CHERRY CREEK BASIN WATER QUALITY AUTHORITY

TABLE 1 - SUMMARY OF POTENTIAL POLLUTANT REDUCTION FACILITIES

REVISIONS FOR 2007 CIP

September 6, 2006

WATERSHED MANAGEMENT PRF'S

Proj. Designation	Project Title	Status	Description	Design Basis			Projected Loads			Projected Treatment			Cost Estimate (1000$)							Unit Cost ($/pound)		Consumptive Use
				Trib. Area	Rate	Volume	Rate	Total	Source	Removal	lbs Removed[12]		Capital	Land Acquisition	Water Augment[8]	Capital Replace[9]	O&M	Annual Cost @ 7%	CCBWQA Share (%)	w/o cost sharing	w/cost sharing	(af/year)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(13)
CCR-1	Reservoir Destratification (mixing)	Conceptual design in progress	Use inlake mixing to minimize algae blooms, therefore chlorophyll a	369 sq. miles	n/a	n/a	n/a	n/a	n/a	note 3	810	lbs/season	$ 862				28	$ 94	100%	$ 117	$ 117	n/a
CCB-1	CCSP Wetlands	Prelimary design prepared in 2003 (Ref 1). Final design of Phase I under contract in 2006	Restore 60 Acres of wetlands in muliple phases	369 sq. miles	3.5 cfs avg daily flow	1415 af/210 days	0.35 mg/l	1050 lbs/(210-day season)	Base flow	Ref 1	600	lbs/season	$ 1,928	$ -	$ -	$ -	19	$ 168	100%	$ 280	$ 280	note 2
CCB-5.1	Cherry Creek Sediment Pond at Arapahoe Road	Feasibility study under contract in 2006.	Design and construct sediment pond	369 sq. miles	Note 14	3600 cy sed/yr	14.6 mg/kg	92 lbs P/yr	base flow	Ref 5	85	lbs/year	$ 4,278	$ 50	$ -	$ -	$ 90	$ 423	12%	$ 4,979	$ 598	not required
CCB-5.2	Arapahoe/Douglas County Line Stream Stabilization (Parker)	Conceptual design by UDFCD identified priority 1	Local stream stabilization (L = 2700 ft)				100 lbs/mile	51 lbs P/yr	Storm Flow	90%	46	lbs/year	$ 700	$ -	$ -	$ -	1	$ 55	25%	$ 1,193	$ 298	note 2
CCB-5.3	Cottonwood Bridge Stream Stabilization[17]	Conceptual design by UDFCD identified priority 1	Local stream stabilization (L = 2700 ft)				100 lbs/mile	51 lbs P/yr	Storm Flow	90%	46	lbs/year	$ 436	$ -	$ -	$ -	2	$ 36	25%	$ 773	$ 193	note 2
CCB-5.4	Cherry Creek Stream Stabilization at Mainstreet (Parker)	Conceptual design by UDFCD identified priority 1	Local stream stabilization (L = 3125 ft)				100 lbs/mile	59 lbs P/yr	Storm Flow	90%	53	lbs/year	$ 1,300	$ -	$ -	$ -	1	$ 101	25%	$ 1,908	$ 477	note 2
CCB-5.5	Stroh Road Stream Stabilization[17]	Conceptual design by UDFCD identified priority 1	Local stream stabilization (L = 3000 ft)				100 lbs/mile	57 lbs P/yr	Storm Flow	90%	51	lbs/year	$ 218	$ -	$ -	$ -	1	$ 18	25%	$ 349	$ 87	note 2
CCB-5.6	Cherry Creek Stream Stabilization at Lincoln Aveneue (Parker)	Conceptual design by UDFCD identified priority 3	Local stream stabilization (L = 2350 ft)				100 lbs/mile	45 lbs P/yr	Storm Flow	90%	40	lbs/year	$ 1,315	$ -	$ -	$ -	1	$ 102	20%	$ 2,556	$ 511	note 2
CCB-5.7	Cherry Creek Stream Stabilization at Eco-Park (Arap County)	Conceptual design by UDFCD identified priority 3	Local stream stabilization (L = 950 ft)				100 lbs/mile	18 lbs P/yr	Storm Flow	90%	16	lbs/year	$ 294	$ -	$ -	$ -	1	$ 24	20%	$ 1,477	$ 295	note 3
CCB-5.8	Cherry Creek Stream Stabilization U/S Arapahoe Rd (Centennial)	Conceptual design by UDFCD identified priority 3	Local stream stabilization (L = 1675 ft)				100 lbs/mile	32 lbs P/yr	Storm Flow	90%	29	lbs/year	$ 518	$ -	$ -	$ -	1	$ 41	25%	$ 1,410	$ 352	note 2
CCB-6	Piney Creek Stream Reclamation	One project completed (see CCB-6.1)	Construct channel reclamation structures for 17.4 miles	22.9 sq. miles	n/a	n/a	100 lbs/mile	1740 lbs/year	Storm Flow	90%	1566	lbs/year	$ 17,744	$ 500	$ -	$ -	735	$ 2,140	25%	$ 1,366	$ 342	note 2
CCB-6.1	Piney Creek Stream Stabilization - Project 1	Authority funded $118,000 Arapahoe County in 2002.	Restore 5200 lf upstream of Parker Road	22.9 sq. miles	n/a	n/a	100 lbs/mile	100 lbs/year	Storm Flow	90%	90	lbs/year	$ 997	$ -	$ -	$ -	$ 10	$ 87	12%	$ 969	$ 115	none required
CCB-8	Limestone Filter Enhancement	Information for hypothetical project. Specific project not identified.	Construct limestone filter bed downstream of retention pond	640 acres	n/a	10.7 af/year/sq mile	427 lbs/sq mile	427 lbs/sq mile	Base and storm flow	Note 4	85	lbs/year/mi^2	$ 943		$ -	$ 595	$ 1	$ 119	43%	$ 1,398	$ 601	Note 5
CCB-11	Advanced Water Treatment Plant[11]	Conceptual design prepared	Construct 2 MGD AWT plant on Cottonwood Creek to treat Cherry Creek and Cottonwood Creek flows.	3 cfs	2-MGD	2260 aft/year	0.21 mg/l average influent	0.03 mg/l effluent	Base flow and groundwater	90%	1096	lbs/year	$ 4,593	unknown	unknown		$ 69	$ 423	100%	$ 386	$ 386	Unknown
CCB-12	Bowtie Property PRF	Purchase completed 2003	Stabilize confluence (Ph I) and construct sediment pond (Ph 2) Note 1	22 sq. mi	2-year flood	300 af	500 mg/l P per ton of sed	85 ton sed w/85 lbs P	base flow and minor flood	70% pond 65% wetlnds	235	lbs/year	$ 826	$ 300	$ 63	$ 1.8	$ 6	$ 95	100%	$ 404	$ 404	note 2
CCB-12.1	Expanded Bowtie Project		Constructed Wetlands u/s Bowtie Property in Cherry Creek	369 sq mi	3.5 cfs avg daily flow	1415 af/210 days	0.35 mg/l	1050 lbs/(210-day season)	Base flow	60%	150	lbs/season	$ 235	$ 200	$ 80	$ -	$ 7	$ 47	100%	$ 311	$ 311	note 2
CCB-13.1	Cottonwood\Peoria Wetlands Pond	Completed 2003	Joint funded project with UDFCD, GWV, Arapahoe County	8.3 sq. mi			note 12		base and flood flows	Note 12	363	lbs/year	$ 1,636	$ -	$ -	$ -	$ 5	$ 131	12%	$ 361	$ 42	Note 2

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CCB-13.2	Cottonwood Stream Reclamation	Phase I completed in 2004. Phase II construction begin in 2007 (Ref 2)	11,600 lf of stream reclamation from Peoria to Perimeter Rd. Pond	8.3 sq. mi			Note 13		base and flood flows	Note 13 Ref 7	850	lbs/year	$ 2,100	$ -	$ -	$ -	$ 53	$ 214	100%	$ 252	$ 252	Note 2
CCB-14	Belleview Open Water Wetlands	Co-funding oportunity with USACE temporarily suspended	Retrofit existing develop. w/wet detention pond	235 Ac SF Resid			400 lbs/mi^2	145 lbs/year	Base and storm flow	50%	70	lbs/year	$ 210	$ -	$ -	$ -	$ 2	$ 18	100%	$ 260	$ 260	No replacement assumed
CCB-15	Surface Water Reuse at Cherry Creek Vista	Consultant reports that not able to obtain water from DWB or ACWWA. Other sources pursued	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	$ -	$ -	$ -	$ -	$ 3.85	100%	$ 303	$ 303	provided by others
CCB-16	Stream Corridor Preservation	Identify sites through UDFCD and other agencies.	Partner with others to purchase property or conservation easements along Cherry Creek																100%			
CCB-17	Reservoir Shoreline Stabilization[15]	Repair eroded shoreline using grading, rock or vegetation where possible	CCSP Recreation sites: Mountain, Lake and Cottonwood Creek Loops							Note 16	54	lbs/yr	$ 550	$ -	$ -	$ -	$ 5	$ 47.35	69%	$ 877	$ 605	

Basis for Analysis

(A) Unit cost of phosphorus removal based on annualized cost of completed project over 35 years at 7% interest rate.

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

NOTES:

1. Feasibility of confluence stabilizaton under investigation with CCB-5.1
2. Augmentation for naturally established wetlands not required (assumption)
3. Reduction in phosphorus concentration is possible, but incidental to the process. For estimating performance, at 10% P conc reduction was assumed.
4. Overall treatment at 70%, incremental benefit estimated at 20%
5. None required for proposed treatment but may be required for other facility in treatment train.
8. Water costs at $ 2,500 per acre foot
9. Present worth of capital replacement
11. Land acquisition and water augmentation not defined
12. Based on mean P reduction reported in 2005 Monitoring Report
13. Loads and removal are result of stream stabilization, riparian wetlands, and settlement during over-bank flood events.
14. TSS measurements at CC-8 used to estimate loads/performance
15. Estimate based on costs for similar work along East Shoreline dating back to 1996 and graduate student reports identifying problem areas.
16. Based on credit received for East Shade Shelter project (18 lbs, Ref 6) times 3 to represent all east shoreline improvements

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. *Posphours 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*

Total Projected Capital Cost = $ 44,560,880