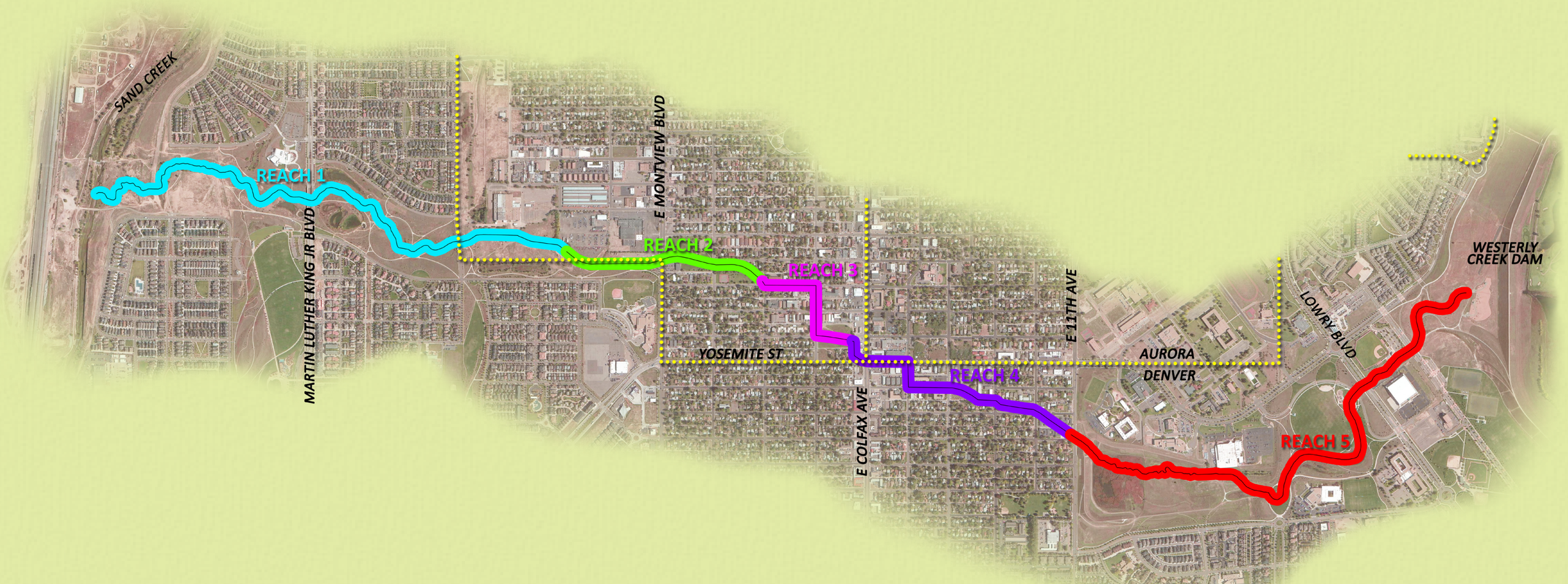
WESTERLY CREEK
CREEK OVERVIEW
WESTERLY CREEK DAM TO SAND CREEK



CHANNEL REACH / TRIBUTARY	WESTERLY CREEK STATIONING	REACH LENGTH (FEET)	TOTAL NUMBER OF PROJECTS
REACH 1	0+00 to 75+50	7,654	0
REACH 2	75+50 to 102+50	2,677	1
REACH 3	102+50 to 120+50	1,863	1
REACH 4	120+50 to 139+00	3,540	1
REACH 5	139+00 to 156+00	7,491	0

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INFRASTRUCTURE STORMWATER MASTER PLAN
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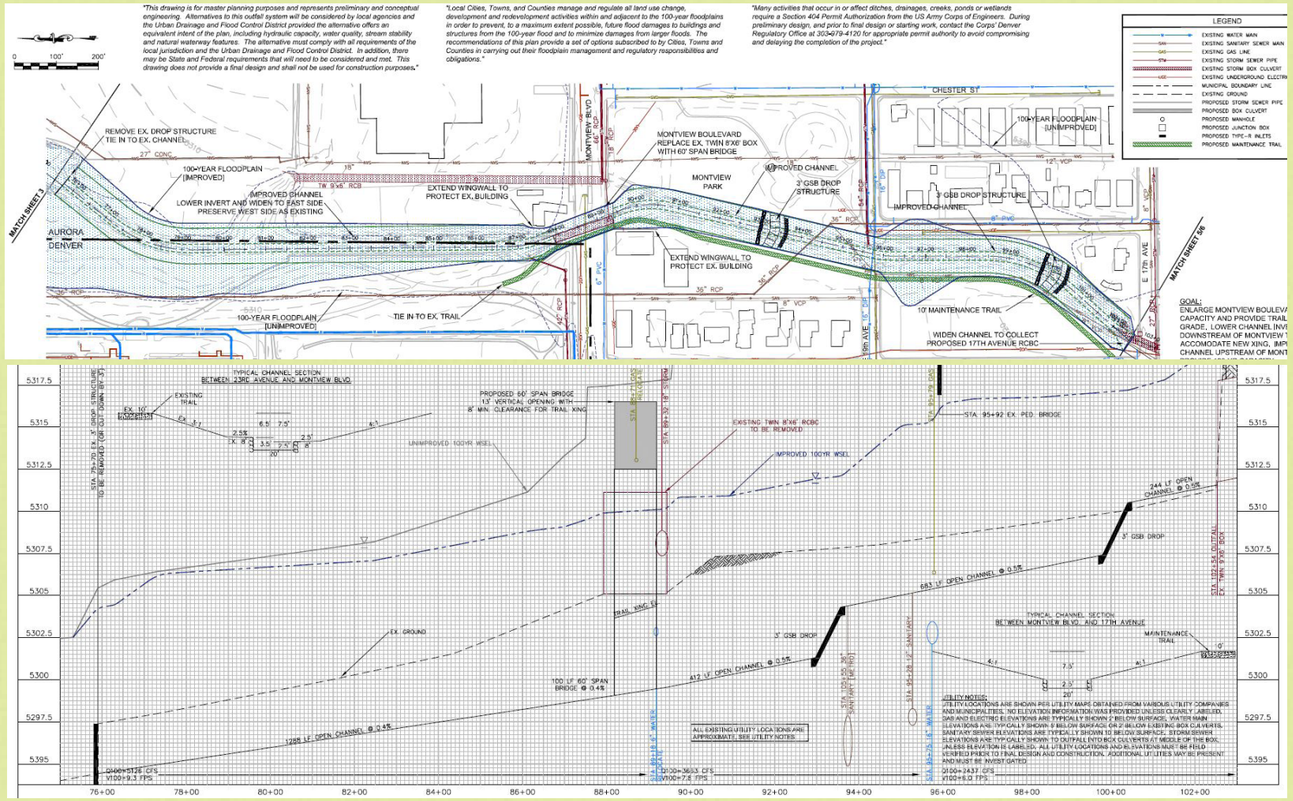
WESTERLY CREEK
PROJECT W.R2.1 - REACH 2 CHANNEL IMPROVEMENTS
WESTERLY CREEK NORTH AND SOUTH OF MONTVIEW BOULEVARD

Item	Quantity	Unit	Unit Cost	Total Cost
Channel Excavation	15,300	CY	$15	$229,500
Boulder Edging	5,100	LF	$90	$459,000
Reclamation & Seeding	4	AC	$1,000	$4,100
Concrete Trail (10')	1,500	LF	$40	$60,000
Drop Structure (3')	2	EA	$96,000	$192,000
Remove Box Culvert	150	LF/Cell	$100	$15,000
Montview Blvd Bridge	1	LS	$1,500,000	$1,500,000
ROW and Easements	74,000	SF	$4	$296,000
Dewatering			1%	$25,000
Mobilization			5%	$122,980
Traffic Control				$20,000
Utility Coordination/Relocation				$20,000
Stormwater Management/Erosion Control			5%	$122,980
SUBTOTAL				**$3,066,560**
Contingencies			25%	$692,640
Engineering Design Services			15%	$415,584
Legal and Administrative Services			5%	$138,528
Construction Administration & Management			10%	$277,056
TOTAL ESTIMATED COST				**$4,590,368**
Annual Operation and Maintenance				
Debris Removal	2700	LF	$15.00	$40,500
Mowing	12	AC	$500	$6,000
Restorative and Rehabilitation	0.51	mile	$5,000	$2,550
TOTAL ANNUAL OPERATION & MAINTENANCE COST				**$49,050**



Item	Local Priority	Global Priority	Project Rating	Project Score
ECONOMIC		**0.5**		
Optimized Asset Lifecycle Costs	0.33	0.165	0.75	0.124
Operational Efficiencies	0.33	0.165	0.5	0.083
Growth and Economic Development	0.34	0.17	0.5	0.085
ENVIRONMENTAL		**0.25**		
City Sustainability Initiatives	0.33	0.083	0.4	0.033
Environmental Risk Management	0.33	0.083	0.6	0.050
Regulatory Compliance	0.34	0.085	0.2	0.017
SOCIAL		**0.25**		
Levels of Service	0.2	0.05	0.8	0.04
Customer/Community Benefit	0.2	0.05	0.4	0.02
Social Risk Management	0.2	0.05	0.8	0.04
System Performance	0.2	0.05	0.4	0.02
Contractual Obligations	0.2	0.05	0.2	0.01
TOTAL SCORE				**0.521**

REACH DESCRIPTION

Reach 2 begins at the existing drop structure near station 75+50 and extends upstream for ½ mile to 17th Avenue near station 102+50. Within this reach there are three key segments: (1) channel downstream of Montview, (2) Montview Boulevard crossing, (3) channel upstream of Montview.

The channel has recently been improved downstream of Montview Boulevard as part of the Stapleton Redevelopment. The channel improvements focused on the channel bottom and west overbank. The east overbank appears to be unimproved. The channel invert has a slope of 0.4% per the improvements, with grade control structures controlling the slope. The existing Montview Boulevard crossing is a twin 8'x6' box culvert with roughly 10-year capacity. The 25-, 50-, and 100-year floods overtop the roadway. The roadway embankment is 11 feet tall and greatly impacts the floodplain by backing water upstream to 19th Avenue.

The channel through Montview Park has 10-year capacity and was last improved in the 1980's as part of the UDFCD 10-year drainageway construction improvements. Existing flooding in this reach impacts 48 structures and produces $3.7M in flood damages.

PROJECT DESCRIPTION

In analyzing alternative crossings it was found that the channel invert had to be lowered by several feet under Montview to attain 100-year capacity. Additional 8'x6' box culverts proved to be unable to provide 100-year capacity. A 60' span bridge (or hydraulically equivalent structure) will be required to replace the existing twin 8'x6' box culverts. Lowering the channel invert provides the opportunity to add a trail crossing below grade avoiding the high traffic crossing atop of Montview. Lowering the channel at Montview also requires lowering the channel downstream for 1200-feet before the grade can tie into the existing invert with the removal of an existing 3' drop structure. The proposed channel downstream of Montview will have a design slope of 0.4%. Upstream of Montview the channel slope will be 0.5% and will require two 3' drop structures to tie back into the existing grade at 17th Avenue.

These improvements provide 100-year capacity through Montview Boulevard eliminating overtopping and improving traffic safety. Adding a trail crossing below grade improves pedestrian safety. The larger Montview crossing greatly reduces the floodplain width upstream, which was largely created by the backwater behind the embankment. The improved channel through Montview has 100-year capacity.

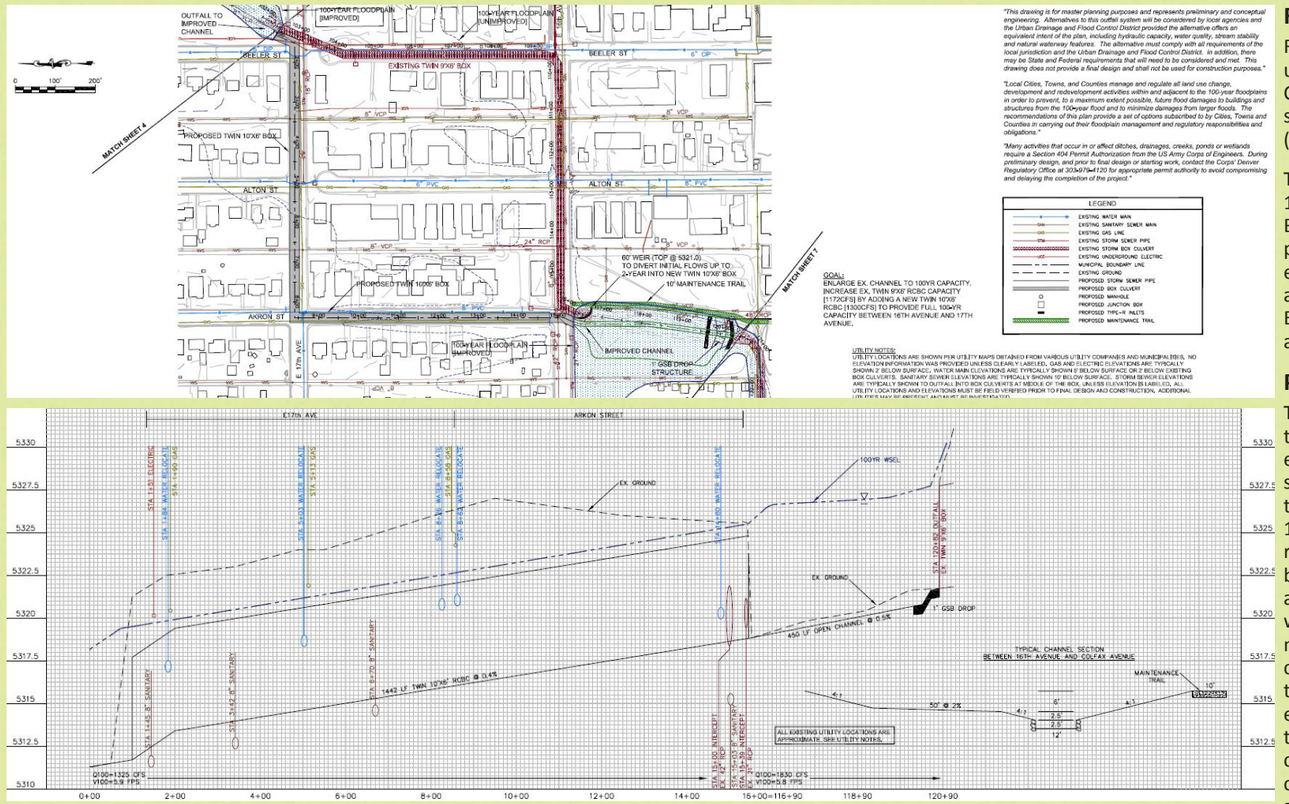
WESTERLY CREEK

PROJECT W.R3.1 - REACH 3 CHANNEL IMPROVEMENTS AND BOX CULVERT

WESTERLY CREEK FROM EAST 17TH AVENUE TO EAST COLFAX AVENUE

Item	Quantity	Unit	Unit Cost	Total Cost
Channel Excavation	2,700	CY	$15	$40,500
Boulder Edging	450	LF	$90	$40,500
Reclamation & Seeding	1	AC	$1,000	$750
Concrete Trail (10')	450	LF	$40	$18,000
Drop Structure (3')	1	EA	$80,000	$80,000
Twin 10'x6" RCBC	1,442	LF	$2,000	$2,884,000
Headwall/Toewall	2	EA	$2,050	$4,100
Wingwalls	2	EA	$10,000	$20,000
Weir Structure	1	LS	$20,000	$20,000
ROW and Easements	0	SF	$4	$0
Dewatering				$20,000
Mobilization			5%	$155,393
Traffic Control				$25,000
Utility Coordination/Relocation				$40,000
Stormwater Management/Erosion Control			5%	$155,393
SUBTOTAL				**$3,503,635**
Contingencies			25%	$875,909
Engineering Design Services			15%	$525,545
Legal and Administrative Services			5%	$175,182
Construction Administration & Management			10%	$350,364
TOTAL ESTIMATED COST				**$5,430,634**

Annual Operation and Maintenance				
Debris Removal	1800	LF	$15.00	$27,000
Mowing	2	AC	$500	$1,000
Restorative and Rehabilitation	0.34	mile	$5,000	$1,700
TOTAL ANNUAL OPERATION & MAINTENANCE COST				**$29,700**



REACH DESCRIPTION

Reach 3 begins at 17th Avenue and extends upstream to the box culvert outlet just north of Colfax Avenue. Within this reach there are two key segments: (1) conveyance between 16th and 17th, (2) open channel upstream of 16th.

The existing drainage feature between 16th and 17th is a twin 9'x6' box culvert (along 16th and Beeler) constructed in the 1980's by UDFCD to provide a 10-year conveyance system. Flows in excess of the 10-year flood overtop 16th Avenue and work their way northeast to 17th Avenue. Existing flooding in this reach impacts 43 structures and produces $3.7M in flood damages.

PROJECT DESCRIPTION

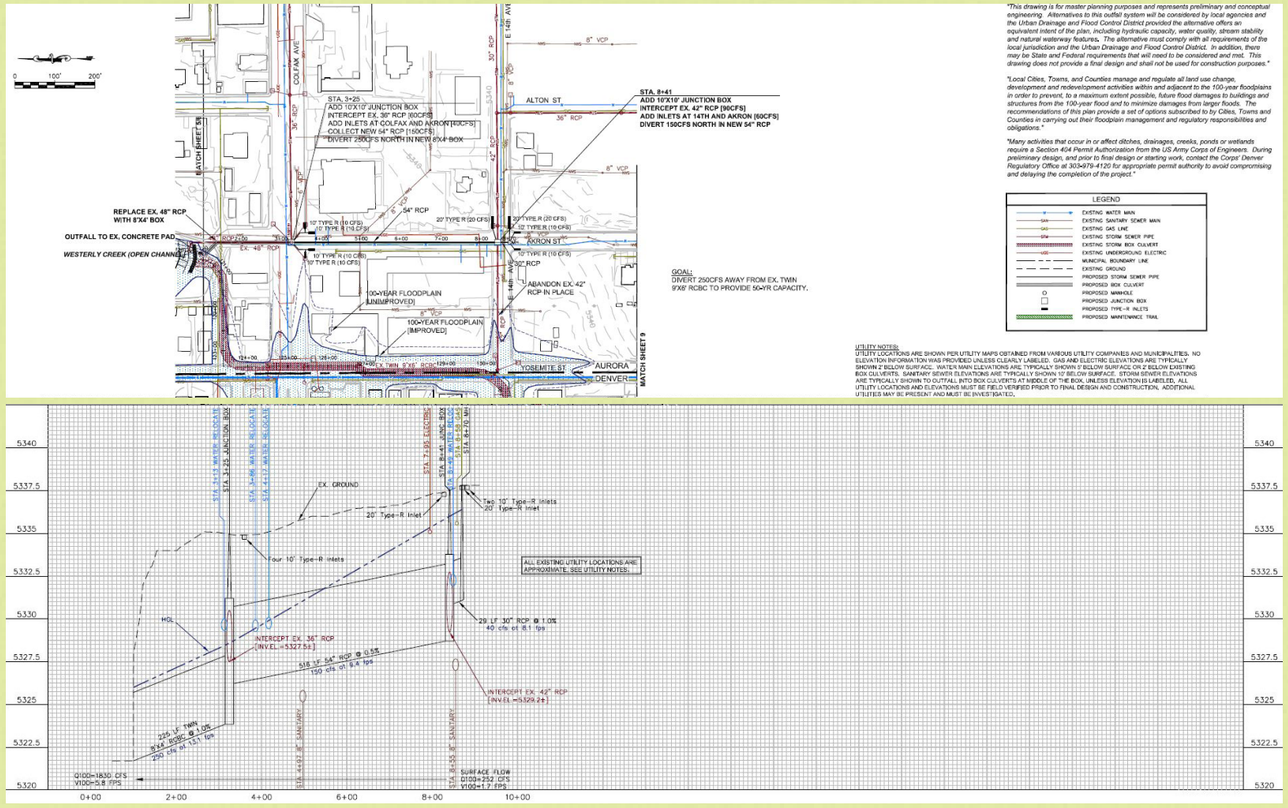
The Sponsors have selected two potential options to improve conveyance through this reach. The economically justified option (this Sheet) is to add a second box culvert to carry the residual flows above the 10-year flood, up to the 100-year flood. A twin 10'x6' box culvert will have capacity to carry the residual flows. The proposed alignment for the new box culvert is north along Akron Street and east along 17th Avenue. There is room in Akron Street west of the existing water main. An existing gas main will need to be relocated to accommodate the culvert. In 17th Avenue the alignment will be along the northern half of the street and will parallel an existing gas main and 18" storm sewer. There are three sanitary main crossings in 17th Avenue. These crossings have dictated the slope of the proposed culvert to pass over the sanitary sewers. There are an additional five water main crossings in which the water mains may be raised or lowered to cross the box culvert.

The second part of this reach addresses improving the open channel upstream of 16th Avenue to 100-year capacity. The channel configuration in this reach required a wide overbank to lower the 100-year level below adjacent residential buildings to the west. The channel improvements are within existing City of Aurora right-of-way. The channel slope will be 0.5% and requires a one-foot drop structure to set the grade. These improvements provide 100-year capacity, remove 43 structures from the floodplain and eliminate $3.7M in flood damages.

Item	Local Priority	Global Priority	Project Rating	Project Score
ECONOMIC		**0.5**		
Optimized Asset Lifecycle Costs	0.33	0.165	0.75	0.124
Operational Efficiencies	0.33	0.165	0.5	0.083
Growth and Economic Development	0.34	0.17	0.5	0.085
ENVIRONMENTAL		**0.25**		
City Sustainability Initiatives	0.33	0.083	0.4	0.033
Environmental Risk Management	0.33	0.083	0.6	0.050
Regulatory Compliance	0.34	0.085	0.2	0.017
SOCIAL		**0.25**		
Levels of Service	0.2	0.05	0.8	0.04
Customer/Community Benefit	0.2	0.05	0.4	0.02
Social Risk Management	0.2	0.05	0.8	0.04
System Performance	0.2	0.05	0.4	0.02
Contractual Obligations	0.2	0.05	0.2	0.01
TOTAL SCORE				**0.521**

WESTERLY CREEK
PROJECT W.R4.1 - REACH 4 BOX CULVERTS
WESTERLY CREEK FROM EAST COLFAX AVENUE TO EAST 11TH AVENUE

Item	Quantity	Unit	Unit Cost	Total Cost
8’x4’ RCBC	225	LF	$715	$160,875
54” RCP	516	LF	$185	$95,460
30” RCP	70	LF	$105	$7,350
5’ Type R Inlet	20	EA	$3,500	$70,000
10’x10’ Junction Box	2	EA	$30,000	$60,000
ROW and Easements	0	SF	$4	$0
Dewatering				$10,000
Mobilization			5%	$19,684
Traffic Control				$10,000
Utility Coordination/Relocation				$150,000
Stormwater Management/Erosion Control			5%	$19,684
SUBTOTAL				**$603,054**
Contingencies			25%	$150,763
Engineering Design Services			15%	$90,458
Legal and Administrative Services			5%	$30,153
Construction Administration & Management			10%	$60,305
TOTAL ESTIMATED COST				**$934,733**
Annual Operation and Maintenance				
Debris Removal	770	LF	$15.00	$11,550
Mowing	0	AC	$500	$0
Restorative and Rehabilitation	0.15	mile	$5,000	$750
TOTAL ANNUAL OPERATION & MAINTENANCE COST				**$12,300**



Item	Local Priority	Global Priority	Project Rating	Project Score
ECONOMIC		**0.5**		
Optimized Asset Lifecycle Costs	0.33	0.165	0.75	0.124
Operational Efficiencies	0.33	0.165	0.5	0.083
Growth and Economic Development	0.34	0.17	0.5	0.085
ENVIRONMENTAL		**0.25**		
City Sustainability Initiatives	0.33	0.083	0.4	0.033
Environmental Risk Management	0.33	0.083	0.6	0.050
Regulatory Compliance	0.34	0.085	0.2	0.017
SOCIAL		**0.25**		
Levels of Service	0.2	0.05	0.8	0.04
Customer/Community Benefit	0.2	0.05	0.4	0.02
Social Risk Management	0.2	0.05	0.8	0.04
System Performance	0.2	0.05	0.4	0.02
Contractual Obligations	0.2	0.05	0.2	0.01
TOTAL SCORE				**0.521**

REACH DESCRIPTION

Reach 4 begins at the existing twin 9’x6’ box culvert outfall approximately 100’ north of Colfax Avenue. Reach 4 extends upstream to 11th Avenue. Within this reach there are two key segments: (1) underground conveyance between Colfax and 13th Avenue, (2) open channel segments between 13th and 11th Avenue. This Sheet addresses the first segment of Reach 4 between 13th and Colfax Avenue.

The existing drainage feature is a twin 9’x6’ box culvert along Xenia, 14th, Yosemite, and the alley north of Colfax. The box culvert was constructed in the 1980’s by UDFCD to provide a 10-year conveyance system. Flows in excess of the 10-year flood overtop 13th Avenue and work their way north primarily along Yosemite Street to Colfax Avenue. The median along Colfax is elevated and acts as a small dam backing water up Yosemite and impacting the adjacent structures. Additional flooding occurs along Xenia between 13th and 14th. Existing flooding in this reach impacts 14 structures and produces $4.1M in flood damages.

PROJECT DESCRIPTION

Several 100-year designs were analyzed, but proved to be too costly for implementation. The Master Plan for this reach focuses on a 50-year underground conveyance system. The existing twin 9’x6’ box culvert is exceeded by 450 cfs during the 50-year event. There are several storm sewers entering the box from both east and west along this reach. The Plan calls for intercepting these storm sewers and diverting flows north to the open channel, allowing the existing box culvert to carry the remaining 50-year event. Two Sheets show this Plan, one for the east side (Aurora, next Sheet) and one for the west side (Denver, this Sheet).

Entering the box culvert from the west are a 48” RCP in 13th Avenue, and a 30” RCP in 14th Avenue. The 48” RCP will be captured in a junction box at 13th and Xanthia. Street inlets will be added along 14th to capture additional surface flows in excess of the storm sewer capacity. A 54” RCP will carry these flows north along Xanthia to 14th Avenue. At 14th additional street inlets will contribute flows and the pipe will be enlarged to a 60” RCP. The 60” RCP will continue north to the alley south of Colfax where it will turn east to Xenia Street. In the alley the 60” RCP will parallel a 27” sanitary sewer main. The 60” RCP will continue to parallel the sanitary sewer along Xenia Street. At Colfax additional flow will be captured by street inlets and the pipe size will increase to a 66” RCP. The 66” RCP will turn east in the alley north of Colfax and parallel the sanitary main until the next alley crossing near station 5+50. At this point the sanitary sewer turns north, under the 66” RCP. Near Yosemite the 66” RCP combines with a proposed 36” RCP in a junction box. The 36” RCP delivers flow from proposed street inlets at Colfax and Yosemite, which aid in alleviating the small dam effect caused by the elevated median in Colfax. From Yosemite the flows are carried in an 8’x4’ box culvert to the open channel. This system diverts 250 cfs away from the existing twin 9’x6’ box culvert.

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