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 2 2 2009

RECEIVED
DEC 23 2009
Colorado Water Conservation Board

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 for an instream flow water right on East Beaver Creek, located in Water Division 4.

Location and Land Status. East Beaver Creek is tributary to South Beaver Creek, which enters the Gunnison River approximately five miles west of the community of Gunnison. This recommendation covers the stream reach from the headwaters to the confluence with South Beaver Creek. The creek originates near Sawtooth Mountain, flows across Forest Service lands for approximately 5.0 miles, and then flows across BLM lands for approximately 0.5 miles.

Biological Summary. East Beaver Creek is a moderate gradient stream with large substrate size. The riparian community covers almost the entire stream valley floor and is composed of multiple species of willow. Beaver activity is very extensive, which results in numerous deep pools where fish can overwinter and which results in constant recharge to alluvial aquifers. Riffle habitat is limited because of the extent of beaver ponds. Fishery surveys indicate that the creek supports a self-sustaining population of Colorado River Cutthroat Trout. The genetic purity of the fish has resulted in a designation as a core conservation population.

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

Party	Date	Discharge	250%-40%	Summer (3/3)	Winter (2/3)
BLM	07/10/2008	2.83	1.1 - 7.1	6.39	2.16
BLM	07/10/2008	2.52	1.0 - 6.3	5.38	3.90

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

> 5.8 cubic feet per second is recommended for the snowmelt runoff period, from April 1 through July 31. This recommendation is driven by the average depth and average velocity criteria. Providing this flow is important during the spawning period for Colorado River Cutthroat Trout.

3.7 cubic feet per second is recommended from August 1 through October 31. This recommendation is driven by the average velocity and average depth criteria. This flow rate should provide sufficient physical habitat when the fish population is heavily foraging and gaining weight in preparation for overwintering.

2.4 cubic feet per second is recommended from November 1 through March 31. This flow should provide adequate physical habitat in the limited riffles in the creek, and it should provide sufficient water circulation to prevent total icing in pools that are critical for overwintering.

Water Availability. The BLM is not aware of any water rights within the proposed reach.

There are no historic gage records available for East Beaver Creek, or for the larger South Beaver Creek watershed in which East Beaver Creek is located. However, there is historic gage data available for Cebolla Creek, located immediately to the west. The BLM recommends using a gage located in the headwater of Cebolla Creek, Cebolla Creek near Lake City gage (USGS 09121500), which was operated from 1946 through 1954. A paired basin analytic approach could be used to identify differences between the two basins in terms of size, aspect, and altitude.

Relationship to Management Plans. Under the current resource management plan, East Beaver Creek is managed to maintain and improve riparian habitat conditions. The BLM has made significant changes to grazing management to improve aquatic and riparian conditions. The identification of East Beaver Creek as supporting a core conservation population of Colorado River Cutthroat Trout will also result in very careful review of proposed management actions that could affect water quality and water quantity, such as proposed rights-of-way, and proposed silvicultural treatments. 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 Colorado 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,

for Linda M. Arania

Linda Arania
Deputy State Director, Natural Resources and Fire

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

DRAFT INSTREAM FLOW RECOMMENDATION

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

Dear Ms. Bassi:

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Biological Summary. East Beaver Creek is a moderate gradient stream with large substrate size The riparian community covers almost the entire stream valley floor and is composed of multiple species of willow. Beaver activity is very extensive, which results in numerous deep pools where fish can overwinter and which results in constant recharge to alluvial aquifers. Riffle habitat is limited because of the extent of beaver ponds. Fishery surveys indicate that the creek supports a self-sustaining population of Colorado River Cutthroat Trout. The genetic purity of the fish has resulted in a designation as a core conservation population.

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

Party	Date	Discharge	250%-40%	Summer (3/3)	Winter (2/3)
BLM	07/10/2008	2.83	1.1 - 7.1	6.39	2.16
BLM	07/10/2008	2.52	1.0 - 6.3	5.38	3.90

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.

> 5.9 cfs is recommended for the snowmelt runoff period, from April 1 through June 30. This recommendation is driven by the average depth and average velocity criteria. Providing this flow is important during the spawning period for Colorado River Cutthroat Trout.
>
> 3.0 cfs is recommended for the remainder of the year, from July 1 through March 30. This recommendation is driven by the average velocity and average depth criteria. This flow should provide adequate physical habitat in the limited riffles in the creek, and it should provide sufficient water circulation to prevent total

icing in pools that are critical for overwintering.

Water Availability. BLM is not aware of any water rights within the proposed reach.

There are no historic gage records available for East Beaver Creek, or for the larger South Beaver Creek watershed in which East Beaver Creek is located. However, there is historic gage data available for Cebolla Creek, located immediately to the west, and Cochetopa Creek, located immediately to the east. BLM suggests a multiple-step analysis to analyze water availability. First, a synthetic basin apportionment could be performed on each of the historic gages, to determine rate and timing of water that is likely to be produced be a watershed of the size of East Beaver Creek. The results of this analysis could be compared with a paired basin analytic approach using a basin of similar size, aspect, and altitude. BLM recommends using a gage located in the headwater of Cebolla Creek, Cebolla Creek near Lake City gage (USGS 09121500), which was operated from 1946 through 1954.

Relationship to Management Plans. Under the current resource management plan, East Beaver Creek is managed to maintain and improve riparian habitat conditions. BLM has made significant changes to grazing management to improve aquatic and riparian conditions. The identification of East Beaver Creek as supporting a core conservation population of Colorado River Cutthroat Trout will also result in very careful review of proposed management actions that could affect water quality and water quantity, such as proposed rights-of-way, and proposed silvicultural treatments. 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,

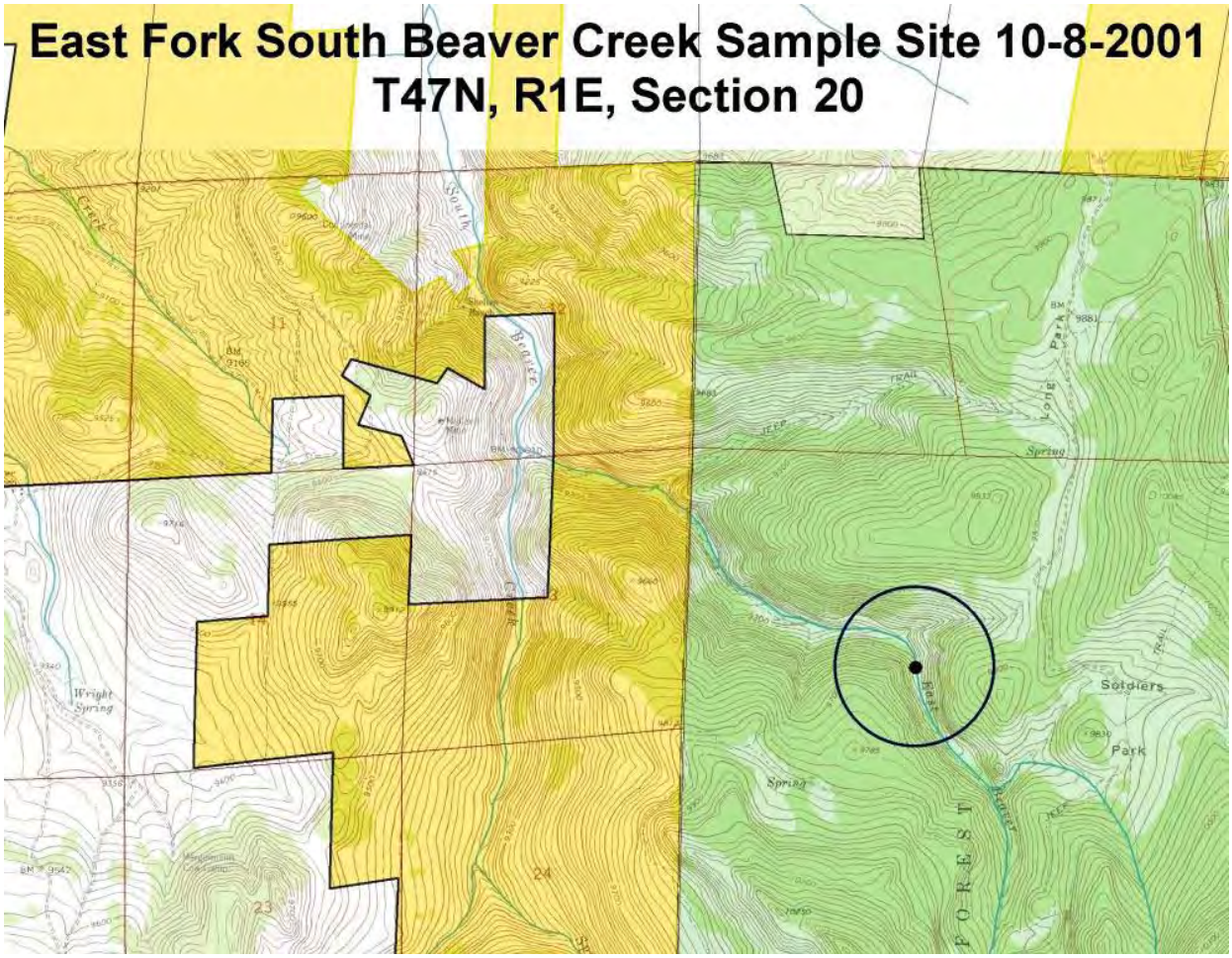
Linda Anania
Deputy State Director
Resources and Fire

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

Gunnison Field Office Stream Surveys
October 2001

East Fork South Beaver Creek - Water Code #38251

East Fork South Beaver Creek, located southeast of Gunnison, CO on USFS lands managed by the Gunnison National Forest, was surveyed on October 8, 2001 by CDOW personnel. Sampling was done to collect fin clips from suspected pure Colorado River Cutthroat trout. BLM lands are also located within the larger sample reach and BLM portions of the stream are known to contain the same fish species as sampled on the forest. The stream was sampled via backpack shocker. Cutthroats were the only species collected. East Fork South Beaver Creek is tributary to South Beaver Creek and then the Gunnison River just upstream of Blue Mesa Reservoir. Personnel present were Dowd and Hedean, CDOW.



Map

Beaver Pond on EF South Beaver Creek

Sample Station on EF South Beaver Creek

FISH COLLECTION RECORD

STREAM NAME: **South Beaver Creek, East Fork**		CODE #: **38251**	STATION #: **1**		
LOCATION: **1.0m below beaver pond complex where stream heads northwest**			DATE: **October 8, 2001**		
UTM ZONE: **13**	UTM X: **334159**	UTM Y: **4244277**	T: **47N**	R: **85W**	S: **18**
COUNTY: **Gunnison**		TOPO MAP NAME: **Spring Hill Creek, CO**			
PERSONNEL: **Dowd, Hedean**			STATION LENGTH: **500**		
AVG. WIDTH: **6.0**	ACREAGE:		POP EST:	**# / AC**	
COLLECTION CODE : **EBEAV-01-DB**					

SPECIMEN CODE	SP.	LENGTH (mm)	WEIGHT (g)	SPECIMEN CODE	SP.	LENGTH (mm)	WEIGHT (g)
EBEAV-01-DB-01	**CRN**	**210**	**71**	**EBEAV-01-DB-11**	**CRN**	**168**	**48**
EBEAV-01-DB-02	**CRN**	**165**	**27**	**EBEAV-01-DB-12**	**CRN**	**157**	**26**
EBEAV-01-DB-03	**CRN**	**168**	**40**	**EBEAV-01-DB-13**	**CRN**	**191**	**33**
EBEAV-01-DB-04	**CRN**	**209**	**62**	**EBEAV-01-DB-14**	**CRN**	**22**	**157**
EBEAV-01-DB-05	**CRN**	**204**	**53**	**EBEAV-01-DB-15**	**CRN**	**215**	**80**
EBEAV-01-DB-06	**CRN**	**215**	**78**	**EBEAV-01-DB-16**	**CRN**	**225**	**100**
EBEAV-01-DB-07	**CRN**	**172**	**20**	**EBEAV-01-DB-17**	**CRN**	**223**	**73**
EBEAV-01-DB-08	**CRN**	**194**	**68**	**EBEAV-01-DB-18**	**CRN**	**147**	**32**
EBEAV-01-DB-09	**CRN**	**177**	**33**	**EBEAV-01-DB-19**	**CRN**	**177**	**37**
EBEAV-01-DB-10	**CRN**	**190**	**38**	**EBEAV-01-DB-20**	**CRN**	**187**	**60**

CRN = Colorado River cutthroat trout

COMMENTS: From CDOW sample sheet: “Sampled 1.0 mile below beaver pond complex where stream heads northwest”.

Discussion:
This stream contains a conservation population of Colorado River cutthroat trout. The population extends from the confluence with South Beaver Creek upstream through BLM lands onto USFS lands.

Riparian habitat in the area is diverse and lush with willow thickets so dense that stream access is difficult in many areas. Beaver activity is common and abundant pool habitat is present. Riffle habitat is more limited due to the extensive beaver activity.

Recommendations:

- Work with the USFS on an instream flow recommendation for this creek

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: East Beaver Creek							CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: Approx. 0.5 mile upstream from BLM-USFS boundary							
DATE: 7/10/09	OBSERVERS: R. Smith, A. Hayes						
LEGAL DESCRIPTION	¼ SECTION: SE	SECTION: 18	TOWNSHIP: 47N N/S	RANGE: 1E E/W	PM: NM		
COUNTY:	WATERSHED: Gunn Sou	WATER DIVISION: # 4	DOW WATER CODE:				
MAP(S): USGS: Spring Hill 7½ min	GPS Zone 13 0335419 4241311						
USFS:							

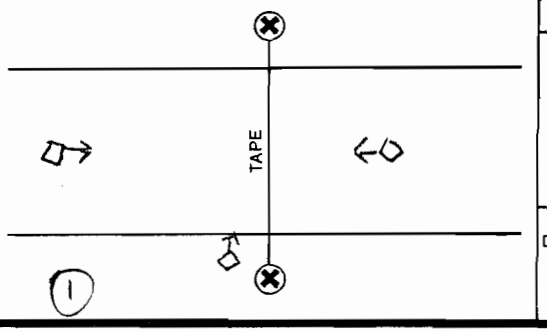
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO	METER TYPE: Marsh McBirney			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: 8"-24" 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
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	5.41 / 5.40
② WS Upstream	17.7	4.52
③ WS Downstream	12.2	6.16
SLOPE	1.64 / 29.9 = 0.054	

SKETCH



LEGEND:
Stake ⊗
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:

Mayfly, Caddis Fly, Stone Fly -

COMMENTS

TDS = 60 Temp 54°F PH 7.9

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: East Beaver Creek	CROSS-SECTION NO.:	DATE: 7-10-08	SHEET ___ OF ___

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 9:10 am

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	1.5		4.66								
G	7.9		5.05								
W	8.7		5.40								
	9.0		5.55	.15				.03			
	10.0		5.50	.10				.68			
	11.0		5.75	.35				.63			
	12.0		5.50	.10				.64			
	13.0		5.90	.50				.74			
	13.5		5.90	.45				.90			
	14.0		6.10	.70				.79			
	14.5		5.8	.40				.72			
	15.0		5.65	.25				.78			
	15.5		5.60	.20				.98			
	16.0		5.60	.20				.66			
	16.5		5.70	.30				.54			
	17.0		5.75	.30				.49			
	17.5		5.80	.50				.84			
	18.0		5.60	.20				.31			
	18.5		5.55	.15				.28			
	19.0		5.70	.30				1.12			
	19.5		5.50	.10				.63			
	20.0		5.45	.05				0.0			
	20.5		5.60	.20				.55			
	22.0		5.65	.25				1.33			
	22.5		5.55	.15				1.63			
	23.0		5.55	.15				.70			
	23.5		5.60	.15				.07			
	24.5		5.50	.10				1.04			
W	24.8		5.41								
G	25.0		5.08								
RS	28.5		4.55								
TOTALS:											

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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: East Beaver Creek
CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: Approx. 0.6 mile upstream from BLM-USFS boundary
DATE: 7-10-08
OBSERVERS: R. Smith, A. Hayes, S. Sherwood
LEGAL DESCRIPTION: ¼ SECTION: SE | SECTION: 18 | TOWNSHIP: 47 N N/S | RANGE: 1 E E/W | PM: NM
COUNTY: Saguache | WATERSHED: Gunnison | WATER DIVISION: 4 | DOW WATER CODE:
MAP(S): USGS: NAD27 Zone 13 0334026
USFS: 4244309

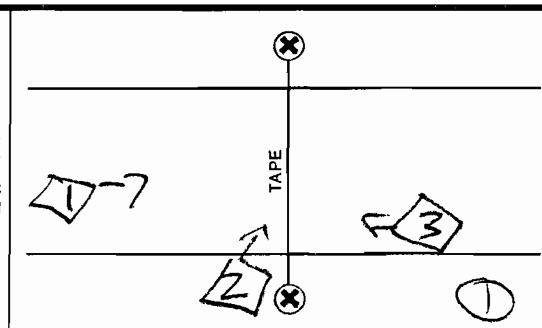
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO
METER TYPE: Marsh-McBirney
METER NUMBER:
DATE RATED:
CALIB/SPIN: ______ sec
TAPE WEIGHT: surveyed lbs/foot
TAPE TENSION: surveyed lbs
CHANNEL BED MATERIAL SIZE RANGE: 8" to 2 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
⊗ Tape @ Stake RB	0.0	surveyed
(1) WS @ Tape LB/RB (9.1)	0.0	6.74 / 6.74
(2) WS Upstream	12.0'	5.90
(3) WS Downstream	12.5'	7.19
SLOPE	1.29 / 24.5' = 0.05	

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:
mayfly, caddisfly, stonefly

COMMENTS

Ph = 7.9 Temp = 54° C TDS = 60

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: East Beaver Creek	CROSS-SECTION NO.: 2	DATE: 7-10-08	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 10:05 am

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	1.5		5.03								
G	7.0		5.66								
W	10.1		6.74								
	10.5		7.0	.25				.66			
	11.5		7.05	.30				.38			
	12.5		6.85	.10				.30			
	13.5		6.95	.20				.25			
	14.5		6.85	.10				2.02			
	15.5		6.80	.05				.30			
	16.0		6.95	.20				.75			
	16.5		6.95	.20				.54			
	17.0		7.00	.25				0			
	17.5		6.85	.10				.92			
	18.0		6.90	.15				.97			
	18.5		7.25	.50				2.78			
	19.0		7.25	.50				0			
	19.5		6.95	.20				0			
	20.0		7.05	.30				.14			
	20.5		6.85	.10				0			
	21.0		6.75	0				0			
	21.5		6.95	.30				1.37			
	22.0		7.05	.50				.23			
	22.5		6.75	0				0			
	23.0		7.05	.3				2.64			
	23.5		6.81	.05				2.00			
	24.0		6.83	.05				2.00			
	24.5		6.75	0				0			
	25.0		6.77	0				0			
	25.5		7.04	.3				1.54			
	26.0		6.78	0				0			
	26.5		6.77	0				0			
	27		6.85	.1				.68			
	27.5		6.80	.05				1.5			
	28.0		6.95	.2				.75			
W	28.3		6.74								
G	31.7		5.68								
	32.9		5.12								
RS	37.2		5.20								
TOTALS:											

End of Measurement	Time:	Gage Reading: _____ 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:	East Beaver Creek
XS LOCATION:	Approx. 0.5 mile upstream from BLM-USFS boundary
XS NUMBER:	1
DATE:	10-Jul-08
OBSERVERS:	R. Smith, A. Hayes. S. Sherwood
1/4 SEC:	SE
SECTION:	18
TWP:	47N
RANGE:	1E
PM:	NM
COUNTY:	Saguache
WATERSHED:	Gunnison
DIVISION:	4
DOW CODE:	38251
USGS MAP:	Spring Hill 7.5'
USFS MAP:	0

SUPPLEMENTAL DATA

		*** NOTE ***
		Leave TAPE WT and TENSION
		at defaults for data collected
TAPE WT:	0.0106	with a survey level and rod
TENSION:	99999	

CHANNEL PROFILE DATA

SLOPE:	0.054

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

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

STREAM NAME: East Beaver Creek
XS LOCATION: Approx. 0.5 mile upstream from BLM-USFS boundary
XS NUMBER: 1

DATA POINTS= 31

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	LS	1.50	4.66			0.00		0.00	0.00	0.0%
1	G	7.90	5.05			0.00		0.00	0.00	0.0%
	W	8.20	5.40			0.00		0.00	0.00	0.0%
		9.00	5.55	0.15	0.03	0.81	0.15	0.14	0.00	0.1%
		10.00	5.50	0.10	0.68	1.00	0.10	0.10	0.07	2.4%
		11.00	5.75	0.35	0.63	1.03	0.35	0.35	0.22	7.8%
		12.00	5.50	0.10	0.64	1.03	0.10	0.10	0.06	2.3%
		13.00	5.90	0.50	0.74	1.08	0.50	0.38	0.28	9.8%
		13.50	5.90	0.45	0.90	0.50	0.45	0.23	0.20	7.2%
		14.00	6.10	0.70	0.79	0.54	0.70	0.35	0.28	9.8%
		14.50	5.80	0.40	0.72	0.58	0.40	0.20	0.14	5.1%
		15.00	5.65	0.25	0.78	0.52	0.25	0.13	0.10	3.4%
		15.50	5.60	0.20	0.98	0.50	0.20	0.10	0.10	3.5%
		16.00	5.60	0.20	0.66	0.50	0.20	0.10	0.07	2.3%
		16.50	5.70	0.30	0.54	0.51	0.30	0.15	0.08	2.9%
		17.00	5.75	0.30	0.49	0.50	0.30	0.15	0.07	2.6%
		17.50	5.80	0.50	0.84	0.50	0.50	0.25	0.21	7.4%
		18.00	5.60	0.20	0.31	0.54	0.20	0.10	0.03	1.1%
		18.50	5.55	0.15	0.28	0.50	0.15	0.08	0.02	0.7%
		19.00	5.70	0.30	1.12	0.52	0.30	0.15	0.17	5.9%
		19.50	5.50	0.10	0.63	0.54	0.10	0.05	0.03	1.1%
		20.00	5.45	0.05	0.00	0.50	0.05	0.03	0.00	0.0%
		20.50	5.60	0.20	0.55	0.52	0.20	0.20	0.11	3.9%
		22.00	5.65	0.25	1.33	1.50	0.25	0.25	0.33	11.8%
		22.50	5.55	0.15	1.63	0.51	0.15	0.08	0.12	4.3%
		23.00	5.55	0.15	0.70	0.50	0.15	0.08	0.05	1.9%
		23.50	5.60	0.15	0.07	0.50	0.15	0.11	0.01	0.3%
		24.50	5.50	0.10	1.04	1.00	0.10	0.07	0.07	2.4%
	W	24.80	5.41			0.31		0.00	0.00	0.0%
1	G	25.00	5.08			0.00		0.00	0.00	0.0%
	RS	28.50	4.55			0.00		0.00	0.00	0.0%
	TOTALS ----------					17.07	0.7 (Max.)	3.89	2.83	100.0%

Manning's n = 0.1770
Hydraulic Radius= 0.22770853

STREAM NAME: East Beaver Creek
XS LOCATION: Approx. 0.5 mile upstream from BLM-USFS boundary
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.89	3.84	-1.1%
5.16	3.89	8.04	106.8%
5.18	3.89	7.70	98.1%
5.20	3.89	7.36	89.4%
5.22	3.89	7.02	80.7%
5.24	3.89	6.69	72.0%
5.26	3.89	6.35	63.3%
5.28	3.89	6.01	54.7%
5.30	3.89	5.68	46.1%
5.32	3.89	5.34	37.5%
5.34	3.89	5.01	28.9%
5.36	3.89	4.68	20.3%
5.37	3.89	4.51	16.0%
5.38	3.89	4.34	11.7%
5.39	3.89	4.18	7.4%
5.40	3.89	4.01	3.1%
5.41	3.89	3.84	-1.1%
5.42	3.89	3.68	-5.4%
5.43	3.89	3.51	-9.6%
5.44	3.89	3.35	-13.8%
5.45	3.89	3.19	-18.0%
5.46	3.89	3.03	-22.2%
5.48	3.89	2.71	-30.3%
5.50	3.89	2.40	-38.3%
5.52	3.89	2.10	-45.9%
5.54	3.89	1.83	-53.0%
5.56	3.89	1.57	-59.5%
5.58	3.89	1.35	-65.3%
5.60	3.89	1.15	-70.5%
5.62	3.89	0.98	-74.9%
5.64	3.89	0.84	-78.5%
5.66	3.89	0.72	-81.5%

WATERLINE AT ZERO
AREA ERROR = 5.402

STREAM NAME: East Beaver Creek
XS LOCATION: Approx. 0.5 mile upstream from BLM-USFS boundary
XS NUMBER: 1 Constant Manning's n

STAGING TABLE *GL* = lowest Grassline elevation corrected for sag
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	5.08	17.07	0.55	1.02	9.32	17.88	100.0%	0.52	11.76	1.26
	5.10	17.04	0.52	1.00	8.93	17.82	99.7%	0.50	11.00	1.23
	5.15	16.97	0.48	0.95	8.08	17.70	99.0%	0.46	9.35	1.16
	5.20	16.90	0.43	0.90	7.24	17.58	98.3%	0.41	7.81	1.08
	5.25	16.82	0.38	0.85	6.39	17.45	97.6%	0.37	6.39	1.00
	5.30	16.75	0.33	0.80	5.56	17.33	96.9%	0.32	5.08	0.91
	5.35	16.68	0.28	0.75	4.72	17.20	96.2%	0.27	3.89	0.82
WL	5.40	16.59	0.23	0.70	3.89	17.07	95.5%	0.23	2.83	0.73
	5.45	16.15	0.19	0.65	3.07	16.61	92.9%	0.18	1.94	0.63
	5.50	14.98	0.15	0.60	2.29	15.42	86.2%	0.15	1.25	0.55
	5.55	11.89	0.13	0.55	1.60	12.28	68.7%	0.13	0.81	0.50
	5.60	8.62	0.13	0.50	1.08	8.95	50.1%	0.12	0.51	0.48
	5.65	5.28	0.14	0.45	0.73	5.55	31.0%	0.13	0.37	0.51
	5.70	3.92	0.13	0.40	0.50	4.13	23.1%	0.12	0.24	0.48
	5.75	2.62	0.13	0.35	0.34	2.79	15.6%	0.12	0.16	0.48
	5.80	1.74	0.13	0.30	0.23	1.88	10.5%	0.12	0.11	0.49
	5.85	1.53	0.10	0.25	0.15	1.65	9.2%	0.09	0.06	0.40
	5.90	0.82	0.10	0.20	0.08	0.92	5.1%	0.09	0.03	0.39
	5.95	0.62	0.07	0.15	0.05	0.68	3.8%	0.07	0.01	0.32
	6.00	0.41	0.05	0.10	0.02	0.45	2.5%	0.04	0.00	0.24
	6.05	0.20	0.02	0.05	0.00	0.22	1.2%	0.02	0.00	0.15

STREAM NAME: East Beaver Creek
XS LOCATION: Approx. 0.5 mile upstream from BLM-USFS boundary
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	2.83	cfs
CALCULATED FLOW (Qc)=	2.83	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	5.41	ft
CALCULATED WATERLINE (WLc)=	5.40	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.70	ft
MAX CALCULATED DEPTH (Dc)=	0.70	ft
(Dm-Dc)/Dm * 100	0.3	%
MEAN VELOCITY=	0.73	ft/sec
MANNING'S N=	0.177	
SLOPE=	0.054	ft/ft
.4 * Qm =	1.1	cfs
2.5 * Qm=	7.1	cfs

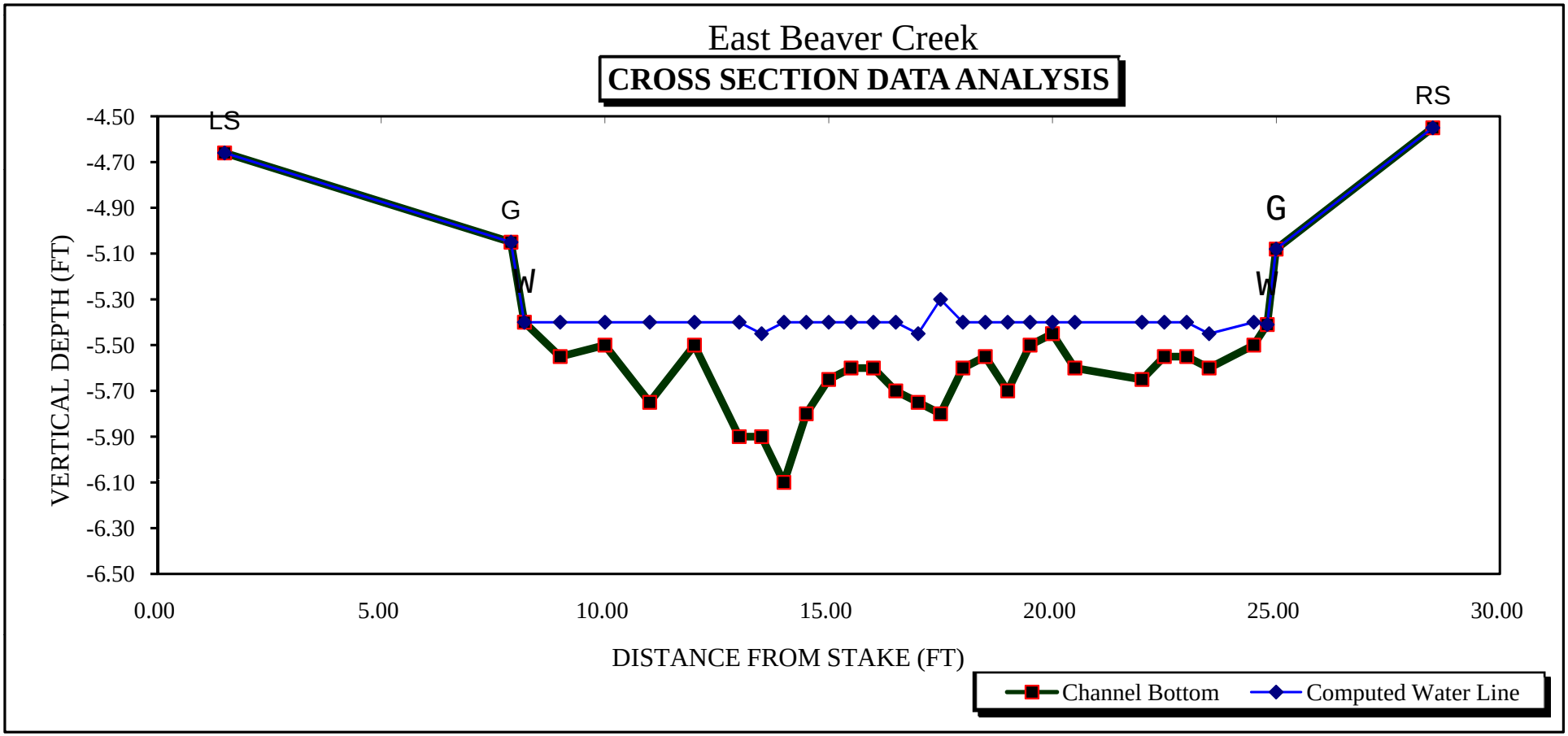
RECOMMENDED INSTREAM FLOW:
============================

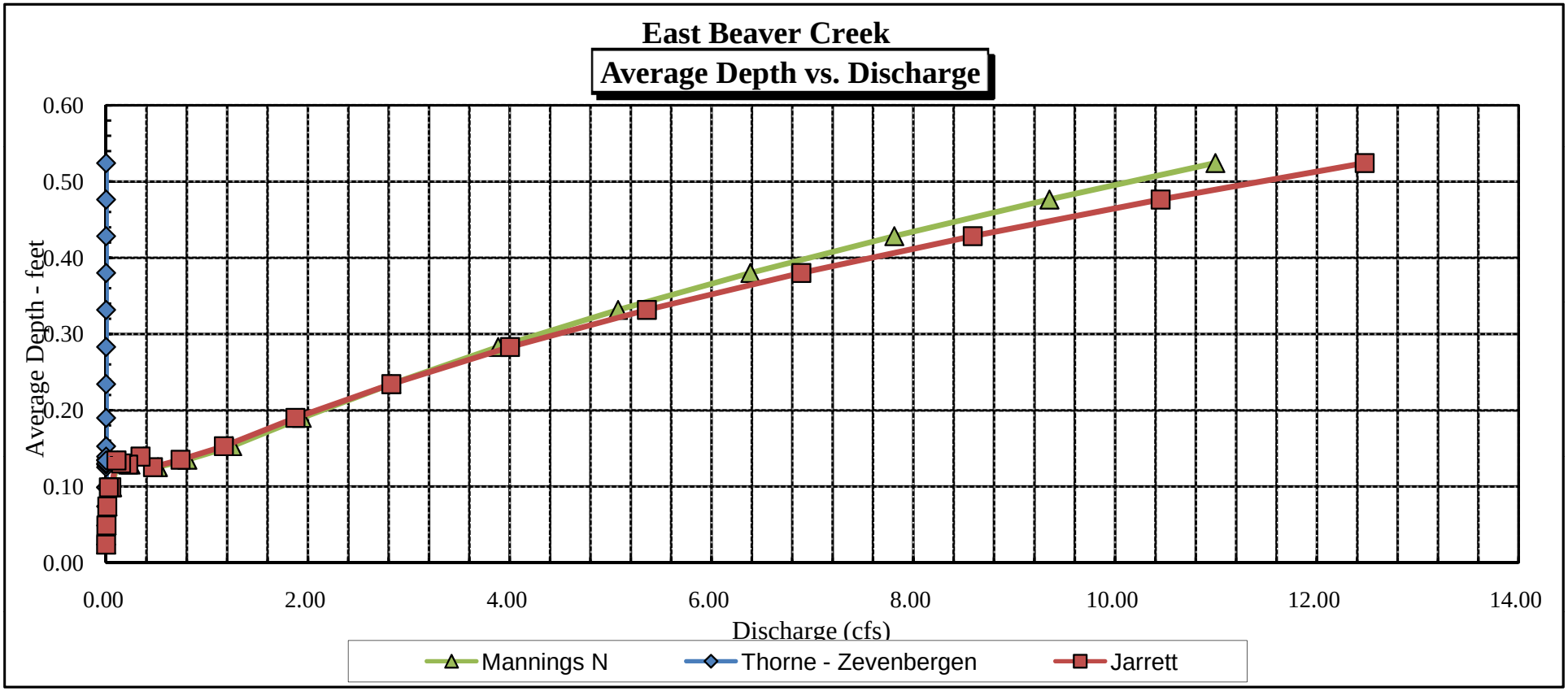
FLOW (CFS)	PERIOD
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

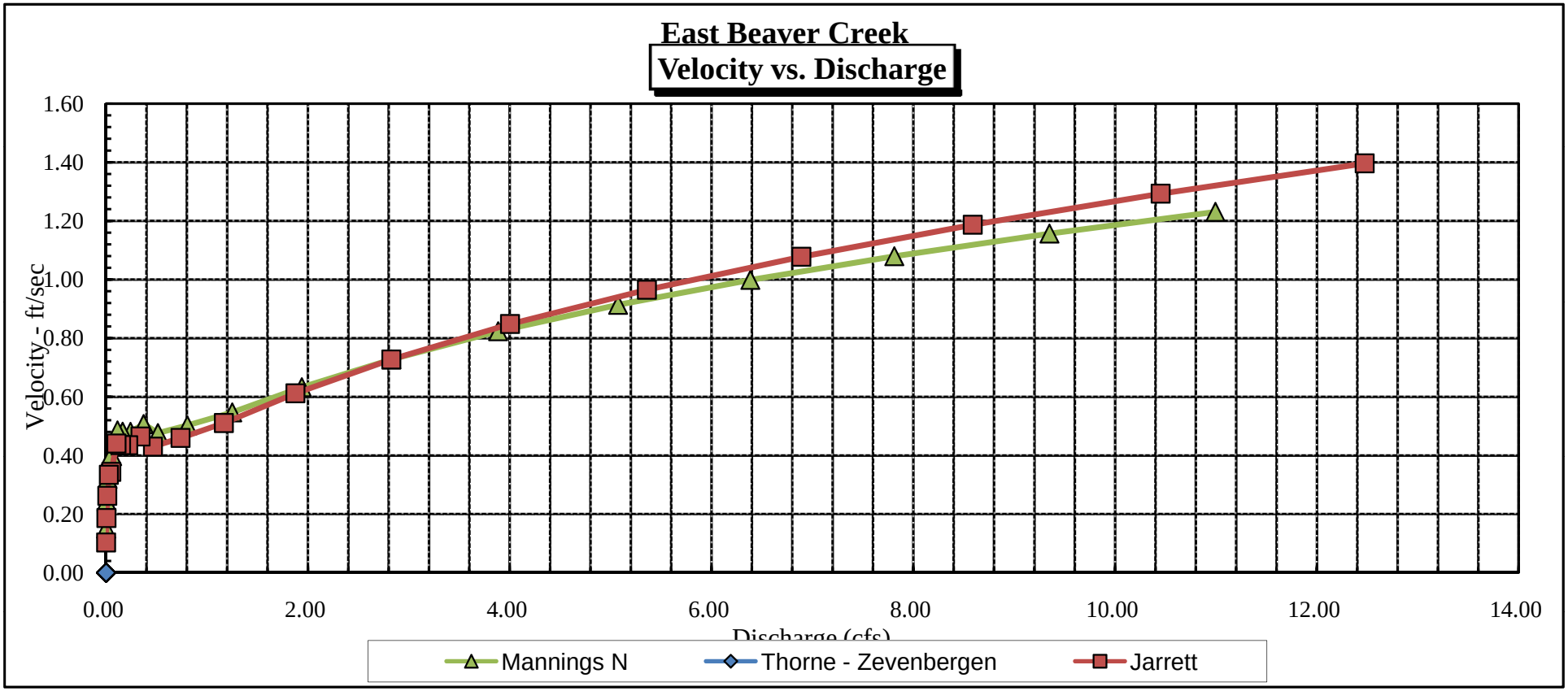
RATIONALE FOR RECOMMENDATION:
============================

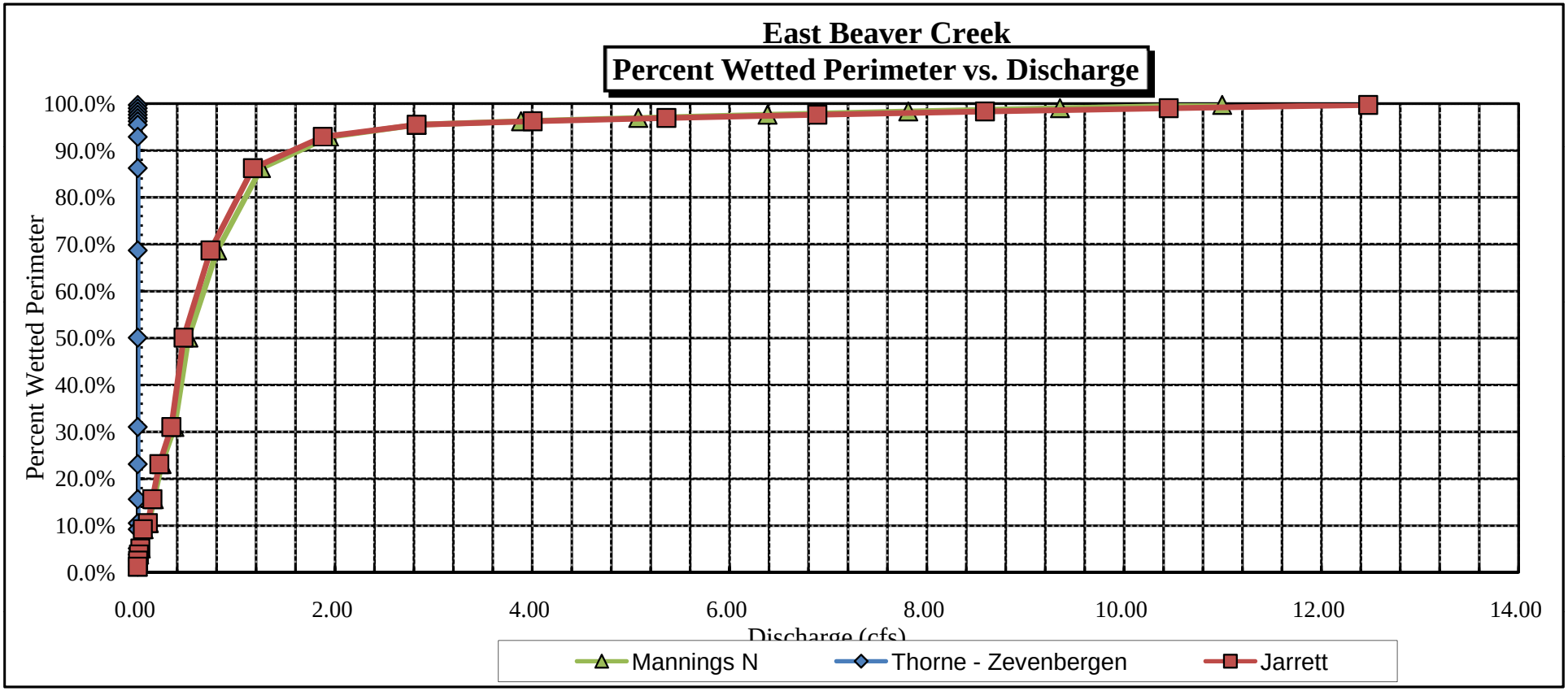
RECOMMENDATION BY: ……………………..……….……........................... AGENCY..……………………….....……...…...…….…...... DATE:......…...…......……………

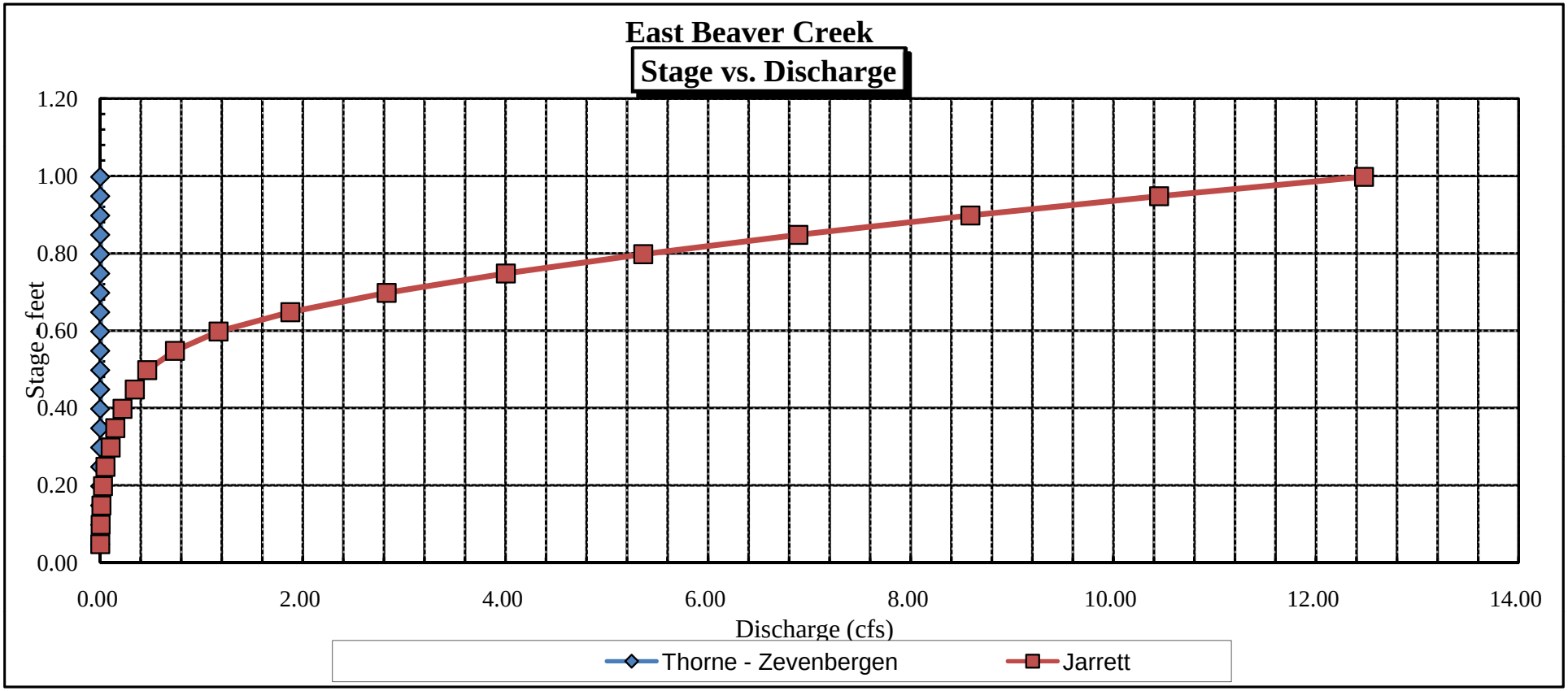
CWCB REVIEW BY: ..……………………………....………………………………………………...…............. DATE:.................…………….....…


East Beaver Creek
CROSS SECTION DATA ANALYSIS
LS
G
W
G
W
RS
-4.50
-4.70
-4.90
-5.10
-5.30
-5.50
-5.70
-5.90
-6.10
-6.30
-6.50
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


East Beaver Creek
Average Depth vs. Discharge
Average Depth - feet
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


East Beaver Creek
Velocity vs. Discharge
Velocity - ft/sec
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


East Beaver Creek
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
2.00
4.00
6.00
8.00
10.00
12.00
14.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


East Beaver Creek
Stage vs. Discharge
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Stage - feet
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
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:	East Beaver Creek
XS LOCATION:	Approx. 0.6 mile upstream from BLM-USFS boundary
XS NUMBER:	1
DATE:	10-Jul-08
OBSERVERS:	R. Smith, A. Hayes. S. Sherwood
1/4 SEC:	SE
SECTION:	18
TWP:	47N
RANGE:	1E
PM:	NM
COUNTY:	Saguache
WATERSHED:	Gunnison
DIVISION:	4
DOW CODE:	38251
USGS MAP:	Spring Hill 7.5'
USFS MAP:	0

SUPPLEMENTAL DATA

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

TAPE WT:	0.0106
TENSION:	99999

CHANNEL PROFILE DATA

SLOPE:	0.053

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

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

STREAM NAME: East Beaver Creek
XS LOCATION: Approx. 0.6 mile upstream from BLM-USFS boundary
XS NUMBER: 1

DATA POINTS= 38

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	LS	1.50	5.03			0.00		0.00	0.00	0.0%
1	G	7.00	5.66			0.00		0.00	0.00	0.0%
	W	10.10	6.74			0.00		0.00	0.00	0.0%
		10.50	7.00	0.25	0.66	0.48	0.25	0.18	0.12	4.6%
		11.50	7.05	0.30	0.38	1.00	0.30	0.30	0.11	4.5%
		12.50	6.85	0.10	0.30	1.02	0.10	0.10	0.03	1.2%
		13.50	6.95	0.20	0.25	1.00	0.20	0.20	0.05	2.0%
		14.50	6.85	0.10	2.02	1.00	0.10	0.10	0.20	8.0%
		15.50	6.80	0.05	0.30	1.00	0.05	0.04	0.01	0.4%
		16.00	6.95	0.20	0.75	0.52	0.20	0.10	0.08	3.0%
		16.50	6.95	0.20	0.54	0.50	0.20	0.10	0.05	2.1%
		17.00	7.00	0.25	0.00	0.50	0.25	0.13	0.00	0.0%
		17.50	6.85	0.10	0.92	0.52	0.10	0.05	0.05	1.8%
		18.00	6.90	0.15	0.97	0.50	0.15	0.08	0.07	2.9%
		18.50	7.25	0.50	2.78	0.61	0.50	0.25	0.70	27.6%
		19.00	7.25	0.50	0.00	0.50	0.50	0.25	0.00	0.0%
		19.50	6.95	0.20	0.00	0.58	0.20	0.10	0.00	0.0%
		20.00	7.05	0.30	0.14	0.51	0.30	0.15	0.02	0.8%
		20.50	6.85	0.10	0.00	0.54	0.10	0.05	0.00	0.0%
		21.00	6.75	0.00	0.00	0.51		0.00	0.00	0.0%
		21.50	6.95	0.20	1.37	0.54	0.20	0.10	0.14	5.4%
		22.00	7.05	0.30	0.23	0.51	0.30	0.15	0.03	1.4%
		22.50	6.73	0.00	0.00	0.59		0.00	0.00	0.0%
		23.00	7.05	0.30	2.64	0.59	0.30	0.15	0.40	15.7%
		23.50	6.81	0.05	2.00	0.55	0.05	0.03	0.05	2.0%
		24.00	6.83	0.05	2.00	0.50	0.05	0.03	0.05	2.0%
		24.50	6.75	0.00	0.00	0.51		0.00	0.00	0.0%
		25.00	6.77	0.00	0.00	0.00		0.00	0.00	0.0%
		25.50	7.04	0.30	1.54	0.57	0.30	0.15	0.23	9.2%
		26.00	6.78	0.00	0.00	0.56		0.00	0.00	0.0%
		26.50	6.77	0.00	0.00	0.00		0.00	0.00	0.0%
		27.00	6.85	0.10	0.68	0.51	0.10	0.05	0.03	1.4%
		27.50	6.80	0.05	1.50	0.50	0.05	0.03	0.04	1.5%
		28.00	6.95	0.20	0.75	0.52	0.20	0.08	0.06	2.4%
	W	28.30	6.74			0.37		0.00	0.00	0.0%
1	G	31.70	5.68			0.00		0.00	0.00	0.0%
		32.90	5.12			0.00		0.00	0.00	0.0%
	RS	37.20	5.20			0.00		0.00	0.00	0.0%
	TOTALS ----------					18.14	0.5 (Max.)	2.92	2.52	100.0%

Manning's n = 0.1173
Hydraulic Radius= 0.16086751

STREAM NAME: East Beaver Creek
XS LOCATION: Approx. 0.6 mile upstream from BLM-USFS boundary
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	2.92	2.52	-13.7%
6.53	2.92	7.19	146.4%
6.55	2.92	6.80	133.1%
6.57	2.92	6.41	119.8%
6.59	2.92	6.03	106.7%
6.61	2.92	5.65	93.6%
6.63	2.92	5.27	80.6%
6.65	2.92	4.89	67.7%
6.67	2.92	4.52	54.9%
6.69	2.92	4.15	42.1%
6.71	2.92	3.78	29.5%
6.73	2.92	3.41	16.9%
6.74	2.92	3.23	10.6%
6.75	2.92	3.05	4.4%
6.76	2.92	2.86	-1.8%
6.77	2.92	2.69	-7.9%
6.78	2.92	2.52	-13.7%
6.79	2.92	2.35	-19.4%
6.80	2.92	2.19	-24.9%
6.81	2.92	2.03	-30.3%
6.82	2.92	1.88	-35.5%
6.83	2.92	1.74	-40.4%
6.85	2.92	1.48	-49.3%
6.87	2.92	1.24	-57.4%
6.89	2.92	1.03	-64.6%
6.91	2.92	0.85	-70.9%
6.93	2.92	0.69	-76.5%
6.95	2.92	0.54	-81.4%
6.97	2.92	0.43	-85.3%
6.99	2.92	0.34	-88.5%
7.01	2.92	0.26	-91.1%
7.03	2.92	0.20	-93.0%

WATERLINE AT ZERO
AREA ERROR = 6.752

STREAM NAME: East Beaver Creek
XS LOCATION: Approx. 0.6 mile upstream from BLM-USFS 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	5.68	24.64	1.05	1.57	25.84	25.92	100.0%	1.00	75.22	2.91
	5.75	24.20	0.99	1.50	24.08	25.46	98.2%	0.95	67.68	2.81
	5.80	23.90	0.96	1.45	22.88	25.14	97.0%	0.91	62.66	2.74
	5.85	23.60	0.92	1.40	21.69	24.82	95.8%	0.87	57.83	2.67
	5.90	23.29	0.88	1.35	20.52	24.50	94.5%	0.84	53.17	2.59
	5.95	22.99	0.84	1.30	19.36	24.18	93.3%	0.80	48.70	2.51
	6.00	22.68	0.80	1.25	18.22	23.86	92.0%	0.76	44.40	2.44
	6.05	22.38	0.76	1.20	17.09	23.54	90.8%	0.73	40.28	2.36
	6.10	22.08	0.72	1.15	15.98	23.22	89.6%	0.69	36.34	2.27
	6.15	21.77	0.68	1.10	14.89	22.90	88.3%	0.65	32.58	2.19
	6.20	21.47	0.64	1.05	13.81	22.58	87.1%	0.61	29.00	2.10
	6.25	21.17	0.60	1.00	12.74	22.26	85.9%	0.57	25.61	2.01
	6.30	20.86	0.56	0.95	11.69	21.94	84.6%	0.53	22.40	1.92
	6.35	20.56	0.52	0.90	10.65	21.62	83.4%	0.49	19.38	1.82
	6.40	20.25	0.48	0.85	9.63	21.30	82.2%	0.45	16.55	1.72
	6.45	19.95	0.43	0.80	8.63	20.98	80.9%	0.41	13.92	1.61
	6.50	19.65	0.39	0.75	7.64	20.66	79.7%	0.37	11.47	1.50
	6.55	19.34	0.34	0.70	6.66	20.34	78.5%	0.33	9.23	1.39
	6.60	19.04	0.30	0.65	5.70	20.02	77.2%	0.28	7.20	1.26
	6.65	18.73	0.25	0.60	4.76	19.70	76.0%	0.24	5.38	1.13
	6.70	18.43	0.21	0.55	3.83	19.38	74.8%	0.20	3.79	0.99
WL	6.75	18.01	0.16	0.50	2.92	18.93	73.0%	0.15	2.45	0.84
	6.80	15.70	0.13	0.45	2.08	16.52	63.7%	0.13	1.52	0.73
	6.85	11.92	0.12	0.40	1.39	12.61	48.6%	0.11	0.94	0.67
	6.90	8.84	0.10	0.35	0.87	9.38	36.2%	0.09	0.52	0.60
	6.95	5.69	0.09	0.30	0.50	6.06	23.4%	0.08	0.28	0.55
	7.00	3.46	0.08	0.25	0.27	3.69	14.2%	0.07	0.14	0.51
	7.05	1.11	0.14	0.20	0.16	1.23	4.7%	0.13	0.12	0.75
	7.10	0.96	0.11	0.15	0.11	1.05	4.0%	0.10	0.07	0.64
	7.15	0.80	0.08	0.10	0.06	0.86	3.3%	0.07	0.03	0.51
	7.20	0.65	0.04	0.05	0.03	0.68	2.6%	0.04	0.01	0.34

STREAM NAME: East Beaver Creek
XS LOCATION: Approx. 0.6 mile upstream from BLM-USFS boundary
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	2.52	cfs
CALCULATED FLOW (Qc)=	2.45	cfs
(Qm-Qc)/Qm * 100 =	2.8	%
MEASURED WATERLINE (WLm)=	6.78	ft
CALCULATED WATERLINE (WLc)=	6.75	ft
(WLm-WLc)/WLm * 100 =	0.3	%
MAX MEASURED DEPTH (Dm)=	0.50	ft
MAX CALCULATED DEPTH (Dc)=	0.50	ft
(Dm-Dc)/Dm * 100	0.4	%
MEAN VELOCITY=	0.84	ft/sec
MANNING'S N=	0.117	
SLOPE=	0.053	ft/ft
.4 * Qm =	1.0	cfs
2.5 * Qm=	6.3	cfs

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

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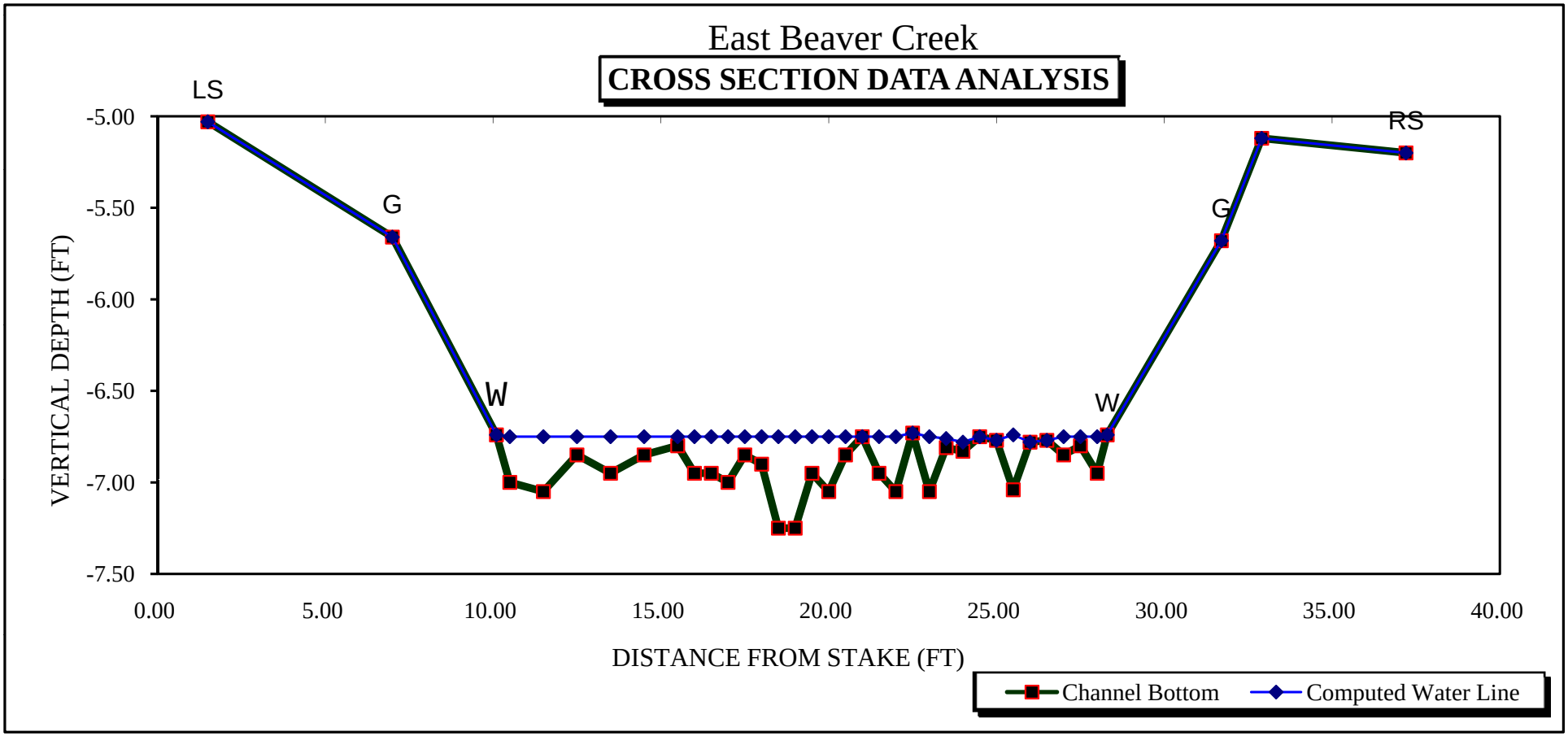
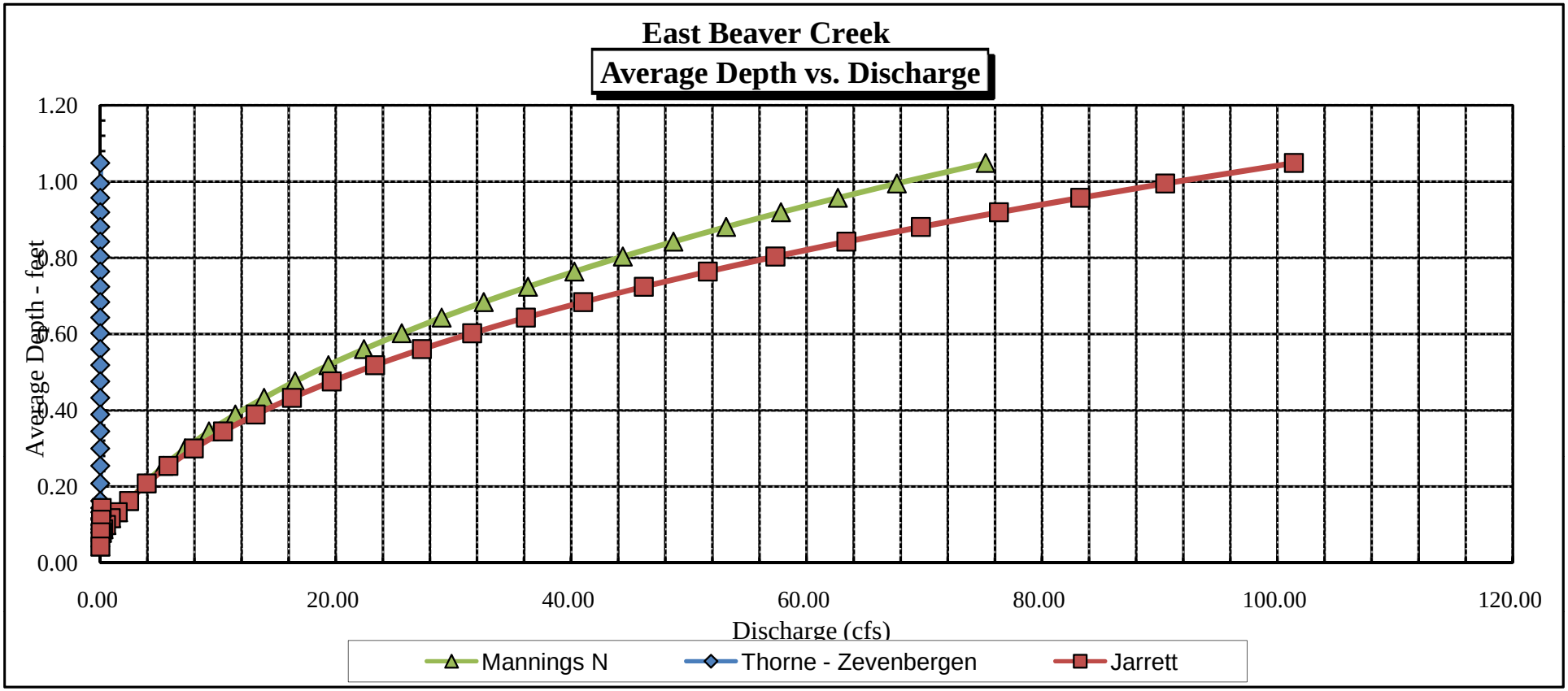
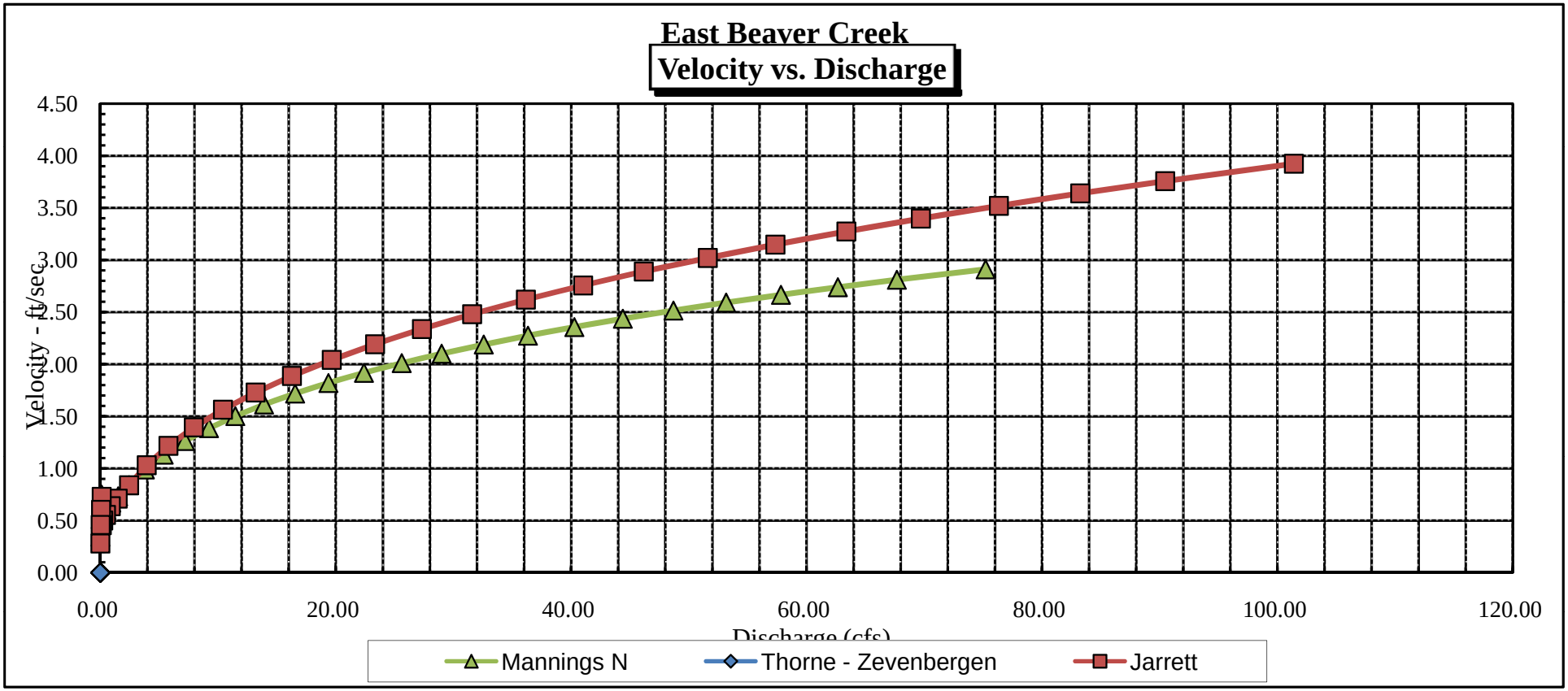
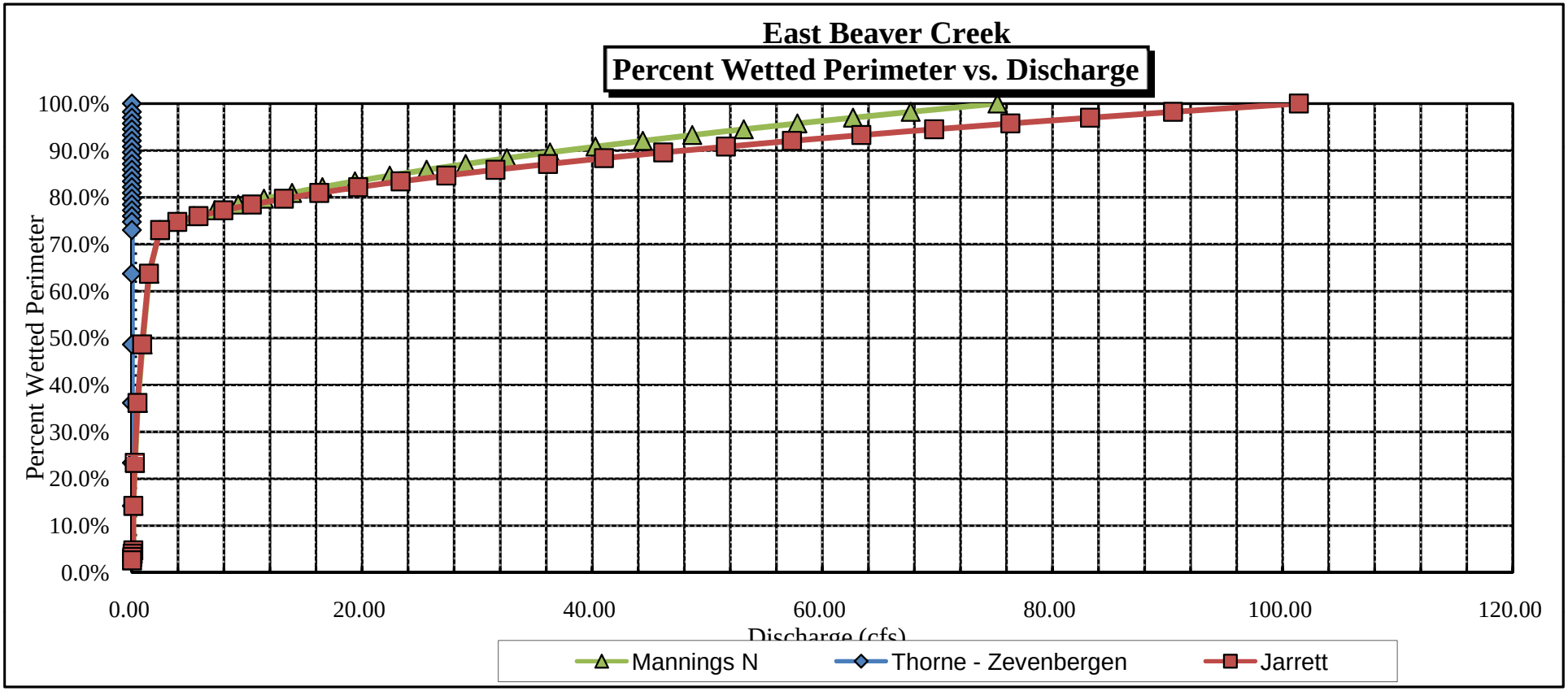
RECOMMENDATION BY: ………………...………..…….............................. AGENCY...……………………......…....…...…..... DATE:......…..….......……………

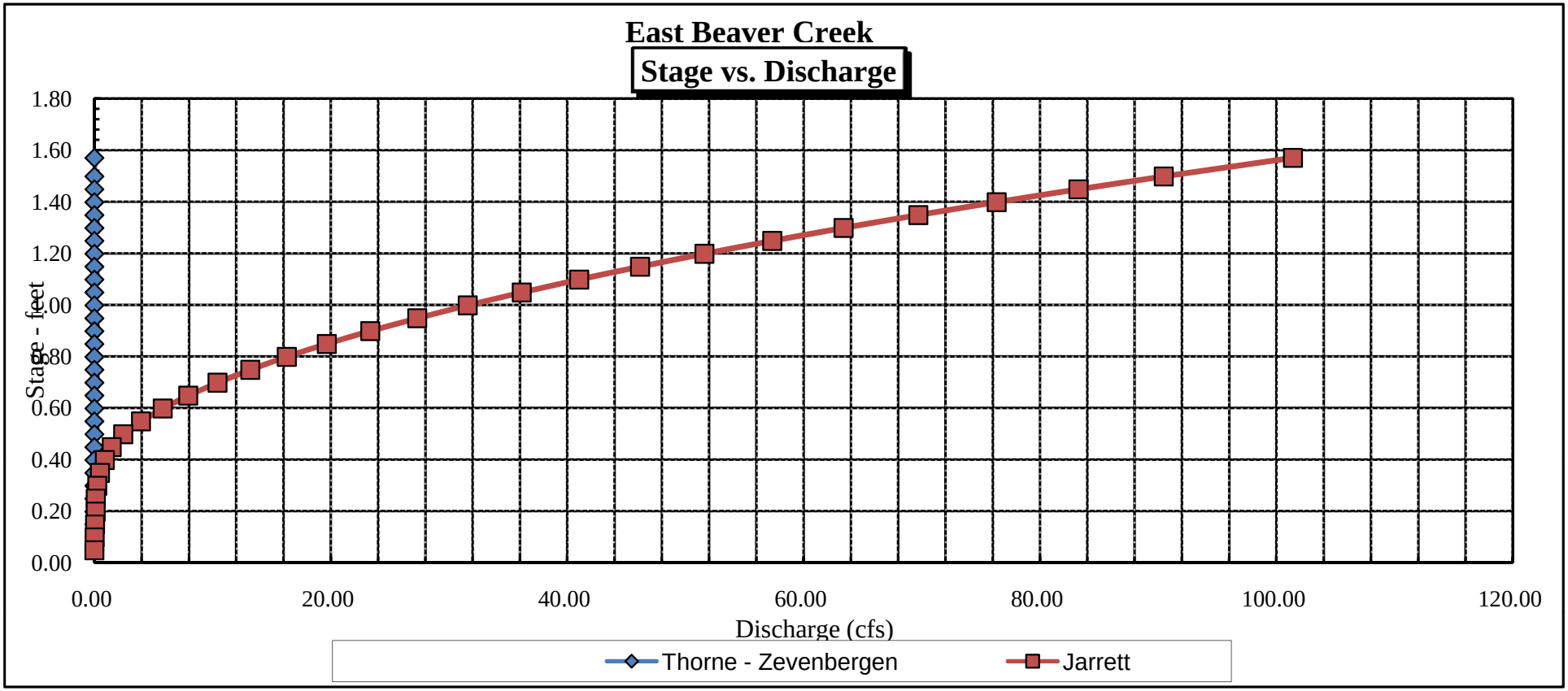
CWCB REVIEW BY: ..……………………….....……………………………………………...…............ DATE:.................…………….....


East Beaver Creek
CROSS SECTION DATA ANALYSIS
LS
G
W
W
G
RS
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


East Beaver Creek
Average Depth vs. Discharge
Average Depth - feet
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


East Beaver Creek
Velocity vs. Discharge
Velocity - ft/sec
4.50
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
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


East Beaver Creek
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


East Beaver Creek
Stage vs. Discharge
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Stage - feet
0.00
20.00
40.00
60.00
80.00
100.00
120.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett