CHERRY CREEK BASIN WATER QUALITY AUTHORITY

2020 CAPITAL IMPROVEMENT PROGRAM SUPPORTING DATA

TAC Draft – October 3, 2019
TAC Recommendation – November 7, 2019
Board Review Version – October 17, 2019
Board Adopted Version – November 21, 2019

2020 CAPITAL IMPROVEMENT PROGRAM

This document presents the details of the 2020 Capital Improvement Program as adopted by the Authority Board and includes the following information:

Table 1 – Summary of Potential Pollutant Reduction Facilities, Revision for 2020 CIP.

This table lists all the PRF projects that have been considered for implementation by the Authority since 2000 and shows their current status. The "green" font represents projects in progress and the "blue" font represents completed projects.

Prior to 2010, Cherry Creek Reservoir was under a total maximum annual load (TMAL) limitation for phosphorus. Since PRFs originally focused on reduction of phosphorus loads discharged into the reservoir, the table was developed to provide a brief summary of the design basis, projected loads and treatment, and estimated PRF costs and costs per pound of phosphorus immobilized. Currently there is no TMAL; instead the control strategy identified in Regulation No. 72 is to minimize nutrient (phosphorus and nitrogen) concentrations. Therefore, PRFs are still evaluated, in part, on their costs per pound for consistency between all potential PRFs (see also Stream Reclamation Unit Costs below). Additional information on how PRFs are evaluated, particularly stream reclamation type projects, is presented in the Authority's report dated June 17, 2011 titled *Stream Reclamation Water Quality Benefit Evaluation Interim Status Report*.

Table 2 – Summary of Recommended Pollutant Reduction Facilities 2020 – 2029 Budget Projections

This table lists the PRFs that are in the current, 10-year CIP projection with more detail provided for the projects in the current budget year. Since the Authority partners with other governmental agencies to design and construct some of the PRFs, the Authority's portion of total project costs is also shown. The column labeled "obligated funds" represents the total amount approved by the Authority for the project prior to the budget year, since most projects take several years from concept through construction. Funds are considered "obligated" once the Board approves funding at a regular Board meeting.

2020 – 2029 CIP Notes

This document serves as the "footnotes" to Table 2 and provides more budgetary detail for the specific projects listed in Table 2, such as updates to cost estimates, project phasing, and general background information.

2020 Budget Detail

These tables provide further 2020 budget detail for operations and maintenance activities proposed for the constructed PRF's including the Reservoir Mixing System (i.e.: compressor and aeration system maintenance).

Stream Reclamation Unit Costs

This exhibit shows the stream reclamation unit costs trend with project length for completed and planned Authority sponsored projects.

Operations and Maintenance Projects

This table shows the cumulative list and identification number for O&M projects.

CHERRY CREEK BASIN WATER QUALITY AUTHORITY

TABLE 1 - SUMMARY OF POTENTIAL POLLUTANT REDUCTION FACILITIES

REVISIONS FOR 2018 CIP

Date: October 10, 2019

Color Code: Blue Project Completed Green: Planned for design/construction during 5-year period See: "2019 CIP Notes" for changes to this Spreadsheet

Proj. Designation	Project Title	Status	Description	Design Basis				Projected Loads					Projected Treatment			Cost Estimate (1000$)								Unit Cost ($/pound)		Note
			PRF Type	Quantity	Unit	Rate	Volume	Rate		Total		Source	Removal	lbs Removed		Capital	Land Acquisition	Water Augment[8]	Capital Replace[9]	O&M	Annual Cost @ 4%	CCBWQA Share (%)	CCBWQA Share ($)	w/o cost sharing	w/cost sharing	
(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)		(9)		(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
CCR-1	Reservoir Destratification (mixing)	Officially start-up April 2008	Use inlake mixing to minimize algae blooms, therefore chlorophyll a	369	sq mi	n/a	n/a	n/a		n/a		n/a		810	lbs/season	$ 968				28	$ 80	100%	$968	$ 99	$ 99	
CCB-1	CCSP Wetlands	Prelim design prepared in 2003 (Ref 1, 8)	Restore 60 Acres of wetlands in multiple phases	369	sq mi	3.5 cfs avg daily flow	1415 af/210 days	0.35	mg/l	1050	lbs/yr	Base flow		600	lbs/season	$ 1,928	$ -	$ -	$ -	19	$ 123	100%	$1,928	$ 204	$ 204	18
CCB-5.1	Cherry Creek Sediment Pond at Arapahoe Road (see CCB-5.14)	Project eliminated and area combined into Phase III of CCB-5.14	Design and construct sediment pond	369	sq mi		3600 cy sed/yr	14.6	mg/l	92	lbs/yr	base flow		85	lbs/year	$ 2,355	$ 50	$ -	$ -	$ 90	$ 219	18%	$424	$ 2,575	$ 463	1, 19
CCB-5.2	Arapahoe/Douglas County Line Stream Stabilization	Project completed w/o Authority participation	Local stream stabilization (L = 2700 ft)	0.51	mi			100	lbs/mi	51	lbs/yr	Storm Flow	90%	46	lbs/year	$ 1,062	$ -	$ -	$ -	1	$ 58	0%	$0	$ 1,258	$ -	
CCB-5.3	Cottonwood Bridge Stream Stabilization	Project completed by Parker w/o Authority participation	Local stream stabilization (L = 2700 ft)	0.51	mi			100	lbs/mi	51	lbs/yr	Storm Flow	90%	46	lbs/year	$ 436	$ -	$ -	$ -	2	$ 25	0%	$0	$ 551	$ -	
CCB-5.4	Cherry Creek Stream Stabilization at Main Street (Parker)	Conceptual design by UDFCD identified priority 1	Local stream stabilization (L = 4000 ft)	0.76	mi			100	lbs/mi	76	lbs/yr	Storm Flow	90%	68	lbs/year	$ 1,776	$ -	$ -	$ -	1	$ 96	11%	$200	$ 1,410	$ 159	2
CCB-5.5	Stroh Road Stream Stabilization	Project completed by Parker w/o Authority participation	Stream stabilization (L = 5000 ft)	0.95	mi			100	lbs/mi	95	lbs/yr	Storm Flow	90%	85	lbs/year	$ 218	$ -	$ -	$ -	1	$ 13	0%	$0	$ 149	$ -	
CCB-5.6	Cherry Creek Stream Stabilization at Lincoln Avenue (Parker)	Conceptual design by UDFCD identified priority 3	Local stream stabilization (L = 2350 ft)	0.45	mi			100	lbs/mi	45	lbs/yr	Storm Flow	90%	40	lbs/year	$ 1,447	$ -	$ -	$ -	1	$ 79	21%	$304	$ 1,960	$ 412	2
CCB-5.7	Cherry Creek Stream Stabilization at Eco-Park (SEMSWA)	IGA w/SEMSWA for design in 2010 and construction in 2011/2012	Local stream stabilization (L = 6850 ft)	1.30	mi			100	lbs/mi	130	lbs/yr	Storm Flow	90%	117	lbs/year	$ 4,756	$ -	$ -	$ -	$ 1	$ 256	24%	$1,155	$ 2,191	$ 532	2
CCB-5.8	Cherry Creek Stream Reclamation U/S Arapahoe Rd (Aurora) (see CCB-5.14)	Now Phase 5 of CCB-5.14	Local stream stabilization (L = 2200 ft)	0.42	mi			100	lbs/mi	42	lbs/yr	Storm Flow	90%	38	lbs/year	$ -	$ -	$ -	$ -	1	$ 1	35%	$0	$ 27	$ 9	2
CCB-5.9.1	Cherry Creek Stream Stabilization at 12-Mile Park (CCSP) - Phase I	Design completed in 2011 for Phase I.	Local stream stabilization (L = 500 ft)	0.09	mi			100	lbs/mi	9	lbs/yr	Storm Flow	90%	9	lbs/year	$ 296	$ -	$ -	$ -	$ 1	$ 17	100%	$296	$ 1,979	$ 1,979	2, 20
CCB-5.9.2	Cherry Creek Stream Stabilization at 12-Mile Park (CCSP) - Phase II	Design completed in 2013 for Phase II.	Local stream stabilization (L = 2500 ft)	0.47	mi			100	lbs/mi	47	lbs/yr	Storm Flow	90%	43	lbs/year	$ 1,429	$ -	$ -	$ -	$ 1	$ 78	100%	$1,429	$ 1,820	$ 1,820	2, 20
CCB-5.10	Cherry Creek Stream Stabilization at PJCOS (Vermillion Creek, PJMD.)	Design completed by PJMD. Authority is funding partner in design	Local stream stabilization (L = 5100 ft)	0.97	mi			100	lbs/mi	97	lbs/yr	Storm Flow	90%	87	lbs/year	$ 3,017	$ -	$ -	$ -	$ 2	$ 164	21%	$643	$ 1,882	$ 401	
CCB-5.11	Cherry Creek Stream Stabilization at Norton Farms (Parker)	Conceptual design by UDFCD identified priority 3	Local stream stabilization (L = 2200 ft)	0.42	mi			100	lbs/mi	42	lbs/yr	Storm Flow	90%	38	lbs/year	$ 900	$ -	$ -	$ -	1	$ 49	28%	$252	$ 1,313	$ 368	2
CCB-5.12	Cherry Creek Stream Stabilization at Pine Lane	Project completed by Parker w/o Authority participation	Local stream stabilization (L = 1500 ft)	0.28	mi			100	lbs/mi	28	lbs/yr	Storm Flow	90%	26	lbs/year	$ 500	$ -	$ -	$ -	1	$ 28		$0	$ 1,087	$ -	
CCB-5.13	Cherry Creek Stream Stabilization at Shop Creek Trail	Preliminary design completed in 2010 (Ref 12).	Local Stream Stabilization (L = 2000 ft)	0.38	mi			100	lbs/mi	38	lbs/yr	Storm Flow	90%	34	lbs/year	$ 603	$ -	$ -	$ -	6	$ 38	100%	$603	$ 1,125	$ 1,125	
CCB-5.14	Cherry Creek Stream Reclamation - CCSP to Eco Park (Ph II to V)	Projects with UDFCD, SEMSWA, and Aurora. Phases started in 2010.	Local stream stabilization (L = 11000 ft)	2.08	mi			100	lbs/mi	208	lbs/yr	Storm Flow	90%	188	lbs/year	$ 10,200	$ -	$ -	$ -	$ 1	$ 547	25%	$2,499	$ 2,920	$ 715	
CCB-5.15	Cherry Creek Stream Reclamation at Country Meadows (Hess Rd)	Project by Town of Parker and Douglas County	Local stream stabilization (L = 7700 ft)	1.46	mi			100	lbs/mi	146	lbs/yr	Storm Flow	90%	131	lbs/year	$ 2,170	$ -	$ -	$ -	$ 2	$ 118	24%	$520	$ 901	$ 216	
CCB-5.16	Cherry Creek Stream Reclamation - 12 Mile Phase III	Project w/in CCSP identified as Reach 1 in Project CCB-5.14 work.	Local stream stabilization (L =720 ft,)	0.14	mi			100	lbs/mi	14	lbs/yr	Storm Flow	90%	12	lbs/year	$ 490	$ -	$ -	$ -	5	$ 31	100%	$490	$ 2,538	$ 2,538	
CCB-5.17	Cherry Creek Stream Reclamation at KOA	Prelimiinary design completed 2019, Extension Requested by UDFCD and Parker in 2019	Local stream stabilization (L =1400 ft original, L=2000 ft with 600 ft extension)	0.38	mi			100	lbs/mi	38	lbs/yr	Storm Flow	90%	34	lbs/year	$ 1,835	$ -	$ -	$ -	18	$ 117	20%	$375	$ 3,422	$ 699	
CCB-5.17	Cherry Creek Stream Reclamation U/S Scott Road	Project requested by Douglas County and UDFCD in 2019	Local stream stabilization (L = 4100 ft)	0.78	mi			100	lbs/mi	78	lbs/yr	Storm Flow	90%	70	lbs/year	$ 2,500	$ -	$ -	$ -	25	$ 159	25%	$625	$ 2,274	$ 569	
CCB-6.1	Piney Creek Stream Stabilization - Project 1	Authority funded $118,000 Arapahoe County in 2002.	Restore 5200 lf upstream of Parker Road	22.90	sq mi	n/a	n/a	100	lbs/mi	100	lbs/yr	Storm Flow	90%	90	lbs/year	$ 997	$ -	$ -	$ -	$ 10	$ 64	13%	$130	$ 709	$ 92	
CCB-6.2	Piney Creek Stream Stabilization - Project 2 U/S Buckley Rd	Project completed w/o Authority participation	Reclaim 1700 lf upstream of Buckley Road	0.32	mi			100	lbs/mi	32	lbs/mi	Storm Flow	90%	29	lbs/year	$ 998	$ -	$ -	$ -	1	$ 54	12%	$120	$ 1,880	$ 226	
CCB-6.4	Piney Creek Stream Reclamation - Reachs 6 & 7	Request from UDFCD in 2014	Local stream stabilization (L = 6,000 ft)	1.14	mi			unk		365	lbs/yr	Storm Flow	90%	329	lbs/year	$ 11,000	$ -	$ -	$ -	$ 2	$ 591	25%	$2,750	$ 1,800	$ 450	12
CCB-7.1	McMurdo Gulch Reclamation (Castle Rock)	Project completed in 2011	Stream Reclamation (L = 15,000 lf)	2.84				100	lbs/mi	284	lbs/yr	Storm Flow	90%	256	lbs/year	$ 1,470	$ -	$ -	$ -	28	$ 107	43%	$630	$ 419	$ 180	
CCB-7.2	McMurdo Gulch Reclamation (Castle Rock)	Construction 2020	Stream Reclamation (L = 2,000 lf)	0.38				100	lbs/mi	38	lbs/yr	Storm Flow	90%	34	lbs/year	$ 1,677	$ -	$ -	$ -	17	$ 107	25%	$420	$ 3,127	$ 783	
CCB-7.2	McMurdo Gulch Reclamation (Castle Rock)	Project Requested by Castle Rock in 2019, Construction 2021	Stream Reclamation (L = 2,500 lf)	0.47				100	lbs/mi	47	lbs/yr	Storm Flow	90%	43	lbs/year	$ 1,440	$ -	$ -	$ -	14	$ 92	25%	$360	$ 2,148	$ 537	
CCB-7.2	McMurdo Gulch Reclamation (Castle Rock)	Project Requested by Castle Rock in 2019, Construction 2024	Stream Reclamation (L = 1,350 lf)	0.26				100	lbs/mi	26	lbs/yr	Storm Flow	90%	23	lbs/year	$ 1,040	$ -	$ -	$ -	10	$ 66	25%	$260	$ 2,873	$ 718	
CCB-8	Limestone Filter Enhancement	Specific project not identified	Construct limestone filter bed downstream of retention pond	1.0	sq mi	n/a	10.7 af/year/sq mile	427	lbs/sq mi	427	lbs/yr	Base and storm flow	20%	85	lbs/year/mi^2	$ 943		$ -	$ 595	$ 1	$ 83	43%	$405	$ 977	$ 420	
CCB-11	Advanced Water Treatment Plant	Conceptual design prepared	Construct 2 MGD AWT plant on Cottonwood Creek to treat Cherry Creek and Cottonwood Creek flows (0.21-mg/ influent, 0.03 mg/l disch)	3	cfs	2-MGD	2260	0.21	mg/l	1272	lbs/yr	Base flow and groundwater	90%	1145	lbs/year	$ 4,593	unknown	unknown		$ 69		100%	$4,593	$ -	$ -	11
CCB-12	Bowtie Property PRF	Purchase completed 2003	Stabilize confluence (Ph I) and construct sediment pond (Ph 2)	22	sq mi	2-year flood	300 af	500	mg/l/ton	85	lbs/yr	base flow and minor flood	70% pond 65% wetlands	235	lbs/year	$ 826	$ 300	$ 63	$ 1.8	$ 6	$ 70	100%	$826	$ 299	$ 299	2
CCB-12.1	Bowtie Phase I	No action to date	Constructed Wetlands u/s Bowtie Property in Cherry Creek (0.20-disch)	369	sq mi	0.5 cfs avg daily flow	210 af/210 days	0.35	mg/l	86	lbs/yr	Base flow	assumed effluent conc	86	lbs/season	$ 235	$ 200	$ 80	$ -	$ 7	$ 35	100%	$235	$ 404	$ 404	

CHERRY CREEK BASIN WATER QUALITY AUTHORITY

TABLE 1 - SUMMARY OF POTENTIAL POLLUTANT REDUCTION FACILITIES

REVISIONS FOR 2018 CIP

Date: October 10, 2019

Color Code: Blue Project Completed Green: Planned for design/construction during 5-year period See: "2019 CIP Notes" for changes to this Spreadsheet

Proj. Designation	Project Title	Status	Description	Design Basis				Projected Loads					Projected Treatment			Cost Estimate (1000$)								Unit Cost ($/pound)		Note
			PRF Type	Quantity	Unit	Rate	Volume	Rate		Total		Source	Removal	lbs Removed		Capital	Land Acquisition	Water Augment[8]	Capital Replace[9]	O&M	Annual Cost @ 4%	CCBWQA Share (%)	CCBWQA Share ($)	w/o cost sharing	w/cost sharing	
CCB-13.1	Cottonwood\Peoria Wetlands Pond	Completed 2003. Restorative maintenance required in 2009	Joint funded project with UDFCD, GWV, Arapahoe County	8.30	sq mi							base and flood flows	measured	363	lbs/year	$ 1,636	$ -	$ -	$ -	$ 5	$ 93	12%	$196	$ 255	$ 31	2
CCB-13.2	Cottonwood Stream Reclamation in CCSP	Phase I completed in 2004. Phase II completed June 2008 (Ref 2)	11,600 lf of stream reclamation from Peoria to Perimeter Rd. Pond	2.20	mi			100	lbs/mi	220	lbs/yr	base and flood flows	see separate calcs	730	lbs/year	$ 2,200	$ -	$ -	$ -	$ 55	$ 173	100%	$2,200	$ 237	$ 237	2
CCB-13.3	Cottonwood Creek Stream Stabilization at Easter Avenue	Authority contributed $338,000 for construction in 2010.	2,600 lf of stream reclamation from Easter Ave to Briarwood Ave	0.49	mi			100	lbs/mi	49	lbs/yr	Storm Flow	90%	44	lbs/year	$ 1,350	$ -	$ -	$ -	$ 1	$ 73	25%	$338	$ 1,655	$ 414	2
CCB-13.4	Peoria Trib B/Airport East and West Pond (Outfall C-1)	Cottonwood Creek Master Planned Improvements. Ponds combined into one.	Combined existing detention ponds and provided EURV	0.35	sq mi			400	lbs/sq mi	140	lbs/yr	Base and storm flow	40%	56	lbs/yr	$ 523	$ -	$ -	$ -	$ -	$ 28	25%	$131	$ 500	$ 125	
CCB-13.5	Cottonwood Creek at Briarwood	Project request by SEMSWA in 2019	Stream Reclamation - South reach = 850 ft and North reach = 700 ft (L = 1550 lf)	0.29	mi			100	lbs/mi	29	lbs/yr	Storm Flow	90%	26	lbs/year	$ 1,550	$ -	$ -	$ -	16	$ 99	25%	$388	$ 3,730	$ 932	
CCB-14	Belleview Wetlands	Co-funding opportunity with USACE on indefinite hold	Retrofit existing develop. w/wet detention pond	235	Ac SF Resid			400	lbs/sq mi	145	lbs/yr	Base and storm flow	50%	73	lbs/year	$ 210	$ -	$ -	$ -	$ 2	$ 13	100%	$210	$ 183	$ 183	2
CCB-15	Surface Water Reuse at Cherry Creek Vista	Supplemental water not available. Project on indefinite hold.	Use water from Cottonwood Creek to irrigate 10-acres			2.92 af/ac-yr	29.2 af/yr	0.20	mg/l	15.9	lbs/yr	base flow	80%	13	lbs/year	$ 50	$ -	$ -	$ -	$ -	$ 3	100%	$50	$ 211	$ 211	
CCB-16	Stream Corridor Preservation	No projects identified in 2012	Partner with others to purchase property or conservation easements along Cherry Creek													$ 100					$ 5	100%	$100			1
CCB-17.2	Reservoir Shoreline Stabilization Mountain Loop Trail	Scheduled for construction beginning in 2012	CCSP Recreation sites: Mountain, Lake and Cottonwood Creek Loops											54	lbs/yr	$ 1,131	$ -	$ -	$ -	$ 5	$ 66	100%	$1,131	$ 1,215	$ 1,215	1, 16
CCB-17.3	West Boat Ramp Parking Lot WQ Improvements	Final design completed in 2012	Provide water quality treatment of parking lot runoff.	3.43	ac prkg lot					3	lbs/yr	parking lot	70%	2.1	lbs/yr	$ 330	$ -	$ -	$ -	$ 1	$ 19	100%	$330	$ 8,903	$ 8,903	1
CCB-17.4	East Boat Ramp Shoreline Stabilization Phase III	Identified during 2011 annual PRF inspection	400 lf of bank stabilization	400	lf	0.1 cy/yr/ft		0.14	lbs/lf	56.0	lbs/yr	bank erosion	80%	44.8	lbs/yr	$ 350	$ -	$ -	$ -	$ 2	$ 21	100%	$350	$ 463	$ 463	
CCB-17.5	East Shade Shelter Shoreline Stabilization Phase II	Identified during 2011 annual PRF inspection	100 lf of bank stabilization	100	lf	0.1 cy/yr/ft		0.14	lbs/lf	14.0	lbs/yr	bank erosion	80%	11.2	lbs/yr	$ 60	$ -	$ -	$ -	$ -	$ 3	100%	$60	$ 287	$ 287	
CCB-17.6	West Shade Shelter Shoreline Stabilization PRF[14]	Identified initially in 2006. UCD Student Project w/WPR in 2013	1,400 lf of bank stabilization	1400	lf	0.1 cy/yr/ft		0.14	lbs/lf	196.0	lbs/yr	bank erosion	80%	179	lbs/yr	$ 950	$ -	$ -	$ -	$ 1,000	$ 51	100%	$662	$ 410	$ 410	21
CCB-17.7	Tower Loop Shoreline Stabilization Phase II	Identified during 2014 annual PRF inspection	700 lf of bank stabilization	700	lf	0.1 cy/yr/ft		0.14	lbs/lf	98.0	lbs/yr	bank erosion	80%	78.4	lbs/yr	$ 700	$ -	$ -	$ -	$ -	$ 38	100%	$700	$ 478	$ 478	
CCB-18	OWTS Sewer Service	No action to date	Provide Sewer Service for OWTS Areas			To Be Determined		To Be Determined					To Be Determined				To Be Determined					100%		To Be Determined		1
CCB-19	Non-point Pollutant Management	No action to date	Assist agricultural contributors to water quality impact			To Be Determined		To Be Determined					To Be Determined			$ 100	$ -	$ -	$ -	$ -	$ 5	100%	$100	To Be Determined		1
CCB-20.1	Detention Pond Retrofit Program - McMurdo Gulch	Phase 1 - McMurdo Gulch	Modify existing ponds to meet current standards for WQ	1	Each			0.40	lbs/Trib Acre	0.4	lbs/yr	Residential		9	lbs/pond/yr	$ 60	$ -	$ -	$ -	$ 0	$ 4	100%	$60	$ 396	$ 396	1, 17
CCB-21	Lone Tree Creek in CCSP	Identified in 2014. Request from Arapahoe County Open Space.	3,600 lf of stream reclamation from CCSP Boundary to Cottonwood Creek	0.68	mi			100	lbs/mi	68	lbs/yr	Storm Flow	90%	61	lbs/yr	$ 800	$ -	$ -	$ -	$ 20	$ 63	100%	$800	$ 1,030.52	$ 1,031	
CCB-22	Happy Canyon Creek	MDP Priority 1 Project	6,600 lf of stream reclamation upstream of I-25	1.25	mi			100	lbs/mi	125	lbs/yr	Storm Flow	90%	113	lbs/yr	$ 7,702	$ -	$ -	$ -	$ 2	$ 415	25%	$1,926	$ 3,685.78	$ 921	

Basis for Analysis

(A) Unit cost of phosphorus removal based on annualized cost of completed project over 35 years at 4% interest rate. CRF = 0.053577

(B) All projects identified provide for additional phosphorus immobilization beyond minimum requirements, unless noted otherwise.

NOTES:
1. Assumed that augmentation for consumptive use not required
2. Augmentation for naturally established wetlands not required (assumption)
8. Water costs at $ 6,500 per acre foot
9. Present worth of capital replacement
11. Land acquisition and water augmentation not defined. CWSD\ACWWA JWPP project influenced scope of project.
12. Total Phosphorus loading derived from laboratory sediment samples & Stantec Geomorphic Study BANCS analysis.
15. Estimate based on costs for similar work along East Shoreline dating back to 1996
16. Benefit approximated based on other shoreline projects and estimates
17. Loads and performance based on calculations for 3 McMurdo Gulch ponds.
18. SEO opined that ET must be augmented. Also, recent Reservoir fluctuations may render project infeasible. Placed on indefinite hold.
19. Technical feasibility may change with CDOT bridge replacement and Valley Country Club assistance
20. Joint project with CCSP. Integrate design with Dog Park uses and improvements. Estimate based on similar stream stabilization projects
21. Phosphorus: Shoreline 177 lbs/yr + Parking Lot 2 lbs/yr =179 lbs/yr

REFERENCES

1. Muller Eng 2003. *Feasibility Evaluation for Cherry Creek State Park Wetlands Project*
2. Muller Eng 2003.*Feasibility Evaluation for Cottonwood Creek Stream Stabilization Project*
3. AMEC 2005. *Draft Feasibility Report Cherry Creek Reservoir Destratification*
4. AMEC 2006. *Recommendations for Prepurchase of Jamor Equipment for Cherry Creek Reservoir Destratification Project.*
5. Tetra Tech August 2006. *Phosphorus Estimates in Cherry Creek and Cost for Removal via Sediment Trap.*
6 WERF 2000. *Phosphorus Credit Trading in the Cherry Creek Basin: An Innovative Approach to Achieving Water Quality Benefits.*
7. Ruzzo, WP September 5, 2003. Cherry Creek Corridor Master Plan-*Estimate of Phosphorus Reduction from Stream Reclamation*
8. Ruzzo, W. P. September 21, 2006. *Cottonwood Creek Reclamation - Water Rights Augmentation Requirements.*
9. TetraTech December 2006. *Design of Cherry Creek Sediment Basin and Stream Stabilization.*
10. Brown and Caldwell Feb 2007. *Shop Creek Wetlands Pollutant Reduction Facility Wetland Assessment*
11. PBSJ October 2006. *Draft McMurdo Gulch Major Drainageway Master Plan*
12. Brown and Caldwell 2010. *Cherry Creek Stream Reclamation at Shop Creek Trail.*
13. CCBWQA TAC June 16, 2011. *Stream Reclamation Water Quality Benefit Evaluation Interim Status Report*
14. Ruzzo Memo, September 4, 2013, *West Shade Shelter Shoreline Stabilization PRF - Water Quality Analysis.*

CHERRY CREEK BASIN WATER QUALITY AUTHORITY

TABLE 2 - SUMMARY OF RECOMMENDED POLLUTANT REDUCTION FACILITIES

2020 - 2029 BUDGET PROJECTIONS (1000$)[5]

	October 10, 2019		Current Project Budget				Prior Year Obligated Funds[3]	Residual PRF Costs	Proposed 2020 Budget			Proposed 2021 Budget			Proposed 2022 Budget			Proposed 2023 Budget			Proposed 2024 Budget	Proposed 2025 Budget	Proposed 2026 Budget	Proposed 2027 Budget	Proposed 2028 Budget	Proposed 2029 Budget
	Project No.	Project Title	Capital[1]	Total	Authority Portion	Authority Portion			Design	Capital	Total	Design	Capital	Total	Design	Capital	Total	Design	Capital	Total	Total	Total	Total	Total	Total	Total
Budget Category - General																										
	CCB-5.13A	Cherry Creek Stream Planning and Approach Study (related to: Cherry Creek at Shop Creek Trail, CCB-5.13; and Cherry Creek 12-mile, CCB-5.16)	$ 125	$ 125	$ 125	100%	$ -	***$ 125***	*$ 125*	*$ -*	***$ 125***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***
Budget Category - Reservoir Projects													$ -													
	CCB-	CCSP Meteorological Station	$ 30	$ 30	$ 30	100%	$ 10	***$ 20***	*$ -*	*$ 20*	***$ 20***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***
	CCR-2	Reservoir Destratification System - Upgrade (Pending WWE Evaluation Report)	$ 300	$ 300	$ 300	100%	$ -	***$ 300***	*$ 50*	*$ 250*	***$ 300***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***
	CCB-17.4	East Boat Ramp Shoreline Stabilization Phase III	$ 350	$ 350	$ 350	100%	$ -	***$ 350***	$ -	$ 50	***$ 50***	$ -	$ -	***$ 300***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***
	CCB-17.5	East Shade Shelter Shoreline Stabilization Phase II	$ 60	$ 60	$ 60	100%	$ -	***$ 60***	*$ 10*	*$ 50*	***$ 60***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***
	CCB-17.6	West Shade Shelter Shoreline Stabilization PRF	$ 950	$ 950	$ 950	100%	$ 25	***$ 925***	*$ 175*	*$ 750*	***$ 925***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***
	CCB-17.7	Tower Loop Shoreline Stabilization Phase II	$ 700	$ 700	$ 700	100%	$ -	***$ 700***	*$ 110*	*$ -*	***$ 110***	$ -	$ 345	***$ 345***	$ -	$ 245	***$ 245***	$ -	$ -	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***
Budget Category - Stream Reclamation Projects																										
	CCB-5.4	Cherry Creek Stream Reclamation at Main Street (Parker)	$ 1,776	$ 1,776	$ 200	11%	$ -	***$ 200***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	***$ -***	***$ 200***	***$ -***	***$ -***	***$ -***	***$ -***
	CCB-5.6	Cherry Creek Stream Stabilization at Lincoln Avenue (Parker)	$ 1,447	$ 1,447	$ 304	21%	$ -	***$ 304***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	***$ -***	***$ -***	***$ 304***	***$ -***	***$ -***	***$ -***
	CCB-5.13	Cherry Creek Stream Stabilzation at Shop Creek (Phase I - monitoring station improvements 2020, Phase II Drop Structure Improvement 2021, Phase III Partnered Project TBD)	$ 603	$ 603	$ 603	100%	$ -	***$ 603***	*$ 50*	*$ 100*	***$ 150***	$ -	$ 350	***$ 350***	$ 103	$ -	***$ 103***	$ -	$ -	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***
	CCB-5.14	Cherry Creek Stream Reclamation - Reach 3	$ 2,567	$ 2,567	$ 640	25%	$ -	***$ 640***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	$ 125	$ 175	***$ 300***		$ 340	***$ 340***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***
	CCB-5.14	Cherry Creek Stream Reclamation - Reach 4	$ 2,720	$ 2,720	$ 680	25%	$ -	***$ 680***	$ 130	$ 50	***$ 180***	$ -	$ 300	***$ 300***	$ -	$ 200	***$ 200***	$ -	$ -	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***
	CCB-5.16	Cherry Creek Stream Reclamation - CCSP 12-mile Phase III	$ 490	$ 490	$ 490	100%	$ 46	***$ 444***	$ -	$ 140	***$ 140***	$ 99	$ 205	***$ 304***	$ -	$ -	***$ -***		$ -	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***
	CCB-5.17	Cherry Creek Stream Reclamation - U/S Scott Road (Douglas County)	$ 2,500	$ 2,500	$ 625	25%	$ -	***$ 625***	$ 75	$ 275	***$ 350***	$ -	$ 275	***$ 275***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***
	CCB-5.17	Cherry Creek Stream Reclamation - D/S Pine Drive aka KOA property (Parker)	$ 1,835	$ 1,835	$ 375	20%	$ 170	***$ 205***	$ -	$ 205	***$ 205***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***
	CCB-7.2	McMurdo Gulch Reclamation (Castle Rock)	$ 4,157	$ 4,157	$ 1,040	25%	$ 420	***$ 620***	$ 60	$ -	***$ 60***	$ -	$ 300	***$ 300***	$ -	$ -	***$ -***	$ 30	$ -	***$ 30***	***$ 230***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***
	CCB-13.5	Cottonwood Creek at Briarwood - South reach = 850 ft and North reach = 700 ft	$ 1,550	$ 1,550	$ 388	25%	$ -	***$ 388***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	$ -	$ -	***$ -***	***$ 88***	***$ 300***	***$ -***	***$ -***		
	CCB-21	Lone Tree Creek in CCSP	$ 2,800	$ 2,800	$ 700	25%	$ -	***$ 700***	$ -	$ -	***$ -***	$ 65		***$ 65***	$ 635	$ -	***$ 635***	$ -	$ -	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***
Budget Category - PRF Preservation, Acquisition, Lease																										
	CCB-16	PRF Preservation, Acquisition, Lease of Land or Water	$ 500	$ 500	$ 500	100%	$ -	***$ 500***	$ -	$ -	***$ 50***	$ -	$ -	***$ 50***	$ -	$ -	***$ 50***		$ 50	***$ 50***	***$ 50***	***$ 50***	***$ 50***	***$ 50***	***$ 50***	***$ 50***
		SUB-TOTALS						***$ 8,389***	***$ 785***	***$ 1,890***	***$ 2,725***	***$ 164***	***$ 1,775***	***$ 2,289***	***$ 863***	***$ 620***	***$ 1,533***	***$ 30***	***$ 390***	***$ 420***	***$ 368***	***$ 550***	***$ 354***	***$ 50***	***$ 50***	***$ 50***

CHERRY CREEK BASIN WATER QUALITY AUTHORITY

TABLE 2 - SUMMARY OF RECOMMENDED POLLUTANT REDUCTION FACILITIES

2020 - 2029 BUDGET PROJECTIONS (1000$)[5]

		October 10, 2019	Current Project Budget				Prior Year Obligated Funds[3]	Residual PRF Costs	Proposed 2020 Budget			Proposed 2021 Budget			Proposed 2022 Budget			Proposed 2023 Budget			Proposed 2024 Budget	Proposed 2025 Budget	Proposed 2026 Budget	Proposed 2027 Budget	Proposed 2028 Budget	Proposed 2029 Budget
	Project No.	Project Title	Capital[1]	Total	Authority Portion	Authority Portion			Design	Capital	Total	Design	Capital	Total	Design	Capital	Total	Design	Capital	Total	Total	Total	Total	Total	Total	Total
36		***OPERATIONS AND MAINTENANCE***																								
37		***Rehabilitation Category***																								
39	OM-	PRF Emergency Repairs	$ 40	$ 40	$ 40	100%	$ -	$ -	$ -	$ 90	$ 90			$ 90			$ 90			$ 90	$ 90	$ 90	$ 90	$ 90	$ 90	$ 90
40		***SUB-TOTAL***	$ 40	$ 40	$ 40					$ 90	$ 90			$ 90			$ 90			$ 90	$ 90	$ 90	$ 90	$ 90	$ 90	$ 90
41		***Restorative Category***																								
42	OM-	Tree/Shrub Planting	$ 2	$ 2	$ 2	100%	$ -	$ -	$ -	$ 3	$ 3			$ 3			$ 4			$ 4	$ 4	$ 5	$ 5	$ 5	$ 5	$ 5
43	OM-	Fence Repair[7]	$ 8	$ 8	$ 8	100%	$ -	$ -	$ -	$ -	$ -			$ -			$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -
44	OM-	Shoreline / Bank Restoration[8]																								
45		*Shop Creek*	$ -	$ -	$ -		$ -	$ -	$ -	$ 3	$ 3			$ -			$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -
46		*Cottonwood at Peoria*	$ -	$ -	$ -		$ -	$ -	$ -	$ 3	$ 3			$ -			$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -
47		*Cottonwood Creek Stream Reclamation*	$ 18	$ 18	$ 18	100%	$ -	$ -	$ -	$ 15	$ 15			$ -			$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -
48		*12-Mile Phase II Bank Stabilization*	$ 16	$ 16	$ 16	100%	$ -	$ -	$ -	$ 34	$ 34			$ -			$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -
49		*East Boat Ramp*	$ 35	$ 35	$ 35	100%	$ -	$ -	$ -	$ 35	$ 35			$ -			$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -
50		*East Shade Shelters*	$ 18	$ 18	$ 18	100%	$ -	$ -	$ -	$ 18	$ 18			$ -			$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -
51	OM-	Wetland Harvesting	$ 40	$ 40	$ 40	100%	$ -	$ -	$ -	$ 40	$ 40			$ 50			$ 60			$ 60	$ 80	$ 100	$ 100	$ 100	$ 100	$ 100
52		***SUB-TOTAL***	$ 137	$ 137	$ 137					$ 151	$ 151			$ 53			$ 64			$ 64	$ 84	$ 105	$ 105	$ 105	$ 105	$ 105
53		***Routine Category***																								
54	OM-7	Reservoir Destratification	$ 67	$ 67	$ 67	100%	$ -	$ -	$ -	$ 95	$ 95			$ 67			$ 100			$ 80	$ 100	$ 80	$ 100	$ 80	$ 100	$ 100
55	OM-14.1	PRF Weed Control	$ 7	$ 7	$ 7	100%	$ -	$ -	$ -	$ 7	$ 7			$ 8			$ 9			$ 9	$ 9	$ 10	$ 10	$ 10	$ 10	$ 10
56	OM-14.2	PRF Reseeding at CCSP	$ 7	$ 7	$ 7	100%	$ -	$ -	$ -	$ 7	$ 7			$ 8			$ 8			$ 9	$ 9	$ 9	$ 9	$ 10	$ 10	$ 10
57	OM-14.3	PRF Mowing	$ -	$ -	$ -	100%	$ -	$ -	$ -	$ -	$ -			$ 2			$ 2			$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2
58	OM-	Meteorological Station	$ -	$ -	$ -	100%	$ -	$ -	$ -	$ 6	$ 6			$ 6			$ 6			$ 6	$ 6	$ 6	$ 6	$ 6	$ 6	$ 6
59		***SUB-TOTAL***	$ 81	$ 81	$ 81					$ 115	$ 115			$ 91			$ 125			$ 106	$ 126	$ 107	$ 127	$ 108	$ 128	$ 128
60		***Operations Category***																								
61	O - 1	RDS Utilities	$ 8	$ 8	$ 8	100%	$ -	$ -	$ -	$ 40	$ 40			$ -			$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -
62		***SUB-TOTAL***	$ 8	$ 8	$ 8					$ 40	$ 40			$ -			$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -
64		***SUB-TOTAL O&M***						$ -	$ -	$ 396	$ 396			$ 234			$ 279			$ 260	$ 300	$ 302	$ 322	$ 303	$ 323	$ 323
65		***GRAND TOTAL***						$ 8,389	$ 785	$ 2,286	$ 3,121			$ 2,523			$ 1,812			$ 680	$ 668	$ 852	$ 676	$ 353	$ 373	$ 373

NOTES:
1. Includes engineering, construction, administration, and contingency
2. Includes technical feasibility, design, construction observation and administrative costs
3. Accumulative expenditures for the project, based on previous years accounting and estimate of current year expenses. All O&M work assumed to be fully obligated.
4. Capital costs and potential benefits unknown. Values are place holders.
5. This budget is the TAC recommendation. The funds allocated to each project are subject to further Board approval.
6. Projects completed in prior years are not shown.
7. 12-Mile Park Ph1
8. 12-Mile Ph1 & P2 (bank); E. Boat Ramp, E. Shades & Tower Loop (Shoreline)

Cherry Creek Basin Water Quality Authority
Summary of Operation & Maintenance (O&M) Costs
Prepared / Updated: August 28, 2019

Project	Quantity			Mowing	Herbicide Application	Reseeding	Tree Planting	Shrub Planting	Misc.	Restorative / Rehabilitation project	Comments	Total Cost
	Each	Hours	Acres									
Shop Creek[1,2]			4		$ 400						50/50 split w/CCSP	
			4			$ 3,200					Seed only	
	1									$ 3,000	MHFD has budgeted for the sediment removal of pond downstream of Parker Road in 2019, $3k included for Authority to fund WQ and Sediment Sampling	$ 6,600
Cottonwood CreekPh I & PhII[1,2]			20		$ 2,000						50/50 split w/CCSP	
			3.75			$ 3,000					Seed only	$ 19,700
	1									$ 14,700	Fencing, Erosion Control, Soil Amendment, and Seeding	
Cottonwood Wetlands[4]			5		$ 500						50/50 split w/CCSP	
			1			$ 800					Seed Only	$ 1,300
CC @ 12-Mile Park Ph I [1, 2]			3		$ 600						Area covers on-going Authority Activities	$ 600
CC @ 12-Mile Park Ph II[3]			13		$ 2,600						Area covers on-going Authority Activities	
	50							$ 3,000			Replacement shrubs @ access points	$ 39,600
	1									$ 34,000	Soil Amendment, Seed Bed Prep, Drill Seed, Blanket, and Fencing	
Mountain/Lake Loop			5		$ 500						50/50 split w/CCSP	$ 500
Cottonwood Creek at Peoria Pond Sediment Removal	1									$ 3,000	GV has requested $320k from MHFD for Sediment Removal, $3k included for Authority to fund WQ and Sediment Sampling	$ 3,000
East Boat Ramp										$ 34,500	Restore shoreline area	$ 34,500
East Shade Shelters										$ 18,400	Restore shoreline area	$ 18,400
West Boat Ramp											WBR is CCSP Maintenance Responsibility	
Subtotal				$ -	$ 6,600	$ 7,000	$ -	$ 3,000	$ -	$ 107,600		
TOTAL				$ 124,200								

Areas in Acres

34
8.75
16

Note 1. Mowing Rate = $200/hr. Herbicide Application Rate =$100/acre. Participation @ 50/50 w/Parks.
Note 2. Reseeding Rate = $800/acre. Seed purchase only.
Note 3. Mowing Rate = $200/hr. Herbicide Application Rate =$100/acre. Participation @ 100%.
Note 4. Tree Replacement = $1,000/ea. Shrub Replacement =$50/ea.. Participation @ 100%.
Note 5. PRF Function Repair/Maintenace. Project Specific Estimate. Participation @ 100%.