

Exhibit C



DATE: January 21, 2021

TO: City/County Drainage Board

FROM: Erin Powers, Senior Engineer, Stormwater Enterprise

SUBJECT: 2021 Sand Creek Drainage Basin Planning Study Approval

RE: Pursuant to City Code 7.7.902, a request for the City/County Drainage Board to recommend approval of the 2021 Sand Creek Drainage Basin Planning Study (DBPS) to City Council.

ACTION REQUESTED: This action is requested to approve the use and implementation of the 2021 Sand Creek Drainage Basin Planning Study, including revisions to associated fees.

BACKGROUND: The last approved Sand Creek DBPS was completed by Kiowa Engineering in 1996. A detention analysis for Upper Sand Creek was completed in 2009 by Wilson & Company. A full update to the Sand Creek DBPS, including Upper Sand Creek, was performed to account for recent annexations and changes in stormwater criteria.

In 2019, the City hired a consulting team led by Stantec Inc to complete the restudy. Stantec partnered with HDR Inc. and Dewberry. The study goals were as follows:

- To produce a complete revision of current (1996) Sand Creek DBPS
- To update DBPS hydrology based on a more appropriate rainfall distribution
- To develop infrastructure improvement recommendations
- To update Sand Creek Basin Drainage Fees
- To develop GIS work products that can be easily integrated into a future City-wide basin planning approach

The 2021 Sand Creek DBPS utilized the newly adopted 6-hr design storm that was recently developed for the Colorado Springs area. Approximately 86 miles of channel and 140 crossing structures (bridges and culverts) were included in the hydraulics model, and recommendations were made as necessary. The study also evaluated detention in Regional Ponds 1 and 2 and provided recommendations for future improvements.

Fees in the Sand Creek Basin currently consist of a drainage fee (\$13,775 / acre), a bridge fee (\$819 / acre), a pond land fee (\$1,070 / acre), a pond facility fee (\$3,957 / acre), and a surcharge (\$1,435 / acre). The 2021 Sand Creek DBPS recommends a change to the drainage fees in the Sand Creek Basin. Specifically, the DBPS recommends a drainage fee of \$18,841 per acre and to remove the current bridge, pond land, pond facility, and surcharge fees.

Because no additional regional detention ponds are planned within the Sand Creek Basin, the pond land and pond facility fees are no longer needed. The surcharge is no longer applicable to

undeveloped areas of Sand Creek. Additionally, all bridges in undeveloped areas of Sand Creek will be part of annexation agreements and therefore not eligible for reimbursement.

RECOMMENDATION: City Staff recommends that the Drainage Board approve the 2021 Sand Creek Drainage Basin Planning Study for use within the City of Colorado Springs.

City Staff further recommends that the Drainage Board approve a recommendation to City Council to increase to the Sand Creek Drainage Fee to set the Sand Creek Basin drainage fee at \$18,841 per acre, and to remove the current bridge, pond land, pond facility, and surcharge fees.

Recommended motions would be:

I move to approve the 2021 Sand Creek Drainage Basin Planning Study for use within the City of Colorado Springs.

I move to approve a recommendation to City Council to set the Sand Creek Basin drainage fee at \$18,841 per acre, and to remove the current bridge, pond land, pond facility, and surcharge fees in the Sand Creek Basin.

Exhibit A

2021 DRAINAGE, BRIDGE AND POND FEES CITY OF COLORADO SPRINGS

Proposed

Basin Name	DBPS Year	Drainage Fee/Acre	Bridge Fee/Acre	Pond Land Fee/Acre	Pond Facility Fee/Acre	Surcharge/Acre
19th Street	1964	\$4,338				
21st Street	1977	\$6,621				
Bear Creek	1980	\$4,261	\$402			
Big Johnson, Crews	1991	\$16,487	\$1,355	\$241		
Black Squirrel Creek	1989	\$15,104		\$3,739		
Camp Creek	1964	\$2,443				
Cottonwood Creek ^{1, 2}	2019	\$14,751	\$1,216			\$778
Douglas Creek	1981	\$13,700	\$306			
Dry Creek ³	1966	\$0				
Elkhorn Basin ⁴	n/a	\$0				
Fishers Canyon ⁵	1991	\$0				
Fountain Creek ⁶	n/a	VAR				
Jimmy Camp Creek	2015	\$8,584			\$2,798	
Kettle Creek ⁷ Old Ranch Trib.	2001	\$0				
Little Johnson	1988	\$14,389		\$1,227		
Mesa	1986	\$11,516				
Middle Tributary	1987	\$25,779		\$1,121		
Miscellaneous ⁸	n/a	\$12,814				
Monument Branch ¹²	1987	\$0				
North Rockrimmon	1973	\$6,622				
Park Vista (MDDP)	2004	\$18,444				
Peterson Field	1984	\$13,912	\$641			
Pine Creek ⁹	1988	\$0				
Pope's Bluff	1976	\$4,409	\$755			
Pulpit Rock	1968	\$7,302				
Sand Creek	2021	\$18,841				
Shooks Run ¹⁰	1994	\$0				
Smith Creek ¹¹	2002	\$0				
South Rockrimmon	1976	\$5,177				
Southwest Area	1984	\$14,718				
Spring Creek	1968	\$11,420				
Templeton Gap	1977	\$7,480	\$83			
Windmill Gulch	1992	\$15,709	\$292	\$3,055		

All Drainage, Bridge and Detention Pond Facilities Fees adjusted by 3.5% over 2020 by City Council Resolution No. 131-20 on December 8, 2020 to be effective on January 1, 2021. Land Fees are based on the Park Land Dedication Fee which is currently \$76,602/acre (0% change for inflation in 2020).

¹ The 2021 Cottonwood Creek drainage fee consists of a capital improvement fee of \$11,682 per acre and land fee of \$3,069 per acre for a total of \$14,751 per acre. These fees are adjusted annually using different procedures but are combined for collection purposes. **The surcharge fee of \$778/ac is due in cash; credits for prior facility construction cannot be used to offset this fee**, which is deposited into a separate City fund known as the "Cottonwood Creek Surcharge" fund.

² The Wolf Ranch portion of the Cottonwood Creek Drainage Basin was approved as a "no fee" basin **as to Drainage Fees only** by City Council on August 28, 2018 by Resolution No. 96-18

³ Dry Creek is a closed basin per City Council Resolution No.118-08 on June 24, 2008

⁴ Elkhorn Basin is a closed basin per the Annexation Agreements for the area.

⁵ Fishers Canyon is a closed basin per City Council Resolution No. 74-08 on April 22, 2008.

⁶ Pursuant to the recommendation of the Subdivision Storm Drainage Board adopted at its meeting of September 15, 1977, there are exempted and excluded from the provisions of this part construction of the main Fountain Creek Channel from the confluence of Fountain Creek with Monument Creek northwest to the City limits. Land developments taking place adjacent to Fountain Creek shall remain responsible for dedicating rights of way necessary for the channelization of Fountain Creek, and the developers shall continue to pay to the City as a condition of subdivision plat approval the applicable drainage fees. Drainage fees are required in accordance with the appropriate basin study.

⁷ Kettle Creek Old Ranch Tributary is a closed basin per City Council Resolution 139-02 on August 27, 2002.

⁸ Miscellaneous fee is assessed on unstudied areas and the Roswell and Westside Basins.

⁹ Pine Creek is a closed basin per City Council Resolution No.236-88 on December 13, 1988.

¹⁰ Shooks Run is a closed basin pursuant to the recommendation of the Drainage Board, adopted at its meeting on October 15, 1963.

¹¹ Smith Creek is a closed basin per City Council Resolution 140-02 on August 27, 2002

¹² Monument Branch Basin is a closed basin per City Council Res. 177-10 on October 12, 2010

2021 DRAINAGE, BRIDGE AND POND FEES CITY OF COLORADO SPRINGS Effective January 1, 2021

Basin Name	DBPS Year	Drainage Fee/Acre	Bridge Fee/Acre	Pond Land Fee/Acre	Pond Facility Fee/Acre	Surcharge/ Acre
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All Drainage, Bridge and Detention Pond Facilities Fees adjusted by 4.0% over 2019 by City Council Resolution No. 153-19 on December 10, 2019 to be effective on January 1, 2020. Land Fees are based on the Park Land Dedication Fee which is currently \$76,602/acre (0% change for inflation in 2019).

¹ The 2020 Cottonwood Creek drainage fee consists of a capital improvement fee of \$11,287 per acre and land fee of \$3,069 per acre for a total of \$14,356 per acre. These fees are adjusted annually using different procedures but are combined for collection purposes. **The surcharge fee of \$752/ac is due in cash; credits for prior facility construction cannot be used to offset this fee**, which is deposited into a separate City fund known as the "Cottonwood Creek Surcharge" fund.

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⁹ Pine Creek is a closed basin per City Council Resolution No.236-88 on December 13, 1988.

¹⁰Sand Creek Detention Pond #2 Surcharge (Ridgeview and Indigo Ranch) = \$1,386/ac. for 2020. Sand Creek Pond fees include two components, one for facility construction costs (\$3,823) and one for land dedication costs (\$1,070), the total Pond fee within Sand Creek is \$4,893/ac.

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Exhibit C

Item 4: d)



City of Colorado Springs
Sand Creek
Drainage Basin
Planning Study

Drainage Board
Meeting
January 21, 2021



Purpose of Today's Meeting

*Provide an overview of the Sand
Creek DBPS process and
presentation of the final DBPS to
the Drainage Board*



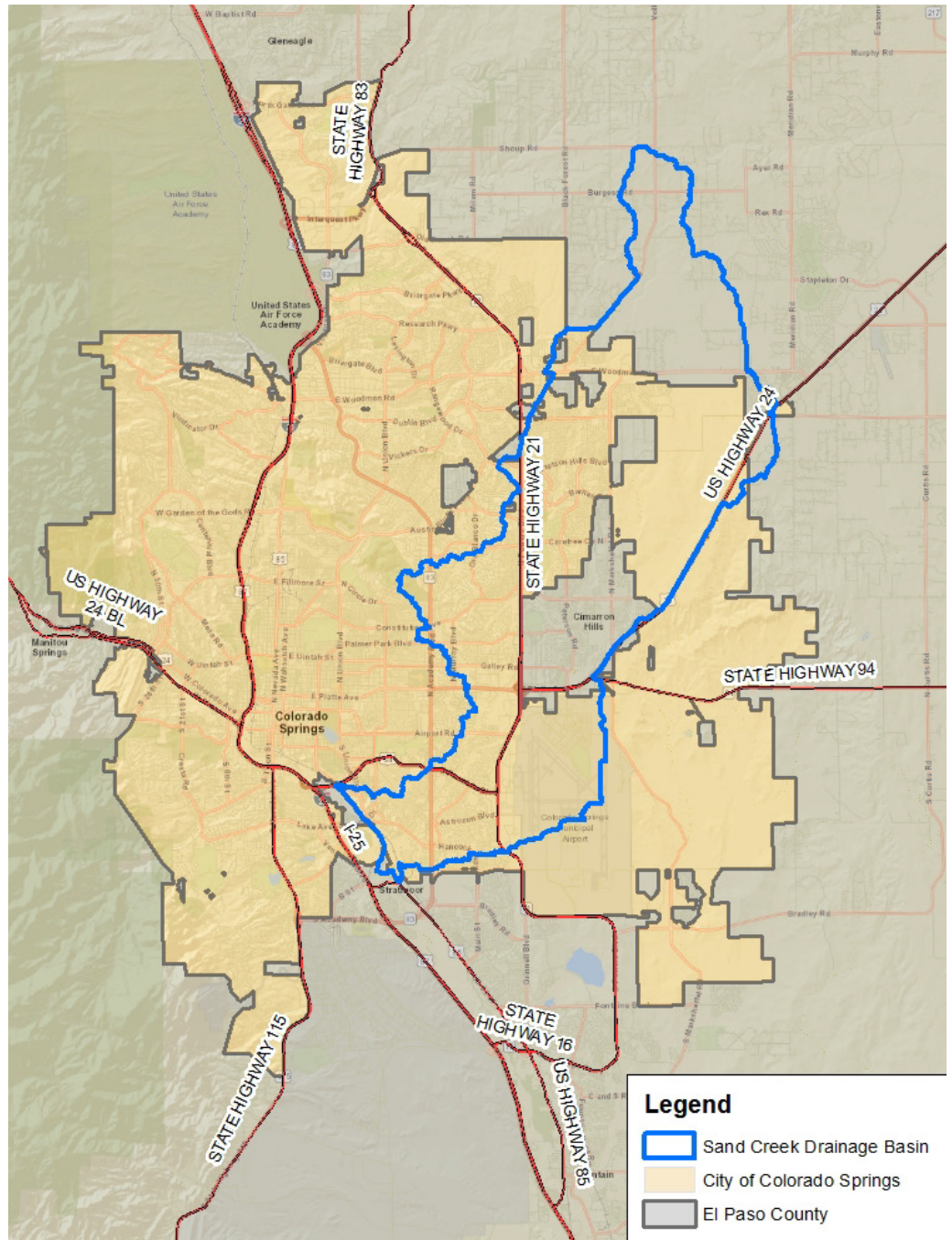


Agenda

1. Introductions
2. Project Study Area & Objectives
3. Hydrology & Hydraulics
4. Problem Areas & Deficiencies
5. Alternative Development
6. Selected Plan
7. Basin Fee Calculation

Project Study Area & Objectives

Study Area



Sand Creek Drainage Basin Planning Study Objectives

- Complete revision of current (1996) Sand Creek DBPS
- Update DBPS hydrology based on a more appropriate rainfall distribution
- Develop infrastructure improvement recommendations
- Update Sand Creek Basin Drainage Fees
- Develop GIS work products that can be easily integrated into a future City-wide basin planning approach

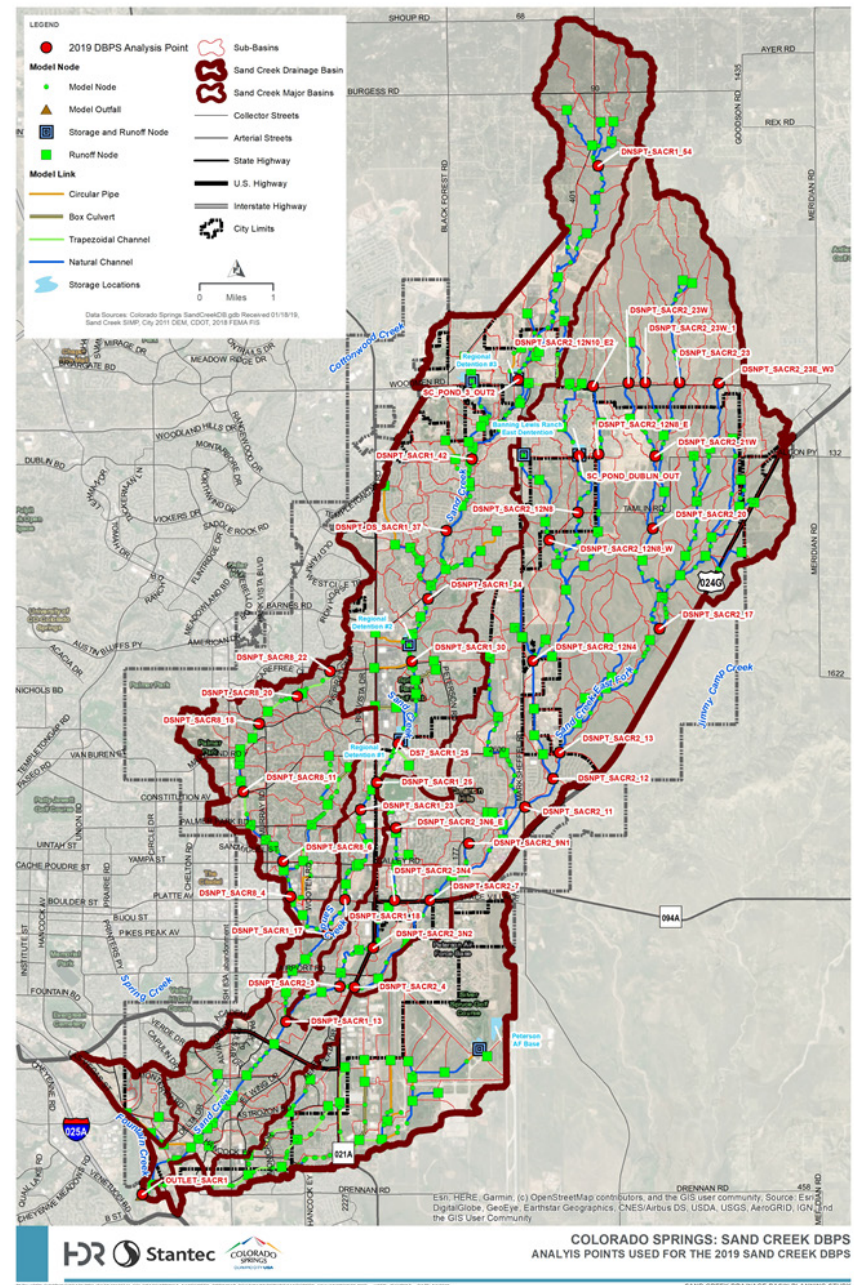


Hydrology

Updated Modeling

Approach

- SWMM non-linear reservoir modeling
- Model outputs summarized for key analysis points throughout the 60 mi² watershed
- Ran 2-, 5-, 10-, 25-, 50-, and 100-year NOAA Atlas 14 rainfall depths using City's new 6-hour distribution
- Model results compared to previous analyses
 - 1996 DBPS
 - 2018 FEMA FIS



Model Validation



- Re-ran model using current rainfall distribution
- Reviewed actual rainfall events
 - Limited confirmation due to lack of gage data
 - Sand Creek Basin only has one stream gage
- Independent confirmation of rainfall models
- Reviewed against Historic Land Use Flow Rates

Key Updates

- Different rainfall duration (6-hr vs 24-hr)
- Different hydrologic methods (SWMM method vs. SCS)
- Model Validation vs 1996 DBPS and FEMA publications
- Generally, flow rates were reduced when compared to previous DBPS versions

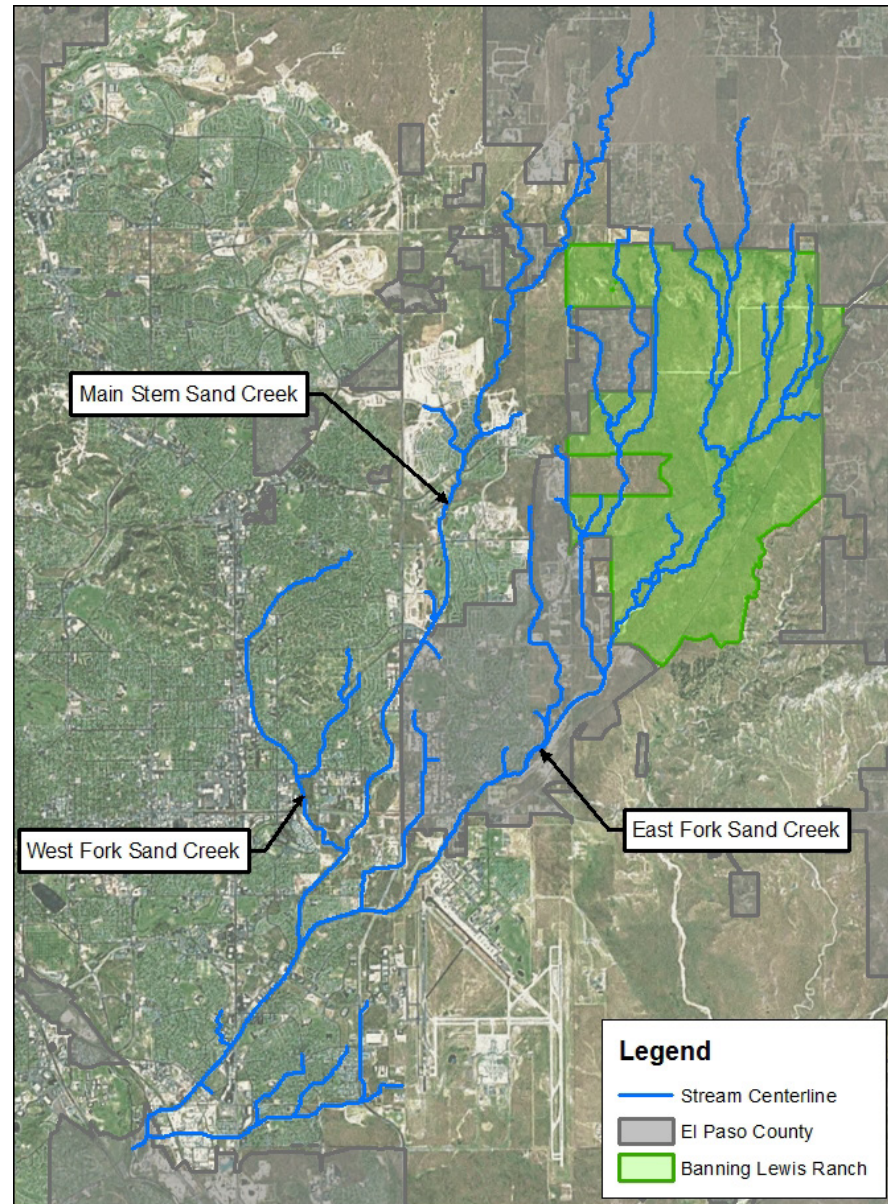
Hydraulics

Sand Creek DBPS - Hydraulics

Approach

Sand Creek

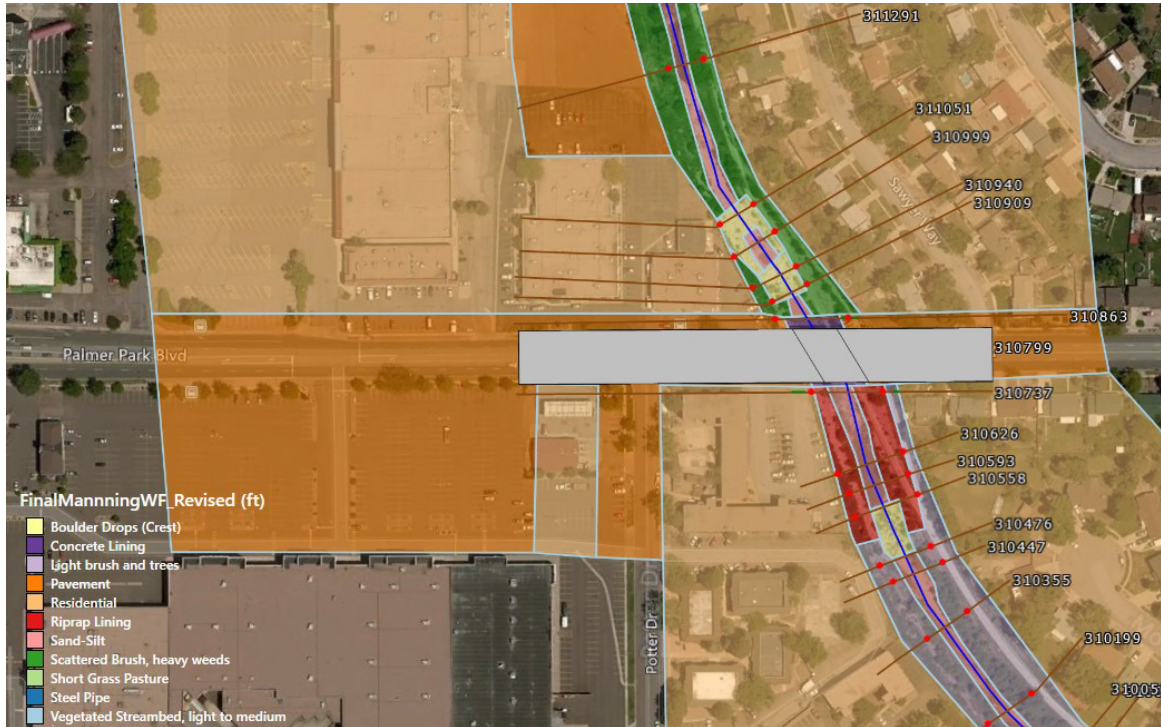
- 86 Miles of Channel modeled
- 140 Structures (Bridges and Culverts)
- 1.5% Overall Slope
- Structure Sources
 - City Plans
 - CDOT Bridge Inspection Database



Sand Creek DBPS - Methodology

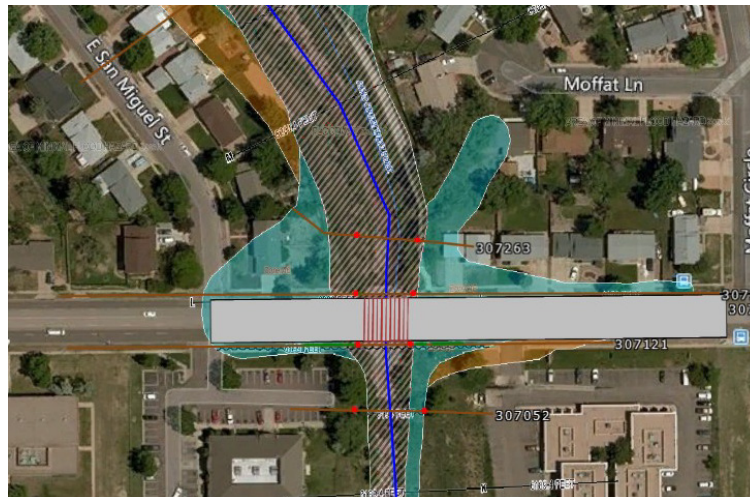
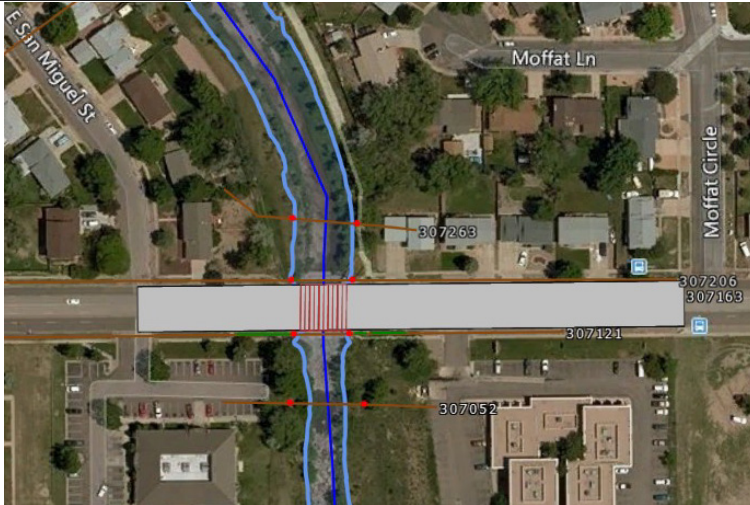
Problem
Identification

- GeoHEC-RAS Model
- Combined surface from 2018 LiDAR
- Structure Sources
 - City Plans
 - CDOT Bridge Inspection Database
- Roughness Layers
 - Based on Land Use



Sand Creek DBPS – Comparison

Results



- Comparison to FEMA
 - Lower water surface elevation
- Comparison to Previous DBPS
 - Lower water surface elevation
- No areas of significant overbank flooding were identified
- Not Assessed
 - Debris Flows
 - Sediment Bulking in large events

Problem Areas & Deficiencies

Problem Area Identification Approach

Problem Areas

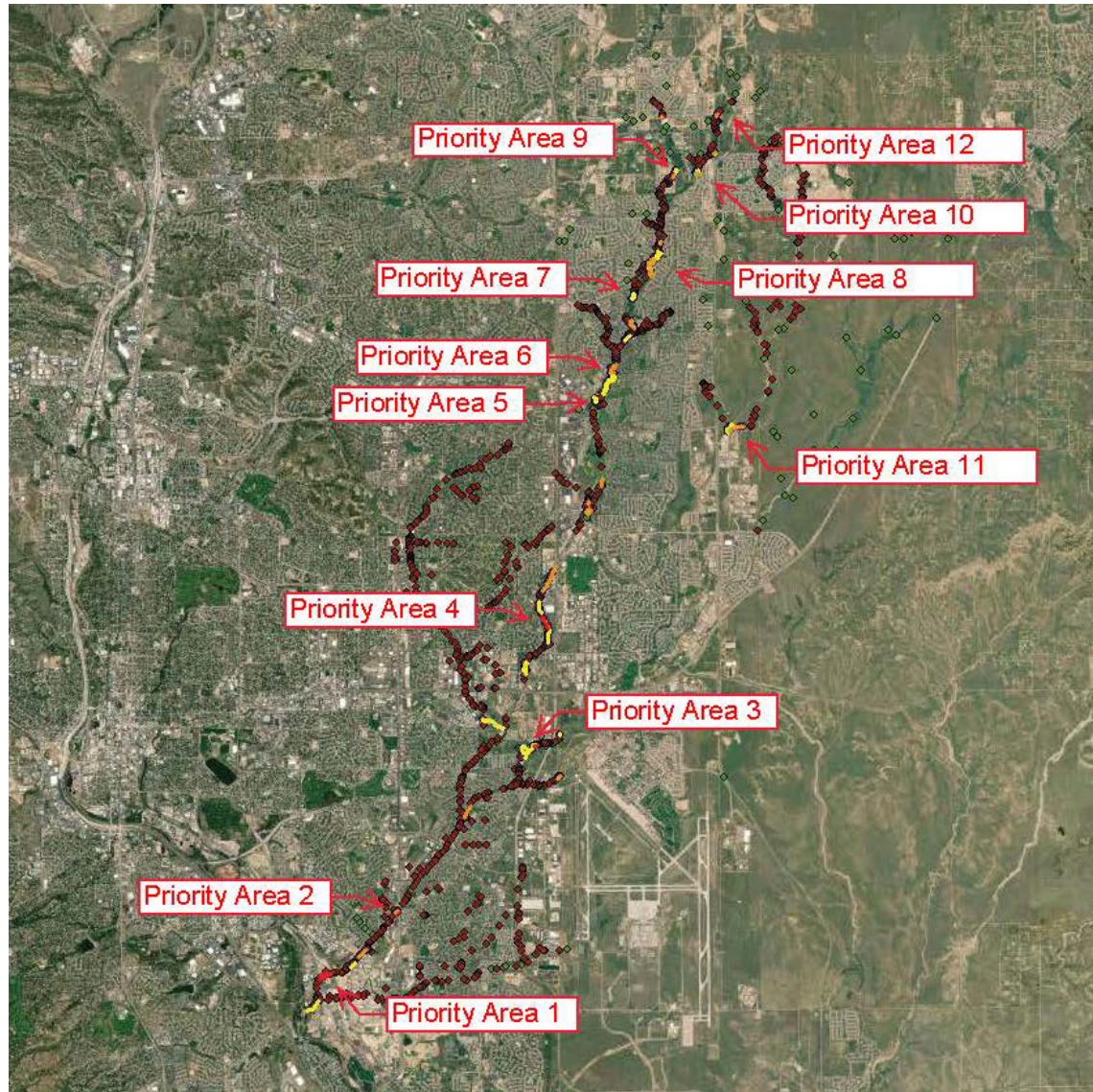
- Problem Area defined as:
 - Lack of 100-year conveyance plus freeboard
 - Excessive velocity causing erosion
 - Observed problem areas
 - Unstable banks or invert
 - Excessive deposition
 - Failing structures



Problem Areas and Deficiencies – Existing and Future

Existing Problem Areas

- Issue areas based on velocities
- Point locations are known issue areas
- Priority Areas Identified



Alternative Development

Alternative Development Assumptions

- No new regional detention ponds
- Ignore effects of onsite detention in future development areas
- Stable slope is 0.3% in lower basin and 0.2% in upper basin
- Improvements not proposed for reaches with existing grade control measures that are functioning adequately even though slope may be steeper than stable slope

Alternative Development Process - Channels

Developed three channel improvement templates

- **Maintenance Only** – current conditions are adequate with proper maintenance and minor localized improvements
- **Engineered Channel** – Balanced engineered solutions with a terraced floodplain within a fairly confined corridor
- **Natural Engineered Channel** – Constructed channels within wider corridors providing natural functions as much as possible

Alternative Development Process – Channel Concepts

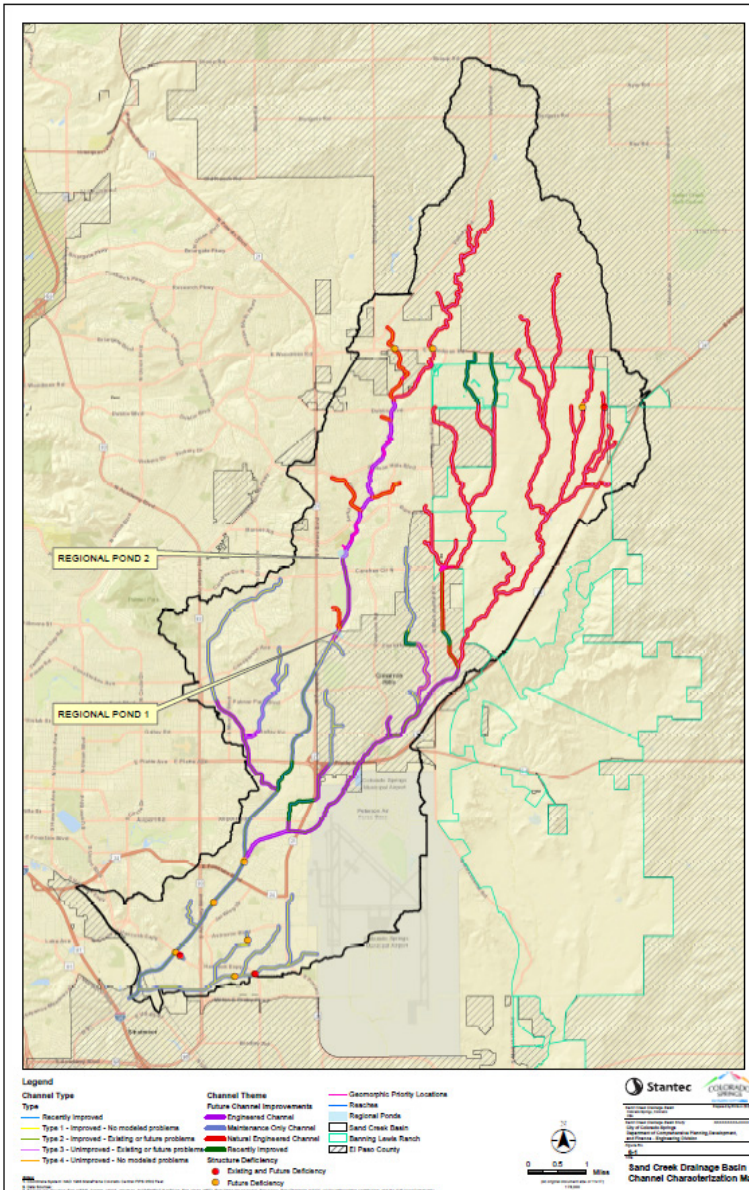
Concepts

- Modifications to channels
 - Reduce slopes/grade control
 - Bank protection
 - Channel dimensions to handle both low and high flows
 - Full restoration of alignment/slope/dimensions
- Floodplain preservation (with improved channel)
- Maintenance access/trails



Alternative Development Process - Channels

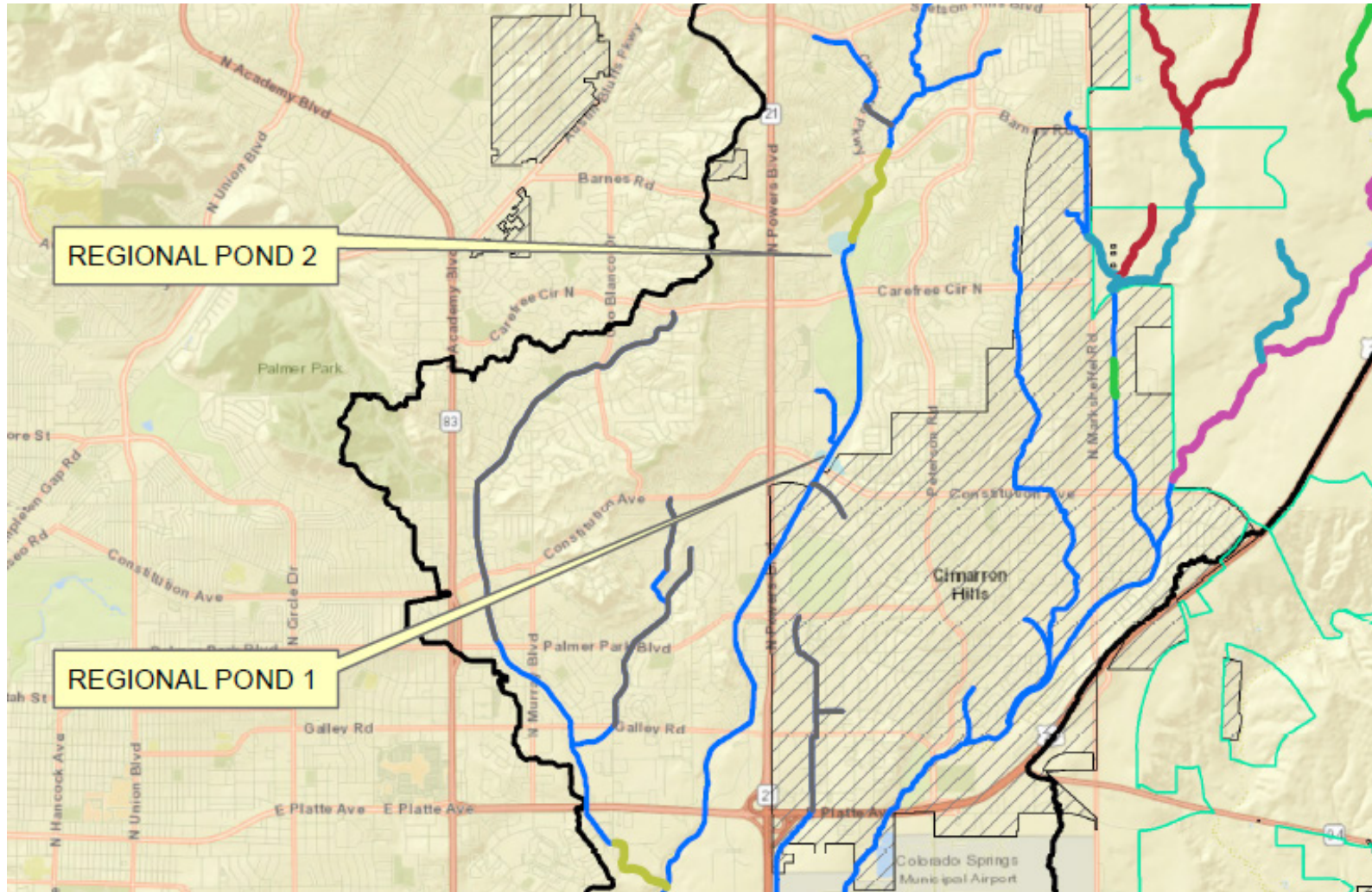
Concepts



- Combined reaches that share similar characteristics
- Many sections will remain maintenance only
- Point locations are known issue areas

Alternative Development Process – Regional Pond Modifications

Selected
Alternative

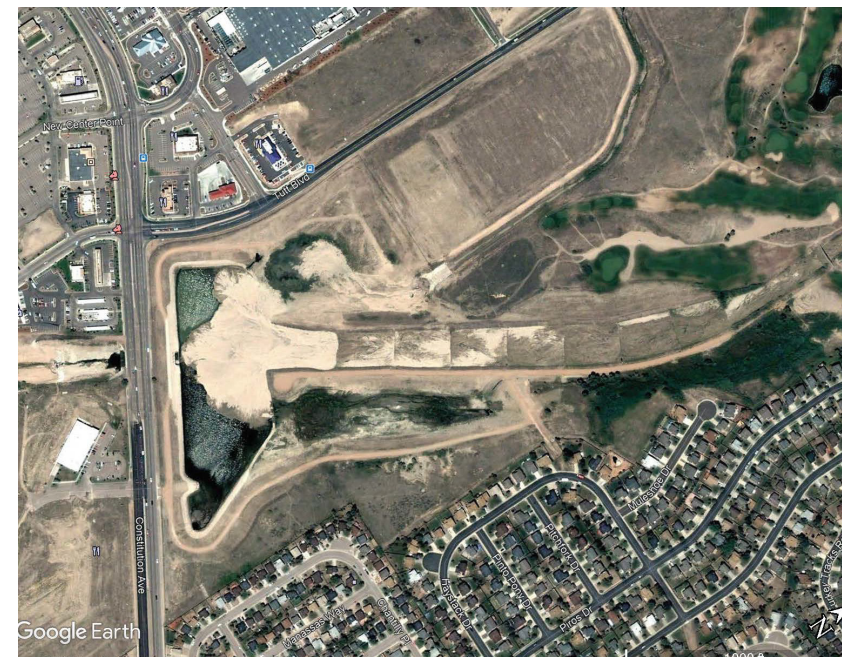
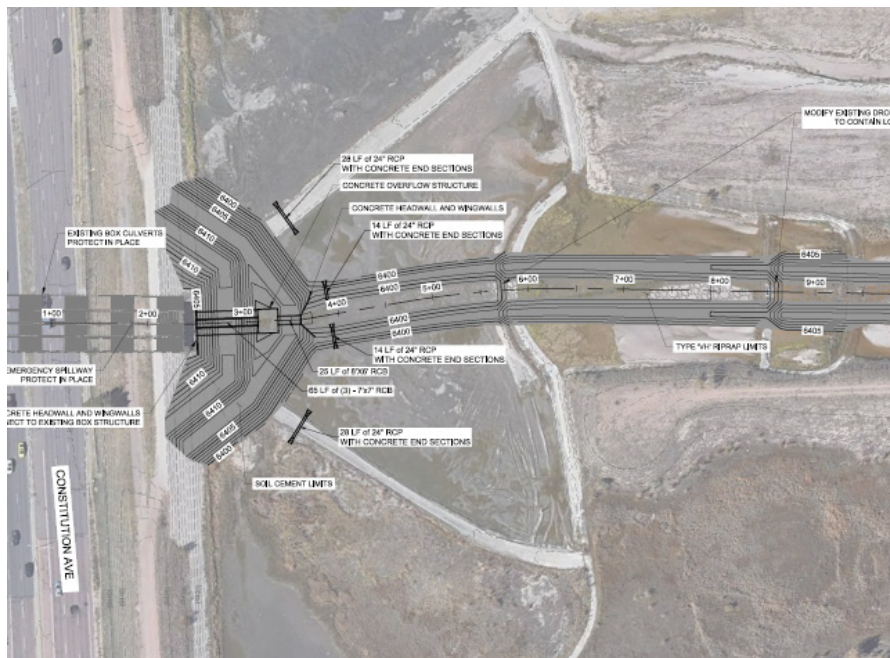


Regional Pond Modification – Example - Pond 1 Outlet Structure

Selected Alternative

Parameter	Without Regional Pond 2 Improvements	With Regional Pond 2 Improvements
Major Outlet Structure		
Existing Dimensions	2-11'x10' and 2-14'x10' RCBCs	2-11'x10' and 2-14'x10' RCBCs
Proposed Dimensions	2-10'x10' RCBCs	3-7'x7' RCBCs
Future Peak 100-yr Inflow (cfs)	3,400	2,896
Future Peak 100-yr Outflow (cfs)	2,484	2,035
Maximum Water Height (ft)	18.2	17.8
Low Flow Outlet Structure		
Existing Dimensions	18" RCP	18" RCP
Proposed Dimensions	6"x8' RCBC	6"x8' RCBC

Regional Pond 1 Improvements dependent on selected option for upstream Regional Pond 2



Alternative Development Process – Overview of Alternatives

- Alternative 1 – Conveyance Improvements with Regional Pond 2 Modifications
- Alternative 2 – Conveyance Improvements with Regional Pond 1 and 2 Modifications
- Channel improvements downstream of Regional Pond 1 may differ in the two alternatives
- Channel improvements upstream of Regional Pond 1 are the same for both alternatives
- Storm drain improvements required for existing and future proposed facilities are the same in both alternatives

Alternative Development Process – Selected Alternative
















- Alternative 2 – Conveyance improvements with Regional Ponds 1 and 2 modifications

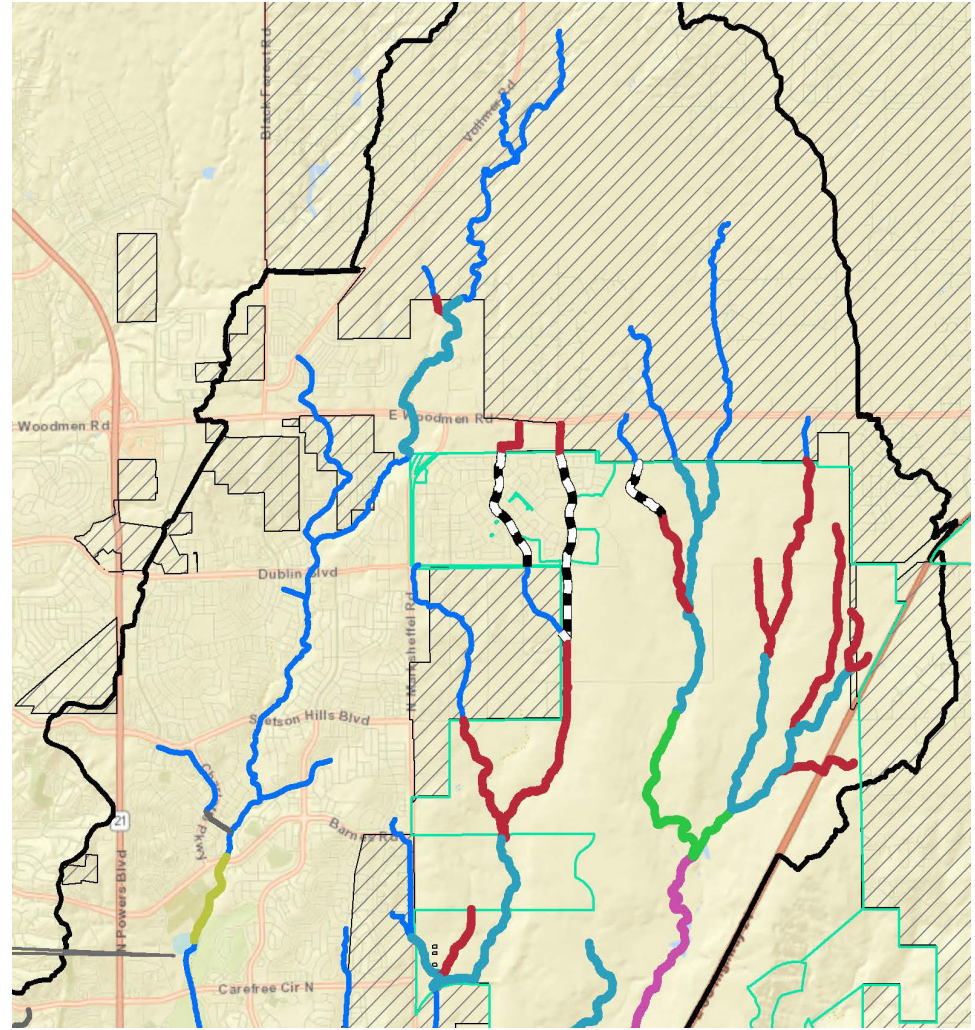


Fee Development

Undeveloped Improvement Determination – Upper Basin

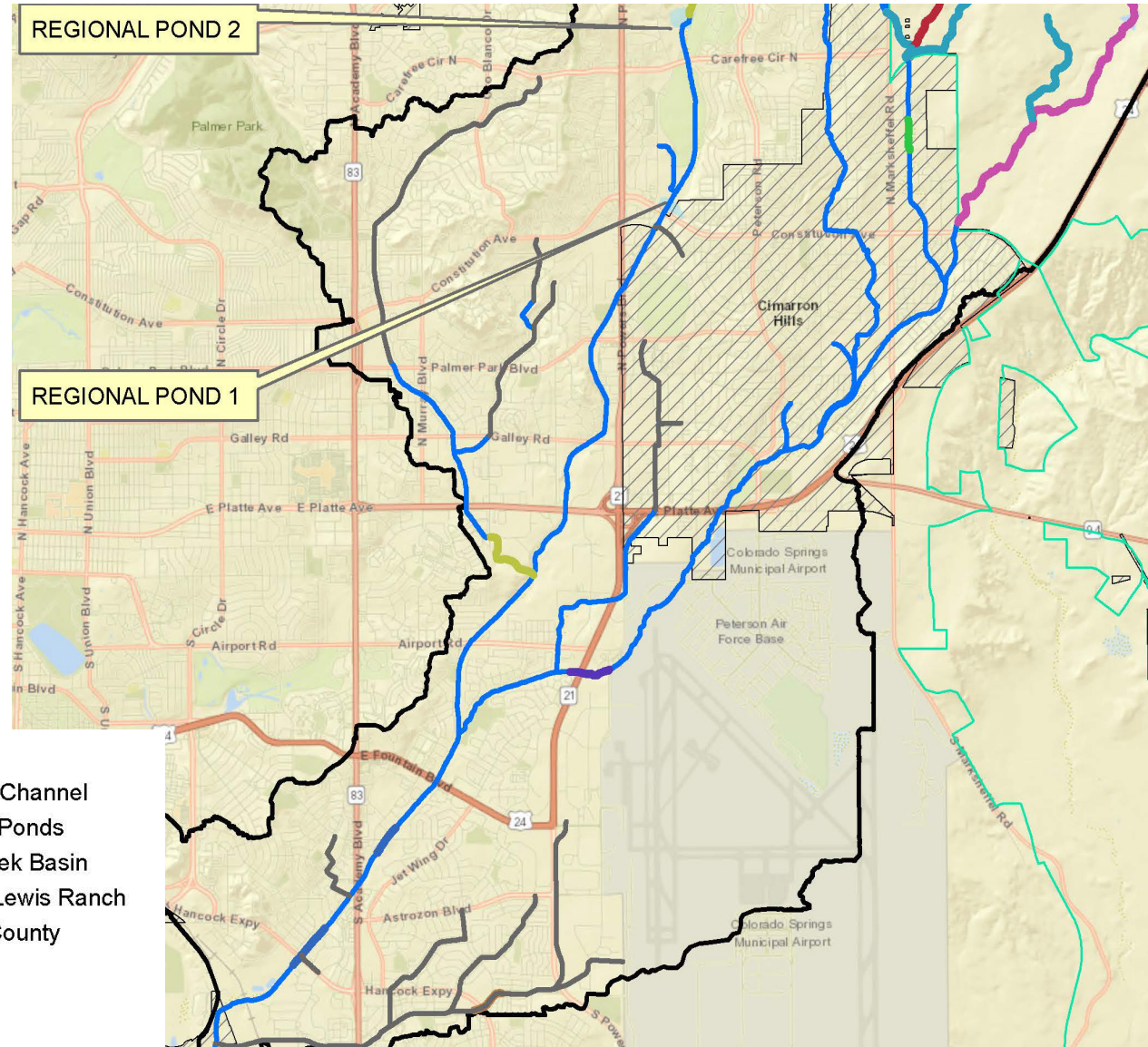
Fee Development

-  Previously Constructed in BLR
-  3
-  4
-  5
-  6
-  7
-  8
-  Concrete
-  MediumSpot
-  Reaches
-  Concrete Channel
-  Regional Ponds
-  Sand Creek Basin
-  Banning Lewis Ranch
-  El Paso County



Undeveloped Improvement Determination – Lower Basin

Fee Development



- Previously Constructed in BLR
- Reaches
- Concrete Channel
- Regional Ponds
- Sand Creek Basin
- Banning Lewis Ranch
- El Paso County
- 3
- 4
- 5
- 6
- 7
- 8
- Concrete
- MediumSpot

Fee Development – Drainage Fee Calculation

- Sand Creek DBPS Cost Estimates for Undeveloped City of Colorado Springs (excluding BLR)

Facility	Estimate (LF)	Cost
Engineered Channel ID 3 (TW = 168')	6,057	\$ 7,268,060
Engineered Channel ID 4 (TW = 200')	1,628	\$ 3,907,703
Natural Channel ID 5 (TW = 84')	2,292	\$ 916,635
Natural Channel ID 6 (TW = 144')	10,647	\$ 7,452,648
Concrete Reach	1,321	\$ 1,321,306
Medium Spot Channel Improvement	13	\$ 4,550,000
Box Culvert 100 < 150 SF	55	\$ 110,000
Box Culvert > 150 SF	160	\$ 420,000

Fee Development – Drainage Fee Calculation

- Sand Creek DBPS Cost Estimates for Undeveloped Banning Lewis Ranch

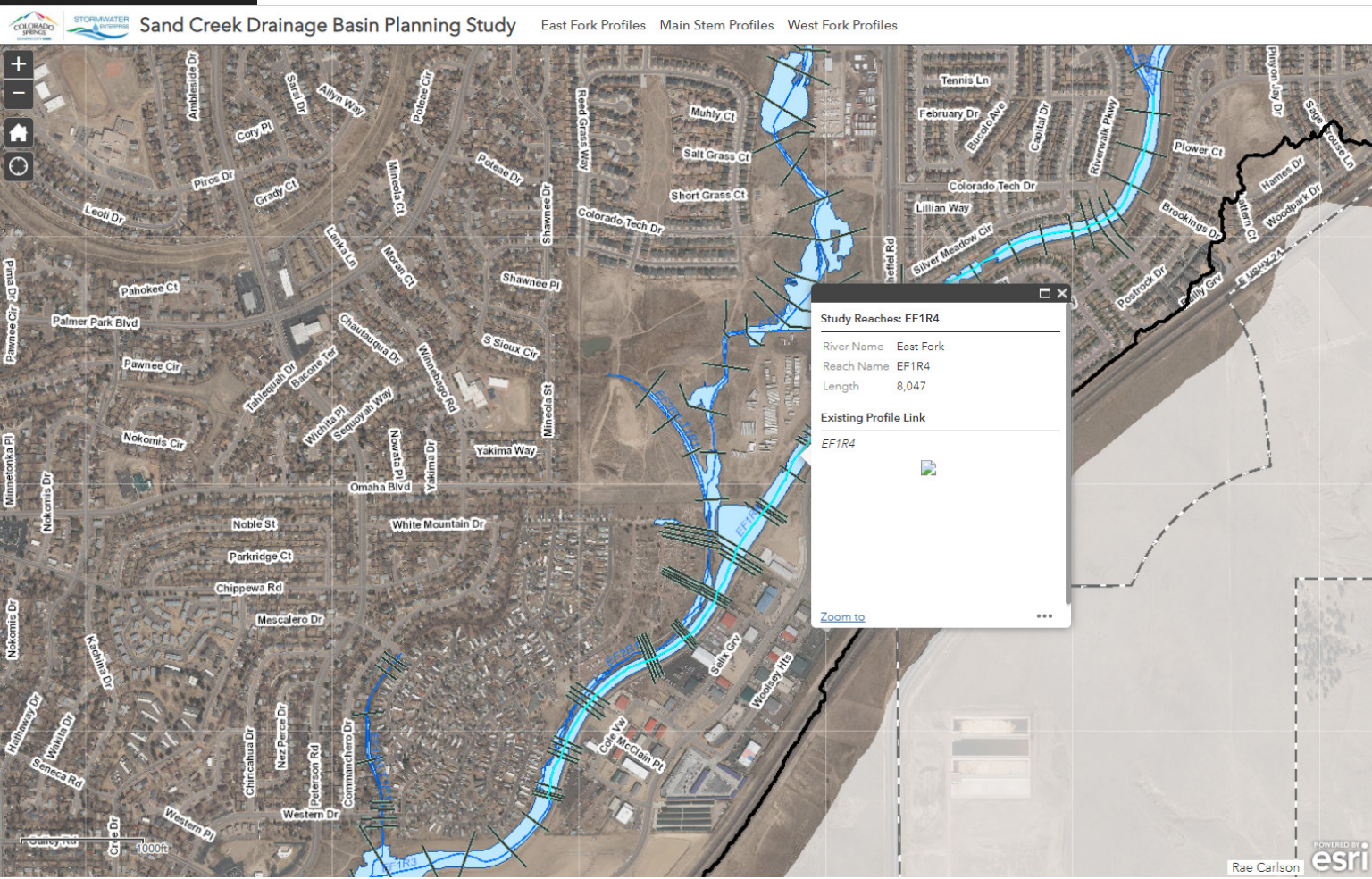
Facility	Estimate (LF)	Cost
Natural Channel ID 5 (TW = 84')	44,144	\$ 17,657,600
Natural Channel ID 6 (TW = 144')	37,619	\$ 26,333,308
Natural Channel ID 7 (TW = 188')	9,352	\$ 9,352,457
Natural Channel ID 8 (TW = 284')	16,060	\$ 32,120,000
48" RCP	5,763	\$ 2,017,062
60" RCP	9,354	\$ 4,209,455
72" RCP	5,587	\$ 3,072,958
84" RCP	1,409	\$ 915,904
Box Culvert 50 < 74 SF	104	\$ 145,600

Fee Development – Drainage Fee Calculation

Cost Type	Costs
Total Improvement Cost	\$ 122,270,696
Total Cost (Including Deferred Areas)	\$ 131,837,737
Deferred Fees	\$ 20,716,825
Fund Balance	\$ 1,551,076
Total Unfunded Cost	\$ 109,569,836
Undeveloped Cost per Acre	\$ 18,841

Online Mapping

Online Map Results



Layer List

Layers

- Existing Model
- Sand Creek Drainage Basin
- Hydraulics
- FEMA Floodplain
- Lakes
- Basin Mask
- Future Model
- Sand Creek Drainage Basin
- Hydraulics
- FEMA Floodplain
- Open Drainage
- Lakes
- Basin Mask
- Hydrology
- Recommendations
- Roadway

Adoption Schedule

Sand Creek DBPS – Adoption Schedule

- Drainage Board Meeting –
January 21, 2021 (Today)
- Council Budget Committee –
February 9, 2021
- City Council Work Session –
February 22, 2021
- City Council Meeting –
March 9, 2021



Thank You