Chapter 8
Potential Regional Facilities

Stormwater management can be handled on-site, at regional facilities, or through a combination of both. A variety of factors determine which approach is most effective. Some factors include:

- Capital and operations/maintenance costs
- Right-of-way availability
- Property ownership
- Extent of existing development
- Extent of redevelopment
- Extent of on-site BMPs already in place
- Zoning
- Land development review practices
- Existing master drainage plans and their recommendations
- Local drainage criteria
- Special goals and objectives related to quantity and quality management
- Other factors

There are many benefits of larger, regional facilities such as their potential to serve as attractive, multi-purpose facilities that become true community assets. The following discussion identifies potential regional facility locations throughout Denver, especially in redevelopment areas identified in *Blueprint Denver: An Integrated Land Use and Transportation Plan* (Denver 2000), that could play a valuable role in protecting water quality, as well as fulfilling other objectives. All of the following discussion is provided at a conceptual level only. Considerable additional analysis will be necessary to determine if the following ideas are feasible.

The *Storm Drainage Master Plan – Phase I Final* (Matrix 2003) found the capacity of the drainage system within a majority of Denver correlates to between a 1- and 5-year system. Although this limited capacity results in periodic flooding, the current systems offer opportunities for regional water quality treatment. The extensive existing drainage networks discharging through only a few outfalls provide opportunities to treat the entire basin runoff at the end-of-pipe, rather than (or in addition to) attempting to treat the runoff in a myriad of small in-tract ponds within the basin. The existing drainage systems provide adequate capacity to treat the "first flush," or a storm of magnitude of ½-inch or less of runoff.

In keeping with the major drainageways information included in the *Storm Drainage Master Plan*, Exhibit 8.1 identifies the major Denver drainage basins. Exhibit 8.2 identifies potential opportunities for regional water quality facilities in these basins. Exhibit 2.3 in Chapter 2 should be referenced for more detailed basin locations by numeric code. A basin-by-basin discussion identifying the key drainage basin characteristics and regional water quality opportunities and constraints follows. These conceptual-level discussions will require additional follow-up work, as identified in Chapter 9, in order to make decisions regarding regional treatment.

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SOUTH PLATTE RIVER

Fourteen drainage basins tributary to the South Platter River are evaluated for regional stormwater treatment opportunities in this discussion, including:

- Prairie Gateway
- I-70 & Colorado Boulevard
- I-70 & York
- Lower Platte Valley
- Central Platte Valley
- 1st & Federal
- Valverde
- Ruby Hill
- Dartmouth
- College View
- West Belleview
- Sloan's Lake
- I-25
- West Harvard Gulch

Prairie Gateway (Basin 0058)

EXHIBIT 8.3 BACKGROUND DATA FOR PRAIRIE GATEWAY (BASIN 0058)	
Location Description:	56th and Quebec
Receiving Waterway:	South Platte River
General Land Use:	Commercial and Industrial (includes Denver Water Pump Station and Bulk Mail Facility)
Drainage Basin Area:	1.59 square miles
Basin Composite Imperviousness:	25%
Outfalls:	100-year retention – no outfall
Capacity of Outfalls:	100-year pipes and detention pond

Prairie Gateway is land along Quebec Street north of 56th Avenue that was previously part of the Rocky Mountain Arsenal. The *Prairie Gateway Outfall Systems Planning Preliminary Design Report* (UDFCD 2003) explored options to manage stormwater runoff and determined 100-year retention systems to be the most feasible option.

Opportunities

All development in the drainage basin must retain and treat water quality on-site or in regional ponds. The basin is being newly developed and must adhere to the current guidelines of the Urban Drainage and Flood Control District (UDFCD) for drainage criteria.

Constraints

Commerce City's storm outfalls do not have the capacity to handle additional runoff; therefore, development must incorporate stormwater ponds into the site planning.

I-70 & Colorado Boulevard (Basin 0060-01)

Exhibit 8.4 summarizes key background data for the I-70 & Colorado Boulevard basin (Basin 0060-01).

EXHIBIT 8.4
BACKGROUND DATA FOR I-70 & COLORADO BOULEVARD (BASIN 0060-01)

Location Description:	North Denver and Commerce City 35th to 64th Avenues, and York to Dahlia Streets
Receiving Waterway:	South Platte River
General Land Use:	Mix of industrial and residential
Drainage Basin Area:	1,745 acres (2.73 square miles)
Basin Composite Imperviousness:	68.7%
Number of Outfalls and 2-Year Hydrology:	2 within Denver: 84" at 54th & Steele – 581 cfs 38" at 58th & York – 130 cfs
Capacity of Outfalls:	Generally less than 2-year

Opportunities

Basin 0060-01 is fully built-out with older neighborhood residential use in the upper reaches and commercial use in the lower reaches. *Blueprint Denver* shows the region downstream (northwest) of Vasquez Boulevard as an Area of Change, meaning that redevelopment is expected to occur in the area of the storm drain outfalls. This is an opportunity for installation of regional water quality treatment, especially since basin runoff is confined to only two outfalls within Denver.

A gravel pit between 54th and 56th Avenues and Brighton Boulevard and the Railroad is an opportunity for an on-line regional water quality pond at the discharge of the 84-inch outfall. However, this site is located within Commerce City, but would primarily treat runoff from Denver.

Vacant land is located northeast of Riverside Cemetery and would be an opportunity for off-line regional water quality treatment. Likewise, this site is located within Commerce City, but would primarily treat runoff from Denver.

Another location for regional water quality treatment within this basin is Swansea Park. This Denver Parks land may provide an opportunity for off-line regional water quality ponds.

An alternatives analysis for combined capital improvements for Basins 0060-01 & 4400-02 found the least-cost solution included regional detention in this basin. Areas identified for regional detention exist at the Park Hill Golf Course, 48th & Colorado, 38th and Grape Street, and the former Dahlia Square. These detention ponds could also be configured for regional water quality treatment.

Constraints

The main constraint to regional water quality treatment is the fact that the outfalls occur outside of Denver in Commerce City. Either land areas must be identified within Denver for regional treatment, or an agreement must be structured with Commerce City for operation and maintenance of regional facilities.

I-70 & York (Basin 0060-02)

Exhibit 8.5 summarizes key background data for the I-70 & York basin (Basin 0060-02).

EXHIBIT 8.5 BACKGROUND DATA FOR I-70 & YORK (BASIN 0060-02)	
Location Description:	North Denver and Commerce City 42nd to 52nd Avenues, and Brighton to Colorado Boulevards
Receiving Waterway:	South Platte River
General Land Use:	Mix of industrial and residential (includes National Western Stock Show Complex)
Drainage Basin Area:	936 acres (1.46 square miles)
Basin Composite Imperviousness:	71.8%
Number of Outfalls and 2-Year Hydrology:	12 within Denver Only large outfalls: 78" & parallel 42" at Race Court – 381 cfs
Capacity of Outfalls:	2-year

The only major (larger than 48 inch) outfall exists at Race Court just upstream of the Burlington Ditch headgate. This outfall drains 580 tributary acres discharging via a 78-inch pipe and parallel 42-inch pipe that have a total capacity of about 410 cfs. The existing system has about a 2-year level of service.

Opportunities

Basin 0060-02 is fully built-out with older neighborhood residential use in the upper reaches and commercial use in the lower reaches. *Blueprint Denver* shows the industrial sites as Areas of Change, meaning that redevelopment is expected to occur in the area of the storm drain outfalls. This is an opportunity for installation of regional water quality treatment, especially since most of the basin runoff is primarily confined to the one outfall north of the National Western Stock Show complex at Race Court.

Constraints

If the expected redevelopment does not occur, then land acquisition would be necessary for a regional facility. No Denver Parks or Open Space land is available in this basin for regional water quality treatment.

Lower Platte Valley (Basin 0062-01/4500-02)

Exhibit 8.6 summarizes key background data for the Lower Platte Valley basin (Basin 0062-01/4500-02).

EXHIBIT 8.6
BACKGROUND DATA FOR LOWER PLATTE VALLEY (BASIN 0062-01/4500-02)

Location Description:	North of Downtown Denver 8th to 38th Avenues, and Grant to Williams Streets, Includes Coors Field
Receiving Waterway:	South Platte River
General Land Use:	Mix of industrial, commercial and residential
Drainage Basin Area:	2,858 acres (4.47 square miles)
Basin Composite Imperviousness:	77.5%
Number of Outfalls and 2-Year Hydrology:	16 outfalls 1 primary outfall captures 81% of the basin: 81" at 36th – 1,215 cfs
Capacity of Outfalls:	Less than 1-year

Basin 0062-01 is fully built-out with older neighborhood residential use in the upper reaches and commercial use in the lower reaches. This basin includes Lower Downtown, Coors Field, rail yards, and a number of existing residential neighborhoods. It is characterized by terrace topography in the upper portions of the basin and nearly flat outfalls near the South Platte River. This condition results in inadvertent detention near the basin headwaters and surcharge of storm sewers in lower reaches.

Opportunities

There are opportunities for regional end-of-pipe water quality treatment along the South Platte River. An off-line water quality pond could be constructed near the outfall of the existing 81-inch pipe in 36th Avenue. The existing pipe has capacity to convey a ½-inch rainfall event (i.e., water quality capture volume) and would capture runoff from 2,260 acres of a developed basin.

Another opportunity for regional end-of-pipe water quality treatment is at 29th and Broadway at an outfall to the South Platte River. An off-line water quality pond could be constructed off the existing 108-inch pipe through Coors Field. The pipe was recently constructed and receives runoff from 81 acres of the Coors Field parking lot. However, proposed improvements will extend the storm drain up 27th Avenue and will expand the tributary area.

Constraints

If the expected redevelopment does not occur, then land acquisition would be necessary for a regional facility. No Denver Parks or Open Space land is currently available in this basin for regional water quality treatment.

Central Platte Valley (Basin 0063-01)

Exhibit 8.7 summarizes key background data for the Central Platte Valley (Basin 0063-01).

EXHIBIT 8.7
BACKGROUND DATA FOR CENTRAL PLATTE VALLEY (BASIN 0063-01)

Location Description:	Southwest of Downtown Denver Alameda to Cherry Creek, along the South Platte River, Includes Elitch Gardens
Receiving Waterway:	South Platte River
General Land Use:	Mix of industrial, commercial and residential
Drainage Basin Area:	1,342 acres (2.10 square miles)
Basin Composite Imperviousness:	83.2%
Number of Outfalls and 2-Year Hydrology:	32+ outfalls in total 6 primary outfalls
Capacity of Outfalls:	1-year to 5-year

This basin includes older neighborhood residential use in the upper reaches east of the railroad tracks and Santa Fe, and commercial use in the majority of the basin for the lower reaches. *Blueprint Denver* shows the majority of the basin (commercial areas) subject to change.

Intercepted stormwater is discharged via at least 32 storm drainage outfalls, which are comprised mainly of local storm drains from I-25 and adjacent properties. Some of the existing larger outfalls include:

- Bayaud Avenue outfall is 36-inch (54-inch upstream) with 351 tributary acres
- 3rd Avenue outfall is 54-inch with 104 tributary acres
- 6th Avenue outfall is 72-inch with 273 tributary acres
- 13th Avenue outfall is 42-inch with 119 tributary acres
- Colfax Avenue outfall is 36-inch with 53 tributary acres
- Elitch's outfall is 48-inch with 44 tributary acres

Opportunities

Redevelopment of the lower industrial areas will provide an opportunity for construction of regional water quality systems. In particular, end-of-pipe water quality ponds on the larger outfalls may be possible. The 72-inch storm drain in 6th and 7th Avenues could be constructed with a low-flow diverter to treat runoff from 273 acres.

Constraints

If the expected redevelopment does not occur, then land acquisition would be necessary for a regional facility. No Denver Parks or Open Space land is currently available in this basin for regional water quality treatment.

1st & Federal (Basin 0064-01)

Exhibit 8.8 summarizes key background data for the 1st & Federal basin (Basin 0064-01).

EXHIBIT 8.8
BACKGROUND DATA FOR 1ST AND FEDERAL BASIN (BASIN 0064-01)

Location Description:	West of Downtown Denver Between Alameda and 8th Avenue, and Between Perry Street and Bryant Street
Receiving Waterway:	Weir Gulch and South Platte River
General Land Use:	Mix of industrial, commercial and residential
Drainage Basin Area:	610 acres (0.95 square mile)
Basin Composite Imperviousness:	66.6%
Number of Outfalls:	8 outfalls
Capacity of Outfalls:	1-year to 5-year

Blueprint Denver shows Federal Boulevard subject to change, along with some of the commercial/industrial area adjacent to the South Platte River.

Intercepted stormwater is discharged in eight storm drainage outfalls that include two to Weir Gulch and six directly to the South Platte River.

Opportunities

Redevelopment of the lower industrial areas may provide an opportunity for construction of regional water quality systems. An on-line water quality pond has been constructed and maintained on Weir Gulch at Barnum Park near 6th and Federal.

Constraints

Much of the industrial land is within the current South Platte River floodplain. No Denver parks or open space land is currently available in this basin for regional water quality treatment; therefore, land acquisition would be necessary to construct a regional facility.

Valverde (Basin 0064-02)

Exhibit 8.9 summarizes key background data for the Valverde basin (Basin 0064-02).

EXHIBIT 8.9
BACKGROUND DATA FOR VALVERDE (BASIN 0064-02)

Location Description:	West of Downtown Denver Between Louisiana and 4th Avenue, and Between Wolffe Street and the South Platte River
Receiving Waterway:	South Platte River
General Land Use:	Mix of industrial and residential
Drainage Basin Area:	1,701 acres (2.66 square miles)
Basin Composite Imperviousness:	69.2%
Number of Outfalls and 2-Year Hydrology:	15 outfalls 1 outfall captures 55% of the basin: 54"x108" at Vallejo Street – 309 cfs
Capacity of Outfalls:	Generally 2-year

Basin 0064-02 is fully built-out with older neighborhood residential use in the upper reaches and commercial use in the lower reaches. *Blueprint Denver* shows Federal Boulevard, Alameda Avenue, and Morrison Road subject to change, along with some of the commercial/industrial areas adjacent to the South Platte River.

Intercepted stormwater is discharged in fifteen storm drainage outfalls.

Opportunities

A regional detention facility is located at West-Bar-Val-Wood Park, which serves the largest stormwater outfall system in the basin (Vallejo Street). The detention facility provides an opportunity for water quality treatment.

Blueprint Denver shows an area of expected redevelopment along the South Platte River. This area could provide an additional opportunity for regional water quality near the outfall of the Vallejo Street system.

An existing pond in Vanderbilt Park could provide water quality treatment for the storm drain system in the southern portion of the basin along Mississippi Avenue.

Constraints

This basin is fully built-out with dense development, and the high cost of real estate prohibits land acquisition for regional facilities.

Ruby Hill (Basin 0065-01)

Exhibit 8.10 summarizes key background data for the Ruby Hill basin (Basin 0065-01).

EXHIBIT 8.10 BACKGROUND DATA FOR SOUTH PLATTE – RUBY HILL (BASIN 0065-01)	
Location Description:	South Platte River Drive and West Evans Avenue in West Denver
Receiving Waterway:	South Platte River
General Land Use:	Mix of industrial and residential
Drainage Basin Area:	832 acres (1.3 square miles)
Basin Composite Imperviousness:	70.1%
Number of Outfalls:	5 existing to South Platte River
Capacity of Outfalls:	2-year to 5-year capacity for existing

Currently, there are only five known outfalls into the South Platte River within this basin:

- 48-inch from West Evans outfalls at Jewell Avenue
- 36-inch by 58-inch from West Evans outfalls at Jewell Avenue
- Direct flow from the southern basin
- Two 36-inch outfalls

This basin is fully built-out with neighborhood residential use in the upper reaches and commercial/light industrial in the lower reaches. *Blueprint Denver* shows the region along both sides of Federal Boulevard as an Area of Change. This is an opportunity for installation of regional water quality treatment. Two existing off-line detention and water quality ponds are located at Pacific Place and South Tejon Street.

Opportunities

A small portion of this basin will be redeveloped. The redevelopment area along Federal Boulevard at West Warren Avenue would be an excellent opportunity to provide water quality and detention.

Constraints

Redevelopment of the site must occur before regional water quality treatment could be constructed. Coordination with private property owners must occur.

Dartmouth (Basin 0065-02)

Exhibit 8.11 summarizes key background data for the Dartmouth basin (Basin 0065-02).

EXHIBIT 8.11 BACKGROUND DATA FOR SOUTH PLATTE-DARTMOUTH (BASIN 0065-02)	
Location Description:	South Platte River Drive and West Dartmouth Avenue in West Denver
Receiving Waterway:	South Platte River
General Land Use:	Mix of industrial and residential
Drainage Basin Area:	512 acres (0.8 square mile)
Basin Composite Imperviousness:	86.8%
Number of Outfalls:	1 existing to South Platte River
Capacity of Outfalls:	2-year to 5-year capacity for existing

Currently, there is only one known outfall into the South Platte River within this basin:

- 73-inch by 55-inch from West Dartmouth Avenue

This basin is fully built-out with light neighborhood residential and commercial/light industrial. Only a very small portion of this basin is within Denver.

Opportunities

No opportunities for regional water quality have been identified for this basin.

Constraints

The majority of the basin is outside of Denver city limits.

College View (Basin 0067-01)

Exhibit 8.12 summarizes key background data for the College View basin (Basin 0067-01).

EXHIBIT 8.12 BACKGROUND DATA FOR COLLEGE VIEW (BASIN 0067-01)	
Location Description:	South Platte River Drive and West Union Avenue
Receiving Waterway:	South Platte River through Arapahoe County
General Land Use:	Mix of industrial, commercial and residential
Drainage Basin Area:	960 acres (1.5 square miles)
Basin Composite Imperviousness:	45.5%
Number of Outfalls and 2-Year Hydrology:	2 existing to Park at Lowell and Quincy Avenue and South Federal and West Layton, 45 cfs and 166 cfs
Capacity of Outfalls:	2-year to 5-year capacity for existing

Outfalls include:

- 30-inch from West Quincy Avenue
- 42-inch from South Federal Boulevard

This basin is fully built-out with neighborhood residential and commercial/light industrial use. Only a very small portion of this basin is within Denver.

Opportunities

The park at South Irving and West Quincy Street is an excellent opportunity for water quality and on-line detention. It is located directly at the outfall across Lowell Boulevard and would benefit the upstream portion of the basin.

Constraints

The majority of the basin is outside of Denver. Discharge agreements with the City of Sheridan would need to be in place before constructing the facility.

West Belleview Avenue (Basin 0067-02)

Exhibit 8.13 summarizes key background data for the West Belleview Avenue basin (Basin 0067-02).

EXHIBIT 8.13 BACKGROUND DATA FOR WEST BELLEVIEW AVENUE (BASIN 0067-02)	
Location Description:	South Sheridan Boulevard, West Denver
Receiving Waterway:	South Platte River through Jefferson County
General Land Use:	Mix of industrial, commercial and residential
Drainage Basin Area:	3,520 acres (5.5 square miles)
Basin Composite Imperviousness:	52.0%
Number of Outfalls and 2-Year Hydrology:	4 existing to existing storm sewers within Jefferson County: 110 cfs, 30 cfs, 16 cfs (from Grant Ranch) and 191 cfs (from South Meade Street)
Capacity of Outfalls:	2-year to 5-year capacity for existing

Outfalls include:

- Future 48-inch from South Meade Street
- Existing 24-inch to 36-inch from Grant Ranch

This basin is fully developed with neighborhood residential and commercial/light industrial use. Only a very small portion of this basin is within Denver.

Opportunities

No new regional water quality facilities in Denver are needed for this basin because Grant Ranch has newly constructed water quality and detention facilities.

Constraints

The majority of the basin is outside of Denver. Existing discharge agreements with surrounding municipalities would need to be considered before any improvements could be constructed.

Sloan's Lake (Basin 4700-01)

Exhibit 8.14 summarizes key background data for Sloan's Lake basin (Basin 4700-01).

EXHIBIT 8.14 BACKGROUND DATA FOR SLOAN'S LAKE (BASIN 4700-01)	
Location Description:	West of Downtown Denver Between 33rd and Colfax Avenues, and Sheridan Boulevard and the South Platte River
Receiving Waterway:	South Platte River
General Land Use:	Mix of industrial and residential
Drainage Basin Area:	1,017 acres (1.59 square miles) within Denver
Basin Composite Imperviousness:	65.0%
Number of Outfalls:	1 outfall 54" along Colfax Avenue
Capacity of Outfalls:	Less than 2-year

Basin 4700-01 is fully built-out (within Denver) with older neighborhood residential use in the upper reaches and commercial use in the lower reaches and Colfax Avenue. This basin includes Sloan's Lake, which provides significant stormwater detention for a 3.7-square-mile tributary area from Lakewood, Edgewater, and Wheatridge.

Opportunities

Sloan's Lake could provide water quality opportunities for a large, urbanized drainage basin. The lake occupies 176.5 acres.

Redevelopment of the commercial areas along Colfax Avenue could provide an opportunity for construction of more localized water quality systems below Sloan's Lake.

Constraints

This basin is fully built-out with dense development, and real estate acquisition would be a constraint for regional facilities.

I-25 (Basin 5000-01)

Exhibit 8.15 summarizes key background data for the I-25 basin (Basin 5000-01).

EXHIBIT 8.15 BACKGROUND DATA FOR I-25 (BASIN 5000-01)	
Location Description:	Mississippi to Alameda Avenues, and I-25 to Downing Street
Receiving Waterway:	South Platte River across I-25
General Land Use:	Mix of commercial and residential
Drainage Basin Area:	802.6 acres (1.25 square miles)
Basin Composite Imperviousness:	71.9%
Number of Outfalls and 2-Year Hydrology:	13+ outfalls, primary outfall is a 54" at Center Street – 387 cfs
Capacity of Outfalls:	Approximately 1-year

Intercepted stormwater is discharged into the South Platte River. The outfalls include:

- 54-inch with 602 tributary acres, or 75% of Basin 5000-01
- 36-inch for the I-25 & Santa Fe intersection
- 30-inch for the Santa Fe & Alameda intersection
- 30-inch for the Alameda & I-25 intersection
- 2-24-inch for local I-25 drainage
- 2-18-inch for local I-25 drainage
- 5-15-inch for local I-25 drainage

Opportunities

Basin 5000-01 is fully built-out with older neighborhood residential use in the upper reaches and commercial use in the lower reaches. *Blueprint Denver* shows the commercial sites as "Areas of Change," meaning that redevelopment is expected to occur in the area of the storm drain outfalls. This is an opportunity for installation of regional water quality treatment, especially since most of the basin runoff is primarily confined to the one outfall in Center Avenue. The regional pond could be located near the Home Depot at Santa Fe and Alameda.

Smaller drain outfalls from the highway and adjacent industrial/commercial land along the Platte River Valley could be treated using ultra-urban retrofits. This may include mechanical treatment systems or other BMPs, and would require a regular maintenance program. The lack of existing BMPs on outfalls in this area may warrant these additional measures.

Constraints

If the expected redevelopment does not occur, then land acquisition would be necessary for a regional facility. No Denver Parks or Open Space land is currently available in this basin for regional water quality treatment.

West Harvard Gulch (Basin 5300-01)

Exhibit 8.16 summarizes key background data for the West Harvard Gulch basin (Basin 5300-01).

EXHIBIT 8.16 BACKGROUND DATA FOR WEST HARVARD GULCH (BASIN 5300-01)	
Location Description:	South Platte River Drive and West Yale Avenue Denver and Englewood
Receiving Waterway:	South Platte River
General Land Use:	Mix of industrial, commercial and residential
Drainage Basin Area:	896 acres (1.4 square miles)
Basin Composite Imperviousness:	57.1%
Number of Outfalls:	1 existing directly to South Platte River
Capacity of Outfalls:	2-year to 5-year capacity for existing

This basin is fully built-out with neighborhood residential and commercial/light industrial. A large portion of this basin is within Englewood and is an open channel.

Opportunities

The open parcel at Federal Boulevard and West Vassar Avenue provides an excellent opportunity for water quality and on-line detention. It is located directly at the 54-inch outfall that serves the entire upper portion of the highly developed upstream residential area.

The lower portion of the West Harvard Gulch provides a unique opportunity for water quality and detention. The gulch passes through a commercial gravel operation and is an excellent location for water quality.

Constraints

Discharge agreements with Englewood would need to be reviewed before constructing regional facilities. Land would have to be acquiredfor regional facilities.

FIRST CREEK

First Creek (Basin 3700)

Exhibit 8.17 summarizes key background data for the First Creek basin (Basin 3700).

EXHIBIT 8.17 BACKGROUND DATA FOR FIRST CREEK (BASIN 3700)	
Location Description:	Near DIA at Pena & 56th Avenue Flows through Aurora, Adams County, Denver, Rocky Mountain Arsenal and Commerce City
Receiving Waterway:	Outfalls to the South Platte River at approximately East 128th Avenue
General Land Use:	Commercial and residential in headwaters Open space through Rocky Mountain Arsenal Cultivated land in Commerce City
Drainage Basin Area:	47.2 square miles (About 9.62 square miles in Denver)
Basin Composite Imperviousness:	About 48% in upper reaches
Number of Outfalls:	Tributary "T" Blue Grama tributary Dogwood West tributary
Capacity of Outfalls:	100-year wetland channels, pipes and detention ponds

First Creek crosses Pena Boulevard just north of 56th Avenue and then flows through the northeastern portion of the Rocky Mountain Arsenal. The upper reaches of First Creek are being developed with regional detention and water quality ponds. Toward the center of the basin, First Creek bisects Green Valley Ranch, which consists of medium-density, single-family residences. First Creek then enters Rocky Mountain Arsenal with a more incised, low-flow channel and wider floodplain areas. The lower First Creek basin consists of irrigated farmland with pockets of light industrial and residential properties. In the lower reaches, First Creek flows across the O'Brian Canal and the Burlington Ditch, which intercept low flow runoff.

Opportunities

All development in the First Creek drainage basin must detain and treat water quality on-site or in regional ponds. The Rocky Mountain Arsenal has strict agreements for the quantity and quality of stormwater runoff into the federal property.

The main regional pond in the upper reaches is the Green Valley Ranch Golf Course pond, also known as the "Himalaya Pond." There are also regional detention ponds adjacent to Pena Boulevard.

Constraints

Since this basin is recently developed, drainage master plans have required incorporation of regional water quality and detention into land planning. Developers must adhere to the current UDFCD drainage criteria guidelines.

IRONDALE GULCH

Irondale Gulch (Basins 3900 & 3901)

Exhibit 8.18 summarizes key background data for Irondale Gulch basins (Basins 3900 and 3901).

EXHIBIT 8.18
BACKGROUND DATA FOR IRONDALE GULCHES (BASINS 3900 & 3901)

Location Description:	North of I-70 and east of Quebec Flows through Aurora, Adams County, Denver, Rocky Mountain Arsenal, and Commerce City
Receiving Waterway:	Outfalls to the South Platte River at approximately East 96th Avenue
General Land Use:	Commercial/Industrial in headwaters Residential in upper reaches Open space through Rocky Mountain Arsenal Cultivated land in Commerce City
Drainage Basin Area:	26.7 square miles (about 12.48 square miles in Denver)
Basin Composite Imperviousness:	50% in upper reaches
Number of Outfalls:	Southern tributary to Havana Lateral at Havana & 56th Avenue Center tributary to Derby Lake in Rocky Mountain Arsenal Northern tributary to Highline Lateral for outfall to Parkfield II detention at Chambers and 56th Avenue
Capacity of Outfalls:	100-year pipes and detention ponds 10-year concrete open channels 100-year natural channels

Irondale Gulch drains through the areas of Aurora's Majestic Commerce Center, Green Valley Ranch residential area, Gateway commercial and multi-family area, Silverado Subdivision, Parkfield Subdivision, Montbello Subdivision, the Rocky Mountain Arsenal and Commerce City with an eventual outfall to the South Platte River at approximately East 96th Avenue. The drainageway throughout the basin and the Arsenal contains several lakes, ponds and detention

areas. The drainage below the Arsenal is primarily storm sewer or roadside ditches, with capacity for only minor floods.

Opportunities

All development along Irondale Gulch must either detain or treat water quality on-site or in regional ponds. The Rocky Mountain Arsenal has strict agreements for the quantity and quality of stormwater runoff into the federal property.

Constraints

Since this basin is recently developed, drainage master plans have required incorporation of water quality and detention into land planning.

CLEAR CREEK

Clear Creek (Basins 4300-03 & 4309-01)

Exhibit 8.19 summarizes key background data for the Clear Creek basins (Basin 4300-03 and 4309-01).

EXHIBIT 8.19
BACKGROUND DATA FOR CLEAR CREEK (BASINS 4300-03 & 4309-01)

Location Description:	Northwest Denver and Arvada Between I-76 and 32nd Avenue Between Harlan Street and Alcott Street
Receiving Waterway:	Clear Creek
General Land Use:	Mostly residential with some commercial including golf course and Regis University
Drainage Basin Area:	2,316 acres (3.62 square miles)
Basin Composite Imperviousness:	56.6%
Number of Outfalls:	4 (from Denver drainage systems) 66" outfall drains Berkeley Lake
Capacity of Outfalls:	2-year

The only major (larger than 48 inch) outfall exists at Sheridan Boulevard in Arvada. This outfall drains 1,343 tributary acres which includes the Berkeley Lake basin to the South. The outfall is a 66-inch pipe with a capacity of about 184 cfs (0.15% slope). The existing system further up in the basin and within Denver has a capacity of about 350 cfs (60" at 1.8%), which is approximately a 2-year capacity.

Opportunities

Berkeley Lake and Rocky Mountain Lake provide water quality treatment for the majority of tributary drainage area within Denver.

Constraints

With the exception of small outfalls at 52nd Avenue and 50th Avenue, the major outfalls occur outside of Denver in Arvada.

SAND CREEK

Four drainage basins tributary to Sand Creek are evaluated for regional stormwater treatment opportunities in this discussion, including:

- North Stapleton (Basin 4400-01)
- Quebec Corridor (Basin 4400-02)
- South Stapleton (Basin 4400-03)
- East Stapleton (Basin 4400-04)

North Stapleton (Basin 4400-01)

Exhibit 8.20 summarizes key background data for the North Stapleton basin (Basin 4400-01).

EXHIBIT 8.20
BACKGROUND DATA FOR NORTH STAPLETON (BASIN 4400-01)

Location Description:	North Stapleton Quebec to Havana, and I-70 to 56th Avenue
Receiving Waterway:	Sand Creek
General Land Use:	Redevelopment of Stapleton Airport
Drainage Basin Area:	3,183 acres (4.97 square miles)
Basin Composite Imperviousness:	42.4%
Number of Outfalls:	1 existing to Sand Creek 3 new outfalls proposed
Capacity of Outfalls:	100-year capacity

Currently, drainage for areas north of I-70 flows to the north into the Rocky Mountain Arsenal. Only one formal major outfall currently exists to Sand Creek: the Colorado Department of Transportation (CDOT) storm pipe for the I-70 corridor, which flows in a storm pipe system parallel to I-70 into Sand Creek.

In the future, all drainage from the basin will discharge through only three outfall locations into Sand Creek. Regional water quality treatment is proposed at these three outfalls.

The Sand Creek floodplain significantly encumbers the site between Sand Creek and I-70 and will eventually become more confined via implementation of the Sand Creek Master Plan channel improvements.

Little drainage infrastructure currently exists in this undeveloped basin, except for the Catellus site, west of and adjacent to Havana. Since no major outfall exists today for the area, 100-year

retention has been constructed. Water is metered-out through small storm drains to allow the ponds to dry between storms.

Opportunities

The *East Stapleton Development Plan: The Green Book* (Green Book) (Denver 1995) and *Outfall Systems Plan-Stapleton Area* (OSP) (Denver and UDFCD 1995) set the plan for future drainage. The current master planning document is the *Infrastructure Master Plan* (BRW 2000), which was approved by Denver Wastewater in April 2001 and generally adheres to the concepts in the OSP. One exception is that the OSP did not include a water quality component in the North Area regional detention basin. The OSP was predicated upon on-site MDCIA (Level 2), gross pollutant removal and water quality facilities (extended detention basins). The *Urban Storm Drainage Criteria Manual, Volume 3* (UDFCD 1999) included guidelines for water quality treatment within the detention basin, and this concept has been adopted in the new *Storm Drainage Master Plan* updates.

The land plan retains the Green Book concept of establishing a major drainageway called the "North Stapleton Outfall Channel." This major drainageway receives almost all runoff generated on the North Stapleton site. The conveyance is a large channel, where multiple uses are envisioned within the proposed drainage corridor. The proposed pond at the outfall is sized to store the 100-year hydrograph without overtopping, and includes a multi-stage outlet for water quality treatment.

Constraints

None were identified because regional water quality treatment of this basin is already planned for when the site is redeveloped.

Quebec Corridor (Basin 4400-02)

Exhibit 8.21 summarizes key background data for the Quebec Corridor (Basin 4400-02).

EXHIBIT 8.21
BACKGROUND DATA FOR QUEBEC CORRIDOR (BASIN 4400-02)

Location Description:	North Denver and Commerce City 12th to 52nd Avenues, and Quebec to Dahlia Streets
Receiving Waterway:	Sand Creek
General Land Use:	Mix of industrial and residential
Drainage Basin Area:	3,206 acres (4.61 square miles)
Basin Composite Imperviousness:	65.0%
Number of Outfalls and 2-Year Hydrology:	1 primary within Denver: 90" & parallel 60" in Dahlia – 1,161 cfs
Capacity of Outfalls:	Less than 5-year

This basin is fully built-out with older neighborhood residential use in the upper reaches and commercial use in the lower reaches. *Blueprint Denver* shows the entire basin as an Area of Stability, inferring that Basin 4400-02 is not an area of future land use change. However, corridor studies are now being initiated for this segment of I-70 that will evaluate the need for highway and commuter rail improvements and identify related transit-oriented development (TOD) opportunities.

Opportunities

Redevelopment of land within these basins would generally require a 100-year drainage system and improvement of highway and rail drainage facilities for a 50-year conveyance system. It is assumed that additional locations for stormwater detention or related conveyance improvements would be planned and constructed as part of the improvement programs associated with any enhanced use within the area.

An alternatives analysis for combined capital improvements for Basins 0060-01 and 4400-02 found the least-cost solution included regional detention in this basin. Areas identified for regional detention exist at the Park Hill Golf Course, 48th and Colorado, future Denver Police Department site at 38th and Grape Street, and Dahlia Square. These detention ponds could also be configured for water quality treatment as well.

Since most of the basin is discharged though one outfall in Dahlia Street, there is an opportunity for an off-line regional water quality facility near the outfall. The pond could treat collected runoff regionally at the end of pipe before discharging into Sand Creek. However, end-of-pipe treatment would locate the pond in Commerce City.

Constraints

The main constraint to regional water quality treatment is the fact that the outfalls occur outside of Denver in Commerce City. Either land areas must be identified within Denver for regional treatment, or an agreement must be structured with Commerce City for operation and maintenance of regional facilities.

South Stapleton (Basin 4400-03)

Exhibit 8.22 summarizes key background data for the South Stapleton basin (Basin 4400-03).

EXHIBIT 8.22 BACKGROUND DATA FOR SOUTH STAPLETON (BASIN 4400-03)	
Location Description:	South Stapleton Quebec to Havana, and Montview to I-70
Receiving Waterway:	Sand Creek
General Land Use:	Redevelopment of Stapleton Airport
Drainage Basin Area:	1,016 acres (1.59 square miles)
Basin Composite Imperviousness:	70.8%
Number of Outfalls:	5 existing to Sand Creek
Capacity of Outfalls:	5-year capacity for existing 100-Year capacity for new systems

This basin will be almost completely redeveloped. South of I-70, only water quality detention is required, provided that the full 100-year storm is conveyed directly to the receiving major drainageway without impact to downstream properties. Therefore, all new Stapleton drainage systems are designed for 100-year capacity.

Opportunities

The Green Book and OSP (Denver and UDFCD 1995) set the plan for future drainage. The current document is the *Infrastructure Master Plan* (BRW 2000), which was approved by Denver Wastewater in April 2001 and which adheres to the concepts in the OSP.

Stapleton Filing No. 1 was recently developed to include in-tract water quality treatment. East of Filing 1 at Stapleton, stormwater will be directed easterly to the proposed regional outfall system discharging at Smith Road and Sand Creek (near RK Mechanical). Several proposed outfalls will be combined into one large regional water quality pond near Smith Road and Sand Creek. Approximately 285 tributary acres will be conveyed to this proposed regional water quality pond via three new storm drains.

Constraints

Redevelopment of the site must occur before regional water quality treatment can be constructed.

East Stapleton (Basin 4400-04)

Exhibit 8.23 summarizes key background data for the East Stapleton basin (Basin 4400-04).

EXHIBIT 8.23 BACKGROUND DATA FOR EAST STAPLETON (BASIN 4400-04)	
Location Description:	East Stapleton Havana to Peoria, and Montview to I-70
Receiving Waterway:	Sand Creek
General Land Use:	Redevelopment of Stapleton Airport
Drainage Basin Area:	1,806 acres (2.82 square miles)
Basin Composite Imperviousness:	73.3%
Number of Outfalls and 2-Year Hydrology:	4 existing to Sand Creek
Capacity of Outfalls:	2-year to 5-year capacity for existing 100-year capacity for new systems

Currently, there are only four known outfalls into Sand Creek within this basin:

- 72-inch from Aurora from the south through the Stapleton site
- 84-inch in Havana from the north, collecting drainage along Smith Road and Havana
- Open channel in Aurora from the north
- I-70 corridor in a parallel storm pipe system to Sand Creek

Drainage on the Stapleton site is currently informal with few storm drains, relying upon infiltration, evaporation and sheet flow to drain the site to Sand Creek. A 72-inch storm drain from Aurora currently flows north though the Stapleton site and discharges to Bluff Lake. This 72-inch pipe can convey runoff only up to the 5-year event. Drainage from the jail and other properties between Smith Road and I-70 is conveyed to Sand Creek in the 84-inch pipe. This pipe has approximate capacity for the 2-year discharge. The area south of Smith Road drains to open channels in Aurora and directly to Sand Creek.

Opportunities

This basin will be almost completely redeveloped. South of I-70, only water quality detention is required, provided that the full 100-year storm is conveyed directly to the receiving major drainageway without impact to downstream properties. Therefore, all new Stapleton drainage systems are designed for 100-year capacity.

Discussions with Denver Parks Department suggest interest in the development of Bluff Lake (in the southeastern portion of the Stapleton site) for limited use as a water quality pond. This lake was formerly fed by Sand Creek via an irrigation-style channel, but this water supply is no longer active. Management plans for Bluff Lake propose to enhance its use as a public amenity and to encourage wetlands restoration. Therefore, additional water supply is desired for the site. Proposed grading plans for the Stapleton site direct stormwater flows to Bluff Lake to enhance

its water volume. A new 7-foot x 5-foot box culvert is proposed to discharge into Bluff Lake for regional water quality treatment. Storm drainage pipes in this area will be constructed commensurate with development.

Constraints

A portion of this basin is within Aurora. Redevelopment of the site must occur before regional water quality treatment could be constructed.

WESTERLY CREEK

Four drainage basins tributary to Westerly Creek are evaluated for regional stormwater treatment opportunities in this discussion, including:

- South Stapleton (Basin 4401-01)
- 11th Avenue to Montview (Basin 4401-02)
- Lowry (Basin 4401-03)
- Upper Westerly Creek (Basin 4401-04)

South Stapleton (Basin 4401-01)

Exhibit 8.24 summarizes key background data for the South Stapleton basin (Basin 4401-01).

EXHIBIT 8.24
BACKGROUND DATA FOR SOUTH STAPLETON (BASIN 4401-01)

Location Description:	South Stapleton MLK to Montview, and Quebec to Peoria
Receiving Waterway:	Westerly Creek
General Land Use:	Redevelopment of Stapleton Airport Residential use in Aurora
Drainage Basin Area:	1,939 acres (3.03 square miles)
Basin Composite Imperviousness:	50.6%
Number of Outfalls:	8
Capacity of Outfalls:	100-year Capacity

The majority of this basin has been recently constructed or will be constructed soon as part of the Stapleton Redevelopment project. The portion south of 26th Avenue and east of Westerly Creek that lies within the City of Aurora is primarily residential.

Opportunities

Regional water quality has been recommended in the *Stapleton Infrastructure Master Plan*. Water quality ponds along Westerly Creek are to be installed as development progresses. No additional water quality is proposed for this basin.

Constraints

There are no constraints for implementation of the water quality ponds shown in the *Stapleton Infrastructure Master Plan*.

11th Avenue to Montview (Basin 4401-02)

Exhibit 8.25 summarizes key background data for Basin 4401-02.

EXHIBIT 8.25 BACKGROUND DATA FOR 11TH AVENUE TO MONTVIEW (BASIN 4401-02)	
Location Description:	South of Stapleton, north of Lowry Quebec to Peoria
Receiving Waterway:	Westerly Creek
General Land Use:	Residential with commercial along roadway corridors
Drainage Basin Area:	1,811 acres (2.83 square miles)
Basin Composite Imperviousness:	62.6%
Number of Outfalls:	3 existing to Westerly Creek, 1 additional proposed
Capacity of Outfalls:	2-year and 5-year capacity

This basin is fully built-out with older neighborhood residential and commercial uses throughout and is not an area of future land use change.

Opportunities

No opportunities have been identified for regional water quality treatment. Water quality will be treated in-tract commensurate with new development.

Constraints

This basin is fully built out with dense development, and acquisition of real estate is a constraint for regional facilities.

Lowry (Basin 4401-03)

Exhibit 8.26 summarizes key background data for the Lowry basin (Basin 4401-03).

EXHIBIT 8.26 BACKGROUND DATA FOR LOWRY (BASIN 4401-03)	
Location Description:	Lowry 11th Avenue to Alameda, Quebec to Havana
Receiving Waterway:	Westerly Creek
General Land Use:	Redevelopment of Lowry Air Force Base Mixed use of residential, commercial
Drainage Basin Area:	2,246 acres (3.51 square miles)
Basin Composite Imperviousness:	40.6%
Number of Outfalls:	5
Capacity of Outfalls:	100-year capacity

The majority of this basin has been recently constructed as part of the Lowry Redevelopment project.

Opportunities

Water quality has been provided as master planned in the *Lowry Master Drainage Plan* (BRW 1998) at two locations: Westerly Creek Pond Dam and Kelly Road Dam. All water flowing into Westerly Creek within the Lowry Redevelopment area is treated at Kelly Road Dam. No additional water quality is proposed for this basin.

Constraints

There are no constraints for implementation of the regional water quality ponds shown in the *Lowry Master Drainage Plan.*

Upper Westerly Creek (Basin 4401-04)

Exhibit 8.27 summarizes key background data for the Upper Westerly Creek basin (Basin 4401-04).

EXHIBIT 8.27 BACKGROUND DATA FOR UPPER WESTERLY CREEK (BASIN 4401-04)	
Location Description:	South of Lowry Alameda to Jewell, west of Havana
Receiving Waterway:	Westerly Creek
General Land Use:	Residential and commercial mix
Drainage Basin Area:	1,824 acres (2.85 square miles)
Basin Composite Imperviousness:	55.6%
Number of Outfalls:	5 existing
Capacity of Outfalls:	2-year and 5-year capacity

This basin is mostly built-out with neighborhood residential and commercial uses throughout, and major redevelopment within the basin is not anticipated.

Opportunities

All runoff flows north to the Westerly Creek Pond Dam where it is treated for water quality.

No additional water quality facilities have been proposed within the basin.

Constraints

This basin is fully built out with dense development, and acquisition of land is required for regional facilities.

CHERRY CREEK

Four drainage basins tributary to Cherry Creek are evaluated for regional stormwater treatment opportunities in this discussion, including:

- Central Business District (Basin 4600-01)
- Cherry Creek Mall (Basin 4600-02)
- Upper Cherry Creek (Basin 4600-03)
- Upper Cherry Creek (Basin 4600-04)

Central Business District (Basin 4600-01)

Exhibit 8.28 summarizes key background data for the Central Business District basin (Basin 4600-01).

EXHIBIT 8.28
BACKGROUND DATA FOR CENTRAL BUSINESS DISTRICT (BASIN 4600-01)

Location Description:	Downtown Denver 6th Avenue to the South Platte River along the lower Cherry Creek corridor
Receiving Waterway:	Cherry Creek
General Land Use:	Commercial
Drainage Basin Area:	1,392 acres (2.17 square miles)
Basin Composite Imperviousness:	83.2%
Number of Outfalls:	42 outfalls
Capacity of Outfalls:	2-year to 5-year

Intercepted stormwater is discharged into Cherry Creek. Some of the major outfalls include:

- 16-foot x 4-foot box culvert from the Pepsi Center
- 10-foot x 5-foot box culvert recently constructed for the Convention Center up to 14th and Stout Street
- 96-inch pipe outfalling at 14th and Market Street draining large pipe in Larimer Street
- 54-inch pipe from Delgany Street

Opportunities

No opportunities have been identified for regional water quality treatment. Water quality will be treated in-tract commensurate with new development.

Constraints

This basin is fully built out with dense development, and the high cost of downtown real estate is a constraint for acquisition for regional stormwater facilities.

Cherry Creek Mall (Basin 4600-02)

Exhibit 8.29 summarizes key background data for the Cherry Creek Mall basin (Basin 4600-02).

EXHIBIT 8.29 BACKGROUND DATA FOR CHERRY CREEK MALL (BASIN 4600-02)	
Location Description:	6th Avenue to Colorado Boulevard Along the Cherry Creek corridor Includes the Denver Country Club and Cherry Creek Mall
Receiving Waterway:	Cherry Creek
General Land Use:	Commercial and residential
Drainage Basin Area:	2,952 acres (4.61 square miles)
Basin Composite Imperviousness:	57.7%
Number of Outfalls:	24 outfalls
Capacity of Outfalls:	2-year to 5-year

Intercepted stormwater is discharged into Cherry Creek. Some of the major outfalls include:

- 56-inch pipe at 1st and Marion Street
- 66-inch pipe from Cherry Creek Mall at University Boulevard and Cherry Creek
- 60-inch pipe from the east side of the Cherry Creek Mall near Steele Street
- 3-foot x 8-foot box culvert in Steele Street
- 48-inch x 76-inch elliptical pipe in Colorado Boulevard north of Cherry Creek
- 66-inch pipe at Garfield Street and Cherry Creek
- 42-inch pipe from University Boulevard south of Cherry Creek
- 72-inch pipe from Washington Street south of Cherry Creek draining 618 acres

Opportunities

No easy opportunities have been identified for regional water quality treatment. Water quality will generally be treated in-tract commensurate with new development. However, there may be an opportunity on the existing 66-inch pipe at University Boulevard that captures runoff from 44 acres of dense commercial development and parking at the mall. This storm sewer could be daylighted and detention constructed if some peripheral parking area were sacrificed.

Constraints

This basin is fully built-out with dense development, and the high cost of real estate prohibits acquisition for regional facilities. The many outfalls preclude construction of a few regional facilities. There are no opportunities for on-line water quality treatment within Cherry Creek.

Upper Cherry Creek (Basin 4600-03)

Exhibit 8.30 summarizes key background data for the Upper Cherry Creek basin (Basin 4600-03).

EXHIBIT 8.30 BACKGROUND DATA FOR UPPER CHERRY CREEK (BASIN 4600-03)	
Location Description:	Denver, Glendale, and Aurora Colorado Boulevard to Quebec Along the Cherry Creek corridor
Receiving Waterway:	Cherry Creek
General Land Use:	Commercial and residential
Drainage Basin Area:	3,597 acres (5.62 square miles)
Basin Composite Imperviousness:	68.9%
Number of Outfalls:	19 Outfalls
Capacity of Outfalls:	2-year to 5-year

The lower reach of this basin is outside Denver limits in the City of Glendale. The upper reaches of the basin are in Aurora. Most of this basin has been developed into neighborhood residential use and parks. *Blueprint Denver* shows the entire basin as an Area of Stability. No areas have been identified as Areas of Change.

This basin is characterized by smaller tributaries to Cherry Creek with travel paths generally less than one mile to each outfall. This reach of the Cherry Creek basin includes the Goldsmith Gulch outfall.

Opportunities

No opportunities have been identified for regional water quality treatment. Water quality will be treated in-tract commensurate with new development.

Constraints

This basin is fully built-out with dense development, and land acquisition is necessary for regional facilities. No opportunities for regional detention were identified in this basin. The many outfalls preclude construction of only a few regional facilities. There are no opportunities for on-line water quality treatment within Cherry Creek.

Upper Cherry Creek (Basin 4600-04)

Exhibit 8.31 summarizes key background data for the Upper Cherry Creek basin (Basin 4600-04).

EXHIBIT 8.31 BACKGROUND DATA FOR UPPER CHERRY CREEK (BASIN 4600-04)	
Location Description:	Denver and Aurora Parker Road, I-225, Yosemite Street Along the Cherry Creek corridor
Receiving Waterway:	Cherry Creek
General Land Use:	Commercial and residential
Drainage Basin Area:	3,693 acres (5.77 square miles)
Basin Composite Imperviousness:	51.3%
Number of Outfalls:	14 outfalls
Capacity of Outfalls:	2-year to 5-year

The lower reach of this basin is outside Denver limits in the City of Aurora. Most of this basin has been developed into neighborhood residential use and parks, with commercial use along major roadway corridors.

This basin is characterized by smaller tributaries to Cherry Creek with travel paths generally less than 1 mile to each outfall. There are three major outfalls in the basin, all located near the point where Cherry Creek passes under Hampden Avenue.

Opportunities

A new stormwater detention pond is proposed in the undeveloped parcel of land owned by Denver Parks west of the intersection of Parker Road and Dartmouth Avenue, just north of the baseball fields. The parcel of land is approximately 4.6 acres in area. Incorporating water quality into a detention pond in this location would treat runoff from approximately 478 acres of land east of Parker Road prior to discharging into Cherry Creek.

Two major storm sewer outfalls discharge into Cherry Creek within 1,200 feet of each other on the west side of Cherry Creek near Hampden Avenue and Dartmouth Avenue. An undeveloped parcel of land approximately 300 ft x 1,100 ft (7.6 acres) in area stretches between the two outfalls. A water quality feature in this location would treat runoff from approximately 728 acres of land to the west before it enters Cherry Creek.

Constraints

It is unclear if Denver Parks has plans for developing either parcels of land or if a water quality feature could be incorporated into whatever development plans they may have. Discussions with Denver Parks need to take place before either of these potential water quality treatment locations could be seriously considered.

GOLDSMITH GULCH

Goldsmith Gulch (Basin 4601-01)

Exhibit 8.32 summarizes key background data for the Goldsmith Gulch basin (Basin 4601-01).

EXHIBIT 8.32 BACKGROUND DATA FOR GOLDSMITH GULCH (BASIN 4601-01)	
Location Description:	I-225 and I-25 Interchange
Receiving Waterway:	Cherry Creek
General Land Use:	Mix of commercial and residential
Drainage Basin Area:	4,992 acres (7.8 square miles)
Basin Composite Imperviousness:	56.6%
Number of Outfalls:	2 existing to Cherry Creek
Capacity of Outfalls:	2-year to 5-year capacity for existing

Outfalls include:

- Open channel to Cherry Creek
- 72-inch by 120-inch from South Monaco Parkway

This basin is fully built-out with neighborhood residential and commercial/light industrial. Only a very small portion of this basin is within Denver. The newly constructed I-25 and I-225 interchange includes off-line detention and water quality ponds as part of the storm sewer system.

Opportunities

Several existing parks and detention facilities located along Goldsmith Gulch provide an opportunity for water quality. Each park's detention facility could potentially be modified to meet the requirements for water quality. The locations of these facilities are Wallace Park, Rosamond Park, Bible Park, Iliff and Monaco, and Cherry Creek and Monaco.

Constraints

Each detention facility will have to be analyzed to determine the effect of modifying the facility with respect to flood attenuation. Agreements between Denver, Greenwood Village, and UDFCD would need to be in place before constructing any facilities.

DRY GULCH AND LAKEWOOD GULCH

The Dry Gulch and Lakewood Gulch basins are evaluated for regional stormwater treatment opportunities together in the following discussion. Dry Gulch is tributary to Lakewood Gulch, which is tributary to the South Platte River.

Lakewood & Dry Gulches (Basins 4800-01 & 4801-01)

Exhibit 8.33 summarizes key background data for the Lakewood Gulch and Dry Gulch basins (Basins 4800-01 & 4801-01).

EXHIBIT 8.33
BACKGROUND DATA FOR LAKEWOOD & DRY GULCHES (BASINS 4800-01 & 4801-01)

Location Description:	6th to Colfax Avenues, and Sheridan to Federal
Receiving Waterway:	Lakewood Gulch and Dry Gulch, a tributary of Lakewood Gulch All tributary to the South Platte River
General Land Use:	Primarily residential
Drainage Basin Area:	Lakewood Gulch: 750 acres (1.17 square miles) Dry Gulch: 248 acres (0.39 square mile)
Basin Composite Imperviousness:	Lakewood Gulch: 59.6% Dry Gulch: 62.0%
Number of Outfalls and 2-Year Hydrology:	1 pipe outfall larger than 24": 39" at Lowell Boulevard – 106 cfs
Capacity of Outfalls:	About 2-year

Lakewood Gulch is a major drainageway with a 16-square-mile watershed, and Dry Gulch is a north bank tributary to Lakewood Gulch. Lakewood and Dry Gulch both discharge to the South Platte River. The gulches begin in Lakewood and terminate into the South Platte River at 14th Avenue. Only about 10 percent of the total tributary area is within Denver. The basins are long and narrow, running west to east.

The basins within Denver are fully built-out primarily with neighborhood residential use, except for commercial use along arterial transportation corridors. *Blueprint Denver* shows linear corridors along Dry Gulch and Colfax subject to change. There are proposed light rail and other transit-oriented improvements that may occur in these basins in the future.

Runoff generally flows down the relatively steep roadways into these major drainageways. Relatively little storm pipe is necessary in these basins due to the capacity of the streets to convey stormwater. Intercepted stormwater in the pipes is discharged in small, local storm drainage outfalls to the drainageways.

Opportunities

An on-line water quality pond could be constructed on Dry Gulch or Lakewood Gulch. However, due to the high peak flows, configuring a water quality pond to retain trapped sediment and trash would be a design challenge.

Constraints

There are no opportunities to construct a regional water quality pond at the end-of-pipe. No land has been identified within the gulches for on-line water quality ponds.

WEIR GULCH

Weir Gulch (Basin 4900-01)

Exhibit 8.34 summarizes key background data for the Weir Gulch basin (Basin 4900-01).

EXHIBIT 8.34
BACKGROUND DATA FOR WEIR GULCH (BASIN 4900-01)

Location Description:	West of Downtown Denver Between 9th and Kentucky Avenues, and Sheridan Boulevard and the South Platte River
Receiving Waterway:	Weir Gulch
General Land Use:	Mix of residential, commercial, and industrial
Drainage Basin Area:	1,473 acres (2.30 square miles) within Denver
Basin Composite Imperviousness:	58.3%
Number of Outfalls and 2-Year Hydrology:	16 outfalls
Capacity of Outfalls:	2-year

Basin 4900-01 tributary to Weir Gulch is fully built-out (within Denver) with older neighborhood residential use in the upper reaches and commercial use in the lower reaches. Two major tributaries outfall into Weir Gulch: 1st Avenue and Dakota Avenue Tributaries.

Opportunities

An existing on-line water quality facility exists on Weir Gulch at Barnum South Park. Strip parks have been developed by the Denver Parks and Recreation Department from 1st Avenue to Alameda Avenue along the gulch, which could be reconfigured to be utilized for regional stormwater management.

Constraints

This basin is fully built-out with dense development, and land acquisition is necessary for regional facilities.

SANDERSON GULCH

Sanderson Gulch (Basin 5100-01)

Exhibit 8.35 summarizes key background data for the Sanderson Gulch basin (Basin 5100-01).

EXHIBIT 8.35
BACKGROUND DATA FOR SANDERSON GULCH (BASIN 5100-01)

Location Description:	West Denver and Jefferson County South Platte River to South Pierce Street
Receiving Waterway:	South Platte River
General Land Use:	Mix of industrial and residential
Drainage Basin Area:	4,864 acres (7.6 square miles)
Basin Composite Imperviousness:	54.6%
Number of Outfalls and 2-Year Hydrology:	1 within Denver: Open Channel at Platte River Drive – See FHAD
Capacity of Outfalls:	100-Year

- Much of the Sanderson Gulch basin is tributary to Mississippi Avenue and the associated outfall.

Opportunities

Basin 5100-01 is fully built-out with older neighborhood residential use in the upper reaches and commercial use in the lower reaches. *Blueprint Denver* shows the region along both sides of Federal Boulevard as an Area of Change, meaning that redevelopment is expected to occur in the area of the storm drain outfalls. This is an opportunity for installation of regional water quality treatment, especially since basin runoff is confined to one major outfall.

An undeveloped open channel section along Mississippi Avenue at Quivas Street is an opportunity for an on-line regional water quality pond at the discharge of the 4 ft x 8 ft CBC. This site is an ideal location for water quality treatment.

Other locations for regional water quality treatment within this basin are Huston Lake, Garfield Lake, Ward Reservoir No. 5, and Harvey Park. These Denver Parks lands may provide an opportunity for off-line regional water quality ponds.

Constraints

The main constraint to regional water quality treatment is the fact that the outfall at Mississippi Gulch requires coordination with Public Service Company and private landowners. Either land areas must be identified within Denver for regional treatment, or an agreement must be structured with Public Service Company for operation and maintenance of regional facilities.

GREENWOOD GULCH

Greenwood Gulch (Basin 5401-01)

Exhibit 8.36 summarizes key background data for the Greenwood Gulch basin (Basin 5401-01).

EXHIBIT 8.36 BACKGROUND DATA FOR GREENWOOD GULCH (BASIN 5401-01)	
Location Description:	East Belleview Avenue and South Monaco Street, Southeast Denver
Receiving Waterway:	Greenwood Gulch
General Land Use:	Mix of industrial, commercial, and residential
Drainage Basin Area:	93 acres (0.15 square mile)
Basin Composite Imperviousness:	84.0%
Number of Outfalls:	3 existing leaves Denver and discharge to Greenwood Gulch
Capacity of Outfalls:	2-year to 5-year capacity for existing

Outfalls include:

- 30-inch from West Quincy Avenue
- 42-inch from South Federal Boulevard

This basin has several future developments planned. The majority of the basin is composed of residential, commercial and light industrial. The entire basin is within Denver.

Opportunities

Existing detention and water quality facilities are servicing this basin. No new facilities are required at this time.

Constraints

Any modifications to existing facilities must conform to the existing developer agreements.

BEAR CREEK

Six drainage basins tributary to Bear Creek are evaluated for regional stormwater treatment opportunities in this discussion, including:

- Fort Logan (Basin 5500-01)
- Upper Bear Creek (Basin 5500-02)
- Academy Park Tributary (Basin 5500-03)
- Marston Lake North (Basin 5500-04)
- Pinehurst Tributary (Basin 5500-05)
- Henry's Lake Tributary (Basin 5501-01)

Fort Logan (Basin 5500-01)

Exhibit 8.37 summarizes key background data for the Fort Logan basin (Basin 5500-01).

EXHIBIT 8.37
BACKGROUND DATA FOR FORT LOGAN (BASIN 5500-01)

Location Description:	Southwest of Downtown Denver Between Yale and Union Avenues, and Between Sheridan and Federal Boulevards
Receiving Waterway:	Bear Creek
General Land Use:	Mix of residential and commercial
Drainage Basin Area:	1,997 acres (3.12 square miles)
Basin Composite Imperviousness:	52.8%
Number of Outfalls:	9 outfalls
Capacity of Outfalls:	1- to 2-year

Basin 5500-01 is primarily residential use on the north side of Bear Creek and a mixture of residential with Fort Logan National Cemetery and Mullen High School on the south side. Wolcott Lake, located on the northern end of the basin, does not receive enough stormwater runoff to be effective for water quality purposes.

Opportunities

The 2003 Fort Logan Cemetery development plan proposes two detention ponds which would provide water quality benefits for the south side of the basin.

No opportunities have been identified for regional water quality treatment on the north side of Bear Creek. Water quality will be treated in-tract commensurate with new development.

Constraints

No Denver Parks or Open Space land is available in this basin on the north side of Bear Creek. Land acquisition would be necessary to provide regional water quality systems to this area.

Upper Bear Creek (Basin 5500-02)

Exhibit 8.38 summarizes key background data for the Upper Bear Creek basin (Basin 5500-02).

EXHIBIT 8.38 BACKGROUND DATA FOR UPPER BEAR CREEK (BASIN 5500-02)	
Location Description:	Southwest of Downtown Denver Between Lakeridge Road and Lehigh Avenue, and Between Wadsworth and Sheridan Boulevards
Receiving Waterway:	Bear Creek
General Land Use:	Mix of residential, commercial, and industrial
Drainage Basin Area:	1,178 acres (1.84 square miles)
Basin Composite Imperviousness:	45.5%
Number of Outfalls:	15 outfalls
Capacity of Outfalls:	2-year

Intercepted stormwater is discharged into Bear Creek. Some of the major outfalls include:

- 30-inch to an open channel at Webster Street
- 30-inch at Reed Street
- 30-inch at Newland Street
- 42-inch at Lamar Street
- 42-inch at Joslin Court
- 48-inch at Golden Way
- 30-inch at the north side of Sheridan Boulevard
- 48-inch at the south side of Sheridan Boulevard

Opportunities

No opportunities have been identified for regional water quality treatment. Water quality will be treated in-tract commensurate with new development.

Constraints

This basin is fully built-out with dense development, and acquisition of real estate is a constraint for regional facilities. The many outfalls preclude construction of only a few isolated regional facilities.

Academy Park Tributary (Basin 5500-03)

Exhibit 8.39 summarizes key background data for the Academy Park Tributary basin (Basin 5500-03).

EXHIBIT 8.39
BACKGROUND DATA FOR ACADEMY PARK TRIBUTARY (BASIN 5500-03)

Location Description:	Southwest of Downtown Denver Between Bear Creek and Quincy Avenue, and Between Wadsworth Boulevard and Ingall Street
Receiving Waterway:	Bear Creek
General Land Use:	Mostly commercial with some residential
Drainage Basin Area:	384 acres (0.60 square mile)
Basin Composite Imperviousness:	67.2%
Number of Outfalls:	3 outfalls Including 54" at Marshall Street
Capacity of Outfalls:	2-year

The majority of this basin (88%) is located within Jefferson County. Only the downstream outfall portion of the basin is located in Denver.

Opportunities

No opportunities have been identified for regional water quality treatment within Denver. Several small facilities associated with individual development have been constructed in the upstream (Jefferson County) portion of the basin.

Constraints

The basin is almost entirely located within Jefferson County.

Marston Lake North (Basin 5500-04)

Exhibit 8.40 summarizes key background data for the Marston Lake North basin (Basin 5500-04).

EXHIBIT 8.40 BACKGROUND DATA FOR MARSTON LAKE NORTH (BASIN 5500-04)	
Location Description:	Quincy to Belleview, Kipling to Wadsworth Wadsworth to Sheridan north of Quincy
Receiving Waterway:	Bear Creek
General Land Use:	Residential and commercial mix
Drainage Basin Area:	1,894 acres (2.96 square miles)
Basin Composite Imperviousness:	45.0%
Number of Outfalls:	1 existing to Bear Creek
Capacity of Outfalls:	5-year capacity

There are over 15 minor storm sewer outfalls to the Marston Lake North channel from its beginning at Lakes Lake to the channel's outfall into Bear Creek. The channel drains approximately 2.96 square miles. There is an existing detention pond called Lakes Lake located between Stanford Avenue and Balsam Way, north of Union Avenue

Opportunities

It is assumed that Lakes Lake was constructed with the intention of providing water quality. If that is not the case, incorporating water quality into the pond would provide treatment for the 453 acres flowing to it.

There is a series of ponds in line with the Marston Lake North channel located east and west of Sheridan near the Oxford Avenue intersection. Any of these ponds could be used for water quality treatment in the lower portion of the basin.

Constraints

Land acquisition may be necessary for the ponds in the lower reach of the basin.

Pinehurst Tributary (Basin 5500-05)

Exhibit 8.41 summarizes key background data for the Pinehurst Tributary basin (Basin 5500-05).

EXHIBIT 8.41
BACKGROUND DATA FOR PINEHURST TRIBUTARY (BASIN 5500-05)

Location Description:	Southwest of downtown Denver Between Bear Creek and Quincy Avenue, and Between Wadsworth and Sheridan Boulevards
Receiving Waterway:	Bear Creek
General Land Use:	Residential and commercial
Drainage Basin Area:	461 acres (0.72 square mile)
Basin Composite Imperviousness:	42.2%
Number of Outfalls:	2 outfalls Primary outfall is 42"
Capacity of Outfalls:	50-year

Basin 5500-05 is primarily residential use in the lower reaches, and golf course/residential in the upper reaches. Colorado Academy is located in the central portion of the basin.

Opportunities

There are several existing and proposed detention/water quality systems throughout the basin. Newly constructed detention and water quality ponds exist on the Colorado Academy site. There is good opportunity for on-line water quality facilities to be constructed in the lower reaches of the channel, just south of Hampden Avenue.

Constraints

Land acquisition costs could be prohibitive.

Henry's Lake (Basin 5501-01)

Exhibit 8.42 summarizes key background data for the Henry's Lake basin (Basin 5501-01).

EXHIBIT 8.42 BACKGROUND DATA FOR HENRY'S LAKE (BASIN 5501-01)	
Location Description:	Southwest of Downtown Denver Between Bear Creek and Stanford Avenue Between Kipling Avenue and Pierce Way
Receiving Waterway:	Bear Creek
General Land Use:	Residential, commercial, golf course, undeveloped
Drainage Basin Area:	864 acres (1.35 square miles)
Basin Composite Imperviousness:	35.0%
Number of Outfalls:	1 outfall (located in Jefferson County)
Capacity of Outfalls:	Not quantified

The majority of this basin (95%) and the outfall are located within Jefferson County. Only 40 acres at the upstream end of the basin are located within Denver. Little Henry's Lake is located on Denver property.

Opportunities

A regional detention pond, Little Henry's Lake, is located just south of Henry's Lake and could provide regional water quality for Denver's 40 tributary acres. The pond is maintained by Denver's Parks and Recreation Department.

RTD owns land adjacent to the existing Park–N-Ride facility near Wadsworth Boulevard and Hampden Avenue in Jefferson County. RTD has expressed some interest in using the land for stormwater detention/water quality purposes.

A series of on-line ponds are located in the lower portion of the drainageway (Jefferson County).

Constraints

The basin is almost entirely located within Jefferson County. A maintenance agreement is required for use of Little Henry's Lake as a regional water quality facility.

DUTCH CREEK

Coon Creek (Basin 5901-01)

Exhibit 8.43 summarizes key background data for the Coon Creek basin (Basin 5901-01).

EXHIBIT 8.43 BACKGROUND DATA FOR COON CREEK (BASIN 5901-01)	
Location Description:	Belleview to Bowles, Kipling to Sheridan
Receiving Waterway:	Coon Creek
General Land Use:	Mixed use of residential, commercial
Drainage Basin Area:	1,984 acres (3.10 square miles)
Basin Composite Imperviousness:	53.2%
Number of Outfalls:	2 to Coon Creek within Denver
Capacity of Outfalls:	5-year capacity

The majority of this basin is relatively new construction and includes on-site detention and water quality facilities. Denver's jurisdiction consists of only a narrow strip of land cutting across Coon Creek and a small tributary basin at the upstream end of the basin. The majority of this basin is located outside of Denver, including the outfall to Dutch Creek.

Opportunities

No opportunities have been identified within Denver for regional water quality treatment.

Constraints

This basin is located almost entirely within Jefferson County.

SUMMARY

Multiple opportunities exist for regional stormwater quality treatment facilities. Chapter 9 identifies work that needs to be completed to further evaluate and plan for regional stormwater treatment at these potential sites.