United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Colorado State Office
2850 Youngfield Street
Lakewood, Colorado 80215-7093
www.blm.gov/co

TAKE PRIDE IN AMERICA

In Reply Refer To:
7250 (CO-932)

DEC 16 2009

Ms. Linda Bassi
Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, Colorado 80203

Dear Ms. Bassi:

The Bureau of Land Management (BLM) is writing this letter to formally communicate its recommendation an instream flow enlargement on lower Cochetopa Creek, located in Water Division 4.

Location and Land Status. Cochetopa Creek is tributary to Tomichi Creek approximately eight miles southeast of Gunnison, CO. The creek is located within the upper Gunnison River watershed. This recommendation covers a reach located in the lower portions of the watershed, beginning at the confluence with Alkali Creek and extending downstream to the headgate of the South Krueger Ditch.

Approximately 60 percent of the 10.0 mile reach is located on federal lands managed by the BLM, while the remaining 40 percent is located on private lands.

Biological Summary. This segment of Cochetopa Creek is a moderate to high gradient stream, with moderate to large substrate size, punctuated by large boulders. Most of the proposed reach is confined by a narrow canyon, and is further confined by the construction and maintenance of State Highway 114. The riparian community is in good condition and diverse, composed of alder, willow, and red osier dogwood. The riparian community often provides good shading for the water column. The presence of alder indicates a very reliable flow regime and consistent groundwater level in the alluvial aquifer. The creek provides an excellent mix of pools, riffles, and runs for fish habitat. The BLM has invested in fisheries habitat improvement projects in this section of the creek, just downstream from Alkali Creek. Fishery surveys indicate that the creek supports a self-sustaining population of brown trout. The survey revealed a variety of age classes and individual specimens up to 12 inches in length.

R2Cross Analysis. BLM collected the following R2Cross data from the creek:

Party	Date	Discharge	250%-40%	Summer (3/3)	Winter (2/3)
BLM	10/07/2008	31.70	12.7-79.2	14.68	Out of range
BLM	10/07/2008	24.48	9.8-61.2	16.06	Out of range

The BLM's analysis of this data, coordinated with the Division of Wildlife, indicates that the following flows are needed to protect the fishery and natural environment to a reasonable degree.

> An enlargement of 6.8 cfs, bringing the total instream flow water right to 15.3 cfs, is recommended during the high temperature period from May 1 through November 15. This recommendation was derived by averaging the results of the data sets. The recommendation is driven by the depth criteria and average velocity criteria. If possible, it is important to protect a constant flow rate for the brown trout spawning period, which can extend through November 15.

Justification for instream flow enlargement. The Cochetopa Creek channel is large, with riffles typically ranging from 30 to 40 feet in width. The channel is also characterized by medium to large size substrate, which tends to reduce water velocities. Substantial flow rates are required to maintain sufficient depth and velocity for salmonids in this type of environment.

The BLM believes the reason that the creek supports a healthy and productive fishery is that the creek very consistently experiences significantly more water than the current instream flow appropriation. During the warm weather period of May through mid-November, gage data reveal the creek experiences flows that are typically three to ten times the current insteam flow water right.

According to the data collected by the BLM, the current instream flow water rights is capable of meeting two of the three instream flow criteria during the winter. However, the current instream flow water right is not capable of meeting three of three instream flow criteria during summer, when the fish population requires more physical habitat for foraging, weight gain, and preparation for the fall spawning period. If the current instream flow water right were to be experienced during snowmelt runoff, less than 2/3 of the active stream channel would be wetted. With this reduction in physical habitat, the creek would not be able to sustain the fish biomass it sustains today.

Water Availability. In 1982, the CWCB appropriated an instream flow water right on Cochetopa Creek that incorporates the steam segment recommended in this letter. The current instream flow water right starts at the confluence with Pauline Creek and extends to the confluence with Tomichi Creek. The appropriation is for 8.5 cfs, year round.

The BLM is aware of the following water rights within the proposed reach:

Home Ditch No. 182 – 10.6 cfsEastside Ditch – 6.0 cfs
Mitchell Ditch – 3.0 cfs
Japeck Ditches 1-5 – 6.5 cfs
Norman Ditch – 12.0 cfs
Sharp Ditch – 8.0 cfs
Hideaway Pasture Ditch – 0.35 cfs, conditional

All of these ditches appear to irrigate lands that are located very close to the creek, allowing the creek to benefit from return flows without extended lag times.

The BLM is also aware of an extensive set of irrigation water right in upstream locations on Cochetopa Creek and its tributary streams. Again, the hydrologic impacts from the operation of these water rights appear to be incorporated into the data collected by the Cochetopa Creek stream gage below Rock Creek. In addition, some of the most senior water rights on the Cochetopa Creek system are located below the reach for the proposed enlargement.

The BLM recommends using the Cochetopa Creek Gage Below Rock Creek (USGS 09118450), which has operated from 1981 to the present, to calculate water availability. This gage is located in the middle of the instream flow reach, and its readings incorporate the operations of all the senior water rights located upstream.

Relationship to Management Plans. Under the current resource management plan, Cochetopa Creek is managed to maintain and improve riparian habitat conditions. This portion of the creek can be accessed by state highway, so it is managed for both dispersed and concentrated recreation, with multiple pullouts and campgrounds along the creek. The BLM management plan specifically calls for instream flow recommendations on creeks within this management unit that support fisheries.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with the BLM's draft recommendation in February 2009. We thank both the Division of Wildlife and the Water Conservation Board for their cooperation in this effort.

If you have any questions regarding our instream flow recommendation, please contact Roy Smith at 303-239-3940.

Sincerely,

Linda Anania

Linda Anania
Deputy State Director, Resources and Fire

cc: Andrew Breibart, Gunnison Field Office
Brian St. George, Gunnison Field Office
Valori Armstrong, Southwest District Manager

DRAFT INSTREAM FLOW RECOMMENDATION

Ms. Linda Bassi
Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, Colorado 80203

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> An enlargement of 6.8 cfs, bringing the total instream flow water right to 15.3 cfs, is recommended during the high temperature period from May 1 through November 15.

This recommendation was derived by averaging the results of the data sets. The recommendation is driven by the depth criteria and average velocity criteria. If possible, it is important to protect a constant flow rate for the brown trout spawning period, which can extend through November 15.

Note: BLM intends to collect additional data during the 2009 field season.

Justification for instream flow enlargement. The Cochetopa Creek channel is large, with riffles typically ranging from 30 to 40 feet in width. The channel is also characterized by medium to large size substrate, which tends to reduce water velocities. Substantial flow rates are required to maintain sufficient depth and velocity for salmonids in this type of environment.

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Relationship to Management Plans. Under the current resource management plan, Cochetopa Creek is managed to maintain and improve riparian habitat conditions. (Art - Have we installed any habitat improvement projects in this reach?) This portion of the creek can be accessed by state highway, so it is managed for both dispersed and concentrated recreation, with multiple pullouts and campgrounds along the creek. The BLM management plan specifically calls for instream flow recommendations on creeks within this management unit that support fisheries.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2009. We thank both the Division of Wildlife and the Water Conservation Board for their cooperation in this effort.

If you have any questions regarding our instream flow recommendation, please contact Roy Smith at 303-239-3940.

Sincerely,

Linda Anania
Deputy State Director
Resources and Fire

cc: Art Hayes, Gunnison Field Office
Field Office Manager, Gunnison Field Office

Gunnison Field Office Stream Surveys
October 2008

Cochetopa Creek - Water Code #39188

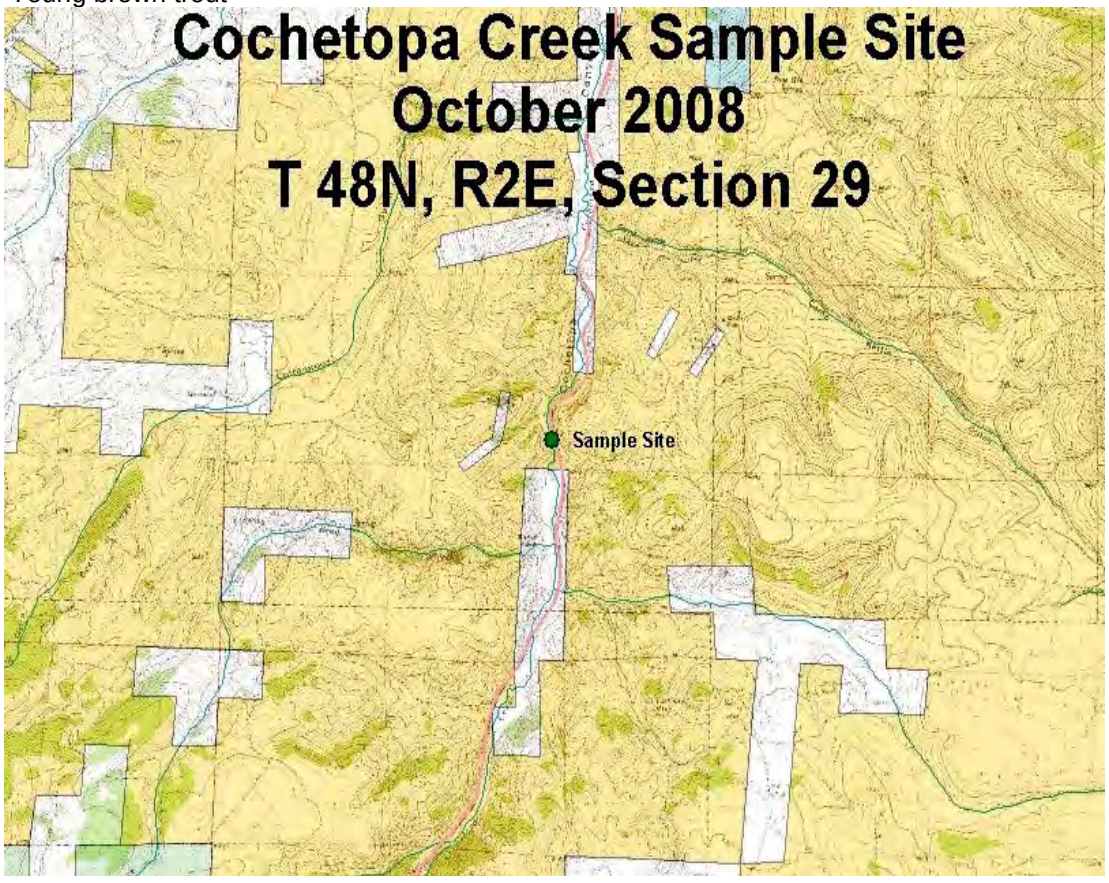
Cochetopa creek, located east of Gunnison, CO on BLM lands managed by the Gunnison Field Office, was sampled on October 7, 2008, to determine fishery status and species composition. Presence/absence sampling was done in support of the Colorado BLM in-stream flow program. A one-pass effort was completed. Sampling was conducted via backpack electro-shocker and approximately 125 feet of stream was sampled at the lowest BLM segment. Personnel present were Tom Fresques and Gregor Dekleva, GSFO. A population estimate was not conducted due to lack of personnel and the width of the stream. Cochetopa creek is tributary to Tomichi creek and then the Gunnison River.

Cochetopa creek

Brown trout *(Salmo trutta)*

Brown trout

Young brown trout



STREAM SURVEY FISH SAMPLING FORM

WATER Cochetopa Creek H2O CODE 39188 DATE 10/7/2008

GEAR BPE EFFORT 125 feet STATION # 1 PASS # 1

CREW Fresques, Dekleva DRAINAGE Gunnison River LOCATION See map

Pass	species	length	weight		Pass	species	length	weight
1	LOC	298			1	LOC	204	
1	LOC	325			1	LOC	183	
1	LOC	267			1	LOC	208	
1	LOC	260			1	LOC	210	
1	LOC	245			1	LOC	75	

GPS Location: See Map

Notes: Stream Width 18 ft. Sample Reach 125 ft.

Conductivity: Electro shocker settings

Other Brown trout noted of various age classes including fish up to eighteen plus inches.

Discussion:

Cochetopa creek is in overall good condition with a healthy riparian area. Plant species include alder, birch, sedge, current, rose, and Red Osier dogwood. However, Canada thistle is also present and common along the stream. The stream itself is in good condition with flow estimated at around 15 CFS. An excellent mix of pools, riffles, and runs provides good habitat. Midges, stone, caddis, and mayflies are present and abundant. Brown trout were the only species collected or seen and all fish collected appeared healthy and robust. Old and new beaver activity was present at the sample site.

Recommendations:

- Pursue instream-flow recommendations for these reaches
- Continue periodic habitat monitoring to ensure stream and riparian habitat remain healthy
- Look into weed spraying in this area to reduce/eliminate Canada thistle.

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Cochetopa Creek lower						CROSS-SECTION NO.: 1	
CROSS-SECTION LOCATION: At BLM - private boundary in canyon							
DATE: 10-7-08	OBSERVERS: R. Smith, A. Hayes						
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 28	TOWNSHIP: 48 (N)S	RANGE: 2 (E)W	PM: NM		
COUNTY: Saguache	WATERSHED: Gunnison	WATER DIVISION: 4	DOW WATER CODE: 39203				
MAP(S): USGS:							
USFS:							

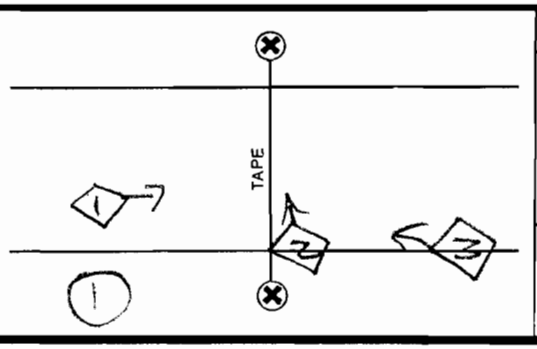
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES)/NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: gravel to 4" cobbles	PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(X) Tape @ Stake LB	0.0	surveyed
(X) Tape @ Stake RB	0.0	surveyed
(1) WS @ Tape LB/RB	0.0 36.0	5.65 / 5.65
(2) WS Upstream	14.0	5.57
(3) WS Downstream	54.0	5.93
SLOPE	0.36/68.0 = .005	

SKETCH



LEGEND:
- Stake (X)
- Station (1)
- Photo (1)
- Direction of Flow

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: YES/(NO)	DISTANCE ELECTROFISHED: ____ ft	FISH CAUGHT: YES/NO	WATER CHEMISTRY SAMPLED: (YES)/NO

LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.)

SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL

AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME:
caddisfly, mayfly, stonefly

COMMENTS

Ph= 8.9
TDS= 160
Temp= 48° C
Brown trout redds observed.

FORM #ISF ED 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME:	CROSS-SECTION NO.:	DATE:	SHEET ___ OF ___
Cocheloopa Creek - lower	1	10-7-08	

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE)	LEFT / RIGHT	Gage Reading: _____ ft	TIME: 1 pm

Features: Stake (S), Grassline (G), Waterline (W), Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	45.0		4.82								
G	41.5		4.77								
	38.5		5.44								
	38.0		5.65								
	37.9		5.75	.1				Ø			
	37		5.95	.3				1.14			
	36		5.95	.3				1.33			
	35		6.05	.4				1.36			
	34		6.10	.45				1.53			
	33		6.10	.45				1.48			
	32		6.0	.35				1.43			
	31		5.95	.30				1.63			
	30		6.0	.40				1.80			
	29		6.10	.45				1.87			
	28		6.10	.5				2.27			
	27		6.25	.6				2.26			
	26		6.25	.6				2.38			
	25		6.25	.6				2.33			
	24		6.40	.75				2.27			
	23		6.45	.8				2.14			
	22		6.50	.85				1.79			
	21		6.40	.75				1.79			
	20		6.65	1.0				1.88			
	19		6.65	1.0				1.96			
	18		6.65	1.0				1.37			
	17		6.50	.9				2.31			
	16		6.45	.8				2.34			
	15		6.45	.8				2.35			
	14		6.25	.6				2.03			
	13		6.20	.6				1.78			
	12		6.05	.4				1.54			
	11		5.95	.3				1.21			
	10		6.00	.35				1.28			
	9		5.95	.3				0.89			
W	8.7		5.65								
G	8.3		4.60								
RS	4.0		4.18								
TOTALS:											

End of Measurement	Time:	Gage Read. _____ ft	CALCULATIONS PERFORMED BY:	CALCULATIONS CHECKED BY:

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO WATER CONSERVATION BOARD

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Cochetopa Creek - lower						CROSS-SECTION NO.: 2	
CROSS-SECTION LOCATION: 100 ft downstream from BLM-private boundary							
DATE: 10-1-08	OBSERVERS: R. Smith, A Hayes						
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 28	TOWNSHIP: 47 (N)/S	RANGE: 2 E/(W)	PM: NM		
COUNTY: Saguache	WATERSHED: Gunnison		WATER DIVISION: 4		DOW WATER CODE: 39203		
MAP(S):	USGS: 346149						
	USFS: 4240265						

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES)/NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ______ sec	TAPE WEIGHT: surveyed lbs/foot	TAPE TENSION: surveyed lbs
CHANNEL BED MATERIAL SIZE RANGE: gravel to 1-foot boulders		PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 3	

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
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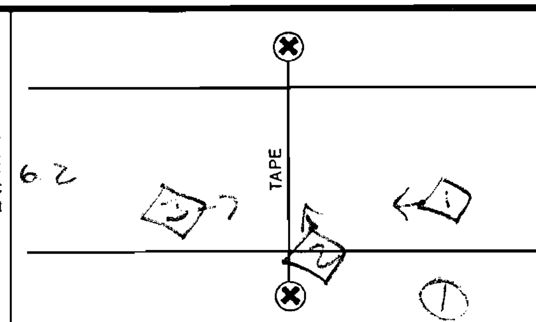
① WS @ Tape LB/RB	0.0 34.4	5.30 // 5.30
② WS Upstream	14.5	5.23
③ WS Downstream	14.0	5.44
SLOPE	0.21 / 28.5 = .007	

SKETCH



LEGEND:

Stake ⊗

Station ①

Photo ◇→

Direction of Flow

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: YES/(NO)	DISTANCE ELECTROFISHED: ______ ft	FISH CAUGHT: YES/NO	WATER CHEMISTRY SAMPLED: (YES)/NO

LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.)

SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL

AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME:

caddisfly, mayfly, stonefly

COMMENTS

TDS = 160

Ph = 8.9

Temp: 48°F

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Cachetopa Creek - lower | CROSS-SECTION NO.: 2 | DATE: 10-7-08 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 2:45 pm

Features (Stake (S), Grassline (G), Waterline (W), Rock (R))	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS&G	3.3		4.22								
	5.0		4.70								
	5.4		4.91								
W	6.2		5.30								
	7.0		5.40	.1				0.14			
	8		5 60	.3				1.23			
	9		5.40	.1				0.39			
	10		5.50	.2				0.25			
	11		5.60	.3				0.77			
	12		5.80	.5				1.48			
	13		5.85	.55				1.75			
	14		6.00	.70				0.56			
	15		6.25	.95				0.66			
	16		6.10	.80				1.07			
	17		6 15	.90				1.78			
	18		6.25	.95				1.68			
	19		6.2	.90				2.18			
	20		6.4	1.10				1.42			
	21		6.4	1.10				0.55			
	22		6.4	1.10				0.60			
	23		6 0	.70				1.39			
	24		6 2	.90				2.63			
	25		6.35	1.10				2.66			
	26		6.35	1.10				1.60			
	27		6.35	1.10				0.11			
	28		6.4	1.10				0.53			
	29		6.5	1.20				0.68			
	30		6.5	1.20				0.67			
	31		6.4	1.10				0.97			
	32		6.25	0.95				0.31			
	33		6 10	0.80				0.60			
	34		5 40	0 10				0			
W	34.4		5.30								
G	35.5		4.25								
	37.3		2.84								
LS	42.1		2.54								
TOTALS:											

End of Measurement | Time: | Gage Readi... _____ ft | CALCULATIONS PERFORMED BY: | CALCULATIONS CHECKED BY:

COLORADO WATER CONSERVATION BOARD
INSTREAM FLOW / NATURAL LAKE LEVEL PROGRAM
STREAM CROSS-SECTION AND FLOW ANALYSIS

LOCATION INFORMATION

STREAM NAME:	Cochetopa Creek - lower
XS LOCATION:	At BLM-Private boundary
XS NUMBER:	1
DATE:	7-Oct-08
OBSERVERS:	R. Smith, A. Hayes
1/4 SEC:	SW
SECTION:	28
TWP:	47N
RANGE:	2E
PM:	New Mexico
COUNTY:	Saguache
WATERSHED:	Gunnison
DIVISION:	4
DOW CODE:	39203
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

TAPE WT:	0.0106
TENSION:	99999

*** NOTE ***
Leave TAPE WT and TENSION at defaults for data collected with a survey level and rod

CHANNEL PROFILE DATA

SLOPE:	0.005

INPUT DATA CHECKED BY: .....DATE.....

ASSIGNED TO: ….....……..…….....DATE.....

STREAM NAME: Cochetopa Creek - lower
XS LOCATION: At BLM-Private boundary
XS NUMBER: 1

DATA POINTS= 37

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	RS	4.00	4.18			0.00		0.00	0.00	0.0%
1	G	8.30	4.60			0.00		0.00	0.00	0.0%
	W	8.70	5.65			0.00		0.00	0.00	0.0%
		9.00	5.95	0.30	0.89	0.42	0.30	0.20	0.17	0.5%
		10.00	6.00	0.35	1.28	1.00	0.35	0.35	0.45	1.4%
		11.00	5.95	0.30	1.21	1.00	0.30	0.30	0.36	1.1%
		12.00	6.05	0.40	1.54	1.00	0.40	0.40	0.62	1.9%
		13.00	6.20	0.60	1.78	1.01	0.60	0.60	1.07	3.4%
		14.00	6.25	0.60	2.03	1.00	0.60	0.60	1.22	3.8%
		15.00	6.45	0.80	2.35	1.02	0.80	0.80	1.88	5.9%
		16.00	6.45	0.80	2.34	1.00	0.80	0.80	1.87	5.9%
		17.00	6.50	0.90	2.31	1.00	0.90	0.90	2.08	6.6%
		18.00	6.65	1.00	1.37	1.01	1.00	1.00	1.37	4.3%
		19.00	6.65	1.00	1.96	1.00	1.00	1.00	1.96	6.2%
		20.00	6.65	1.00	1.88	1.00	1.00	1.00	1.88	5.9%
		21.00	6.40	0.75	1.79	1.03	0.75	0.75	1.34	4.2%
		22.00	6.50	0.85	1.79	1.00	0.85	0.85	1.52	4.8%
		23.00	6.45	0.80	2.14	1.00	0.80	0.80	1.71	5.4%
		24.00	6.40	0.75	2.27	1.00	0.75	0.75	1.70	5.4%
		25.00	6.25	0.60	2.33	1.01	0.60	0.60	1.40	4.4%
		26.00	6.25	0.60	2.38	1.00	0.60	0.60	1.43	4.5%
		27.00	6.25	0.60	2.26	1.00	0.60	0.60	1.36	4.3%
		28.00	6.10	0.50	2.27	1.01	0.50	0.50	1.14	3.6%
		29.00	6.10	0.45	1.87	1.00	0.45	0.45	0.84	2.7%
		30.00	6.00	0.40	1.80	1.00	0.40	0.40	0.72	2.3%
		31.00	5.95	0.30	1.63	1.00	0.30	0.30	0.49	1.5%
		32.00	6.00	0.35	1.43	1.00	0.35	0.35	0.50	1.6%
		33.00	6.10	0.45	1.48	1.00	0.45	0.45	0.67	2.1%
		34.00	6.10	0.45	1.53	1.00	0.45	0.45	0.69	2.2%
		35.00	6.05	0.40	1.36	1.00	0.40	0.40	0.54	1.7%
		36.00	5.95	0.30	1.33	1.00	0.30	0.30	0.40	1.3%
		37.00	5.95	0.30	1.14	1.00	0.30	0.29	0.32	1.0%
		37.90	5.75	0.10	0.00	0.92	0.10	0.05	0.00	0.0%
		38.00	5.65			0.14		0.00	0.00	0.0%
		38.50	5.44			0.00		0.00	0.00	0.0%
1	G	41.50	4.77			0.00		0.00	0.00	0.0%
	LS	45.00	4.82			0.00		0.00	0.00	0.0%
	TOTALS ----------					29.62	1 (Max.)	16.83	31.70	100.0%

Manning's n = 0.0383
Hydraulic Radius= 0.56821346

STREAM NAME: Cochetopa Creek - lower
XS LOCATION: At BLM-Private boundary
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	16.83	16.63	-1.2%
5.40	16.83	24.04	42.9%
5.42	16.83	23.44	39.3%
5.44	16.83	22.84	35.7%
5.46	16.83	22.25	32.2%
5.48	16.83	21.65	28.6%
5.50	16.83	21.06	25.1%
5.52	16.83	20.46	21.6%
5.54	16.83	19.87	18.1%
5.56	16.83	19.28	14.5%
5.58	16.83	18.69	11.0%
5.60	16.83	18.10	7.5%
5.61	16.83	17.80	5.8%
5.62	16.83	17.51	4.0%
5.63	16.83	17.22	2.3%
5.64	16.83	16.92	0.6%
5.65	16.83	16.63	-1.2%
5.66	16.83	16.34	-2.9%
5.67	16.83	16.04	-4.7%
5.68	16.83	15.75	-6.4%
5.69	16.83	15.46	-8.1%
5.70	16.83	15.17	-9.9%
5.72	16.83	14.58	-13.3%
5.74	16.83	14.00	-16.8%
5.76	16.83	13.42	-20.3%
5.78	16.83	12.84	-23.7%
5.80	16.83	12.26	-27.1%
5.82	16.83	11.69	-30.6%
5.84	16.83	11.11	-34.0%
5.86	16.83	10.54	-37.4%
5.88	16.83	9.97	-40.7%
5.90	16.83	9.41	-44.1%

WATERLINE AT ZERO
AREA ERROR = 5.643

STREAM NAME: Cochetopa Creek - lower
XS LOCATION: At BLM-Private boundary
XS NUMBER: 1 Constant Manning's n

GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.77	36.64	1.20	1.88	44.04	37.68	100.0%	1.17	134.17	3.05
	4.79	34.90	1.24	1.86	43.21	35.92	95.3%	1.20	134.18	3.11
	4.84	32.78	1.27	1.81	41.54	33.76	89.6%	1.23	130.95	3.15
	4.89	32.54	1.23	1.76	39.91	33.48	88.9%	1.19	123.18	3.09
	4.94	32.29	1.19	1.71	38.29	33.20	88.1%	1.15	115.61	3.02
	4.99	32.05	1.14	1.66	36.68	32.91	87.4%	1.11	108.24	2.95
	5.04	31.81	1.10	1.61	35.08	32.63	86.6%	1.08	101.08	2.88
	5.09	31.57	1.06	1.56	33.50	32.35	85.9%	1.04	94.13	2.81
	5.14	31.32	1.02	1.51	31.93	32.07	85.1%	1.00	87.40	2.74
	5.19	31.08	0.98	1.46	30.37	31.78	84.4%	0.96	80.87	2.66
	5.24	30.84	0.93	1.41	28.82	31.50	83.6%	0.91	74.56	2.59
	5.29	30.59	0.89	1.36	27.28	31.22	82.9%	0.87	68.47	2.51
	5.34	30.35	0.85	1.31	25.76	30.93	82.1%	0.83	62.59	2.43
	5.39	30.11	0.81	1.26	24.25	30.65	81.4%	0.79	56.94	2.35
	5.44	29.87	0.76	1.21	22.75	30.37	80.6%	0.75	51.51	2.26
	5.49	29.73	0.71	1.16	21.26	30.19	80.1%	0.70	46.19	2.17
	5.54	29.60	0.67	1.11	19.78	30.01	79.6%	0.66	41.11	2.08
	5.59	29.46	0.62	1.06	18.30	29.83	79.2%	0.61	36.27	1.98
WL	5.64	29.32	0.57	1.01	16.83	29.64	78.7%	0.57	31.68	1.88
	5.69	29.21	0.53	0.96	15.37	29.50	78.3%	0.52	27.31	1.78
	5.74	29.11	0.48	0.91	13.91	29.36	77.9%	0.47	23.21	1.67
	5.79	28.86	0.43	0.86	12.46	29.08	77.2%	0.43	19.44	1.56
	5.84	28.59	0.39	0.81	11.02	28.77	76.4%	0.38	15.96	1.45
	5.89	28.31	0.34	0.76	9.60	28.47	75.6%	0.34	12.77	1.33
	5.94	28.04	0.29	0.71	8.19	28.17	74.8%	0.29	9.87	1.20
	5.99	22.68	0.31	0.66	6.93	22.80	60.5%	0.30	8.59	1.24
	6.04	20.27	0.29	0.61	5.86	20.39	54.1%	0.29	7.01	1.20
	6.09	17.99	0.27	0.56	4.90	18.09	48.0%	0.27	5.64	1.15
	6.14	15.09	0.27	0.51	4.12	15.19	40.3%	0.27	4.74	1.15
	6.19	14.42	0.23	0.46	3.38	14.51	38.5%	0.23	3.52	1.04
	6.24	13.18	0.20	0.41	2.69	13.26	35.2%	0.20	2.55	0.95
	6.29	10.50	0.20	0.36	2.14	10.57	28.1%	0.20	2.02	0.95
	6.34	9.91	0.16	0.31	1.63	9.98	26.5%	0.16	1.33	0.82
	6.39	9.33	0.12	0.26	1.14	9.39	24.9%	0.12	0.77	0.68
	6.44	7.57	0.09	0.21	0.72	7.61	20.2%	0.09	0.41	0.57
	6.49	3.97	0.11	0.16	0.45	4.00	10.6%	0.11	0.28	0.64
	6.54	3.14	0.09	0.11	0.27	3.16	8.4%	0.09	0.15	0.54
	6.59	2.61	0.05	0.06	0.13	2.62	6.9%	0.05	0.05	0.37
	6.64	2.07	0.01	0.01	0.01	2.07	5.5%	0.01	0.00	0.10

STREAM NAME: Cochetopa Creek - lower
XS LOCATION: At BLM-Private boundary
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	31.70	cfs
CALCULATED FLOW (Qc)=	31.68	cfs
(Qm-Qc)/Qm * 100 =	0.1	%
MEASURED WATERLINE (WLm)=	5.65	ft
CALCULATED WATERLINE (WLc)=	5.64	ft
(WLm-WLc)/WLm * 100 =	0.1	%
MAX MEASURED DEPTH (Dm)=	1.00	ft
MAX CALCULATED DEPTH (Dc)=	1.01	ft
(Dm-Dc)/Dm * 100	-0.7	%
MEAN VELOCITY=	1.88	ft/sec
MANNING'S N=	0.038	
SLOPE=	0.005	ft/ft
.4 * Qm =	12.7	cfs
2.5 * Qm=	79.2	cfs

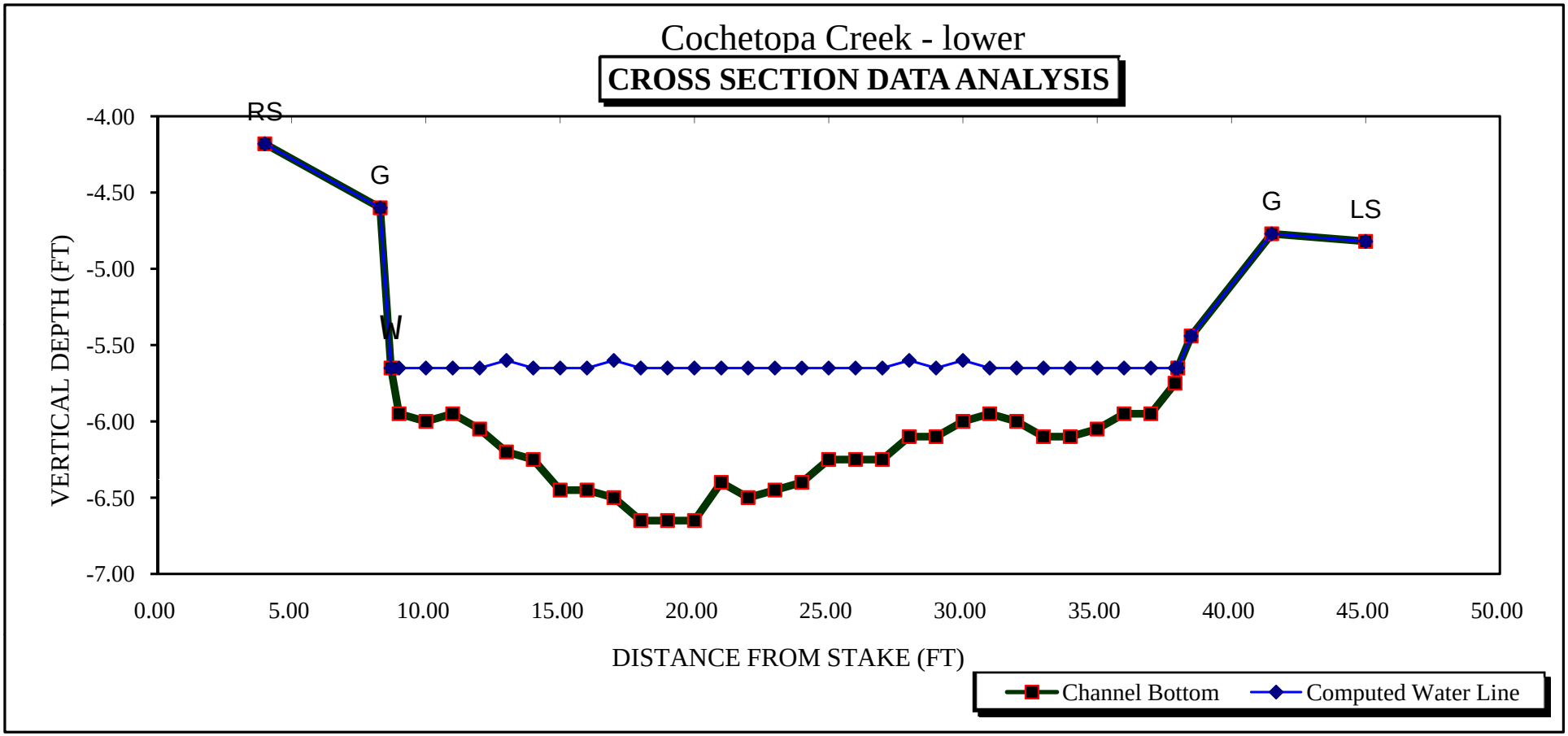
RECOMMENDED INSTREAM FLOW:
=============================

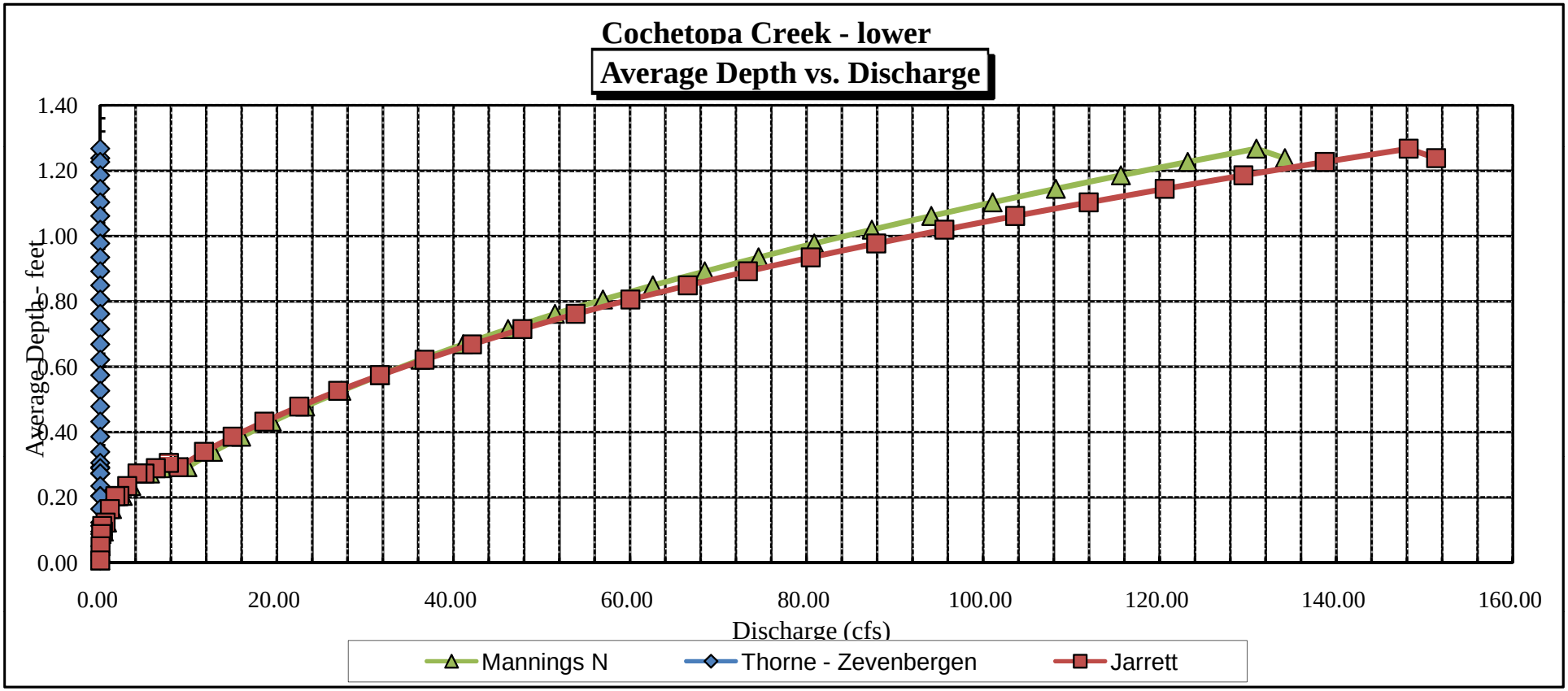
FLOW (CFS)	PERIOD
___________	___________
___________	___________
___________	___________
___________	___________

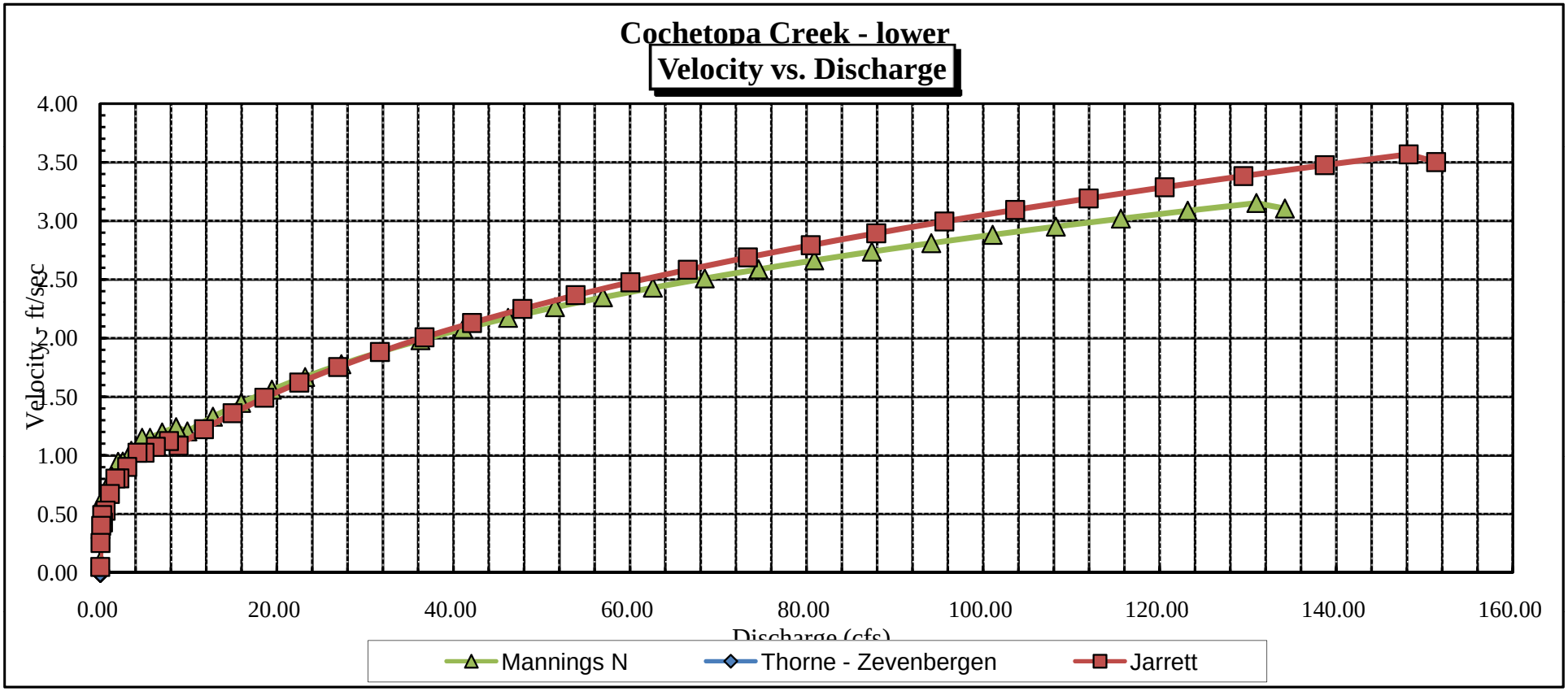
RATIONALE FOR RECOMMENDATION:
=============================

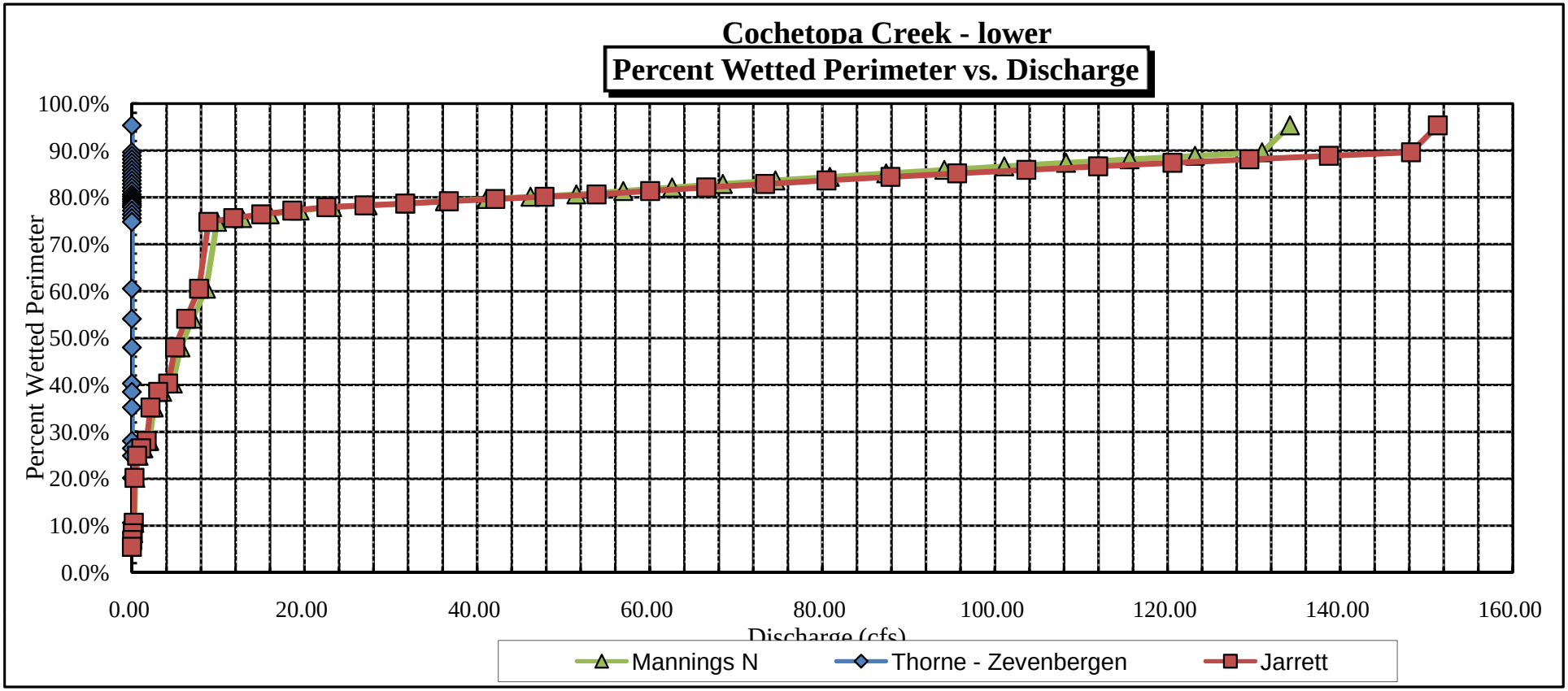
RECOMMENDATION BY: ……………………...………...……............................... AGENCY...…………………….......……....…....……....... DATE:.......…...…......……………

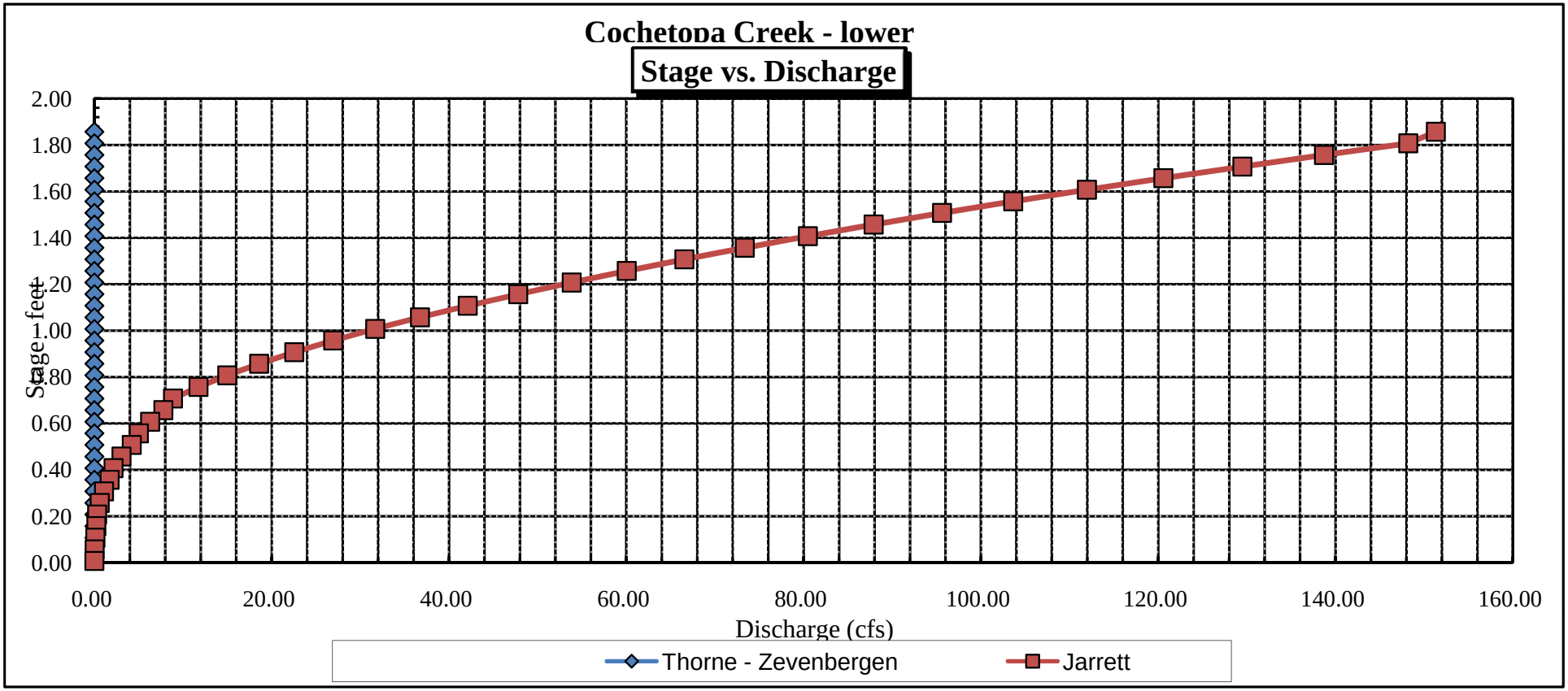
CWCB REVIEW BY: ..……………………….....………………………………………………...…............. DATE:..................…………….....…


Cochetopa Creek - lower
CROSS SECTION DATA ANALYSIS
RS
G
W
G
LS
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Cochetopa Creek - lower
Average Depth vs. Discharge
Average Depth - feet
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Cochetopa Creek - lower
Velocity vs. Discharge
Velocity - ft/sec
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Cochetopa Creek - lower
Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Cochetopa Creek - lower
Stage vs. Discharge
Stage, feet
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD
INSTREAM FLOW / NATURAL LAKE LEVEL PROGRAM
STREAM CROSS-SECTION AND FLOW ANALYSIS

LOCATION INFORMATION

STREAM NAME:	Cochetopa Creek - lower
XS LOCATION:	700' downstream from BLM-private boundary
XS NUMBER:	2
DATE:	7-Oct-08
OBSERVERS:	R. Smith, A. Hayes
1/4 SEC:	SW
SECTION:	28
TWP:	47N
RANGE:	2E
PM:	New Mexico
COUNTY:	Saguache
WATERSHED:	Gunnison
DIVISION:	4
DOW CODE:	39203
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

TAPE WT:	0.0106
TENSION:	99999

*** NOTE ***
Leave TAPE WT and TENSION at defaults for data collected with a survey level and rod

CHANNEL PROFILE DATA

SLOPE:	0.007

INPUT DATA CHECKED BY: .....DATE.....

ASSIGNED TO: ….....……..…….....DATE.....

STREAM NAME: Cochetopa Creek - lower
XS LOCATION: 700' downstream from BLM-private boundary
XS NUMBER: 2

DATA POINTS= 36

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
1 RS & G	3.30	4.22			0.00		0.00	0.00	0.0%
	5.00	4.70			0.00		0.00	0.00	0.0%
	5.40	4.91			0.00		0.00	0.00	0.0%
W	6.20	5.30			0.00		0.00	0.00	0.0%
	7.00	5.40	0.10	0.14	0.81	0.10	0.09	0.01	0.1%
	8.00	5.60	0.30	1.23	1.02	0.30	0.30	0.37	1.5%
	9.00	5.40	0.10	0.39	1.02	0.10	0.10	0.04	0.2%
	10.00	5.50	0.20	0.25	1.00	0.20	0.20	0.05	0.2%
	11.00	5.60	0.30	0.77	1.00	0.30	0.30	0.23	0.9%
	12.00	5.80	0.50	1.48	1.02	0.50	0.50	0.74	3.0%
	13.00	5.85	0.55	1.75	1.00	0.55	0.55	0.96	3.9%
	14.00	6.00	0.70	0.56	1.01	0.70	0.70	0.39	1.6%
	15.00	6.25	0.95	0.66	1.03	0.95	0.95	0.63	2.6%
	16.00	6.10	0.80	1.07	1.01	0.80	0.80	0.86	3.5%
	17.00	6.15	0.90	1.78	1.00	0.90	0.90	1.60	6.5%
	18.00	6.25	0.95	1.68	1.00	0.95	0.95	1.60	6.5%
	19.00	6.20	0.90	2.18	1.00	0.90	0.90	1.96	8.0%
	20.00	6.40	1.10	1.42	1.02	1.10	1.10	1.56	6.4%
	21.00	6.40	1.10	0.55	1.00	1.10	1.10	0.61	2.5%
	22.00	6.40	1.10	0.60	1.00	1.10	1.10	0.66	2.7%
	23.00	6.00	0.70	1.39	1.08	0.70	0.70	0.97	4.0%
	24.00	6.20	0.90	2.65	1.02	0.90	0.90	2.39	9.7%
	25.00	6.35	1.10	2.66	1.01	1.10	1.10	2.93	12.0%
	26.00	6.35	1.10	1.60	1.00	1.10	1.10	1.76	7.2%
	27.00	6.35	1.10	0.11	1.00	1.10	1.10	0.12	0.5%
	28.00	6.40	1.10	0.53	1.00	1.10	1.10	0.58	2.4%
	29.00	6.50	1.20	0.68	1.00	1.20	1.20	0.82	3.3%
	30.00	6.50	1.20	0.67	1.00	1.20	1.20	0.80	3.3%
	31.00	6.40	1.10	0.97	1.00	1.10	1.10	1.07	4.4%
	32.00	6.25	0.95	0.31	1.01	0.95	0.95	0.29	1.2%
	33.00	6.10	0.80	0.60	1.01	0.80	0.80	0.48	2.0%
	34.00	5.40	0.10	0.00	1.22	0.10	0.07	0.00	0.0%
W	34.40	5.30			0.41		0.00	0.00	0.0%
1 G	35.30	4.25			0.00		0.00	0.00	0.0%
	37.30	2.84			0.00		0.00	0.00	0.0%
LS	42.10	2.54			0.00		0.00	0.00	0.0%
TOTALS ----------					28.73	1.2 (Max.)	21.86	24.48	100.0%

Manning's n = 0.0925
Hydraulic Radius= 0.76082701

STREAM NAME: Cochetopa Creek - lower
XS LOCATION: 700' downstream from BLM-private boundary
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	21.86	21.66	-0.9%
5.05	21.86	28.80	31.8%
5.07	21.86	28.22	29.1%
5.09	21.86	27.65	26.5%
5.11	21.86	27.07	23.8%
5.13	21.86	26.50	21.2%
5.15	21.86	25.92	18.6%
5.17	21.86	25.35	16.0%
5.19	21.86	24.78	13.4%
5.21	21.86	24.21	10.8%
5.23	21.86	23.64	8.1%
5.25	21.86	23.07	5.6%
5.26	21.86	22.79	4.3%
5.27	21.86	22.51	3.0%
5.28	21.86	22.22	1.7%
5.29	21.86	21.94	0.4%
5.30	21.86	21.66	-0.9%
5.31	21.86	21.38	-2.2%
5.32	21.86	21.10	-3.5%
5.33	21.86	20.82	-4.8%
5.34	21.86	20.54	-6.0%
5.35	21.86	20.27	-7.3%
5.37	21.86	19.72	-9.8%
5.39	21.86	19.17	-12.3%
5.41	21.86	18.63	-14.8%
5.43	21.86	18.10	-17.2%
5.45	21.86	17.58	-19.6%
5.47	21.86	17.06	-21.9%
5.49	21.86	16.56	-24.3%
5.51	21.86	16.06	-26.5%
5.53	21.86	15.57	-28.8%
5.55	21.86	15.09	-31.0%

WATERLINE AT ZERO
AREA ERROR = 5.293

STREAM NAME: Cochetopa Creek - lower
XS LOCATION: 700' downstream from BLM-private boundary
XS NUMBER: 2 Constant Manning's n

GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.25	31.89	1.66	2.25	53.01	33.11	100.0%	1.60	97.45	1.84
	4.29	31.70	1.63	2.21	51.64	32.90	99.4%	1.57	93.71	1.81
	4.34	31.48	1.59	2.16	50.06	32.65	98.6%	1.53	89.44	1.79
	4.39	31.27	1.55	2.11	48.49	32.40	97.8%	1.50	85.25	1.76
	4.44	31.05	1.51	2.06	46.94	32.15	97.1%	1.46	81.15	1.73
	4.49	30.83	1.47	2.01	45.39	31.90	96.3%	1.42	77.15	1.70
	4.54	30.61	1.43	1.96	43.85	31.65	95.6%	1.39	73.23	1.67
	4.59	30.39	1.39	1.91	42.33	31.40	94.8%	1.35	69.40	1.64
	4.64	30.17	1.35	1.86	40.82	31.15	94.1%	1.31	65.66	1.61
	4.69	29.95	1.31	1.81	39.31	30.90	93.3%	1.27	62.01	1.58
	4.74	29.80	1.27	1.76	37.82	30.72	92.8%	1.23	58.37	1.54
	4.79	29.66	1.23	1.71	36.33	30.54	92.2%	1.19	54.80	1.51
	4.84	29.52	1.18	1.66	34.85	30.37	91.7%	1.15	51.33	1.47
	4.89	29.38	1.14	1.61	33.38	30.19	91.2%	1.11	47.95	1.44
	4.94	29.24	1.09	1.56	31.92	30.02	90.7%	1.06	44.67	1.40
	4.99	29.09	1.05	1.51	30.46	29.84	90.1%	1.02	41.48	1.36
	5.04	28.95	1.00	1.46	29.01	29.66	89.6%	0.98	38.40	1.32
	5.09	28.80	0.96	1.41	27.56	29.48	89.0%	0.94	35.41	1.28
	5.14	28.66	0.91	1.36	26.13	29.30	88.5%	0.89	32.52	1.24
	5.19	28.51	0.87	1.31	24.70	29.12	87.9%	0.85	29.73	1.20
	5.24	28.37	0.82	1.26	23.27	28.94	87.4%	0.80	27.04	1.16
WL	5.29	28.22	0.77	1.21	21.86	28.76	86.8%	0.76	24.46	1.12
	5.34	27.68	0.74	1.16	20.46	28.21	85.2%	0.73	22.19	1.08
	5.39	27.08	0.70	1.11	19.09	27.60	83.4%	0.69	20.06	1.05
	5.44	26.08	0.68	1.06	17.76	26.57	80.2%	0.67	18.24	1.03
	5.49	25.01	0.66	1.01	16.48	25.47	76.9%	0.65	16.57	1.01
	5.54	23.94	0.64	0.96	15.26	24.37	73.6%	0.63	15.01	0.98
	5.59	22.87	0.62	0.91	14.09	23.27	70.3%	0.61	13.55	0.96
	5.64	22.44	0.58	0.86	12.96	22.82	68.9%	0.57	11.94	0.92
	5.69	22.12	0.54	0.81	11.85	22.48	67.9%	0.53	10.38	0.88
	5.74	21.80	0.49	0.76	10.75	22.14	66.9%	0.49	8.92	0.83
	5.79	21.47	0.45	0.71	9.67	21.79	65.8%	0.44	7.55	0.78
	5.84	20.51	0.42	0.66	8.61	20.81	62.9%	0.41	6.43	0.75
	5.89	20.01	0.38	0.61	7.60	20.29	61.3%	0.37	5.31	0.70
	5.94	19.60	0.34	0.56	6.61	19.87	60.0%	0.33	4.27	0.65
	5.99	19.20	0.29	0.51	5.64	19.45	58.7%	0.29	3.32	0.59
	6.04	18.59	0.25	0.46	4.70	18.80	56.8%	0.25	2.50	0.53
	6.09	17.94	0.21	0.41	3.78	18.12	54.7%	0.21	1.79	0.47
	6.14	15.93	0.18	0.36	2.93	16.07	48.5%	0.18	1.27	0.43
	6.19	14.11	0.15	0.31	2.18	14.23	43.0%	0.15	0.84	0.39
	6.24	11.23	0.14	0.26	1.55	11.31	34.1%	0.14	0.55	0.36
	6.29	9.90	0.10	0.21	1.02	9.95	30.1%	0.10	0.30	0.29
	6.34	8.86	0.06	0.16	0.55	8.89	26.8%	0.06	0.12	0.21
	6.39	5.24	0.05	0.11	0.24	5.26	15.9%	0.04	0.04	0.17
	6.44	2.14	0.04	0.06	0.09	2.15	6.5%	0.04	0.01	0.16
	6.49	1.14	0.01	0.01	0.01	1.14	3.5%	0.01	0.00	0.05

STREAM NAME: Cochetopa Creek - lower
XS LOCATION: 700' downstream from BLM-private boundary
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	24.48	cfs
CALCULATED FLOW (Qc)=	24.46	cfs
(Qm-Qc)/Qm * 100 =	0.1	%
MEASURED WATERLINE (WLm)=	5.30	ft
CALCULATED WATERLINE (WLc)=	5.29	ft
(WLm-WLc)/WLm * 100 =	0.1	%
MAX MEASURED DEPTH (Dm)=	1.20	ft
MAX CALCULATED DEPTH (Dc)=	1.21	ft
(Dm-Dc)/Dm * 100	-0.6	%
MEAN VELOCITY=	1.12	ft/sec
MANNING'S N=	0.093	
SLOPE=	0.007	ft/ft
.4 * Qm =	9.8	cfs
2.5 * Qm=	61.2	cfs

RECOMMENDED INSTREAM FLOW:
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FLOW (CFS)	PERIOD
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____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

RATIONALE FOR RECOMMENDATION:
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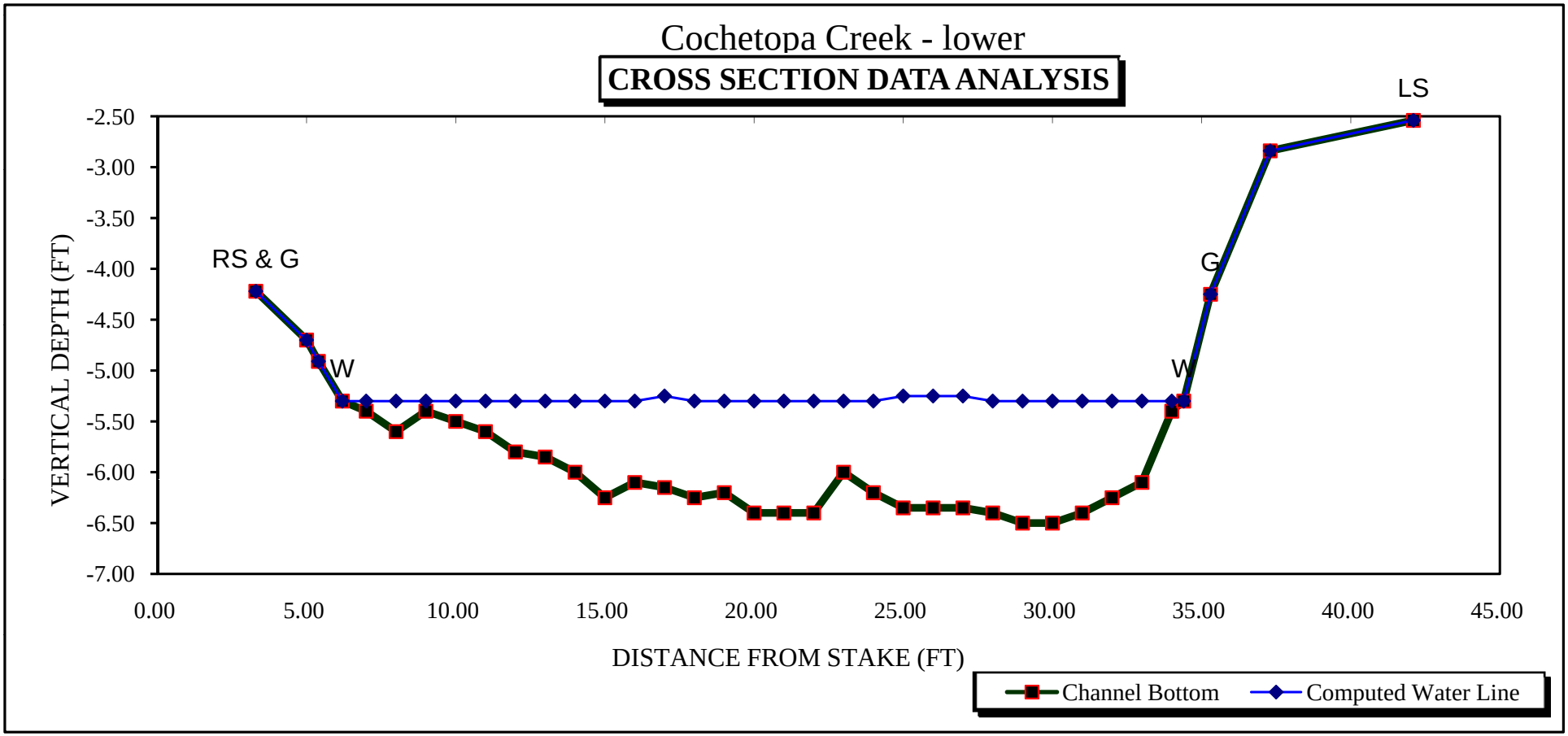
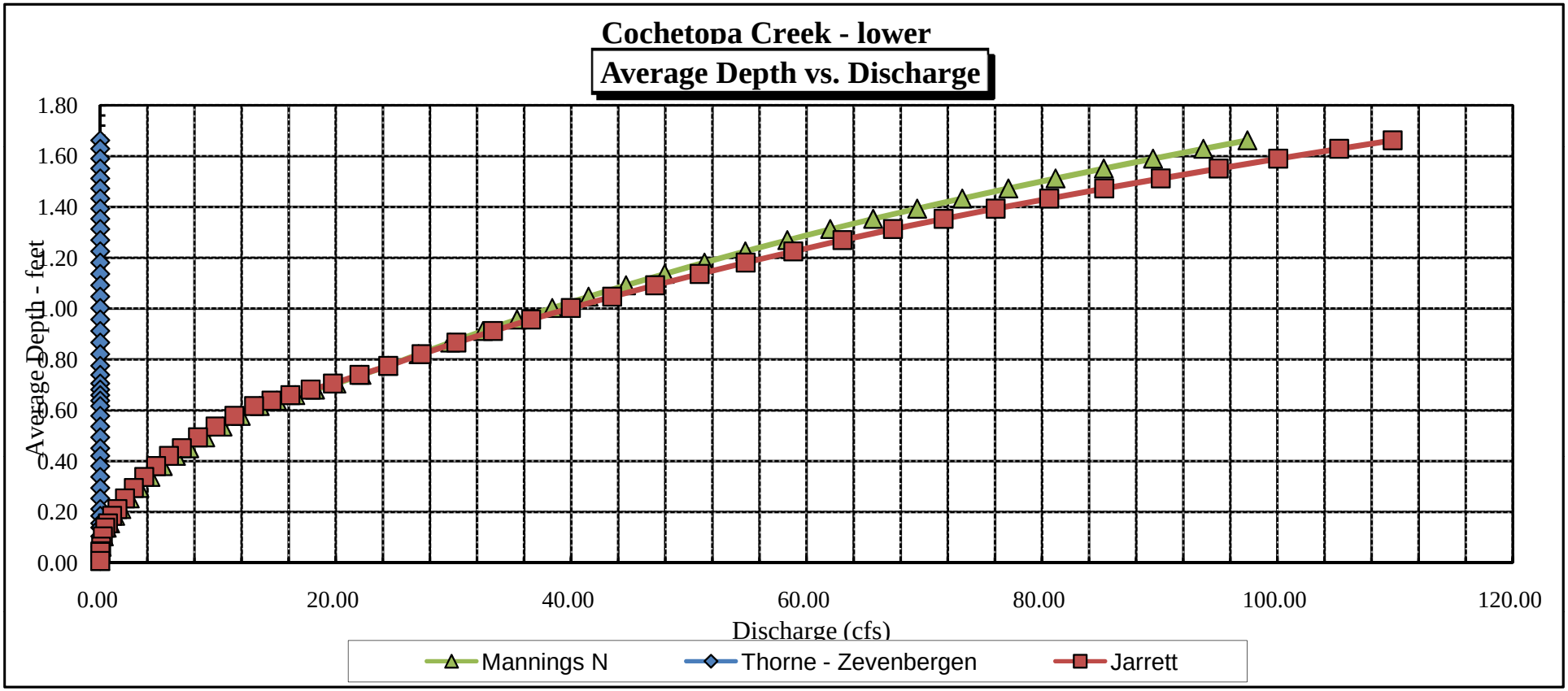
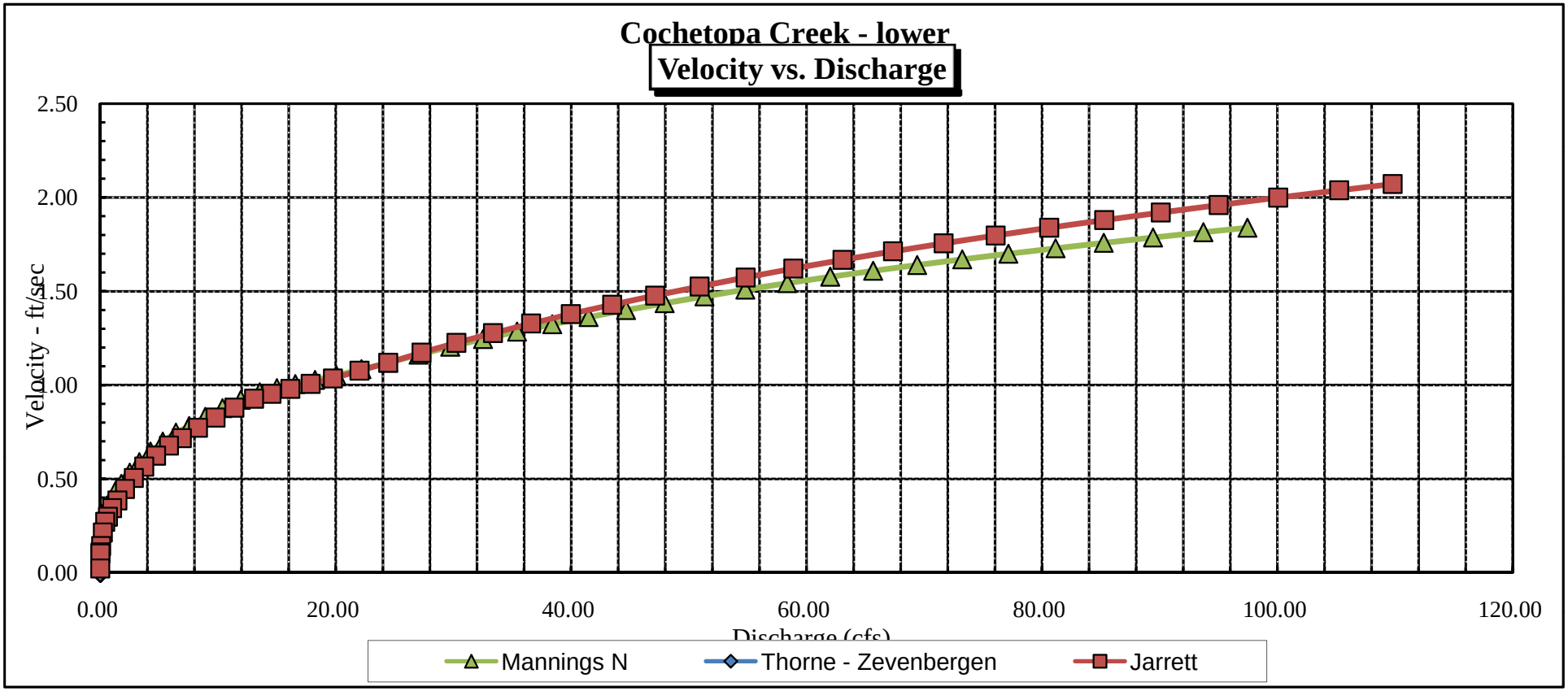
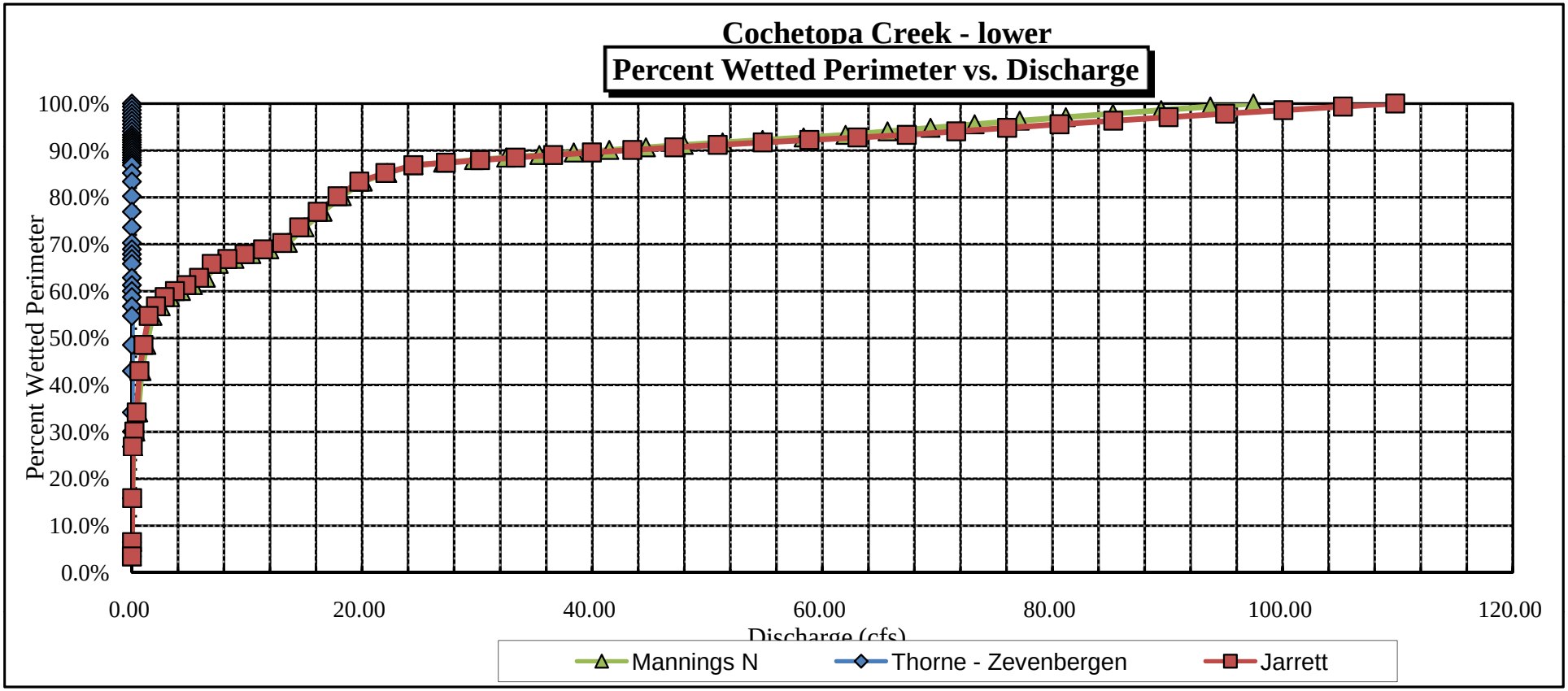
RECOMMENDATION BY: ………………...………..……............................... AGENCY..……………………......…….....….....…....... DATE:......…..….......……………

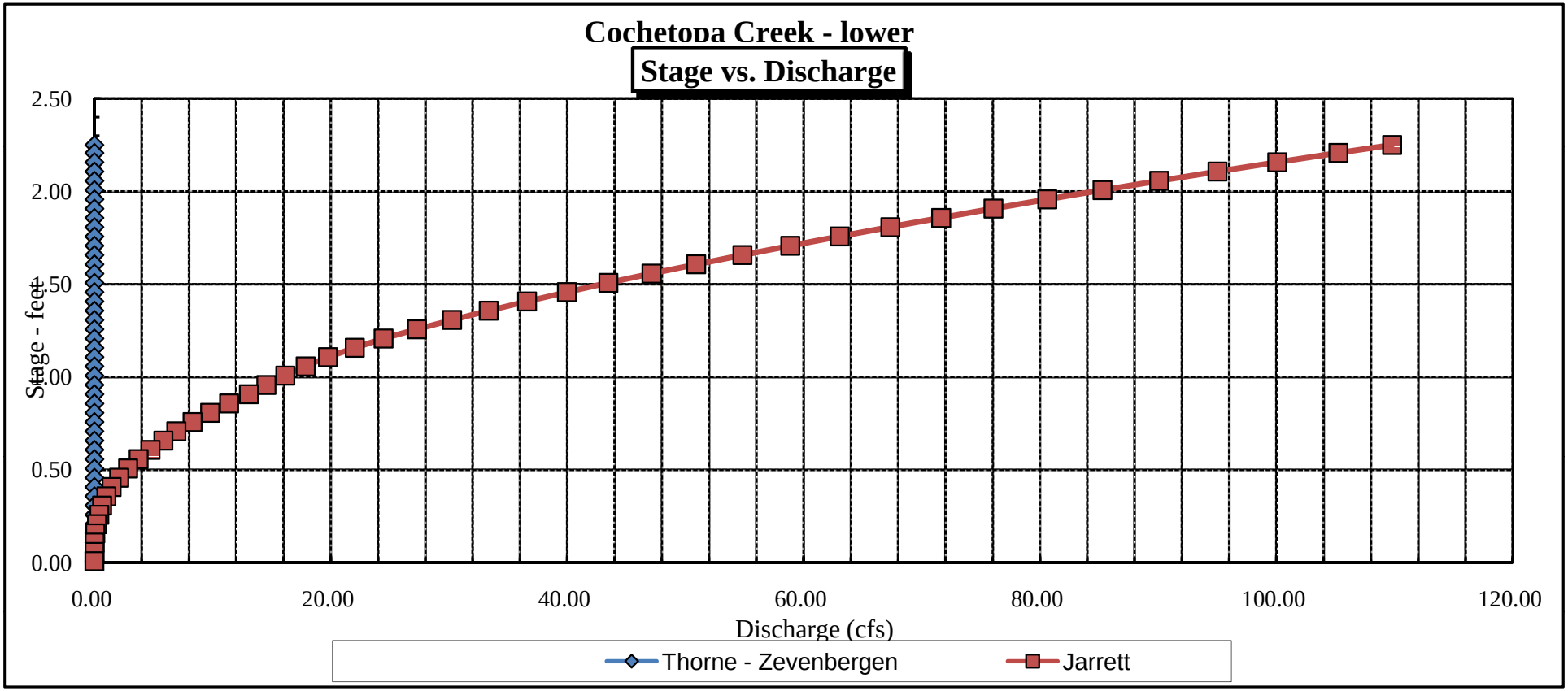
CWCB REVIEW BY: ..……………………….....…………………………………………………...…............. DATE:.................…………….....…


Cochetopa Creek - lower
CROSS SECTION DATA ANALYSIS
LS
RS & G
W
G
W
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Cochetopa Creek - lower
Average Depth vs. Discharge
Average Depth - feet
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Cochetopa Creek - lower
Velocity vs. Discharge
Velocity - ft/sec
2.50
2.00
1.50
1.00
0.50
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Cochetopa Creek - lower
Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
20.00
40.00
60.00
80.00
100.00
120.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Cochetopa Creek - lower
Stage vs. Discharge
Stage - feet
2.50
2.00
1.50
1.00
0.50
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett