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 1 1 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 for an instream flow enlargement on Blue Creek, located in Water Division 4.

Location and Land Status: Blue Creek is a tributary to the Gunnison River at Morrow Point Reservoir, approximately eight miles east of Cimarron. U.S. Highway 50 crosses the creek approximately five miles southwest of Blue Mesa Dam. The creek is located within the Upper Gunnison River watershed. This recommendation covers a reach beginning at the confluence of Big Blue Creek and Little Blue Creek, extending downstream to the confluence with Morrow Point Reservoir.

All of the 3.5-mile reach is located on federally managed lands. The upper 1.25 miles are managed by the BLM, and the lower 2.25 miles are managed by the National Park Service as part of Curecanti National Recreation Area.

Biological Summary: This segment of Blue Creek is a moderate to high gradient stream, with moderate to large substrate size, punctuated by large boulders. The proposed reach is confined by a narrow canyon, and some portions of the creek are further confined by the construction and maintenance of U.S. Highway 50. The riparian community is in good condition and composed of willow, alder, and spruce. The creek provides a good mix of pools, riffles, and runs for fish habitat. The riparian community often provides good shading for the water column. Fishery surveys indicate that the creek supports a self-sustaining population of brook trout, rainbow trout, and speckled dace.

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

Party	Date	Discharge	250%-40%	Summer (3/3)	Winter (2/3)
BLM	07/20/2007	15.69	6.3-39.2	8.65	Out of range
BLM	09/27/2007	13.26	5.3-33.2	10.03	Out of range
BLM	10/06/2008	14.58	5.8-36.4	15.99	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 4.5 cfs, bringing the total instream flow water right to 11.5 cfs, is recommended during the period from April 1 through July 31. This recommendation was derived by averaging the results of the data sets. The recommendation is driven by the depth criteria.

Justification for instream flow enlargement: The Blue 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. According to the data collected by the BLM, the current instream flow water right is not capable of meeting 3 of 3 instream flow criteria during summer, when the fish population requires more physical habitat for foraging, weight gain, and preparation for overwintering. 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.

The BLM believes that the reason that the creek supports a healthy and productive fishery is that the creek consistently experiences significantly more water than the current instream flow appropriation. During the warm weather period of May through October, spot flow measurements have typically measured flows that are approximately double the current instream flow water right.

Water Availability: In 1984, the Colorado Water Conservation Board (CWCB) appropriated an instream flow water right on Blue Creek that incorporates the steam segment recommended in this letter. The appropriation is for 7.0 cfs, year round.

The BLM is not aware of any water rights within the proposed enlargement reach. However, the BLM is aware of the following water rights located upstream from the proposed reach:

Beaver Ditch – 4.0 cfs
Big Blue Ditch – 66.0 cfs
Bruce Franklin Ditch – 10.85 cfs
Miller Ditch – 1.5 cfs
Squirrel Ditches 1 & 2 – 6.0 cfs
Roach Logan Ditch – 1.0 cfs
Sheldon Ditch – 2.0 cfs
Squirrel Lake Feeder Ditch – 3.0 cfs
Horizon Ditch – 1.6 cfs
Hazel Ditch – 17.0 cfs

The BLM recommends analysis of the irrigated acreage location of these ditches, to determine which of these ditches provide return flows to Blue Creek. It appears as if the largest of the ditches, the Big Blue Ditch, irrigates acreage located within the Cimarron River watershed. The BLM is not aware of any historic gaging data for Blue Creek. The BLM recommends employing a paired basin analytic approach utilizing the Curecanti Creek gage near Sapinero. This gage is located only three miles from Blue Creek, and it provides an excellent indication of raw water available in a basin with a very similar elevation and precipitation pattern.

Relationship to Management Plans: Under the current resource management plan, Blue Creek is managed to maintain and improve riparian habitat conditions. The creek corridor has not been historically grazed, so the primary management issue is recreation use and erosion from U.S. Highway 50. This creek is managed for dispersed recreation and doesn't have any developed facilities because of the steep canyon walls. 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 Anañia

Linda Anañia,
Deputy State Director, Natural Resources and Fire

cc: Andrew Breibart, Gunnison Field Office
Brian St. George, Gunnison Field Office
Chuck Pettee, National Park Service

DRAFT INSTREAM FLOW RECOMMENDATION

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 enlargement on Blue Creek, located in Water Division 4.

Location and Land Status. Blue Creek is tributary to the Gunnison River at Morrow Point Reservoir, approximately eight miles east of Cimarron. U.S. Highway 50 crosses the creek approximately five miles southwest of Blue Mesa Dam. The creek is located within the upper Gunnison River watershed. This recommendation covers a reach beginning at the confluence of Big Blue Creek and Little Blue Creek and extending downstream to the confluence with Morrow Point Reservoir.

All of the 3.5-mile reach is located on federally managed lands. The upper 1.25 miles are managed by the BLM, and the lower 2.25 miles are managed by the National Park Service as part of Curecanti National Recreation Area.

Biological Summary. This segment of Blue Creek is a moderate to high gradient stream, with moderate to large substrate size, punctuated by large boulders. The proposed reach is confined by a narrow canyon, and some portions of the creek are further confined by the construction and maintenance of U.S. Highway 50. The riparian community is in good condition and composed of willow, alder, and spruce. The creek provides a good mix of pools, riffles, and runs for fish habitat. The riparian community often provides good shading for the water column. Fishery surveys indicate that the creek supports a self-sustaining population of brook trout, rainbow trout, and speckled dace.

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

Party	Date	Discharge	250%-40%	Summer (3/3)	Winter (2/3)
BLM	07/20/2007	15.69	6.3-39.2	8.65	Out of range
BLM	09/27/2007	13.26	5.3-33.2	10.03	Out of range
BLM	10/06/2008	14.58	5.8-36.4	15.99	Out of range

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 4.5 cfs, bringing the total instream flow water right to 11.5 cfs, is recommended during the high temperature period from May 1 through October 31. This recommendation was derived by averaging the results of the data sets. The

recommendation is driven by the depth criteria.

Justification for instream flow enlargement. The Blue 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. According to the data collected by BLM, the current instream flow water right is capable of meeting 2 of the 3 instream flow criteria during the winter. However, the current instream flow water right is not capable of meeting 3 of 3 instream flow criteria during summer, when the fish population requires more physical habitat for foraging, weight gain, and preparation for overwintering. 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.

BLM believes that the reason that the creek supports a healthy and productive fishery is that the creek consistently experiences significantly more water than the current instream flow appropriation. During the warm weather period of May through October, spot flow measurements have typically measured flows that are approximately double the current instream flow water right.

Water Availability. In 1984, the CWCB appropriated an instream flow water right on Blue Creek that incorporates the steam segment recommended in this letter. The appropriation is for 7.0 cfs, year round.

BLM is not aware of any water rights within the proposed enlargement reach. However, BLM is aware of the following water rights located upstream from the proposed reach:

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Hazel Ditch – 17.0 cfs

BLM recommends analysis of the irrigated acreage location of these ditches, to determine which of these ditches provide return flows to Blue Creek. It appears as if the largest of the ditches, the Big Blue Ditch, irrigates acreage located within the Cimarron River watershed.

BLM is not aware of any historic gaging data for Blue Creek. BLM recommends employing a paired basin analytic approach utilizing the Cimarron River gage near Cimarron, CO (USGS

09126000). This basin is immediately to the west of the Blue Creek watershed, and it has similar size, aspect, and elevation. The Cimarron River gage will need to be adjusted for storage practices at Silverjack Reservoir and for irrigation practices within the Cimarron River basin.

Relationship to Management Plans. Under the current resource management plan, Blue Creek is managed to maintain and improve riparian habitat conditions. The creek corridor has not been historically grazed, so the primary management issues is recreation use and erosion from U.S. Highway 50. This creek is managed for dispersed recreation and doesn't have any developed facilities because of the steep canyon walls. 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
July 2007
Blue Creek (Big Blue) - Water Code #38489

Big Blue Creek, located west of Gunnison, CO on BLM lands managed by the Gunnison Field Office was sampled on July 20, 2007. Big Blue Creek is tributary to Morrow Point Reservoir/Gunnison River. Sampling was done in support of the Colorado BLM in-stream flow program. A two-pass removal population estimate was also completed. Sampling was conducted via backpack electro-shocker and approximately 225 feet of stream was sampled. Personnel present were Tom Fresques, Art Hayes, Roy Smith, and Malia Boyum, BLM.

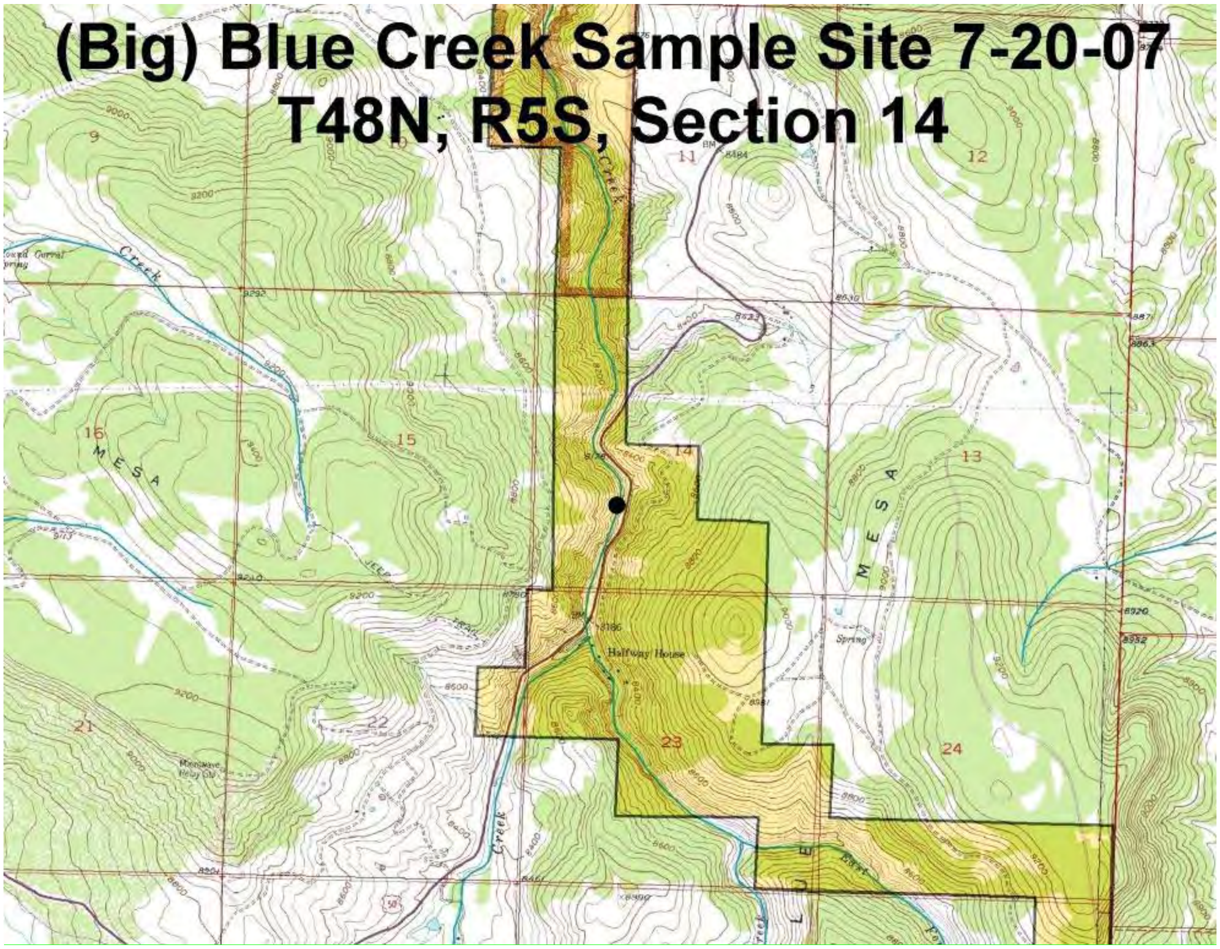
A total of 11 fish were collected. See data sheet below.

Rainbow Trout

Brook Trout

Speckled Dace

Sample Reach


(Big) Blue Creek Sample Site 7-20-07
T48N, R5S, Section 14
Creek
MESA
Halfway House
Spring
9
11
12
13
14
15
16
21
22
23
24

Map

STREAM SURVEY FISH SAMPLING FORM

WATER: Big Blue Creek H2O CODE: 38489 DATE: 7/20/2007

GEAR: Backpack Electroshocker EFFORT: 225 ft. STATION # 1 PASS # 1 & 2

CREW: Fresques, Hayes, Smith, Boyum DRAINAGE: Morrow Point Reservoir LOCATION: Adjacent to Highway 50 at large pullout in canyon.

species	length	weight	mark		species	length	weight	mark
Pass #1					**Pass #2**			
RBT	260				BRK	222		
RBT	252				SPD	98		
BRK	62				SPD	72		
BRK	55				SPD	113		
SPD	77							
SPD	93							

Notes: Stream Width 8-10 ft. Sample Reach 225 ft.

Discussion:
Stream had good flow and was slightly off color due to rains. Stream habitat looked good with a few nice pools and runs and good riparian vegetation consisting of willow, sedges, rush, spruce, and alder. Fewer fish were collected then anticipated. It could be that the site is fished a lot by the public given easy roadside access and the large pull-out/parking area. Speckled dace were very large. All fish captured appeared healthy. Lots of aquatic insects noted including caddis, stone, and mayflies as well as pteronarcy's stone flies and snails.

Recommendations:

- Pursue an instream flow on this

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Blue Creek						CROSS-SECTION NO.:
CROSS-SECTION LOCATION: 300' below highway 50 crossing						
DATE: 9-27-07	OBSERVERS: R. Smith, M. Eberle					
LEGAL DESCRIPTION	¼ SECTION: NW	SECTION: 23	TOWNSHIP: 50 N/S	RANGE: 5 E/W	PM: NM	
COUNTY: Gunnison	WATERSHED: Gunnison	WATER DIVISION: 4	DOW WATER CODE: 38487			
MAP(S): USGS: Curecanti, Needle 7.5'						
USFS:						

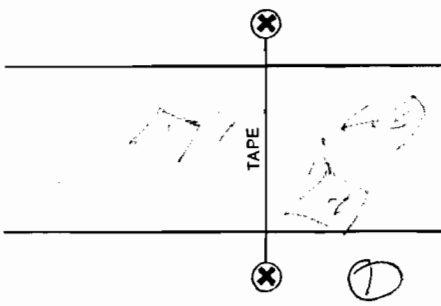
SUPPLEMENTAL DATA

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: gravel 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	0.0	4.89 / 4.84
② WS Upstream	25.0	4.69
③ WS Downstream	40.0	5.52
SLOPE	0.83 / 65.0 = .0127	

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:

COMMENTS

TDS = 90
Ph = 8.2
Temp: 41° F

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Blue Creek	CROSS-SECTION NO.: 1	DATE: 9-27-07	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 7:30 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&G	2.0		4.10								
	3.1		4.64								
W	4.1		4.89								
	5.0		5.30	.4				0.86			
	6.0		5.20	.3				0.82			
	7.0		5.20	.3				0.73			
	8.0		5.20	.3				2.30			
	9.0		5.15	.25				1.05			
	10.0		5.35	.45				1.09			
	11.0		5.25	.35				0.57			
	12.0		5.35	.45				1.21			
	13.0		5.30	.40				2.48			
	14.0		5.20	.30				2.60			
	15.0		5.55	.65				1.81			
	16.0		5.55	.70				1.06			
	17.0		5.45	.60				1.84			
	18.0		5.55	.70				2.23			
	19.0		5.35	.50				1.26			
	20.0		5.40	.55				1.07			
	21.0		5.30	.45				2.27			
	22.0		5.50	.65				1.54			
	23.0		5.15	.30				1.69			
R	24.0		4.80	0				0			
R	25.0		4.80	0				0			
	26.0		5.05	.20				.85			
R	27.0		4.75	0				0			
	28.0		4.95	.10				.13			
W	29.4		4.84								
	32.5		4.44								
RS&G	38.6		3.98								
TOTALS:											

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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

LOCATION INFORMATION

STREAM NAME: [illegible]						CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: 500 ft. [illegible]						
DATE: [illegible]	OBSERVERS: [illegible]					
LEGAL DESCRIPTION	¼ SECTION: [illegible]	SECTION: [illegible]	TOWNSHIP: 48 N/S	RANGE: 5 E/W	PM: NM	
COUNTY: [illegible]	WATERSHED: Gunnison		WATER DIVISION: 4		DOW WATER CODE: 38489	
MAP(S):	USGS: Curecanti Needle 7.5'					
	USFS:					

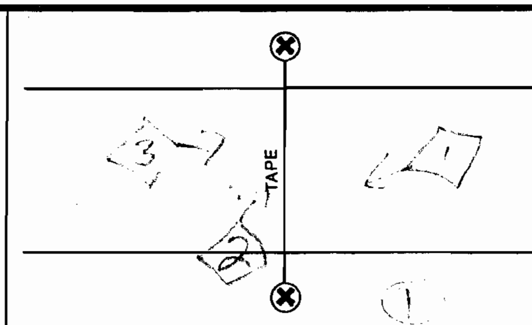
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES/NO (YES circled)	METER TYPE: [illegible] - McBirney			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ______ sec	TAPE WEIGHT: ______ lbs/foot	TAPE TENSION: ______ lbs
CHANNEL BED MATERIAL SIZE RANGE: [illegible] cobbles [illegible] boulders		PHOTOGRAPHS TAKEN: YES/NO (YES circled)	NUMBER OF PHOTOGRAPHS: 3	

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	
⊗ Tape @ Stake RB	0.0	
(1) WS @ Tape LB/RB	0.0	5.4[illegible]
(2) WS Upstream		
(3) WS Downstream		
SLOPE	[illegible] = 0.015	

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:

stonefly, mayfly, caddisfly

COMMENTS

[illegible]

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Blue Creek	CROSS-SECTION NO.: 2	DATE: 7-20-01	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ft	TIME: 12:30

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)
L/B											
			0.65								
			5.86						0.76		
			5.90								
			5.80								
			5.78								
			6.14								
			5.08								
			6.15								
			6.11								
			6.13								
			6.05								
			5.78								
			5.83								
			5.62								
			5.32								
			5.61								
TOTALS:											

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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

LOCATION INFORMATION

STREAM NAME: Blue Creek					CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: 300 ft. downstream from Hwy 50 bridge					
DATE: 9-6-95	OBSERVERS: [illegible], A. [illegible]				
LEGAL DESCRIPTION	¼ SECTION: NW	SECTION: [illegible]	TOWNSHIP: 48 N/S	RANGE: [illegible] E/W	PM: [illegible]
COUNTY: [illegible]	WATERSHED: Gunnison	WATER DIVISION: 4	DOW WATER CODE: 38489		
MAP(S): USGS: Currecanti Needle 7.5'					
USFS:					

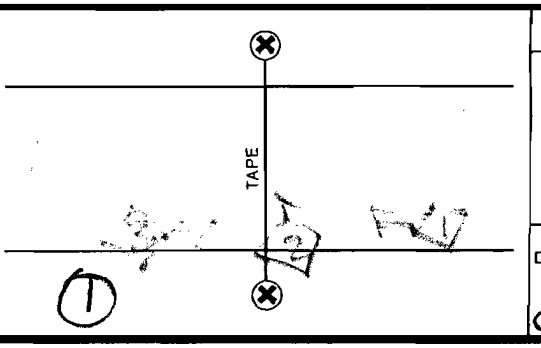
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO	METER TYPE: 11-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: ____ lbs/foot	TAPE TENSION: ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: gravel to [illegible]	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	5.08 5.10
② WS Upstream	13.0	5.00
③ WS Downstream	31.0	5.76
SLOPE	0.76/43.0 = .018	

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:
stonefly, mayfly, caddisfly

COMMENTS

Ph = 8.7
Temp = 45°F
[illegible]

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: [illegible]	CROSS-SECTION NO.: 1	DATE: 10 - [illegible] 08	SHEET ___ OF ___

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ft	TIME: 1:20 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)
RSIC-	1.3		4.35								
W	14.0		5.10								
	15.0		5.15	.05				0			
	16.0		5.15	.05				0			
	17		5.15	.05				0			
	18		5.20	.10				.25			
	19		5.20	.10				.30			
	20		5.40	.30				.72			
	21		5.20	.10				1.30			
	22		5.8	.70				1.72			
	23		5.8	.70				2.32			
	24		5.6	.50				2.10			
	25		5.8	.70				2.16			
	26		5.65	.55				1.85			
	27		5.6	.50				1.46			
	28		5.5	.40				2.09			
	29		5.6	.50				1.91			
	30		5.5	.40				2.01			
	31		5.3	.20				1.42			
	32		5.6	.50				.82			
	33		5.5	.40				1.65			
	34		5.65	.55				2.21			
	35		5.35	.25				2.17			
	36		5.3	.20				1.17			
	37		5.6	.50				1.43			
	38		5.3	.20				.30			
	39		5.6	.50				.06			
	40		5.3	.20				.43			
LW	0.7		5.08								
RSIC	44.2		4.32								
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:	Big Blue Creek
XS LOCATION:	300 ft. below Hwy. 50 crossing
XS NUMBER:	1
DATE:	27-Sep-07
OBSERVERS:	R. Smith, M. Eberle
1/4 SEC:	NW
SECTION:	23
TWP:	48N
RANGE:	5W
PM:	NM
COUNTY:	Gunnison
WATERSHED:	Gunnison
DIVISION:	4
DOW CODE:	38489
USGS MAP:	Curecanti Needle 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:	0.0127

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

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

STREAM NAME: Big Blue Creek
XS LOCATION: 300 ft. below Hwy. 50 crossing
XS NUMBER: 1

DATA POINTS= 30

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
1	LS & GL	2.00	4.10			0.00		0.00	0.00	0.0%
		3.10	4.64			0.00		0.00	0.00	0.0%
	W	4.10	4.89			0.00		0.00	0.00	0.0%
		5.00	5.30	0.40	0.86	0.99	0.40	0.38	0.33	2.5%
		6.00	5.20	0.30	0.82	1.00	0.30	0.30	0.25	1.9%
		7.00	5.20	0.30	0.73	1.00	0.30	0.30	0.22	1.7%
		8.00	5.20	0.30	2.30	1.00	0.30	0.30	0.69	5.2%
		9.00	5.15	0.25	1.05	1.00	0.25	0.25	0.26	2.0%
		10.00	5.35	0.45	1.09	1.02	0.45	0.45	0.49	3.7%
		11.00	5.25	0.35	0.57	1.00	0.35	0.35	0.20	1.5%
		12.00	5.35	0.45	1.21	1.00	0.45	0.45	0.54	4.1%
		13.00	5.30	0.40	2.48	1.00	0.40	0.40	0.99	7.5%
		14.00	5.20	0.30	2.60	1.00	0.30	0.30	0.78	5.9%
		15.00	5.55	0.65	1.81	1.06	0.65	0.65	1.18	8.9%
		16.00	5.55	0.70	1.06	1.00	0.70	0.70	0.74	5.6%
		17.00	5.45	0.60	1.84	1.00	0.60	0.60	1.10	8.3%
		18.00	5.55	0.70	2.23	1.00	0.70	0.70	1.56	11.8%
		19.00	5.35	0.50	1.26	1.02	0.50	0.50	0.63	4.8%
		20.00	5.40	0.55	1.07	1.00	0.55	0.55	0.59	4.4%
		21.00	5.30	0.45	2.27	1.00	0.45	0.45	1.02	7.7%
		22.00	5.50	0.65	1.54	1.02	0.65	0.65	1.00	7.5%
		23.00	5.15	0.30	1.69	1.06	0.30	0.30	0.51	3.8%
	R	24.00	4.80	0.00	0.00	1.06		0.00	0.00	0.0%
	R	25.00	4.80	0.00	0.00	0.00		0.00	0.00	0.0%
		26.00	5.05	0.20	0.85	1.03	0.20	0.20	0.17	1.3%
	R	27.00	4.75	0.00	0.00	1.04		0.00	0.00	0.0%
		28.00	4.95	0.10	0.13	1.02	0.10	0.07	0.01	0.1%
	W	28.40	4.84			0.41		0.00	0.00	0.0%
		32.50	4.44			0.00		0.00	0.00	0.0%
1	RS & GL	38.60	3.98			0.00		0.00	0.00	0.0%
	TOTALS ----------					23.77	0.7 (Max.)	8.85	13.26	100.0%

Manning's n = 0.0578
Hydraulic Radius= 0.3722403

STREAM NAME: Big Blue Creek
XS LOCATION: 300 ft. below Hwy. 50 crossing
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	8.85	8.99	1.5%
4.62	8.85	15.33	73.3%
4.64	8.85	14.78	67.0%
4.66	8.85	14.24	60.9%
4.68	8.85	13.70	54.8%
4.70	8.85	13.16	48.7%
4.72	8.85	12.64	42.8%
4.74	8.85	12.11	36.9%
4.76	8.85	11.60	31.0%
4.78	8.85	11.09	25.3%
4.80	8.85	10.59	19.6%
4.82	8.85	10.11	14.3%
4.83	8.85	9.88	11.7%
4.84	8.85	9.65	9.1%
4.85	8.85	9.43	6.5%
4.86	8.85	9.21	4.0%
4.87	8.85	8.99	1.5%
4.88	8.85	8.77	-0.9%
4.89	8.85	8.55	-3.4%
4.90	8.85	8.34	-5.8%
4.91	8.85	8.13	-8.2%
4.92	8.85	7.92	-10.5%
4.94	8.85	7.51	-15.2%
4.96	8.85	7.10	-19.7%
4.98	8.85	6.71	-24.2%
5.00	8.85	6.31	-28.7%
5.02	8.85	5.92	-33.1%
5.04	8.85	5.54	-37.4%
5.06	8.85	5.16	-41.7%
5.08	8.85	4.79	-45.9%
5.10	8.85	4.42	-50.1%
5.12	8.85	4.04	-54.3%

WATERLINE AT ZERO
AREA ERROR = 4.871

STREAM NAME: Big Blue Creek
XS LOCATION: 300 ft. below Hwy. 50 crossing
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	4.10	35.01	0.90	1.45	31.38	35.67	100.0%	0.88	83.43	2.66
	4.12	34.68	0.88	1.43	30.64	35.34	99.1%	0.87	80.68	2.63
	4.17	33.92	0.85	1.38	28.93	34.56	96.9%	0.84	74.39	2.57
	4.22	33.15	0.82	1.33	27.25	33.78	94.7%	0.81	68.37	2.51
	4.27	32.39	0.79	1.28	25.61	33.01	92.5%	0.78	62.62	2.45
	4.32	31.62	0.76	1.23	24.01	32.23	90.3%	0.75	57.14	2.38
	4.37	30.86	0.73	1.18	22.45	31.45	88.2%	0.71	51.92	2.31
	4.42	30.09	0.70	1.13	20.92	30.67	86.0%	0.68	46.96	2.24
	4.47	29.42	0.66	1.08	19.44	29.99	84.1%	0.65	42.16	2.17
	4.52	28.81	0.62	1.03	17.98	29.36	82.3%	0.61	37.55	2.09
	4.57	28.19	0.59	0.98	16.56	28.73	80.5%	0.58	33.20	2.01
	4.62	27.58	0.55	0.93	15.16	28.10	78.8%	0.54	29.10	1.92
	4.67	26.90	0.51	0.88	13.80	27.41	76.9%	0.50	25.28	1.83
	4.72	26.19	0.48	0.83	12.47	26.69	74.8%	0.47	21.75	1.74
	4.77	25.30	0.44	0.78	11.18	25.79	72.3%	0.43	18.55	1.66
	4.82	23.03	0.43	0.73	9.97	23.49	65.8%	0.42	16.30	1.64
WL	4.87	21.76	0.41	0.68	8.85	22.18	62.2%	0.40	13.89	1.57
	4.92	20.68	0.38	0.63	7.79	21.06	59.0%	0.37	11.62	1.49
	4.97	19.81	0.34	0.58	6.78	20.15	56.5%	0.34	9.50	1.40
	5.02	19.19	0.30	0.53	5.80	19.50	54.7%	0.30	7.49	1.29
	5.07	18.73	0.26	0.48	4.86	19.01	53.3%	0.26	5.67	1.17
	5.12	18.47	0.21	0.43	3.93	18.74	52.5%	0.21	4.02	1.02
	5.17	17.69	0.17	0.38	3.02	17.93	50.3%	0.17	2.66	0.88
	5.22	14.13	0.16	0.33	2.21	14.34	40.2%	0.15	1.84	0.83
	5.27	12.06	0.13	0.28	1.55	12.23	34.3%	0.13	1.14	0.73
	5.32	9.14	0.11	0.23	1.02	9.27	26.0%	0.11	0.68	0.66
	5.37	6.28	0.10	0.18	0.64	6.37	17.9%	0.10	0.40	0.63
	5.42	4.63	0.08	0.13	0.38	4.70	13.2%	0.08	0.20	0.54
	5.47	3.42	0.05	0.08	0.17	3.46	9.7%	0.05	0.07	0.39
	5.52	1.80	0.02	0.03	0.04	1.81	5.1%	0.02	0.01	0.23

STREAM NAME: Big Blue Creek
XS LOCATION: 300 ft. below Hwy. 50 crossing
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	13.26	cfs
CALCULATED FLOW (Qc)=	13.89	cfs
(Qm-Qc)/Qm * 100 =	-4.7	%
MEASURED WATERLINE (WLm)=	4.87	ft
CALCULATED WATERLINE (WLc)=	4.87	ft
(WLm-WLc)/WLm * 100 =	-0.1	%
MAX MEASURED DEPTH (Dm)=	0.70	ft
MAX CALCULATED DEPTH (Dc)=	0.68	ft
(Dm-Dc)/Dm * 100	3.0	%
MEAN VELOCITY=	1.57	ft/sec
MANNING'S N=	0.058	
SLOPE=	0.0127	ft/ft
.4 * Qm =	5.3	cfs
2.5 * Qm=	33.2	cfs

RECOMMENDED INSTREAM FLOW:
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FLOW (CFS)	PERIOD
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____________________	____________________
____________________	____________________
____________________	____________________
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RATIONALE FOR RECOMMENDATION:
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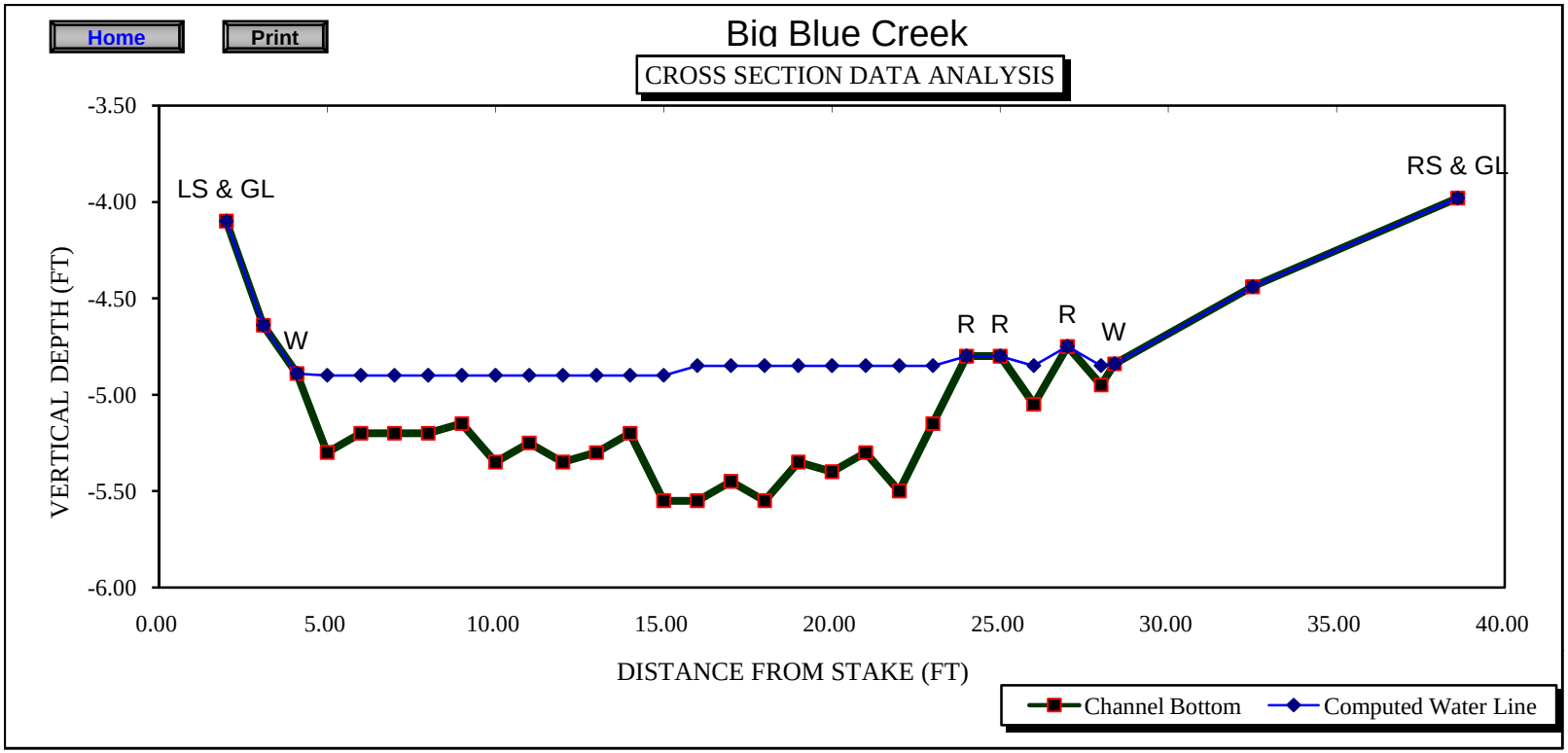
RECOMMENDATION BY: …………………....………..……............................... AGENCY...………………………......…….....…..……....... DATE:......…...…......……………

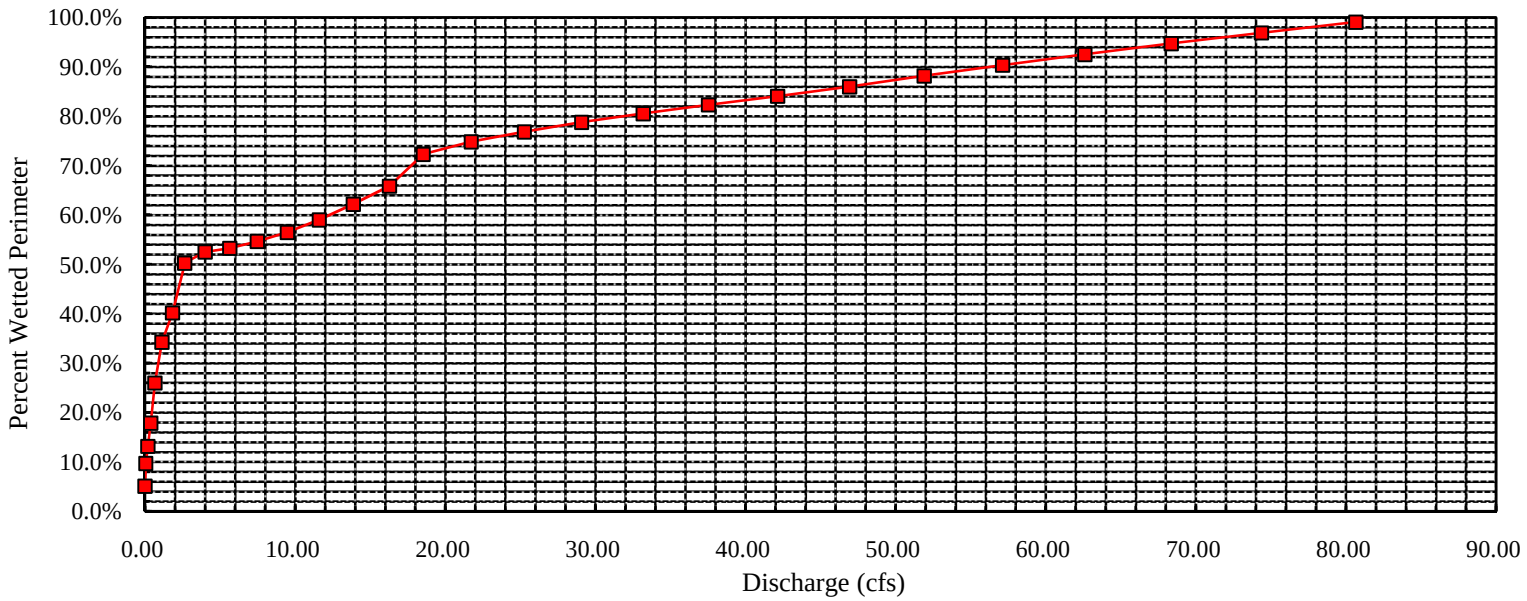
CWCB REVIEW BY: ..………………………….....………………………………………………...…............. DATE:.................……………...….



ChartMin	0	ChartMinY	-6
ChartMax	40	ChartMaxY	-3.5

Home Print

Percent Wetted Perimeter vs. Discharge



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

LOCATION INFORMATION

STREAM NAME:	Big Blue Creek
XS LOCATION:	500 ft. below Highway 50 crossing
XS NUMBER:	2
DATE:	20-Jul-07
OBSERVERS:	R. Smith, M. Boyum
1/4 SEC:	NW
SECTION:	23
TWP:	48N
RANGE:	5W
PM:	NM
COUNTY:	Gunnison
WATERSHED:	Gunnison
DIVISION:	4
DOW CODE:	38489
USGS MAP:	Curecanti Needle 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:	0.015

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

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

STREAM NAME: Big Blue Creek
XS LOCATION: 500 ft. below Highway 50 crossing
XS NUMBER: 2

DATA POINTS= 23

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
1 LS & G	1.00	4.69			0.00		0.00	0.00	0.0%
	2.50	5.19			0.00		0.00	0.00	0.0%
W	4.00	5.47			0.00		0.00	0.00	0.0%
	5.50	5.65	0.20	1.01	1.51	0.20	0.30	0.30	1.9%
	7.00	5.86	0.40	0.36	1.51	0.40	0.60	0.22	1.4%
	8.50	5.90	0.45	1.53	1.50	0.45	0.68	1.03	6.6%
	10.00	5.80	0.35	2.25	1.50	0.35	0.53	1.18	7.5%
	11.50	5.78	0.35	1.66	1.50	0.35	0.53	0.87	5.6%
	13.00	6.14	0.70	0.80	1.54	0.70	1.05	0.84	5.4%
	14.50	6.08	0.60	1.96	1.50	0.60	0.90	1.76	11.2%
	16.00	6.15	0.70	1.91	1.50	0.70	1.05	2.01	12.8%
	17.50	6.11	0.65	1.92	1.50	0.65	0.98	1.87	11.9%
	19.00	6.33	0.85	1.78	1.52	0.85	1.28	2.27	14.5%
	20.50	6.23	0.75	0.05	1.50	0.75	1.13	0.06	0.4%
	22.00	5.96	0.50	1.75	1.52	0.50	0.75	1.31	8.4%
	23.50	5.98	0.50	1.95	1.50	0.50	0.75	1.46	9.3%
	25.00	5.83	0.35	0.39	1.51	0.35	0.53	0.20	1.3%
	26.50	5.62	0.15	0.93	1.51	0.15	0.23	0.21	1.3%
	28.00	5.62	0.15	0.38	1.50	0.15	0.23	0.09	0.5%
	29.50	5.61	0.15	0.00	1.50	0.15	0.19	0.00	0.0%
W	30.50	5.48			1.01		0.00	0.00	0.0%
	32.00	5.22			0.00		0.00	0.00	0.0%
1 RS & G	35.00	4.58			0.00		0.00	0.00	0.0%
TOTALS ----------					26.65	0.85 (Max.)	11.66	15.69	100.0%

Manning's n = 0.0780
Hydraulic Radius= 0.43762512

STREAM NAME: Big Blue Creek
XS LOCATION: 500 ft. below Highway 50 crossing
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	11.66	11.33	-2.9%
5.23	11.66	18.30	56.9%
5.25	11.66	17.72	51.9%
5.27	11.66	17.14	47.0%
5.29	11.66	16.56	42.0%
5.31	11.66	15.99	37.1%
5.33	11.66	15.43	32.3%
5.35	11.66	14.87	27.5%
5.37	11.66	14.31	22.7%
5.39	11.66	13.76	18.0%
5.41	11.66	13.21	13.3%
5.43	11.66	12.67	8.6%
5.44	11.66	12.40	6.3%
5.45	11.66	12.13	4.0%
5.46	11.66	11.86	1.7%
5.47	11.66	11.59	-0.6%
5.48	11.66	11.33	-2.9%
5.49	11.66	11.06	-5.1%
5.50	11.66	10.80	-7.4%
5.51	11.66	10.54	-9.6%
5.52	11.66	10.28	-11.8%
5.53	11.66	10.02	-14.1%
5.55	11.66	9.51	-18.4%
5.57	11.66	9.01	-22.8%
5.59	11.66	8.51	-27.0%
5.61	11.66	8.02	-31.2%
5.63	11.66	7.56	-35.2%
5.65	11.66	7.13	-38.8%
5.67	11.66	6.72	-42.4%
5.69	11.66	6.31	-45.9%
5.71	11.66	5.91	-49.3%
5.73	11.66	5.51	-52.7%

WATERLINE AT ZERO
AREA ERROR = 5.462

STREAM NAME: Big Blue Creek
XS LOCATION: 500 ft. below Highway 50 crossing
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	4.69	33.48	1.05	1.64	35.11	33.82	100.0%	1.04	84.02	2.39
	4.71	33.31	1.03	1.62	34.37	33.64	99.5%	1.02	81.34	2.37
	4.76	32.93	0.99	1.57	32.71	33.24	98.3%	0.98	75.51	2.31
	4.81	32.54	0.95	1.52	31.07	32.85	97.1%	0.95	69.87	2.25
	4.86	32.16	0.92	1.47	29.45	32.45	95.9%	0.91	64.44	2.19
	4.91	31.77	0.88	1.42	27.86	32.05	94.8%	0.87	59.20	2.13
	4.96	31.39	0.84	1.37	26.28	31.65	93.6%	0.83	54.16	2.06
	5.01	31.01	0.80	1.32	24.72	31.25	92.4%	0.79	49.32	2.00
	5.06	30.62	0.76	1.27	23.18	30.86	91.2%	0.75	44.69	1.93
	5.11	30.24	0.72	1.22	21.66	30.46	90.1%	0.71	40.25	1.86
	5.16	29.85	0.68	1.17	20.15	30.06	88.9%	0.67	36.02	1.79
	5.21	29.42	0.63	1.12	18.67	29.61	87.6%	0.63	32.03	1.72
	5.26	28.87	0.60	1.07	17.21	29.05	85.9%	0.59	28.33	1.65
	5.31	28.31	0.56	1.02	15.78	28.49	84.2%	0.55	24.84	1.57
	5.36	27.75	0.52	0.97	14.38	27.92	82.6%	0.52	21.56	1.50
	5.41	27.20	0.48	0.92	13.01	27.36	80.9%	0.48	18.49	1.42
WL	5.46	26.64	0.44	0.87	11.66	26.79	79.2%	0.44	15.63	1.34
	5.51	25.90	0.40	0.82	10.35	26.04	77.0%	0.40	13.05	1.26
	5.56	25.10	0.36	0.77	9.07	25.23	74.6%	0.36	10.70	1.18
	5.61	23.95	0.33	0.72	7.84	24.09	71.2%	0.33	8.65	1.10
	5.66	20.61	0.33	0.67	6.77	20.73	61.3%	0.33	7.50	1.11
	5.71	19.89	0.29	0.62	5.76	20.01	59.2%	0.29	5.86	1.02
	5.76	19.18	0.25	0.57	4.78	19.29	57.0%	0.25	4.41	0.92
	5.81	16.64	0.23	0.52	3.88	16.75	49.5%	0.23	3.42	0.88
	5.86	14.81	0.21	0.47	3.09	14.89	44.0%	0.21	2.53	0.82
	5.91	12.12	0.20	0.42	2.43	12.20	36.1%	0.20	1.93	0.80
	5.96	11.22	0.16	0.37	1.84	11.29	33.4%	0.16	1.28	0.70
	6.01	9.24	0.15	0.32	1.35	9.30	27.5%	0.15	0.88	0.65
	6.06	8.75	0.10	0.27	0.91	8.80	26.0%	0.10	0.46	0.51
	6.11	6.66	0.08	0.22	0.50	6.69	19.8%	0.08	0.21	0.42
	6.16	3.02	0.09	0.17	0.28	3.04	9.0%	0.09	0.14	0.48
	6.21	2.40	0.06	0.12	0.15	2.41	7.1%	0.06	0.05	0.37
	6.26	1.47	0.03	0.07	0.05	1.48	4.4%	0.03	0.01	0.24
	6.31	0.38	0.01	0.02	0.00	0.39	1.1%	0.01	0.00	0.10

STREAM NAME: Big Blue Creek
XS LOCATION: 500 ft. below Highway 50 crossing
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	15.69	cfs
CALCULATED FLOW (Qc)=	15.63	cfs
(Qm-Qc)/Qm * 100 =	0.4	%
MEASURED WATERLINE (WLm)=	5.48	ft
CALCULATED WATERLINE (WLc)=	5.46	ft
(WLm-WLc)/WLm * 100 =	0.2	%
MAX MEASURED DEPTH (Dm)=	0.85	ft
MAX CALCULATED DEPTH (Dc)=	0.87	ft
(Dm-Dc)/Dm * 100	-2.1	%
MEAN VELOCITY=	1.34	ft/sec
MANNING'S N=	0.078	
SLOPE=	0.015	ft/ft
.4 * Qm =	6.3	cfs
2.5 * Qm=	39.2	cfs

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

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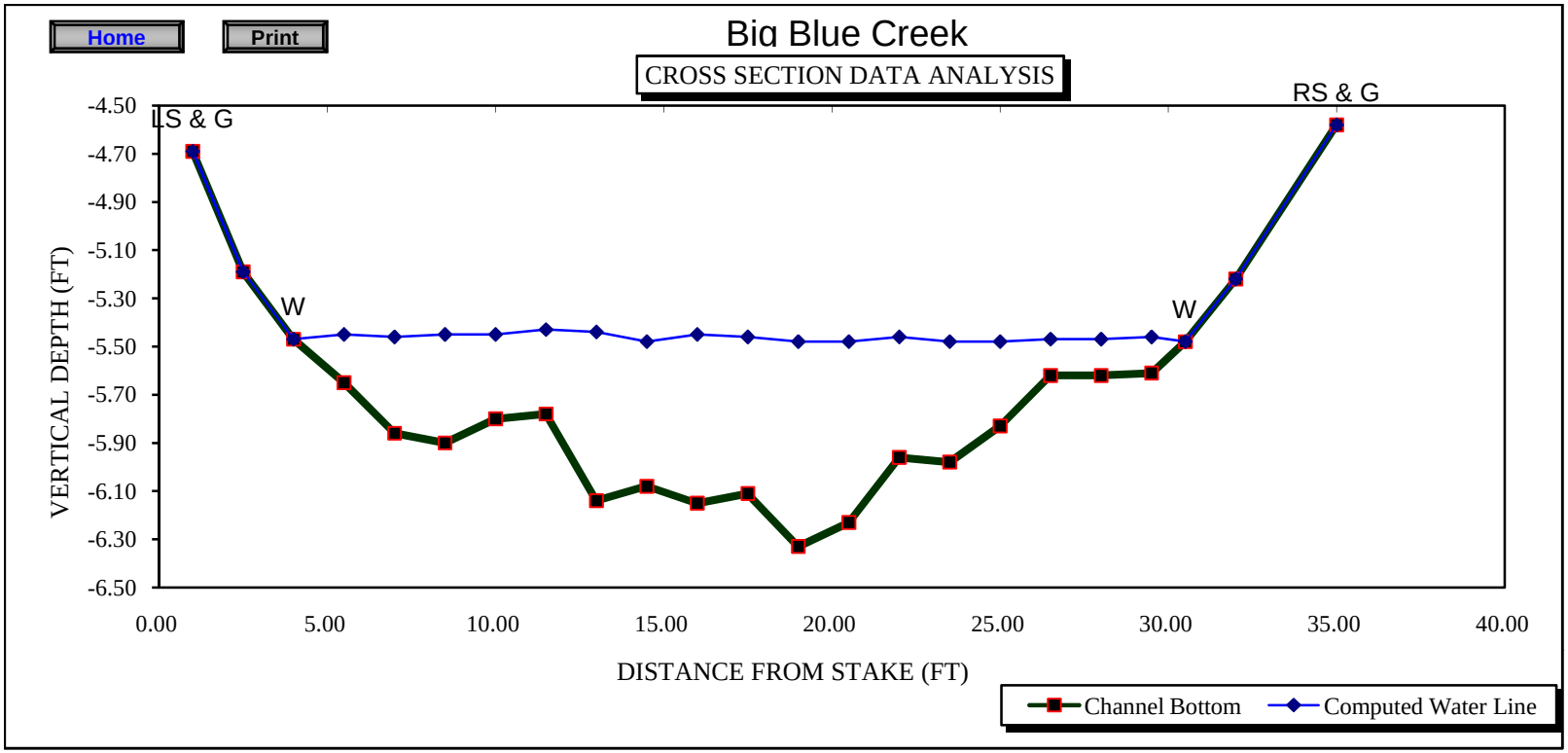
RECOMMENDATION BY: ………………...………..……............................... AGENCY...……………………......…….....…....……....... DATE:.......…....…......……………

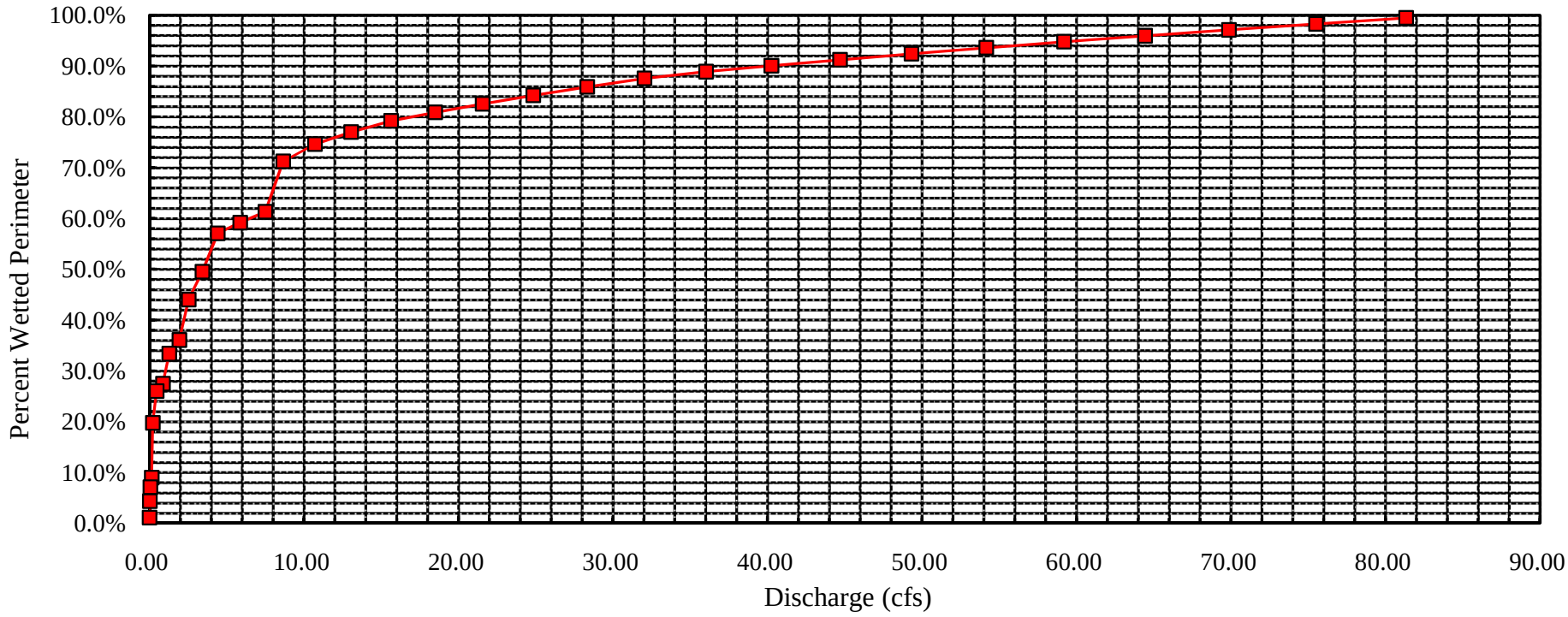
CWCB REVIEW BY: ..……………………………....……………………………………………………...…............. DATE:..................…………….....



ChartMin	0	ChartMinY	-6.5
ChartMax	40	ChartMaxY	-4.5

Home Print

Percent Wetted Perimeter vs. Discharge



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

LOCATION INFORMATION

STREAM NAME:	Blue Creek
XS LOCATION:	300' downstream from Hwy. 50 bridge
XS NUMBER:	1
DATE:	6-Oct-08
OBSERVERS:	R. Smith, A. Hayes
1/4 SEC:	NW
SECTION:	23
TWP:	48N
RANGE:	5W
PM:	New Mexico
COUNTY:	Gunnison
WATERSHED:	Gunnison
DIVISION:	4
DOW CODE:	38489
USGS MAP:	Curecanti Needle 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:	0.18

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

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

STREAM NAME: Blue Creek
XS LOCATION: 300' downstream from Hwy. 50 bridge
XS NUMBER: 1

DATA POINTS= 30

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	7.80	4.35			0.00		0.00	0.00	0.0%
W	14.00	5.10			0.00		0.00	0.00	0.0%
	15.00	5.15	0.05	0.00	1.00	0.05	0.05	0.00	0.0%
	16.00	5.15	0.05	0.00	1.00	0.05	0.05	0.00	0.0%
	17.00	5.15	0.05	0.00	1.00	0.05	0.05	0.00	0.0%
	18.00	5.20	0.10	0.23	1.00	0.10	0.10	0.02	0.2%
	19.00	5.20	0.10	0.30	1.00	0.10	0.10	0.03	0.2%
	20.00	5.40	0.30	0.72	1.02	0.30	0.30	0.22	1.5%
	21.00	5.20	0.10	1.30	1.02	0.10	0.10	0.13	0.9%
	22.00	5.80	0.70	1.72	1.17	0.70	0.70	1.20	8.3%
	23.00	5.80	0.70	2.32	1.00	0.70	0.70	1.62	11.1%
	24.00	5.60	0.50	2.10	1.02	0.50	0.50	1.05	7.2%
	25.00	5.80	0.70	2.48	1.02	0.70	0.70	1.74	11.9%
	26.00	5.65	0.55	1.85	1.01	0.55	0.55	1.02	7.0%
	27.00	5.60	0.50	1.46	1.00	0.50	0.50	0.73	5.0%
	28.00	5.50	0.40	2.09	1.00	0.40	0.40	0.84	5.7%
	29.00	5.60	0.50	1.91	1.00	0.50	0.50	0.96	6.6%
	30.00	5.50	0.40	2.01	1.00	0.40	0.40	0.80	5.5%
	31.00	5.30	0.20	1.42	1.02	0.20	0.20	0.28	1.9%
	32.00	5.60	0.50	0.82	1.04	0.50	0.50	0.41	2.8%
	33.00	5.50	0.40	1.65	1.00	0.40	0.40	0.66	4.5%
	34.00	5.65	0.55	2.21	1.01	0.55	0.55	1.22	8.3%
	35.00	5.35	0.25	2.17	1.04	0.25	0.25	0.54	3.7%
	36.00	5.30	0.20	1.17	1.00	0.20	0.20	0.23	1.6%
	37.00	5.60	0.50	1.43	1.04	0.50	0.50	0.72	4.9%
	38.00	5.30	0.20	0.30	1.04	0.20	0.20	0.06	0.4%
	39.00	5.60	0.50	0.06	1.04	0.50	0.50	0.03	0.2%
	40.00	5.30	0.20	0.43	1.04	0.20	0.17	0.07	0.5%
W	40.70	5.08			0.73		0.00	0.00	0.0%
1 LS & G	44.20	4.32			0.00		0.00	0.00	0.0%
TOTALS ----------					27.31	0.7 (Max.)	9.17	14.58	100.0%

Manning's n = 0.1916
Hydraulic Radius= 0.33576862

STREAM NAME: Blue Creek
XS LOCATION: 300' downstream from Hwy. 50 bridge
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	9.17	9.43	2.8%
4.84	9.17	16.52	80.1%
4.86	9.17	15.92	73.6%
4.88	9.17	15.33	67.2%
4.90	9.17	14.74	60.8%
4.92	9.17	14.16	54.4%
4.94	9.17	13.59	48.2%
4.96	9.17	13.02	41.9%
4.98	9.17	12.45	35.8%
5.00	9.17	11.89	29.7%
5.02	9.17	11.33	23.6%
5.04	9.17	10.78	17.6%
5.05	9.17	10.51	14.6%
5.06	9.17	10.24	11.7%
5.07	9.17	9.97	8.7%
5.08	9.17	9.70	5.8%
5.09	9.17	9.43	2.8%
5.10	9.17	9.16	-0.1%
5.11	9.17	8.90	-3.0%
5.12	9.17	8.64	-5.8%
5.13	9.17	8.38	-8.7%
5.14	9.17	8.12	-11.5%
5.16	9.17	7.63	-16.8%
5.18	9.17	7.17	-21.8%
5.20	9.17	6.72	-26.8%
5.22	9.17	6.29	-31.4%
5.24	9.17	5.88	-35.9%
5.26	9.17	5.46	-40.4%
5.28	9.17	5.06	-44.8%
5.30	9.17	4.66	-49.2%
5.32	9.17	4.27	-53.4%
5.34	9.17	3.91	-57.4%

WATERLINE AT ZERO
AREA ERROR = 5.100

STREAM NAME: Blue Creek
XS LOCATION: 300' downstream from Hwy. 50 bridge
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	4.35	36.26	0.90	1.45	32.74	37.00	100.0%	0.88	99.33	3.03
	4.40	35.62	0.87	1.40	30.95	36.35	98.2%	0.85	91.52	2.96
	4.45	34.98	0.83	1.35	29.19	35.69	96.5%	0.82	84.00	2.88
	4.50	34.33	0.80	1.30	27.45	35.04	94.7%	0.78	76.79	2.80
	4.55	33.69	0.76	1.25	25.75	34.39	93.0%	0.75	69.90	2.71
	4.60	33.05	0.73	1.20	24.08	33.74	91.2%	0.71	63.32	2.63
	4.65	32.40	0.69	1.15	22.45	33.09	89.4%	0.68	57.05	2.54
	4.70	31.76	0.66	1.10	20.84	32.44	87.7%	0.64	51.09	2.45
	4.75	31.12	0.62	1.05	19.27	31.78	85.9%	0.61	45.44	2.36
	4.80	30.47	0.58	1.00	17.73	31.13	84.1%	0.57	40.10	2.26
	4.85	29.83	0.54	0.95	16.23	30.48	82.4%	0.53	35.08	2.16
	4.90	29.19	0.51	0.90	14.75	29.83	80.6%	0.49	30.36	2.06
	4.95	28.54	0.47	0.85	13.31	29.18	78.9%	0.46	25.95	1.95
	5.00	27.90	0.43	0.80	11.90	28.52	77.1%	0.42	21.85	1.84
	5.05	27.25	0.39	0.75	10.52	27.87	75.3%	0.38	18.07	1.72
WL	5.10	26.64	0.34	0.70	9.17	27.25	73.7%	0.34	14.60	1.59
	5.15	23.48	0.34	0.65	7.87	24.08	65.1%	0.33	12.28	1.56
	5.20	21.32	0.32	0.60	6.72	21.91	59.2%	0.31	10.06	1.50
	5.25	20.58	0.28	0.55	5.67	21.14	57.1%	0.27	7.77	1.37
	5.30	19.85	0.23	0.50	4.66	20.37	55.1%	0.23	5.74	1.23
	5.35	17.18	0.22	0.45	3.74	17.64	47.7%	0.21	4.37	1.17
	5.40	15.34	0.19	0.40	2.92	15.73	42.5%	0.19	3.14	1.07
	5.45	14.01	0.16	0.35	2.19	14.33	38.7%	0.15	2.06	0.94
	5.50	12.68	0.12	0.30	1.52	12.95	35.0%	0.12	1.20	0.79
	5.55	9.27	0.11	0.25	0.98	9.46	25.6%	0.10	0.71	0.72
	5.60	5.84	0.10	0.20	0.60	5.96	16.1%	0.10	0.42	0.71
	5.65	3.75	0.10	0.15	0.36	3.84	10.4%	0.09	0.24	0.68
	5.70	2.84	0.07	0.10	0.19	2.89	7.8%	0.07	0.10	0.54
	5.75	1.92	0.04	0.05	0.07	1.95	5.3%	0.04	0.03	0.37
	5.80	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Blue Creek
XS LOCATION: 300' downstream from Hwy. 50 bridge
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	14.58	cfs
CALCULATED FLOW (Qc)=	14.60	cfs
(Qm-Qc)/Qm * 100 =	-0.1	%
MEASURED WATERLINE (WLm)=	5.09	ft
CALCULATED WATERLINE (WLc)=	5.10	ft
(WLm-WLc)/WLm * 100 =	-0.2	%
MAX MEASURED DEPTH (Dm)=	0.70	ft
MAX CALCULATED DEPTH (Dc)=	0.70	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.59	ft/sec
MANNING'S N=	0.192	
SLOPE=	0.18	ft/ft
.4 * Qm =	5.8	cfs
2.5 * Qm=	36.4	cfs

RECOMMENDED INSTREAM FLOW:
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FLOW (CFS)	PERIOD
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RATIONALE FOR RECOMMENDATION:
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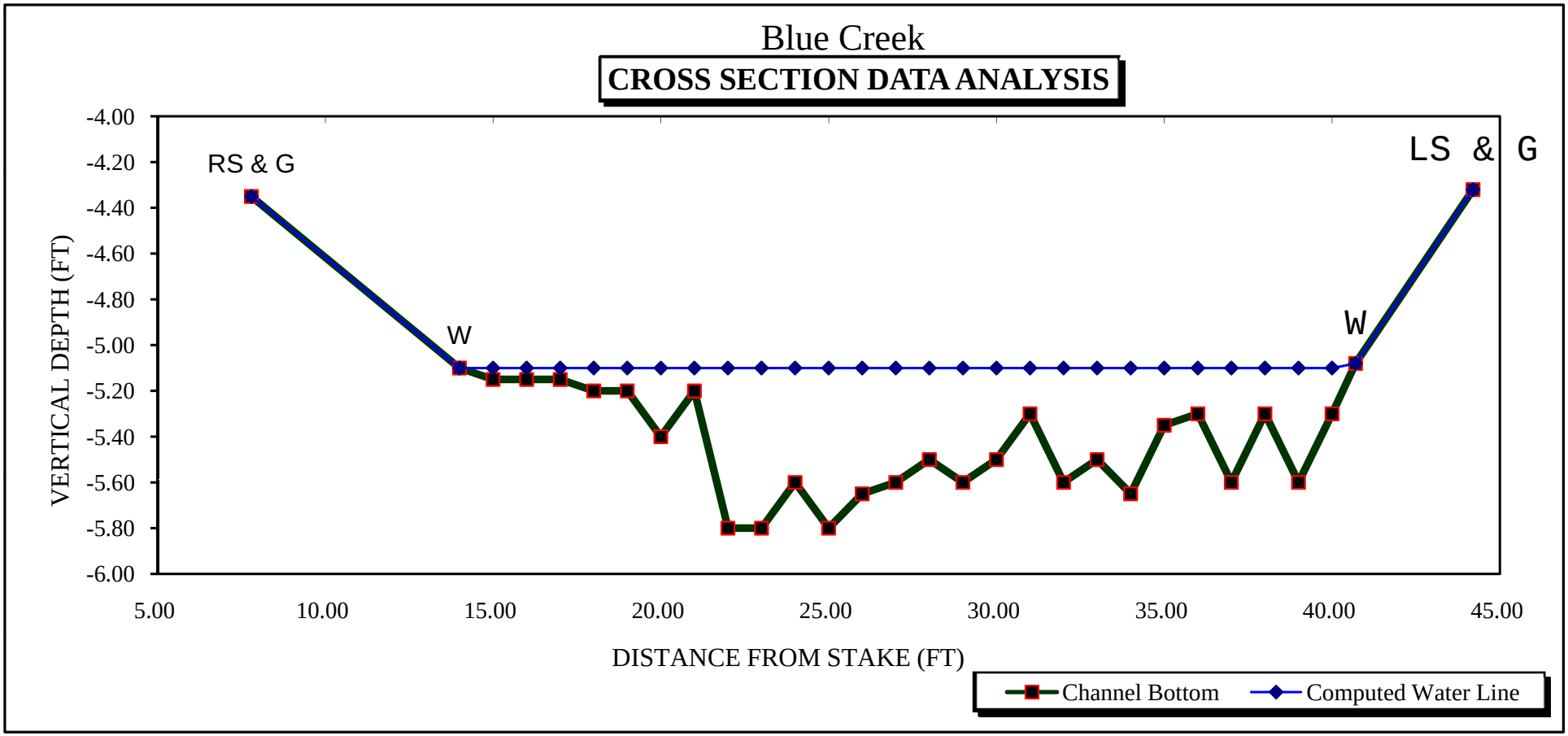
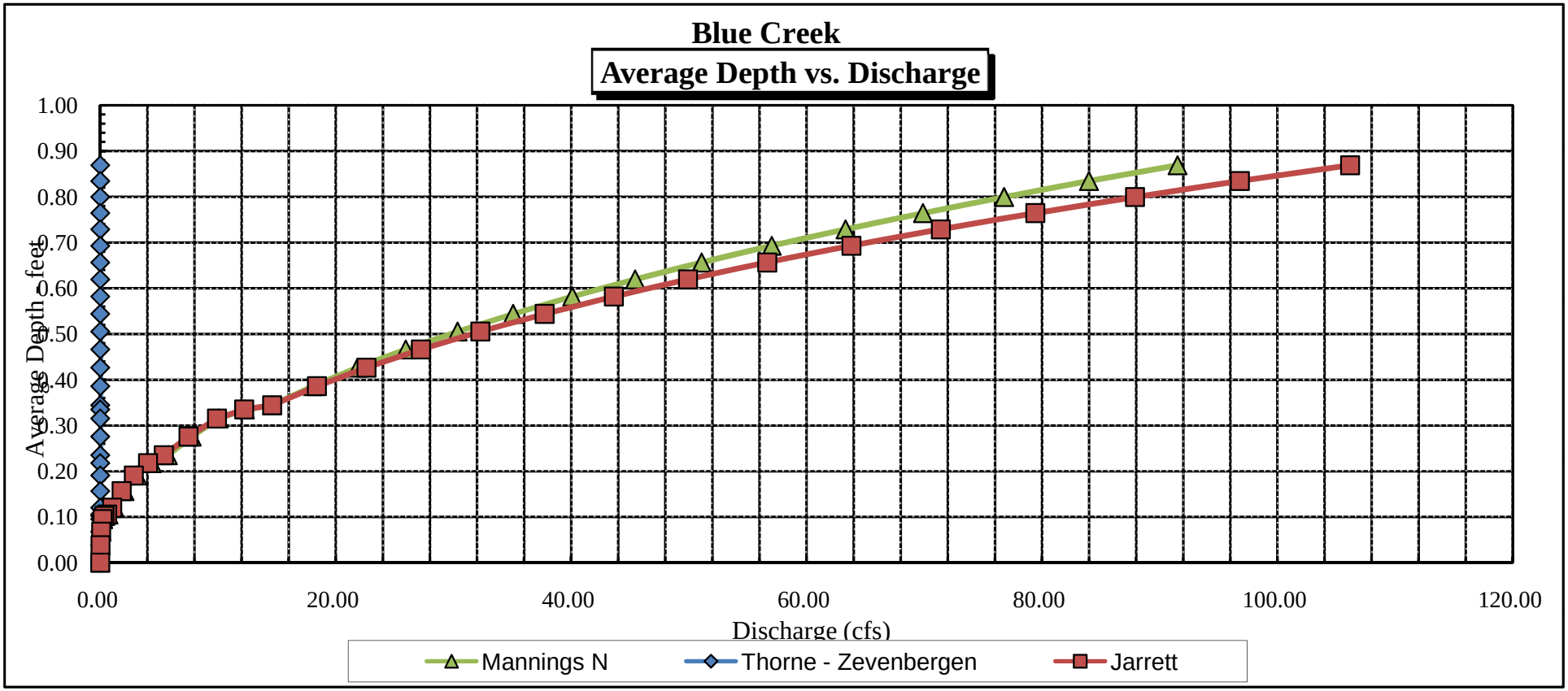
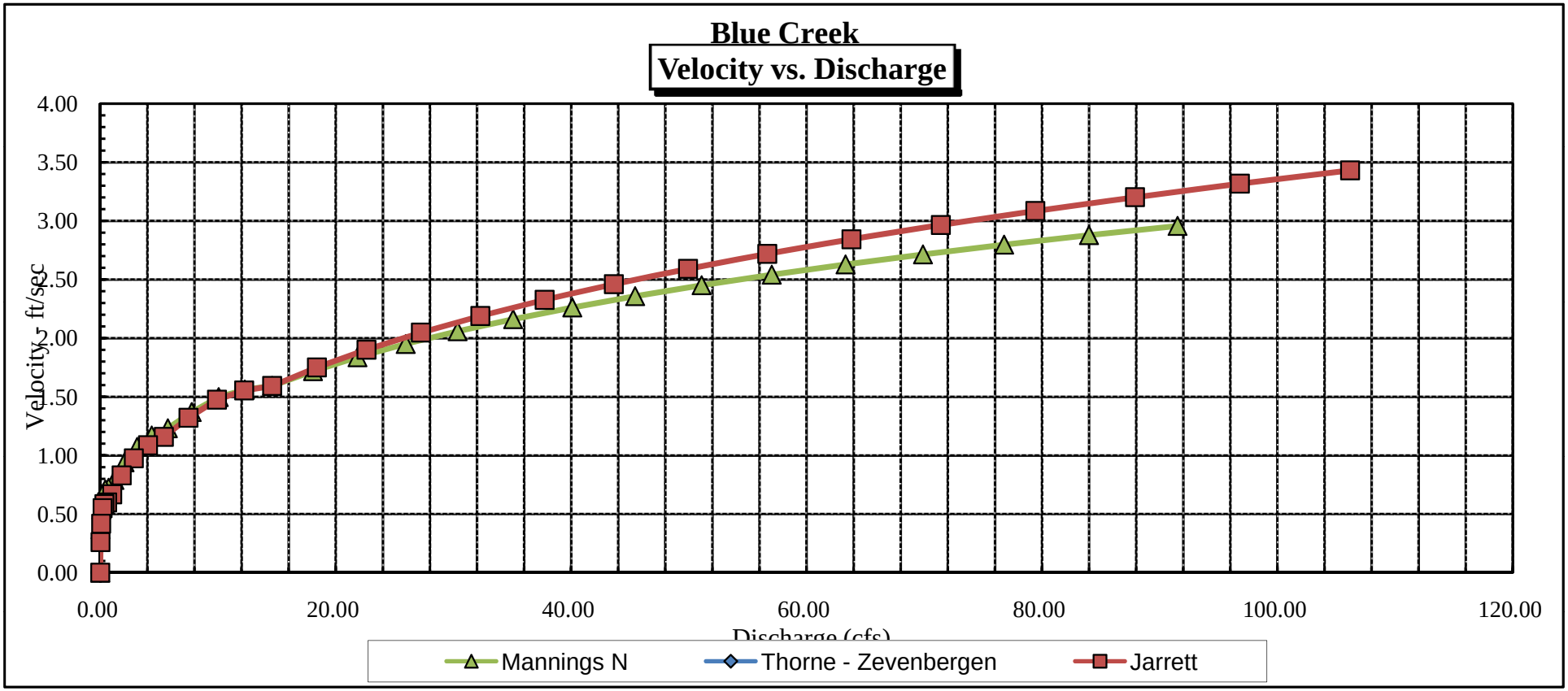
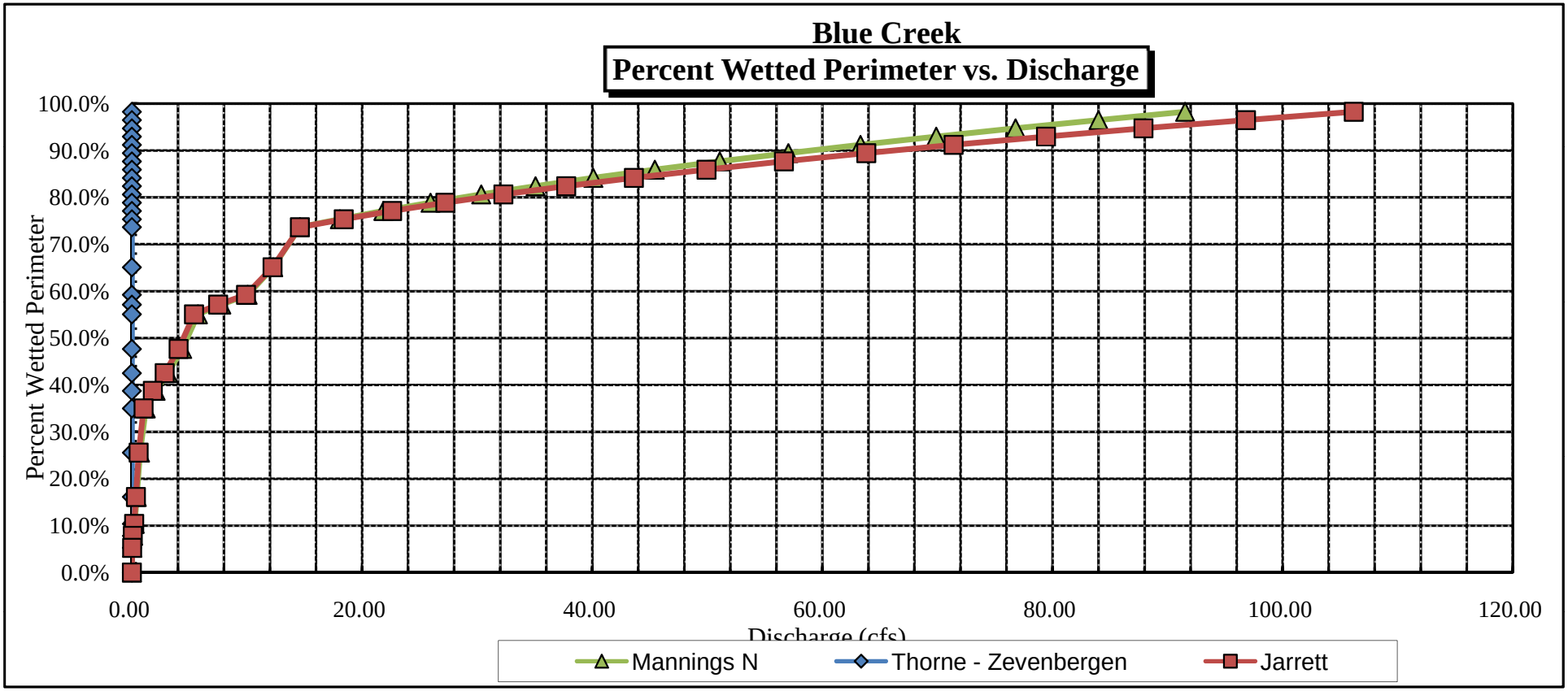
RECOMMENDATION BY: ……………………………………………………… AGENCY……………………………………………… DATE:……………………………

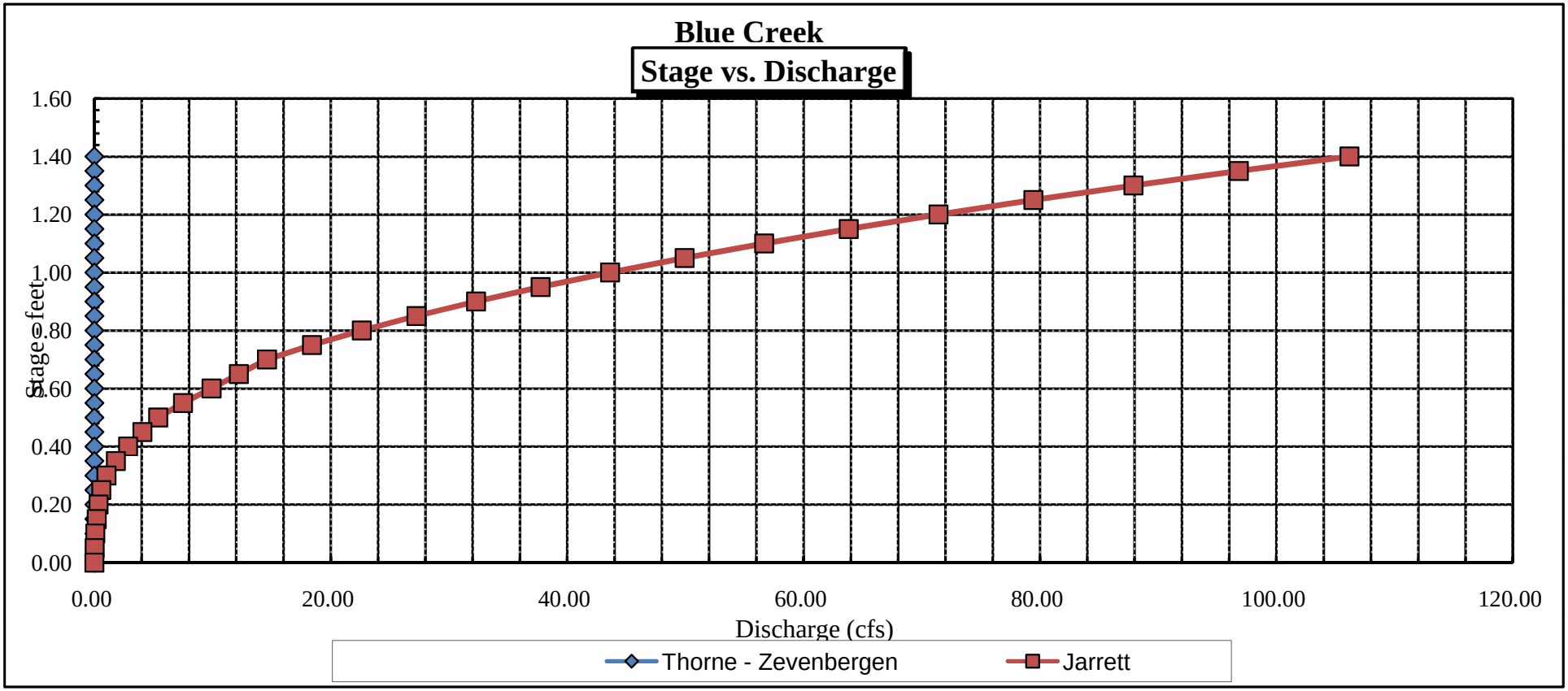
CWCB REVIEW BY: ……………………………………………………………………………………………………… DATE:……………………………


Blue Creek
CROSS SECTION DATA ANALYSIS
RS & G
W
W
LS & G
-4.00
-4.20
-4.40
-4.60
-4.80
-5.00
-5.20
-5.40
-5.60
-5.80
-6.00
VERTICAL DEPTH (FT)
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


Blue Creek
Average Depth vs. Discharge
Average Depth - feet
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Blue Creek
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
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Blue 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


Blue Creek
Stage vs. Discharge
Stage - feet
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)
Thorne - Zevenbergen
Jarrett