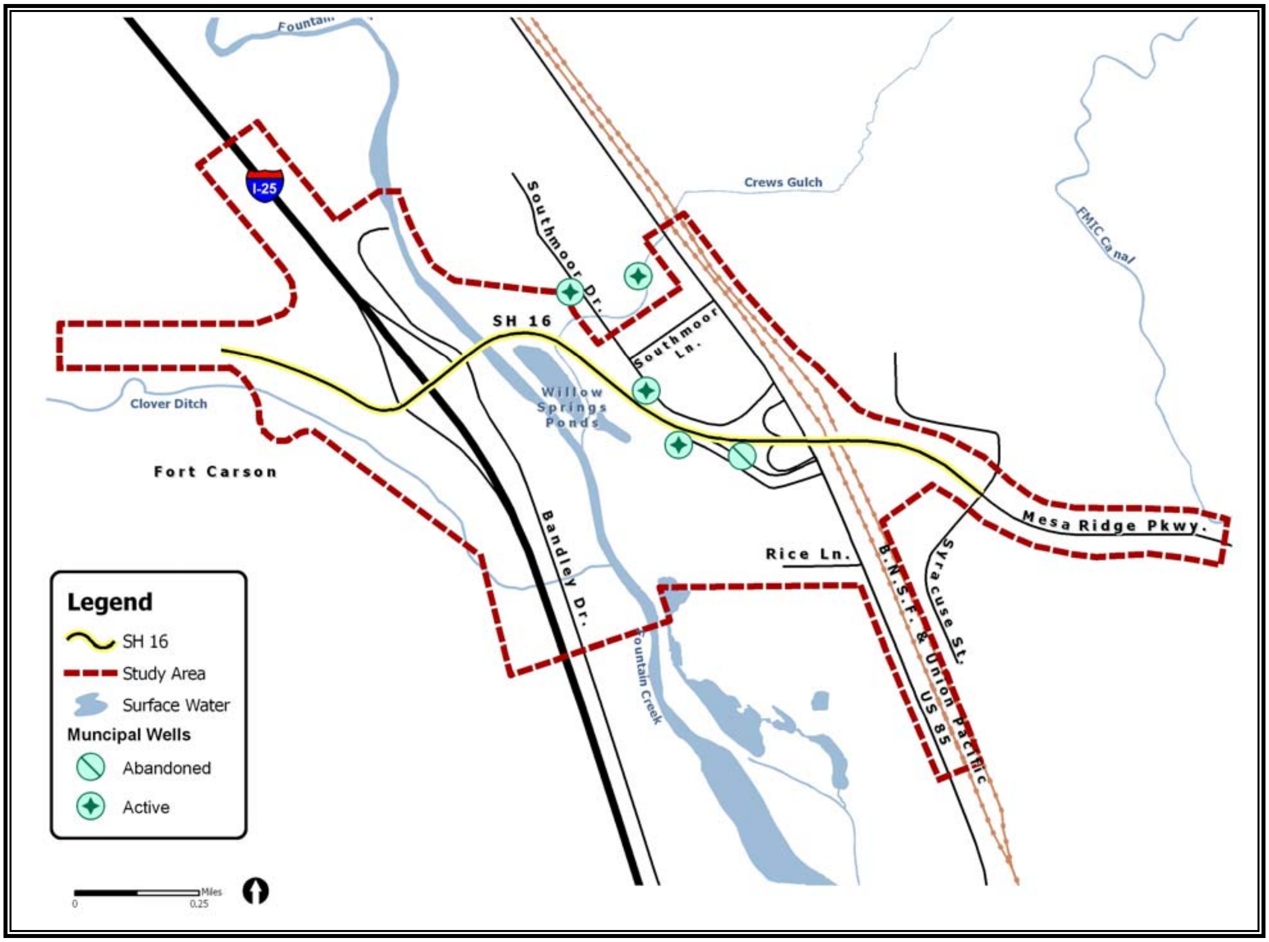
WATER QUALITY EXISTING CONDITIONS

To meet the requirements of the federal Clean Water Act, every two years the Colorado Water Quality Control Division of the Colorado Department of Public Health and Environment prepares a 303(d) List of Waters requiring TMDLs (Total Maximum Daily Loads). The waters listed are those for which technology-based effluent limitations and other required controls are not stringent enough to attain water quality standards. Fountain Creek, from Monument Creek to Steele Hollow Creek, was removed from the 303(d) list for manganese and selenium on March 11, 2003. This action followed July 2002 changes in which Arkansas Basin water supply use-based standards for manganese were modified and an ambient-based selenium standard was adopted. On September 13, 2006 several segments within the Arkansas River Basin were added to the 303(d) list. Those relevant to this study include Fountain Creek, from Monument Creek to SH 47 (listed for *E. coli*) and Fountain Creek and tributaries above Monument Creek (listed for *E. coli* and selenium).

Colorado Springs Utilities has recently monitored three major sewage spills into Fountain Creek. Two of these spills occurred in 2005. The first was caused by vandalism to a manhole cover and the second, by a flash flood. Together these spills sent more than 300,000 gallons of raw sewage into Fountain Creek. A blocked sewer main near

Fountain Boulevard (about six miles north of the SH 16 study area) caused the most recent spill in January 2006. This spill contained 44,000 gallons of raw sewage, much of which flowed into Fountain Creek.

Figure 2
Municipal Wells in and Adjacent to the Study Area



Pierre Shale formations are exposed within the study area along the floodplain and in the cut banks of Fountain Creek north of the existing SH 16 crossing. These formations are a natural source of selenium to groundwater. Similarly, erosion of shale formations due to increased stormwater runoff contributes to increased selenium in surface waters such as Fountain Creek.

According the Colorado Department of Public Health and Environment, tetrachloroethylene (PCE) has been found in the groundwater of the Widefield Aquifer.

PCE was used by the Schlage Lock Company facility in Security, Colorado from 1977 to 1992. Surface releases of this chemical from three source areas on Schlage Lock Company property resulted in the eventual migration of the contaminant to groundwater.

Once in the groundwater, PCE moved through the shallow aquifer for 3.5 miles to the Willow Springs Ponds area. All residential drinking water wells known to be impacted by this contamination have had treatment systems installed. Treatment of the groundwater has been on-going. Treatment of water within the Willow Springs Ponds is conducted using two aerators that have been placed in the north pond. Due to concerns over PCE contamination, both Willow Springs Ponds are currently closed to fishing, boating, and swimming.

Under Section 305(b) of the Clean Water Act, the Colorado Water Quality Control Division classifies surface water quality conditions according to the uses for which they are presently suitable or intended to become suitable. Suitable uses of Fountain Creek include:

- Class 2 Warm Water Aquatic Life: Waters ***not*** capable of sustaining a wide variety of cold or warm water biota
- Recreation Class 2: Surface waters ***not*** suitable or intended for primary contact recreational uses (e.g., swimming)
- Water Supply: Surface waters suitable or intended for potable water supplies
- Agriculture: Surface waters suitable, or intended to become suitable, for irrigation of crops and not hazardous as livestock drinking water

El Paso County has issued a fish consumption advisory for both of the Willow Springs Ponds, and currently prohibits fishing there.

No known water quality data is available for Crews Gulch or Clover Ditch.

Additional issues and characteristics of the Fountain Creek Watershed include sedimentation, bank erosion, flooding, non-point source pollution, wildlife habitat, wetlands, municipal water delivery, wastewater treatment facilities, floodplain zoning, and public recreation. Several regional watershed planning efforts in progress include:

- *Fountain Creek Watershed Plan* (2002) – documentation of watershed issues to aid a coordinated regional approach to protection and restoration. This effort is being led by the Pikes Peak Area Councils of Government.
- *Army Corps of Engineers Watershed Study* – evaluation of watershed erosion, sedimentation, and hydrology with identification of remedial projects. This effort is being led by the Albuquerque District of the U.S. Army Corps of Engineers.
- *Water Quality Management (208) Plan*—strategy recommendations for regulatory agencies to address regional water treatment needs and non-point source pollution issues. This effort is being led by the Pikes Peak Area Councils of Government.

WATER RESOURCES AND WATER QUALITY IMPACTS

No-Action Alternative

Urban development in the SH 16 study area is expected to continue in the future, whether or not improvements are made to SH 16. Continued roadway maintenance will be necessary to maintain existing water quality conditions. Substantial impacts to water resources or water quality are not expected to occur as a result of the No-Action Alternative.

The existing State Highway 16 and adjoining roadways were constructed prior to establishment of current Municipal Separate Stormwater Systems (MS4) requirements. Therefore, to a large degree, stormwater draining from the existing highway is not detained or treated before discharge to nearby waters. This would continue to be the case under the No-Action Alternative.

Proposed Action

The Proposed Action would result in an increase of impervious surface area due to the widening of SH 16 and reconstruction of the SH 16/I-25 and SH 16/US 85 interchanges. The paved surface area of the existing study area roadways (excluding the I-25 and US 85 mainlines) is approximately 21 acres while the paved surface area of the Proposed Action is approximately 31 acres. Therefore, the Proposed Action would increase the existing impervious surface area of SH 16 and the adjoining street system by 10 acres, or approximately 48 percent. In addition, the amount of daily traffic on SH 16 will increase 50 percent by 2030, thus increasing the amount of vehicle-generated water pollutants that have potential to reach nearby receiving waters.

Expansion of impervious surface area can increase the volume and pollutant load of highway runoff into receiving waters. Calculations were performed by Moser and Associates in 2004 to estimate the pollutant loading for three constituents (TSS, Total Kjeldahl Nitrogen and Copper). Calculations were performed for the average annual rainfall and for a 2-year event. **Table 1** summarizes the findings over the entire project area.

Table 1: Pollutant Loading Summary

Pollutants		2-Year 1 hour Event (1.0 in)[1]		Average Annual Rainfall Precipitation (15.4 in)	
		Pre-Project	Post-Project	Pre-Project	Post-Project
EMC (mg/L)		Pounds/Event		Pounds/Year	
Total Suspended Solids	142	1090	1587	16815	24495
Total Kjeldahl Nitrogen	1.83	14	20.5	216.7	315.7
Copper	0.054	0.4	0.6	6.4	9.3

[1] Value is an approximation obtained from the National Oceanic Atmospheric Administration (NOAA) Atlas.

Note: Pre-Project Impervious Area = 38.1 acres, Post-Project Impervious Surface Area = 55.5 acres.

The Proposed Action will be designed to capture 100% of stormwater runoff from the impervious surface associated with SH 16. The water quality mitigation features of the SH 16 will capture not only runoff from the newly added impervious surface, but also runoff from the existing lanes which were not constructed under MS4 requirements. The net result would be improved water quality from the highway runoff, compared to existing conditions.

Construction of the SH 16 Fountain Creek Bridge would require the placement of two piers below the ordinary high water elevation of Fountain Creek. Piers in this location are necessary to support the bridge span. Bridge construction could result in the sedimentation of nearby waterbodies resulting from accelerated soil erosion. Sediment discharged into receiving waters increases turbidity, heightens costs for water treatment, and affects aquatic plant and wildlife species.

In addition to impacts during construction, impacts from highway operations may affect water resources. Pollutants in highway runoff are varied and depend on such things as surrounding land uses, litter laws, auto-emission regulations, traffic characteristics, climatic conditions, and maintenance practices. These pollutants may affect streams in the study area, and include nutrients, petroleum products, lubricants, heavy metals from parts wear, trash and sediment.

WATER RESOURCES AND WATER QUALITY MITIGATION

The use of standard erosion and sediment control best management practices (BMPs) in accordance with the *Erosion Control and Storm Water Quality Guide*, CDOT, 2002 will be included in the final design plans. All work on this project will conform to Section 107.25 (Water Quality Control) and Section 208 (Erosion Control) of the *CDOT Standard Specifications for Road and Bridge Construction*. A Section 404 permit from the U.S. Army Corps of Engineers will be required for the placement of any fill within the ordinary high water line of Fountain Creek.

As noted above, the Proposed Action will be designed to capture 100% of stormwater runoff from the impervious surface associated with SH 16. The design will adhere to Colorado's MS4 (Municipal Separate Storm Sewer System) Phase II Stormwater Regulations. Under Phase II, CDOT will develop, implement, and enforce a Stormwater Management Program designed to capture the discharge of pollutants. Both CDOT and El Paso County hold MS4 Phase II Permits and participate in the Colorado Discharge Permit System (CDPS) program. Because these permits may overlap geographically and in content, close coordination between the two agencies holding MS4 permits will be required to identify and implement the most appropriate elements of the permit.

To minimize water quality impacts and to comply with stormwater permit regulations, permanent stormwater quality control BMPs will be implemented. **Table 2** lists the general permanent BMPs that were considered for this project.

Conceptual locations for water quality basins within the study area are shown in **Figure 3**. These basins would require five acres of land outside of CDOT's right-of-way. Subsequent to these conceptual plans, an evaluation of the feasibility of various Permanent Stormwater Quality Facilities (PSQFs) was conducted August/September 2006. Nineteen water quality basins and one "direct flow" area were identified within the project limits. The impervious surface area and runoff volume was determined for each basin. PSQFs were then identified that could capture the anticipated runoff volumes and best accommodate right-of-way restrictions. A preliminary screening of the entire inventory of PSQFs within CDOT's "Erosion Control and Stormwater Quality Guide, 2002" was conducted to determine which facilities were practical for use in the project area (see **Table 3**).

Those PSQFs that were identified as practical were then evaluated for their ability to capture 100% of the runoff from impervious areas resulting from the SH 16 improvements. As a result of this process it was determined that 100% of the runoff from the Proposed Action could be intercepted and conveyed through 18 PSQFs. The conceptual grading plans for each of the PSQFs are included in the Water Quality Assessment Report (Moser & Associates Engineering, 2006)

Figure 3
Conceptual Locations for Water Quality Basins

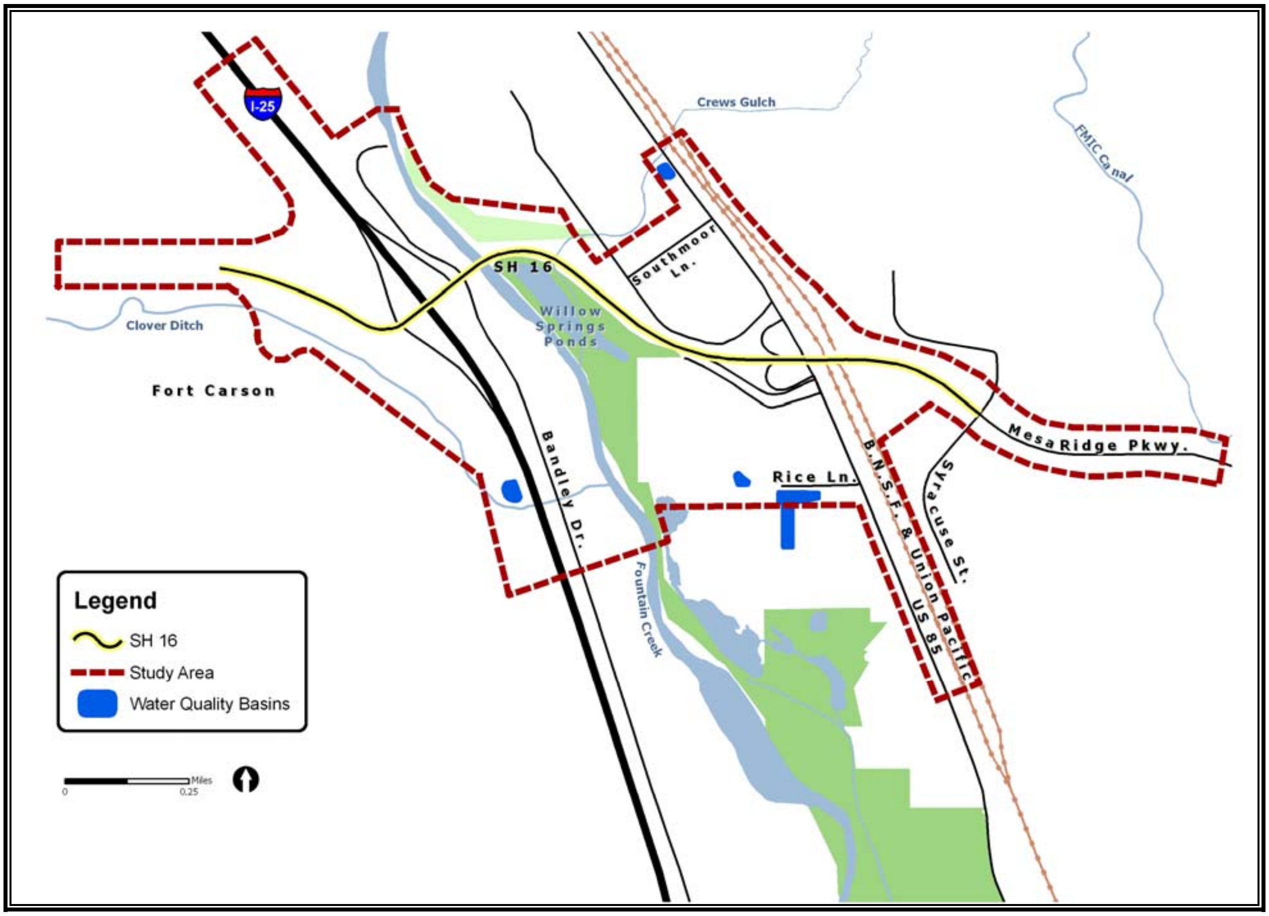


Table 2: Comparison of Structural Stormwater Best Management Practices Considered

BMP	Treatment Mechanism [(a)(b)(c)]	Total Suspended Solids	Phosphorous	Nitrates	Metals	Bacteria	Maintenance	Effective Life	Capital Cost	Operating & Maintenance Cost
Extended Sediment Detention Basin	Detention. Treats the first flush of water by storing the increased runoff for a short time followed by slow release. Extends time of runoff for sediment removal and reduces peak stormwater runoff rates. Works well in conjunction with other BMPs.	Moderate to high 55-75	Moderate 45-55	Low to Moderate 24-60	Moderate 30-60	Moderate 50	Moderate maintenance of pond, periodic sediment removal	20-50 years	Moderate	Low
Bio retention Pond	Retention. Flow regulating structure with a permanent pool of water surrounded by facultative vegetation that treats water quality through sedimentation, soil absorption and uptake of pollutants by plants. Works best in conjunction with other BMPs and part of a larger flood control basin.	Moderate to high 75-80	Moderate 45-50*	Low 20*	Low to Moderate 20-60*	NA	Moderate erosion and sediment control and sediment removal	5-20 years	Moderate	Low
Constructed Wetland Basin	Retention. Requires perennial base flow to maintain aquatic vegetation and microorganisms. Natural system for pollutant removal through sedimentation, chemical processes in water and biological uptake by vegetation and microorganisms, efficiency is highly variable and dependent upon design. Requires hydrologic condition to maintain wetland.	Moderate depends upon maintenance 50-60	Moderate 40-60	Low to moderate 20-50	Moderate to high 30-70	NA	Moderate to high removal of sediments if they are not periodically flushed out	20-50 years	Moderate to high	Moderate
Infiltration Basin	Shallow basin that captures runoff and stores it until it can infiltrate into the soil. Requires room for installation and soils with a high infiltration rate.	Moderate 75	Moderate 45-70	Low 20-30	High 50-80	Moderate 75	Low mowing and sediment control	5-10 years	Moderate	Moderate
Sand Filter Basin	Infiltration. Underground vault or trench filled with sand and an underground drain to disperse the water. Treatment occurs through sedimentation and filtration. Not suited for high sediment loads or peak stormwater runoffs.	High 75-90	Moderate 45-55	Low to moderate 35-55	Moderate to high 50-80	NA	High due to sediment loading	5-20 years	Moderate	Moderate
Infiltration Trench	Infiltration. Essentially an excavated trench or underground vault that holds water until it can infiltrate into the soil. Ideally suited for small urban drainage areas and low water storage volume. Treats pollutants through sorption, precipitation, filtering and bacterial degradation.	High 75	Moderate 50-55	Moderate 45-55	Moderate to high 75-80	High 75	Moderate to high due to sediment and pollutant clogging. Sediment control recommended as a pretreatment	10-15 years	Moderate to high	Moderate
Grass Swale	Filter. Vegetation reduces flow volume from small storms and protects against erosion during large storms. Runoff limited by infiltration capacity of soil.	Low to Moderate 30-40	Low 0-15	Low 0-15	Low 0-20	NA	Mowing and sediment removal	5-20 years	Low	Low
Filter Strips	Filter. Sheet flow runoff is treated by infiltration into soil and uptake by plants in an evenly sloped vegetated area.	Low to Moderate 27-50	Low to moderate 20-40	Low to moderate 20-40	Moderate to high 40-80	NA	Mowing	20-50 years	Low	Low

* Can concentrate soluble forms that can be released during flooding

a. City of Colorado Springs, 2002, Stormwater Quality Policies, Procedures and Best Management Practices (BMPs) Drainage Criteria Manual Volume 2;
b. Federal Highway Administration, 2004. Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring. Tetra-Tech, Inc.
c. Young et al, 1996. Evaluation and Management of Highway Runoff Water Quality. Federal Highway Administration, FHWA=PD-96-032

Table 3: Permanent Stormwater Quality Facilities (PSQFs)
(from Moser & Associates Engineering)

Type of PSQF	Considered as an Alternative	Reason
Extended Detention Pond with Micropool	Yes	Can handle large drainage areas
Wet Pond	No	Not practical
Wet Extended Detention Pond	No	Not practical
Shallow Wetland	No	Not practical; no base flow anticipated
Extended Detention Shallow Wetland	No	Not practical; no base flow anticipated
Pond/Wetland System	No	Not practical; no base flow anticipated
Pocket Wetland	No	Not practical; no base flow anticipated
Infiltration Trench	No	Not practical; maintenance intensive
Infiltration Basin	Yes	
Surface Sand Filter	No	Not practical; dense vegetation required over pervious surfaces
Subsurface Sand Filter	No	Not practical
Perimeter Sand Filter	No	Not practical
Organic Filter	No	Not practical
Pocket Sand Filter	No	Not practical; dense vegetation required over pervious surfaces
Bioretention	Yes	
Dry Swale	Yes	
Wet Swale	No	Not practical; wetland vegetation required
Sheet Flow to Buffers	Yes	
Catch Basin Insert	No	Not practical; pre-treatment only
Water Quality Inlet with Oil/Grit Separator	No	Not practical
Street Sweeping	No	Not practical
Deep Sump Catch Basins	No	Not practical; pre-treatment only
On-line Storage in Storm Drain Network (Vaults)	No	Not practical; underground water quality storage required
Porous Pavements	No	Not practical
Proprietary/Manufactured Systems	Yes	If space is limited

Of the considered PSQFs, those that will be implemented in the project area will be determined during final design. If PSQFs are altered or refined during the design and construction, the overall commitment to protect water quality and minimize water quality impacts will be maintained.

In addition to MS4 control measures (PSQFs) discussed above, the following BMPs will be applied during construction to reduce construction-related and/or long-term operation impacts to water resources and water quality as appropriate:

- All disturbed areas will be revegetated with native grass and forb species. Seed, mulch and mulch tackifier will be applied in phases throughout the project.
- Erosion control blankets, erosion bales, erosion logs, silt fence or other sediment control device will be used as sediment barriers and filters adjacent to wetlands, surface waterways and at inlets where appropriate.
- Check dams and sediment traps will be used where appropriate to slow the velocity of water through roadside ditches and in swales.
- Provisions to minimize the amount of disturbance, limit the amount of time that areas can be disturbed, and control the use, storage and disposal of construction related chemical and materials.
- Culvert riprap outlet protection.
- Grass-lined swales (GLS) are vegetated swales or ditches having mild slopes. These swales are recommended in locations where the tributary drainage area is relatively small with a goal of filtering the sediment-laden runoff and allowing it to settle before reaching the receiving stream.
- Extended Dry Detention Basins (EDDB) are sedimentation basins designed to drain completely following stormwater events. These basins are recommended in locations where the tributary drainage area is relatively large and where right-of-way is available.
- Development of a Spill Prevention and Emergency Response Plan for use during construction concerning storage, handling, and use of chemical and other products.
- Final design will be reviewed by CDOT's Regional Hydraulic Engineer to ensure all appropriate measures have been taken to protect water resources and water quality.

- Due to concerns over PCE contamination, any groundwater that is pumped from excavations or borings in the Crews Gulch areas will be tested, and treated as necessary, to meet State surface water quality standards before it is discharged.

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