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 Big Beaver Creek, located in Water Division 6. In 2002, BLM forwarded an initial instream flow recommendation on this stream to protect Colorado River Cutthroat Trout. In 2003, the board appropriated a water right for 2.9 cfs (April 1 to July 14) and 1.0 cfs (July 15 – March 31) based upon that recommendation. At the time of the earlier recommendation, BLM possessed insufficient data to make a summer flow recommendation based on meeting all three of the CWCB's instream flow criteria and instead submitted a recommendation based upon meeting two of three criteria. Since that time, BLM has collected additional data on the creek that will allow us to make a recommendation based upon three of three criteria.

Location and Land Status. Big Beaver Creek is tributary to the White River approximately 16 miles southeast of Meeker. The stream reach covered by this recommendation runs from the confluence with Allen Creek to the confluence with East Beaver Creek. Eighty-five percent of the 3.1 mile reach is located on public lands, while the remaining 15 percent is located on private lands.

Biological Summary. Big Beaver Creek is a high gradient stream with moderate to large substrate size, with boulders commonly found in the stream channel. Most of the creek is confined by a narrow valley. The riparian community is diverse, vigorous, and provides substantial shading for the creek. Riparian species include cottonwood, alder, birch, willow, and spruce.

The creek provides a good mixture of runs, riffles, and pools for fish habitat. Aquatic insects are diverse and abundant, and include mayfly, caddisfly, and stonefly species. Fishery surveys confirmed that the population of Colorado River Cutthroat Trout and mottled sculpin survived the drought year of 2002-2003 and continue to thrive. BLM is in the process of testing the fish population for genetic purity.

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

Party	Date	Discharge	250%-40%	Summer (3/3)	Winter (2/3)
BLM	07/14/2008	5.27	2.1-13.2	5.83	2.92
BLM	07/14/2008	5.06	2.0-12.6	4.44	2.64

BLM's data analysis of this data, coordinated with the Colorado Division of Wildlife (CDOW),

indicates that the following flows are needed to protect the fishery and natural environment to a reasonable degree.

> A enlargement of 2.1 cfs is recommended for the snowmelt runoff period, from April 1 through July 14. This recommendation is driven by the average depth and average velocity criteria. The large channel substrate and narrow valley tends to concentrate flow in a few usable channels between rocks, so this flow rate is necessary to make more of the channel usable by salmonids. If this recommendation is implemented, the total instream flow water right on the creek during the snowmelt runoff period will be 5.0 cfs.

Justification for insteam flow enlargement. BLM believes that all streams providing habitat for Colorado River Cutthroat Trout merit full protection under the CWCB instream flow program. From the BLM perspective, full protection means protecting flow rates that meet all three instream flow criteria whenever sufficient water is available in the stream system. The BLM is investigating whether the Big Beaver Creek population should be identified as a core conservation population. BLM and CDOW also have plans to investigate barriers along the creek, and if necessary, construct barriers to prevent non-native fish passage from Lake Avery up into this stream reach. BLM believes that all feasible opportunities to manage viable Colorado River Cutthroat Trout populations should be supported by instream flow water rights, because such actions help make formal listing of the species under the Endangered Species Act unnecessary.

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

There are no historic gage records available for Big Beaver Creek. BLM recommends conducting a paired basin analysis using data from South Fork Williams Fork gage near Pagoda, CO (USGS 09249200). The South Fork of the Williams Fork drains the opposite side of Sleepy Cat Peak, so the South Fork basin experiences very similar weather and temperature patterns to Big Beaver Creek.

Relationship to Management Plans. The White River Resource Management Plan identifies Big Beaver Creek as one of the few Colorado River Cutthroat Trout fisheries managed by BLM in this field office. BLM monitoring has established that current livestock grazing practices remain compatible with the maintenance of proper functioning conditions , and has implemented cooperative efforts with the U.S. Forest Service and CDOW to further study the fish population and watershed conditions in this creek. If this population turns out to have genetic purity, BLM may implement more intensive management actions to expand and protect the fish population.

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.

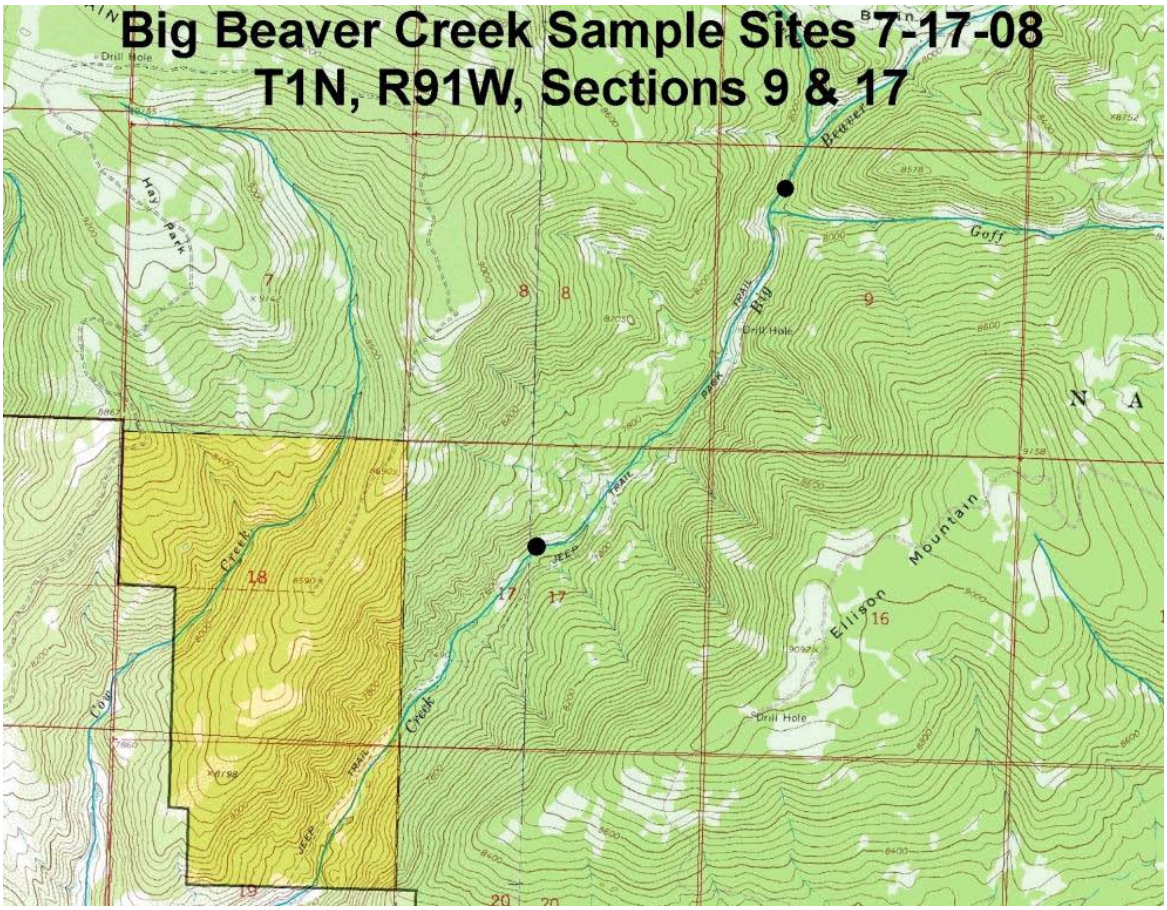
Sincerely,

Linda Anania
Deputy State Director
Resources and Fire

cc: Kent Walter, White River FO
Ed Hollowed, White River FO
Bob Lange, White River FO

White River Field Office Stream Surveys
July 2008
Big Beaver Creek - Water Code #24935

Big Beaver Creek, located northeast of Meeker, Colorado on USFS lands managed by the White River National Forest was sampled on July 17, 2008. Big Beaver Creek is tributary to Lake Avery and then the North Fork White River. Work was done cooperatively with the USFS, and CDOW and the plan was to sample a lower BLM segment but we miscalculated where we were and failed to sample a BLM reach. We sampled two 300 foot reaches and completed a two pass removal population estimate at each site. In addition, fin clips were obtained from 30 adult cutthroats at each site for genetic analysis. Sampling was conducted via backpack electro-shocker. Personnel present were Greg Glasgow, USFS Fish Biologist, Tom Fresques, BLM Fish Biologist, Gregor Dekleva, Bio Tech, Alex Griffith, Bio Tech, and CDOW Technicians, Brandon and Sam.



Big Beaver Creek

Working up fish

Colorado River cutthroat trout *(Oncorhynchus clarki pleuriticus)*

Mottled sculpin

Discussion:

Riparian condition was good and vegetation along the creek consisted of cottonwood, alder, birch, willow, horsetail, current, sedges, spruce, and aspen. Fish habitat was good with a good mix of runs, riffles, and pools. Fish appeared healthy and aquatic insects were diverse and abundant with caddis, mayflies, and stoneflies present. Within the sample stations, Colorado River cutthroat trout and mottled sculpin were the only species collected. One rainbow trout was caught via hook and line by Sam, CDOW Technician approximately 75 feet downstream of the upper sample station.

It is believed that some sort of barrier keeps the majority of fish from moving out of Lake Avery and up into Big Beaver Creek. This is important in that Lake Avery contains non-native rainbow trout that can hybridize with the pure native cutthroat found in the creek. However, based on the capture of an obvious rainbow trout in the upper reaches of the creek, the barrier may not be entirely effective at all flows. It may be that due to the exceptionally high flows this past spring, some non-native fish were able to move upstream.

Recommendations:

- Hike the BLM reach and look for barriers. Work with CDOW and private land owners between the BLM reach and the Lake to locate barrier(s). Determine adequacy of barrier(s) once located and work cooperatively to improve them as needed

- May want to get some fin clips from lower down in the stream on BLM and/or private lands above the lake

- Pursue instream flow recommendations for this creek in cooperation with the USFS

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Big Beaver Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: At Bl/l- private boundary						
DATE: 7/14	OBSERVERS: Bob LANGE, Roy SMITH					
LEGAL DESCRIPTION	¼ SECTION: NE	SECTION: 19	TOWNSHIP: 1 (N)/S	RANGE: 9 E/(W)	PM: 6th	
COUNTY: Rio Blanco	WATERSHED: White R.	WATER DIVISION: 6	DOW WATER CODE: 34735			
MAP(S): USGS:	Zone 13 0274755					
USFS:	7,384 ft.	4435364				

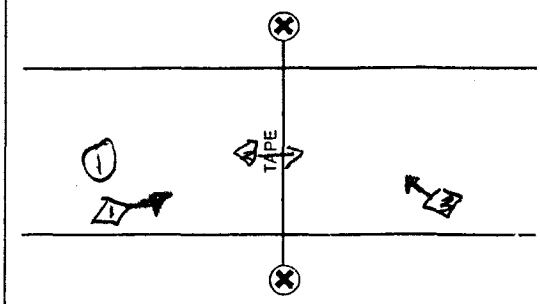
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES)/NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: _____ sec	TAPE WEIGHT: _____ lbs/foot	TAPE TENSION: _____ lbs
CHANNEL BED MATERIAL SIZE RANGE: 4" Cobbles to 2' boulders.	PHOTOGRAPHS TAKEN: (YES)/NO	3	NUMBER OF PHOTOGRAPHS:	

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	3.33/3.33
(2) WS Upstream	10.0	3.57
(3) WS Downstream	14.0	3.08
SLOPE	0.49/24.0 = .0204	

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:

Caddis Fly, May Fly, Stone Fly, Nematodes

COMMENTS

TDS: 390 Ph= 8.5 Temp= 14° C

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Big Beaver Creek	CROSS-SECTION NO.: 1	DATE: 7-[illegible]-98	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 1:25 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)G	1.0		2.54								
W	5.5		3.33								
	6.0		3.58	0.25					0.89		
	7.0		3.60	0.3					0.61		
	8.0		3.31	0					Ø		
	9.0		3.45	0.15					0.35		
	10.0		3.73	0.40					1.14		
	11.0		3.70	0.35					1.57		
	12.0		3.55	0.20					2.07		
	13.0		3.50	0.15					0.94		
	14.0		3.60	0.30					0.76		
	15.0		3.[illegible]	0.30					0.98		
	16.0		3.[illegible]	0.30					Ø		
	17.0		3.[illegible]	0.30					0.65		
	18.0		3.[illegible]	0.30					0.07		
	19.0		3.[illegible]	0.30					0.97		
	20.0		3.60	0.30					0.89		
	21.0		3.70	0.35					1.36		
	22.0		3.75	0.45					1.00		
	23.0		3.70	0.40					0.14		
	24.0		3.[illegible]	0.60					1.53		
	25.0		3.58	0.25					0.66		
W	25.4		3.33								
RS+G	26.0		2.65								
TOTALS:											

End of Measurement	Time:	Gage Reading: _____ 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: Big Beaver Creek	CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: At BLM private boundary	
DATE: 7-14-08	OBSERVERS: R. Smith, B. Lange
LEGAL DESCRIPTION: ¼ SECTION: NE; SECTION: 19; TOWNSHIP: 1 N/S (N circled); RANGE: 91 E/W (W circled); PM: 6th	
COUNTY: Rio Blanco	WATERSHED: White; WATER DIVISION: 6; DOW WATER CODE: 24935
MAP(S): USGS: GPS Z13 027874	USFS: 4435378

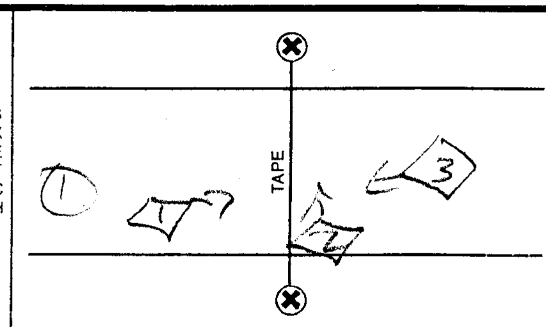
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES/NO (YES circled)	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: 4" cobbles to 3' 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	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
(1) WS @ Tape LB/RB	0.0	3.78/3.71
(2) WS Upstream	11.0	3.39
(3) WS Downstream	11.0	3.91
SLOPE	0.52/22.0 .024	

SKETCH



LEGEND: Stake ⊗; Station (1); Photo ◇→; Direction of Flow

AQUATIC SAMPLING SUMMARY

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

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=390
Ph 8.5
Temp. 11° C

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Big Beaver Ck.	CROSS-SECTION NO.: 2	DATE: 7-14-08	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 2:40 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)
G RS	1.0		2.89								
W	4.0		5.71	∅				∅			
	5.0		3.75	0.05				∅			
	6.0		3.7	0.10				1.11			
	7.0		3.8	0.10				0.20			
	8.0		3.9	0.20				0.97			
	9.0		4.05	0.35				0.41			
	9.5		4.15	0.45				0.97			
	10.0		4.15	0.45				1.84			
	10.5		4.1	0.40				0.92			
	11.0		4.1	0.40				0.99			
	11.5		4.15	0.40				1.25			
	12.0		4.1	0.40				2.50			
	12.5		4.2	0.50				1.54			
	13.0		4.05	0.30				∅			
	13.5		3.95	0.20				2.22			
	14.0		4.00	0.25				2.85			
	14.5		4.05	0.30				2.33			
	15.0		4.20	0.45				1.04			
	15.5		4.05	0.30				1.92			
	16.0		4.0	0.25				1.80			
	16.5		4.10	~~0.35~~ 0.30				0.50			
	17.0		3.90	0.10				0.23			
	18.0		3.85	0.10				1.28			
	19.0		4.00	0.25				1.95			
	20.0		4.05	0.30				0.16			
	21.0		3.90	0.15				0.26			
W (LB)	21.6		3.78	∅				∅			
G (RB)	24.0		2.87								
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 Beaver Creek
XS LOCATION:	At BLM-private boundary
XS NUMBER:	1
DATE:	14-Jul-08
OBSERVERS:	R. Smith, B. Lange
1/4 SEC:	NE
SECTION:	19
TWP:	1N
RANGE:	91W
PM:	Sixth
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	24935
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: 0.0204

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

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

STREAM NAME: Big Beaver Creek
XS LOCATION: At BLM-private boundary
XS NUMBER: 1

DATA POINTS= 24

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	2.54			0.00		0.00	0.00	0.0%
	W	5.50	3.33			0.00		0.00	0.00	0.0%
		6.00	3.58	0.25	0.89	0.56	0.25	0.19	0.17	3.2%
		7.00	3.60	0.30	0.61	1.00	0.30	0.30	0.18	3.5%
		8.00	3.31	0.00	0.00	1.04		0.00	0.00	0.0%
		9.00	3.45	0.15	0.35	1.01	0.15	0.15	0.05	1.0%
		10.00	3.75	0.40	1.14	1.04	0.40	0.40	0.46	8.6%
		11.00	3.70	0.35	1.57	1.00	0.35	0.35	0.55	10.4%
		12.00	3.55	0.20	2.07	1.01	0.20	0.20	0.41	7.8%
		13.00	3.50	0.15	0.94	1.00	0.15	0.15	0.14	2.7%
		14.00	3.60	0.30	0.76	1.00	0.30	0.30	0.23	4.3%
		15.00	3.65	0.30	0.98	1.00	0.30	0.30	0.29	5.6%
		16.00	3.55	0.30	0.00	1.00	0.30	0.30	0.00	0.0%
		17.00	3.60	0.30	0.65	1.00	0.30	0.30	0.20	3.7%
		18.00	3.60	0.30	0.07	1.00	0.30	0.30	0.02	0.4%
		19.00	3.60	0.30	0.97	1.00	0.30	0.30	0.29	5.5%
		20.00	3.60	0.30	0.89	1.00	0.30	0.30	0.27	5.1%
		21.00	3.70	0.35	1.36	1.00	0.35	0.35	0.48	9.0%
		22.00	3.75	0.45	1.00	1.00	0.45	0.45	0.45	8.5%
		23.00	3.70	0.40	0.14	1.00	0.40	0.40	0.06	1.1%
		24.00	3.90	0.60	1.53	1.02	0.60	0.60	0.92	17.4%
		25.00	3.58	0.25	0.66	1.05	0.25	0.18	0.12	2.2%
	W	25.40				3.60		0.00	0.00	0.0%
1	RS & G	26.00				0.00		0.00	0.00	0.0%
	TOTALS ----------					23.36	0.6 (Max.)	5.81	5.27	100.0%

Manning's n = 0.0925
Hydraulic Radius= 0.24882405

STREAM NAME: Big Beaver Creek
XS LOCATION: At BLM-private boundary
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	5.81	5.68	-2.2%
3.07	5.81	10.76	85.1%
3.09	5.81	10.34	77.9%
3.11	5.81	9.92	70.7%
3.13	5.81	9.51	63.6%
3.15	5.81	9.10	56.5%
3.17	5.81	8.68	49.4%
3.19	5.81	8.28	42.4%
3.21	5.81	7.87	35.4%
3.23	5.81	7.47	28.5%
3.25	5.81	7.07	21.6%
3.27	5.81	6.67	14.7%
3.28	5.81	6.47	11.3%
3.29	5.81	6.27	7.9%
3.30	5.81	6.07	4.5%
3.31	5.81	5.88	1.1%
3.32	5.81	5.68	-2.2%
3.33	5.81	5.49	-5.6%
3.34	5.81	5.30	-8.9%
3.35	5.81	5.10	-12.2%
3.36	5.81	4.91	-15.5%
3.37	5.81	4.73	-18.7%
3.39	5.81	4.35	-25.1%
3.41	5.81	3.98	-31.5%
3.43	5.81	3.62	-37.7%
3.45	5.81	3.26	-43.9%
3.47	5.81	2.91	-50.0%
3.49	5.81	2.56	-56.0%
3.51	5.81	2.21	-62.0%
3.53	5.81	1.88	-67.7%
3.55	5.81	1.56	-73.1%
3.57	5.81	1.27	-78.2%

WATERLINE AT ZERO
AREA ERROR = 3.313

STREAM NAME: Big Beaver Creek
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	2.54	24.12	0.94	1.36	22.73	25.37	100.0%	0.90	48.44	2.13
	2.56	23.98	0.92	1.34	22.16	25.21	99.4%	0.88	46.65	2.10
	2.61	23.69	0.89	1.29	20.97	24.87	98.0%	0.84	42.93	2.05
	2.66	23.40	0.85	1.24	19.80	24.54	96.7%	0.81	39.35	1.99
	2.71	23.11	0.81	1.19	18.63	24.20	95.4%	0.77	35.91	1.93
	2.76	22.82	0.77	1.14	17.48	23.86	94.0%	0.73	32.60	1.86
	2.81	22.53	0.73	1.09	16.35	23.52	92.7%	0.70	29.43	1.80
	2.86	22.24	0.68	1.04	15.23	23.18	91.3%	0.66	26.41	1.73
	2.91	21.95	0.64	0.99	14.13	22.84	90.0%	0.62	23.52	1.67
	2.96	21.66	0.60	0.94	13.04	22.50	88.7%	0.58	20.78	1.59
	3.01	21.37	0.56	0.89	11.96	22.16	87.3%	0.54	18.19	1.52
	3.06	21.08	0.52	0.84	10.90	21.82	86.0%	0.50	15.74	1.44
	3.11	20.79	0.47	0.79	9.85	21.48	84.7%	0.46	13.44	1.36
	3.16	20.50	0.43	0.74	8.82	21.14	83.3%	0.42	11.30	1.28
	3.21	20.21	0.39	0.69	7.80	20.80	82.0%	0.38	9.31	1.19
	3.26	19.92	0.34	0.64	6.80	20.46	80.6%	0.33	7.48	1.10
WL	3.31	19.59	0.30	0.59	5.81	20.09	79.2%	0.29	5.83	1.00
	3.36	18.89	0.26	0.54	4.85	19.32	76.2%	0.25	4.43	0.91
	3.41	18.26	0.21	0.49	3.92	18.62	73.4%	0.21	3.19	0.81
	3.46	17.67	0.17	0.44	3.03	17.97	70.8%	0.17	2.12	0.70
	3.51	16.83	0.13	0.39	2.16	17.05	67.2%	0.13	1.25	0.58
	3.56	14.66	0.09	0.34	1.36	14.81	58.4%	0.09	0.64	0.47
	3.61	7.90	0.10	0.29	0.76	8.00	31.5%	0.10	0.37	0.48
	3.66	5.64	0.08	0.24	0.43	5.72	22.5%	0.08	0.18	0.41
	3.71	3.84	0.05	0.19	0.18	3.89	15.3%	0.05	0.06	0.30
	3.76	1.11	0.07	0.14	0.08	1.15	4.5%	0.07	0.03	0.38
	3.81	0.70	0.04	0.09	0.03	0.73	2.9%	0.04	0.01	0.28
	3.86	0.30	0.02	0.04	0.01	0.31	1.2%	0.02	0.00	0.16

STREAM NAME: Big Beaver Creek
XS LOCATION: At BLM-private boundary
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	5.27	cfs
CALCULATED FLOW (Qc)=	5.83	cfs
(Qm-Qc)/Qm * 100 =	-10.6	%
MEASURED WATERLINE (WLm)=	3.32	ft
CALCULATED WATERLINE (WLc)=	3.31	ft
(WLm-WLc)/WLm * 100 =	0.2	%
MAX MEASURED DEPTH (Dm)=	0.60	ft
MAX CALCULATED DEPTH (Dc)=	0.59	ft
(Dm-Dc)/Dm * 100	2.2	%
MEAN VELOCITY=	1.00	ft/sec
MANNING'S N=	0.093	
SLOPE=	0.0204	ft/ft
.4 * Qm =	2.1	cfs
2.5 * Qm=	13.2	cfs

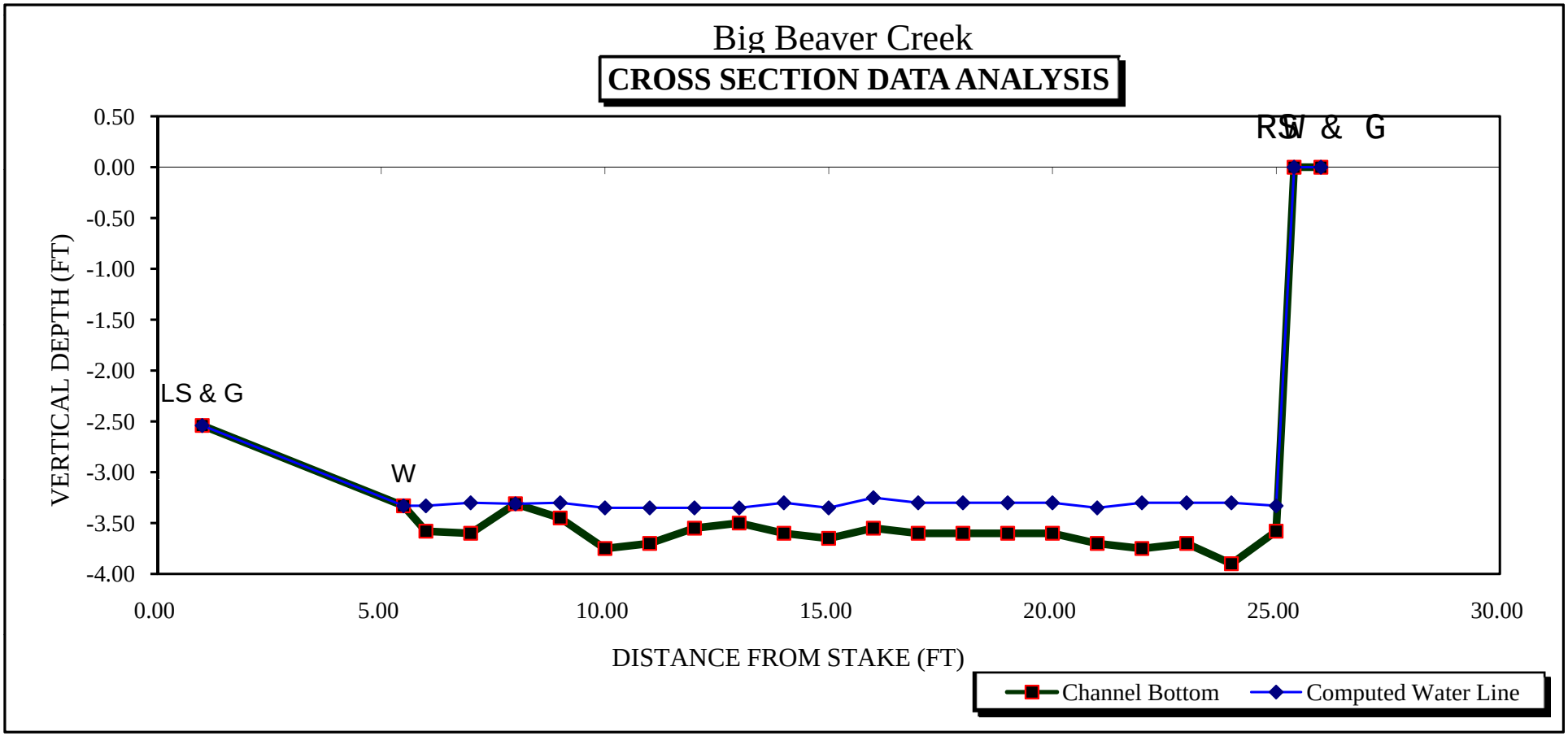
RECOMMENDED INSTREAM FLOW:
=============================

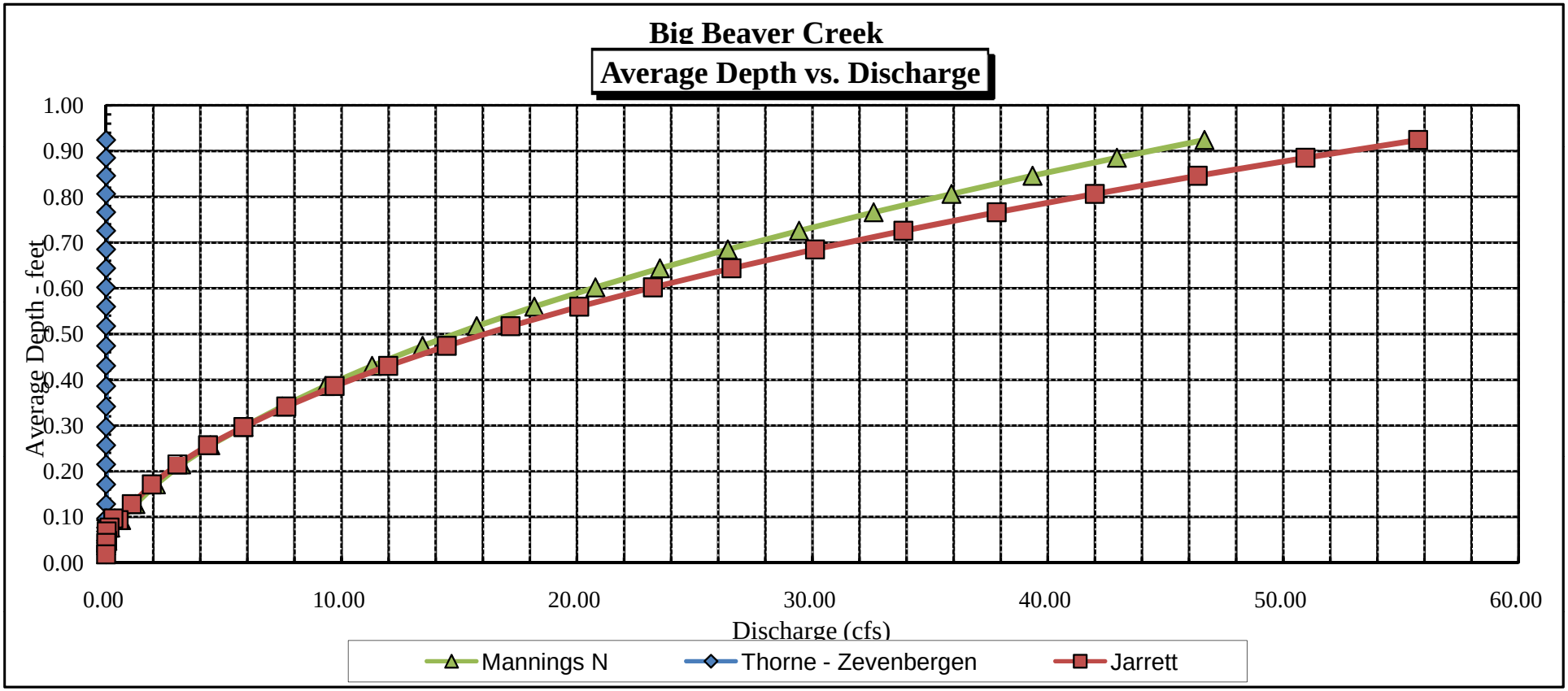
FLOW (CFS)	PERIOD
___________	___________
___________	___________
___________	___________
___________	___________

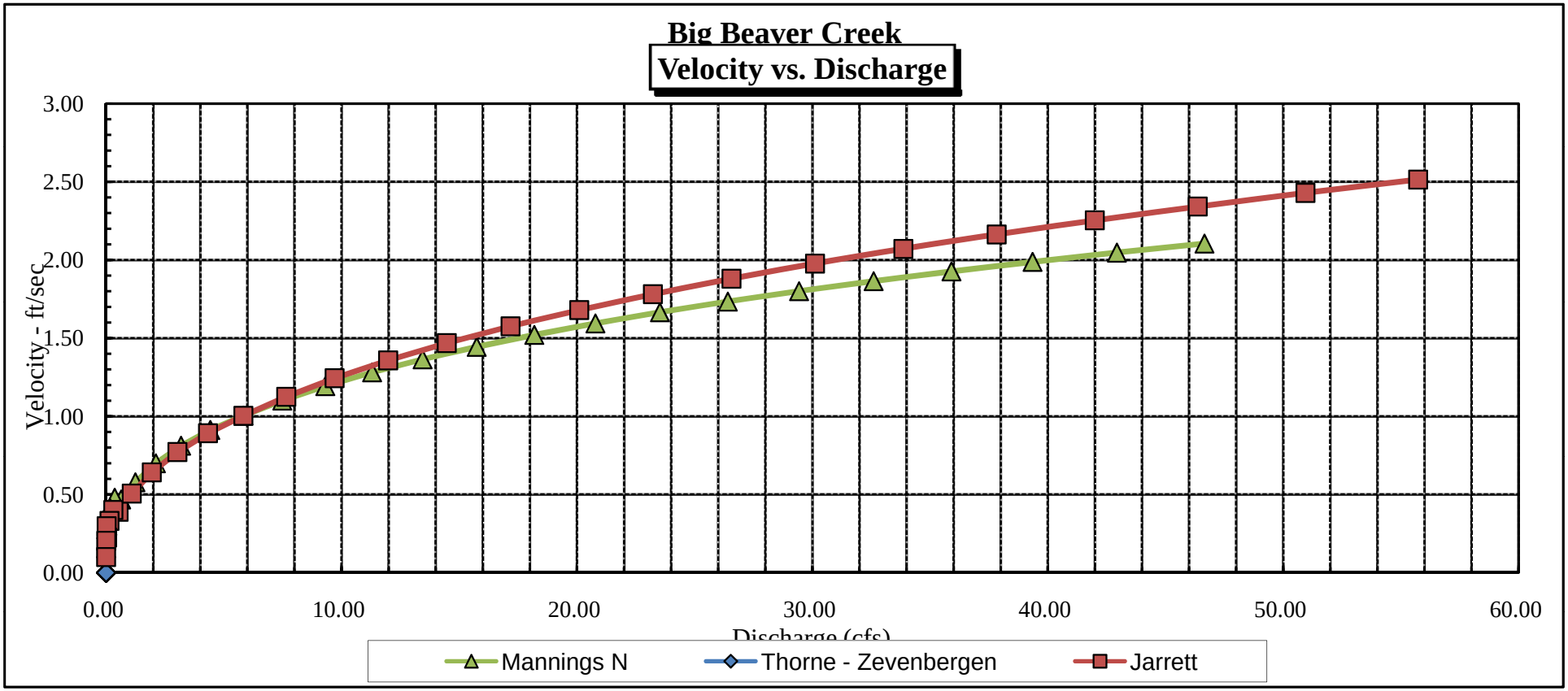
RATIONALE FOR RECOMMENDATION:
=============================

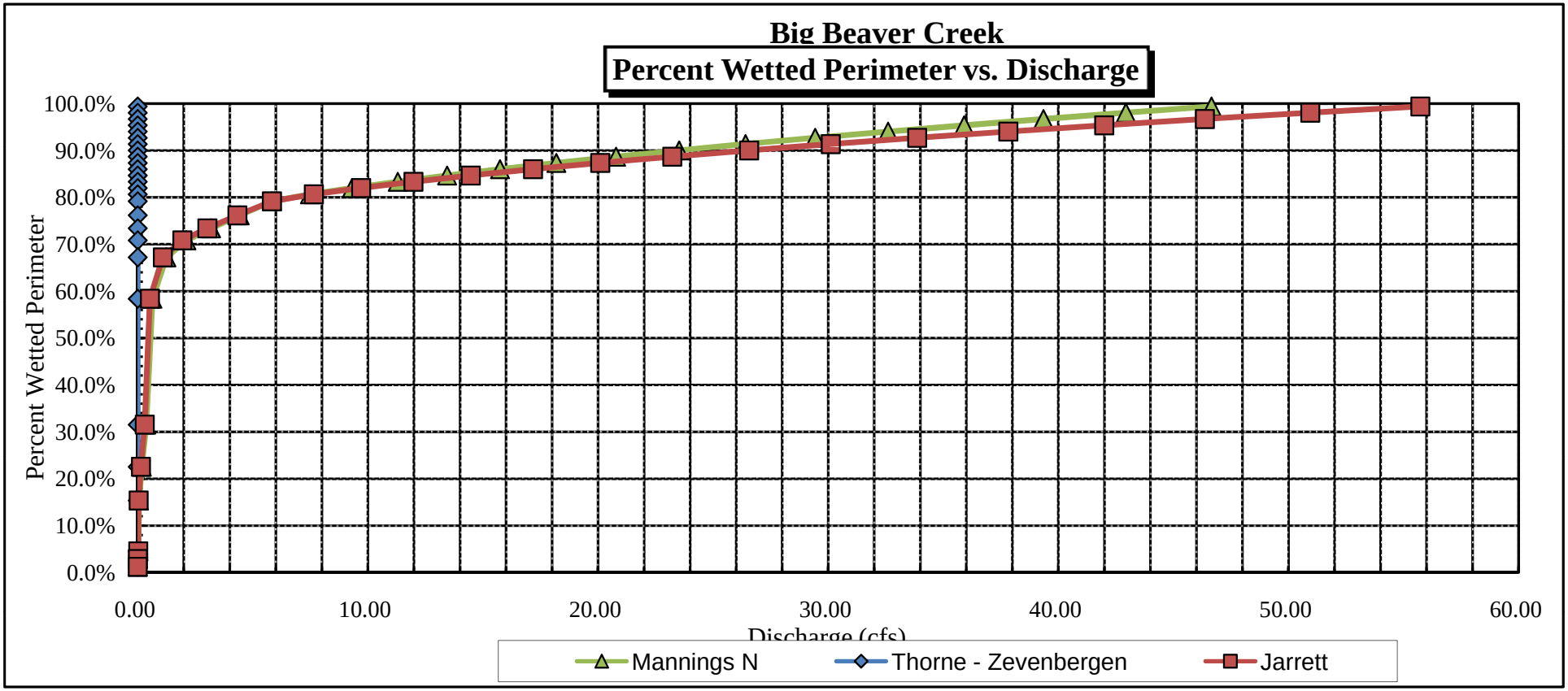
RECOMMENDATION BY: ………………..………..……................................ AGENCY..…………………….....……...…...……...... DATE:......…...…......……………

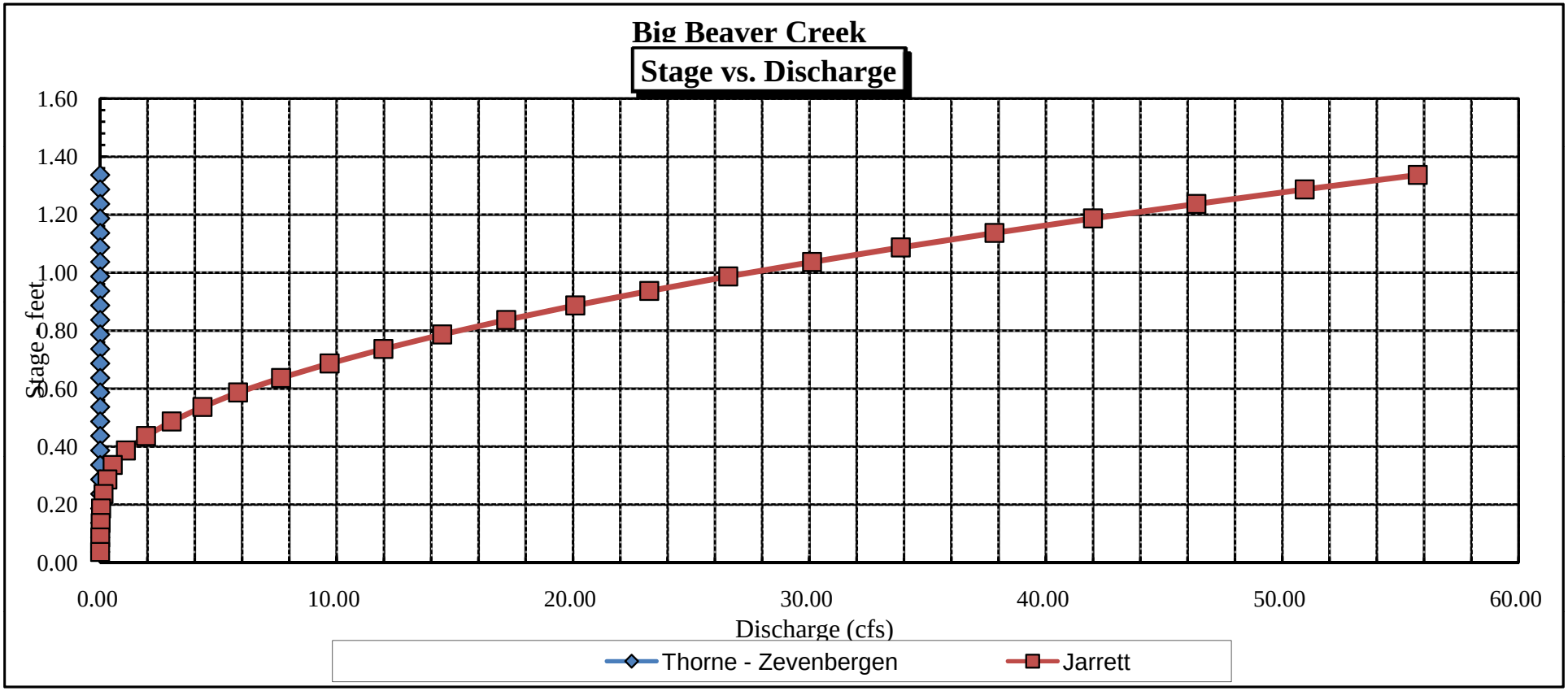
CWCB REVIEW BY: ..…………………………....……………………………………………………...…............. DATE:.................…………….....


Big Beaver Creek
CROSS SECTION DATA ANALYSIS
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
VERTICAL DEPTH (FT)
LS & G
W
RS & G
0.00
5.00
10.00
15.00
20.00
25.00
30.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Big Beaver 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
10.00
20.00
30.00
40.00
50.00
60.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Big Beaver Creek
Velocity vs. Discharge
Velocity - ft/sec
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
10.00
20.00
30.00
40.00
50.00
60.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Big 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
10.00
20.00
30.00
40.00
50.00
60.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Big Beaver 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
10.00
20.00
30.00
40.00
50.00
60.00
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:	Big Beaver Creek
XS LOCATION:	At BLM-private boundary
XS NUMBER:	2
DATE:	14-Jul-08
OBSERVERS:	R. Smith, B. Lange
1/4 SEC:	NE
SECTION:	19
TWP:	1N
RANGE:	91W
PM:	Sixth
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	24935
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:	0.024

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

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

STREAM NAME: Big Beaver Creek
XS LOCATION: At BLM-private boundary
XS NUMBER: 2

DATA POINTS= 29

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	1.00	2.89			0.00		0.00	0.00	0.0%
	W	4.00	3.71			0.00		0.00	0.00	0.0%
		5.00	3.75	0.05	0.00	1.00	0.05	0.05	0.00	0.0%
		6.00	3.80	0.10	1.11	1.00	0.10	0.10	0.11	2.2%
		7.00	3.80	0.10	0.20	1.00	0.10	0.10	0.02	0.4%
		8.00	3.90	0.20	0.97	1.00	0.20	0.20	0.19	3.8%
		9.00	4.05	0.35	0.41	1.01	0.35	0.26	0.11	2.1%
		9.50	4.15	0.45	0.97	0.51	0.45	0.23	0.22	4.3%
		10.00	4.15	0.45	1.84	0.50	0.45	0.23	0.41	8.2%
		10.50	4.10	0.40	0.92	0.50	0.40	0.20	0.18	3.6%
		11.00	4.10	0.40	0.99	0.50	0.40	0.20	0.20	3.9%
		11.50	4.15	0.40	1.25	0.50	0.40	0.20	0.25	4.9%
		12.00	4.10	0.40	2.50	0.50	0.40	0.20	0.50	9.9%
		12.50	4.20	0.50	1.54	0.51	0.50	0.25	0.39	7.6%
		13.00	4.05	0.30	0.00	0.52	0.30	0.15	0.00	0.0%
		13.50	3.95	0.20	2.22	0.51	0.20	0.10	0.22	4.4%
		14.00	4.00	0.25	2.85	0.50	0.25	0.13	0.36	7.0%
		14.50	4.05	0.30	2.33	0.50	0.30	0.15	0.35	6.9%
		15.00	4.20	0.45	1.04	0.52	0.45	0.23	0.23	4.6%
		15.50	4.05	0.30	1.92	0.52	0.30	0.15	0.29	5.7%
		16.00	4.00	0.25	1.80	0.50	0.25	0.13	0.23	4.5%
		16.50	4.10	0.35	0.50	0.51	0.35	0.18	0.09	1.7%
		17.00	3.90	0.10	0.23	0.54	0.10	0.08	0.02	0.3%
		18.00	3.85	0.10	1.28	1.00	0.10	0.10	0.13	2.5%
		19.00	4.00	0.25	1.95	1.01	0.25	0.25	0.49	9.6%
		20.00	4.05	0.30	0.16	1.00	0.30	0.30	0.05	0.9%
		21.00	3.90	0.15	0.26	1.01	0.15	0.12	0.03	0.6%
	W	21.60	3.78			0.61		0.00	0.00	0.0%
1	LS & G	24.00	2.87			0.00		0.00	0.00	0.0%
	TOTALS ----------					17.81	0.5 (Max.)	4.26	5.06	100.0%

Manning's n = 0.0747
Hydraulic Radius= 0.23899591

STREAM NAME: Big Beaver Creek
XS LOCATION: At BLM-private boundary
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	4.26	4.00	-6.0%
3.50	4.26	8.58	101.4%
3.52	4.26	8.19	92.5%
3.54	4.26	7.82	83.6%
3.56	4.26	7.44	74.7%
3.58	4.26	7.07	65.9%
3.60	4.26	6.69	57.2%
3.62	4.26	6.32	48.6%
3.64	4.26	5.96	40.0%
3.66	4.26	5.59	31.4%
3.68	4.26	5.23	22.9%
3.70	4.26	4.87	14.5%
3.71	4.26	4.70	10.3%
3.72	4.26	4.52	6.1%
3.73	4.26	4.34	2.0%
3.74	4.26	4.17	-2.0%
3.75	4.26	4.00	-6.0%
3.76	4.26	3.83	-9.9%
3.77	4.26	3.67	-13.8%
3.78	4.26	3.51	-17.6%
3.79	4.26	3.35	-21.4%
3.80	4.26	3.19	-25.1%
3.82	4.26	2.90	-32.0%
3.84	4.26	2.61	-38.6%
3.86	4.26	2.34	-45.1%
3.88	4.26	2.08	-51.2%
3.90	4.26	1.83	-57.0%
3.92	4.26	1.60	-62.5%
3.94	4.26	1.38	-67.7%
3.96	4.26	1.16	-72.7%
3.98	4.26	0.96	-77.4%
4.00	4.26	0.78	-81.7%

WATERLINE AT ZERO
AREA ERROR = 3.730

STREAM NAME: Big Beaver Creek
XS LOCATION: At 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	2.89	22.95	0.93	1.31	21.31	23.43	100.0%	0.91	61.67	2.89
	2.93	22.70	0.90	1.27	20.39	23.17	98.9%	0.88	57.76	2.83
	2.98	22.38	0.86	1.22	19.27	22.84	97.5%	0.84	53.05	2.75
	3.03	22.07	0.82	1.17	18.16	22.51	96.0%	0.81	48.52	2.67
	3.08	21.75	0.78	1.12	17.06	22.18	94.6%	0.77	44.17	2.59
	3.13	21.44	0.75	1.07	15.98	21.85	93.2%	0.73	40.01	2.50
	3.18	21.12	0.71	1.02	14.92	21.52	91.8%	0.69	36.03	2.42
	3.23	20.81	0.67	0.97	13.87	21.19	90.4%	0.65	32.25	2.32
	3.28	20.49	0.63	0.92	12.84	20.86	89.0%	0.62	28.64	2.23
	3.33	20.18	0.59	0.87	11.82	20.52	87.6%	0.58	25.23	2.13
	3.38	19.86	0.54	0.82	10.82	20.19	86.2%	0.54	22.01	2.03
	3.43	19.55	0.50	0.77	9.83	19.86	84.8%	0.50	18.98	1.93
	3.48	19.23	0.46	0.72	8.86	19.53	83.4%	0.45	16.14	1.82
	3.53	18.92	0.42	0.67	7.91	19.20	81.9%	0.41	13.51	1.71
	3.58	18.60	0.37	0.62	6.97	18.87	80.5%	0.37	11.07	1.59
	3.63	18.29	0.33	0.57	6.05	18.54	79.1%	0.33	8.84	1.46
	3.68	17.97	0.29	0.52	5.14	18.21	77.7%	0.28	6.83	1.33
WL	3.73	17.23	0.25	0.47	4.26	17.46	74.5%	0.24	5.12	1.20
	3.78	16.00	0.21	0.42	3.43	16.21	69.2%	0.21	3.75	1.09
	3.83	14.05	0.19	0.37	2.68	14.26	60.8%	0.19	2.72	1.01
	3.88	12.50	0.16	0.32	2.01	12.70	54.2%	0.16	1.82	0.90
	3.93	10.99	0.13	0.27	1.43	11.17	47.7%	0.13	1.12	0.78
	3.98	9.42	0.10	0.22	0.92	9.57	40.8%	0.10	0.59	0.65
	4.03	6.69	0.08	0.17	0.51	6.81	29.1%	0.07	0.27	0.54
	4.08	4.70	0.05	0.12	0.23	4.78	20.4%	0.05	0.10	0.41
	4.13	2.25	0.02	0.07	0.05	2.29	9.8%	0.02	0.01	0.25
	4.18	0.30	0.01	0.02	0.00	0.31	1.3%	0.01	0.00	0.14

STREAM NAME: Big Beaver Creek
XS LOCATION: At BLM-private boundary
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	5.06	cfs
CALCULATED FLOW (Qc)=	5.12	cfs
(Qm-Qc)/Qm * 100 =	-1.4	%
MEASURED WATERLINE (WLm)=	3.75	ft
CALCULATED WATERLINE (WLc)=	3.73	ft
(WLm-WLc)/WLm * 100 =	0.4	%
MAX MEASURED DEPTH (Dm)=	0.50	ft
MAX CALCULATED DEPTH (Dc)=	0.47	ft
(Dm-Dc)/Dm * 100	6.0	%
MEAN VELOCITY=	1.20	ft/sec
MANNING'S N=	0.075	
SLOPE=	0.024	ft/ft
.4 * Qm =	2.0	cfs
2.5 * Qm=	12.6	cfs

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

FLOW (CFS)	PERIOD
___________________	___________________
___________________	___________________
___________________	___________________
___________________	___________________

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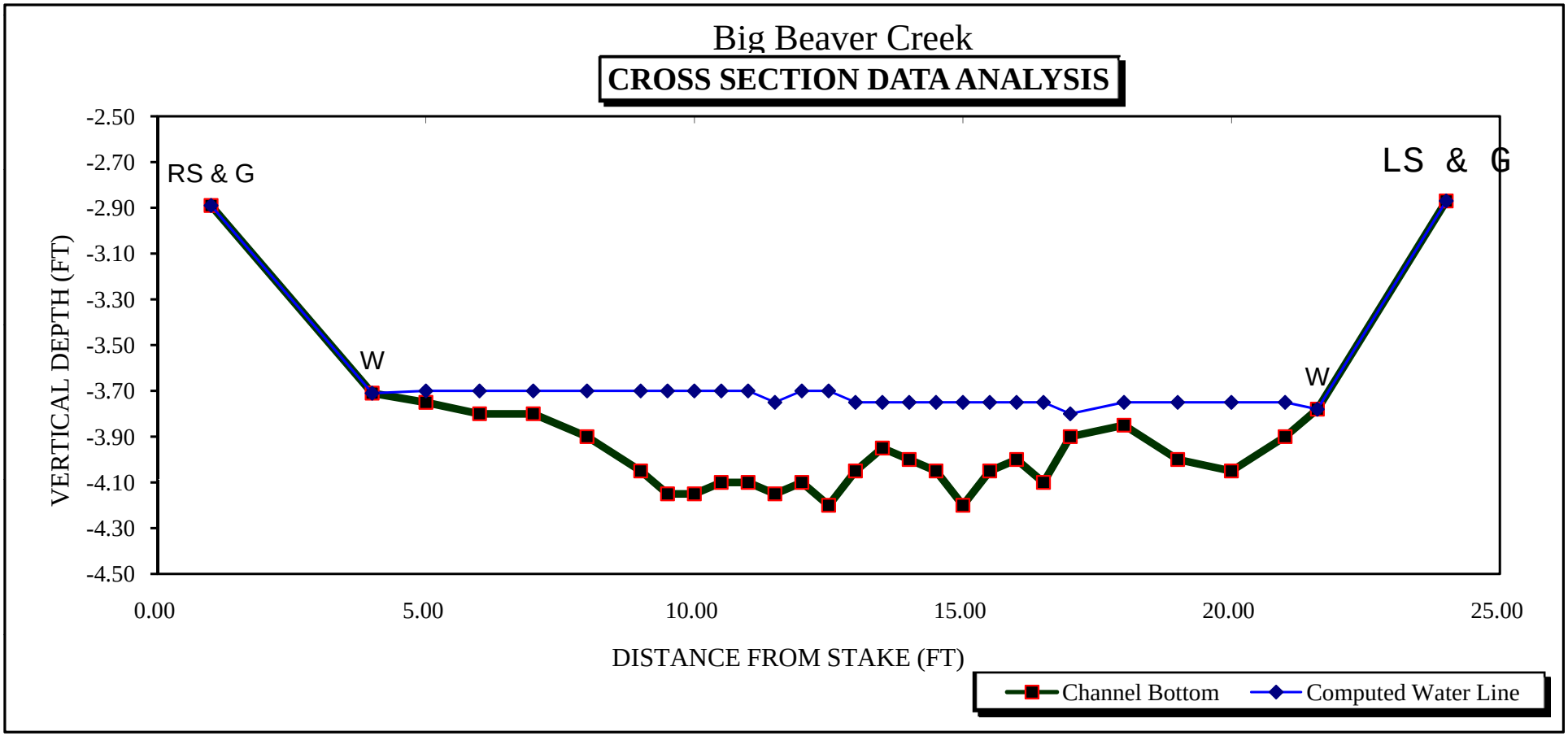
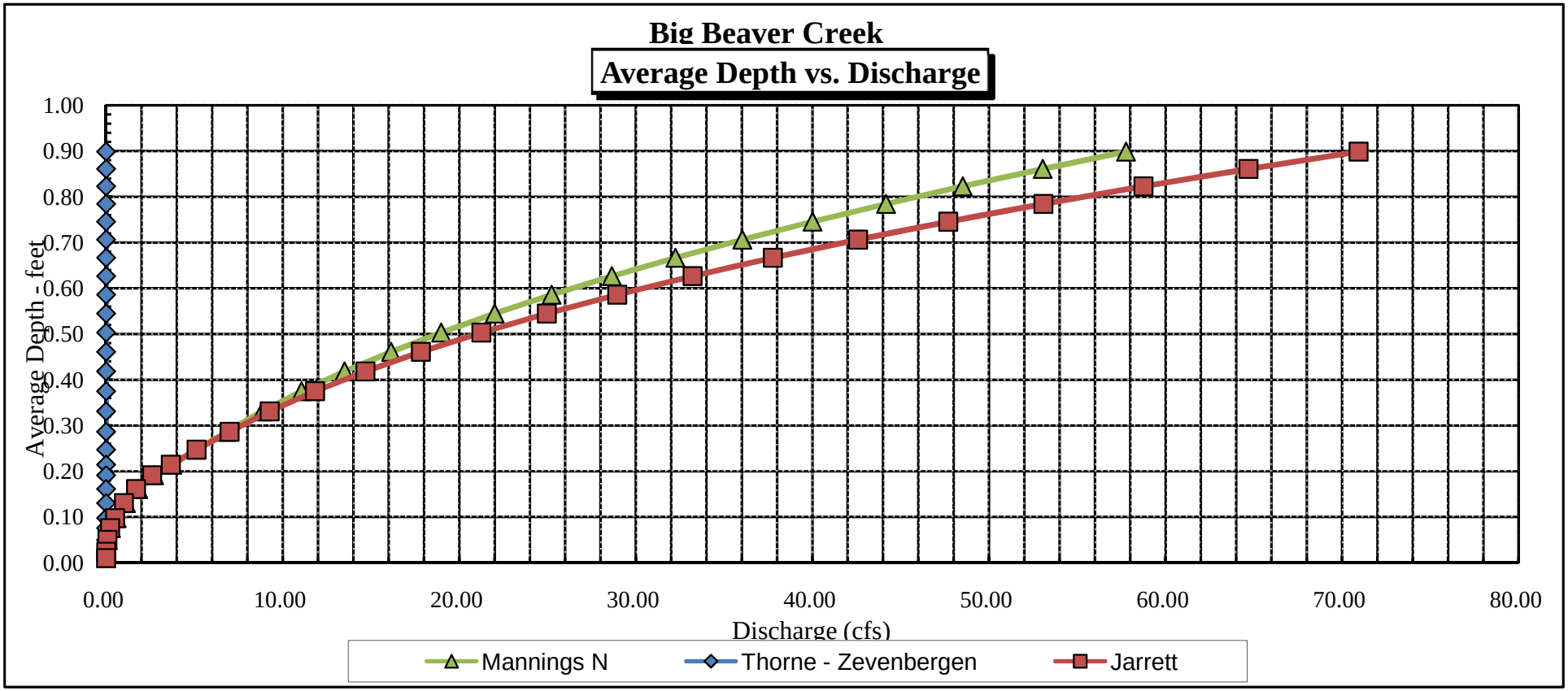
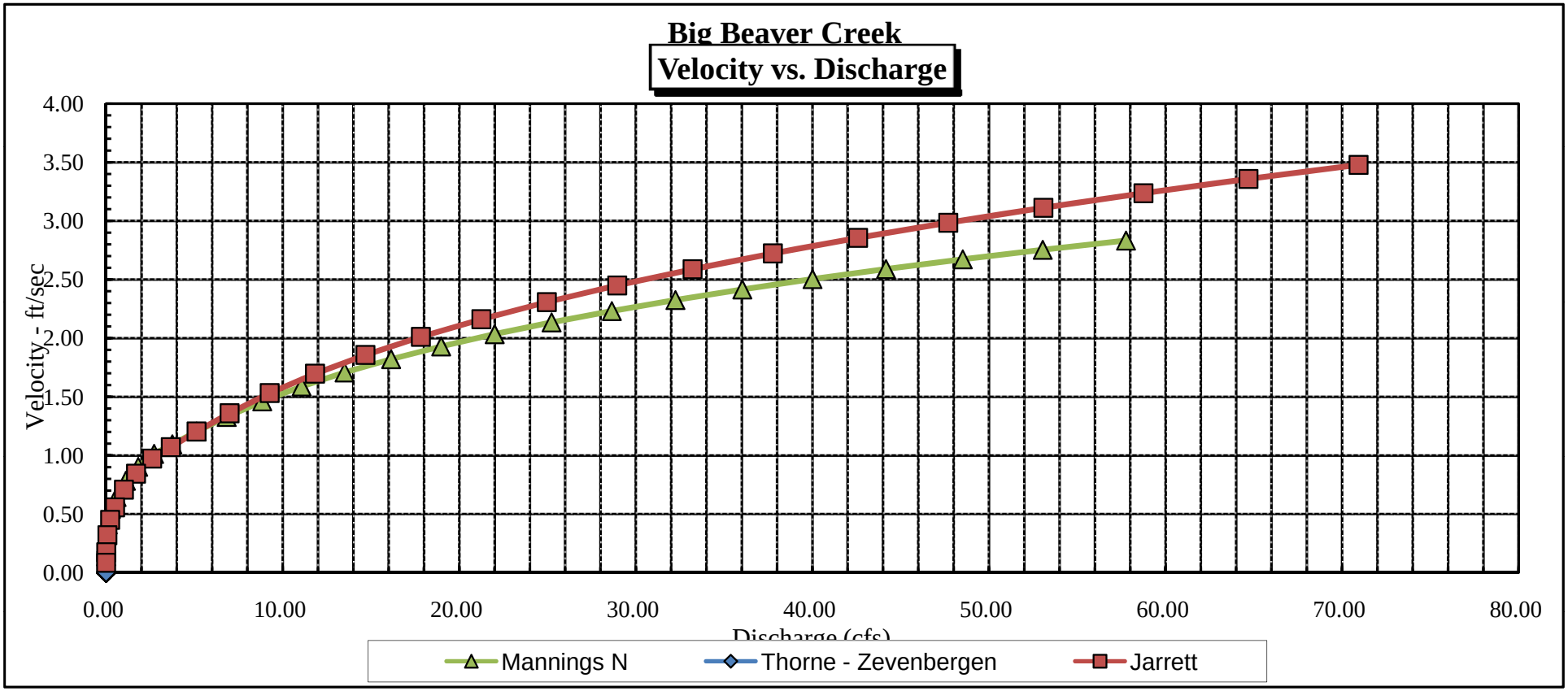
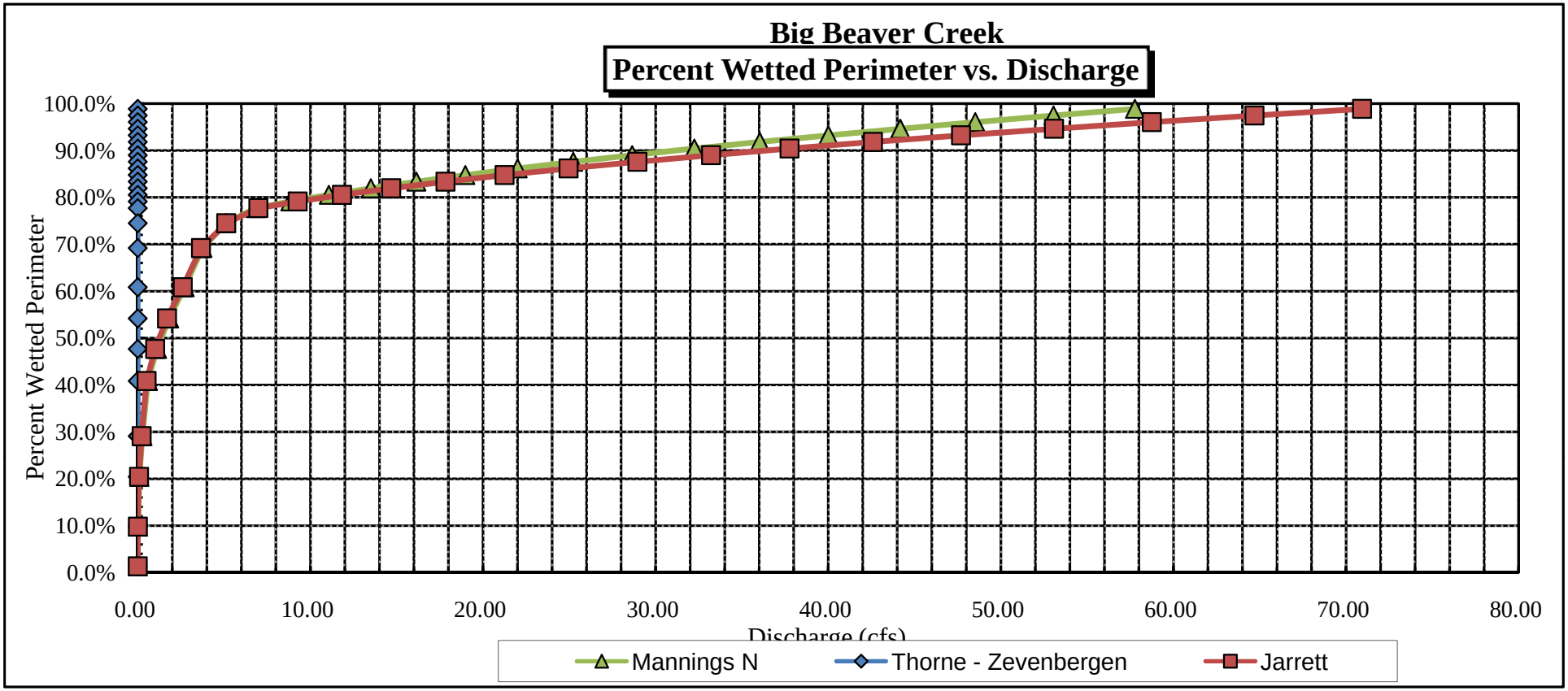
RECOMMENDATION BY: ……………………………………………… AGENCY……………………………………………… DATE:……………………………

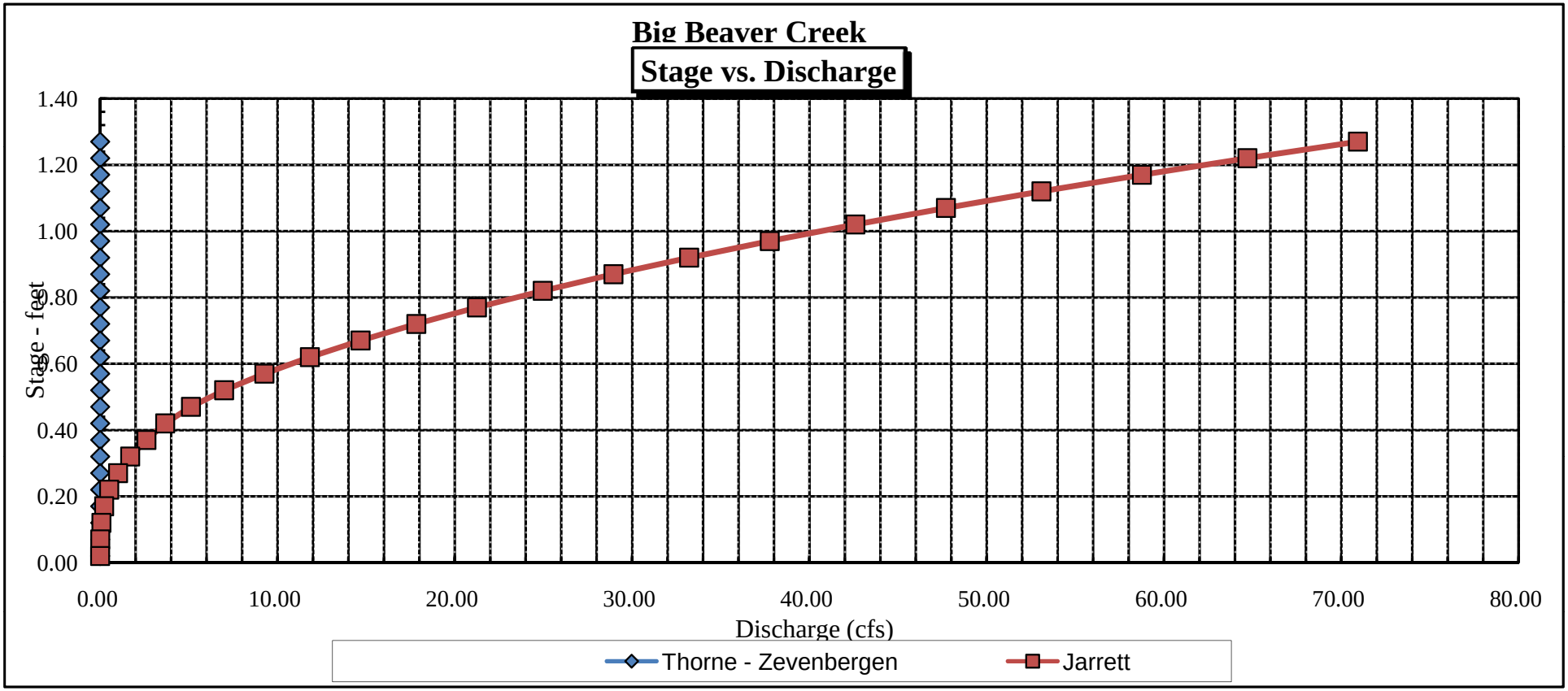
CWCB REVIEW BY: ……… DATE:……………………………


Big Beaver Creek
CROSS SECTION DATA ANALYSIS
RS & G
W
W
LS & G
-2.50
-2.70
-2.90
-3.10
-3.30
-3.50
-3.70
-3.90
-4.10
-4.30
-4.50
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Big Beaver 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
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Big Beaver 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
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Big 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
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Big Beaver Creek
Stage vs. Discharge
Stage - feet
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett