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

MAR 7 2012

In Reply Refer To:
7250 (CO-932)

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 increase of the existing instream flow water right on Stuck Creek, located in Water Division 1. In 1978, the Colorado Water Conservation Board appropriated an instream flow water right for 1.0 cubic feet per second year-round on the entire length of this creek.

Location and Land Status: Stuck Creek is tributary to the Laramie River approximately one mile south of the Colorado-Wyoming border. This recommendation covers the stream reach beginning headwaters (40° 52' 53.37" N, 106° 7' 15.79" W) and extending downstream to the headgate of the Warren Ditch, a distance of approximately 10.93 miles. Approximately 3.44 miles of this stream reach are managed by the BLM, and 6.48 miles are managed by the U.S. Forest Service. Approximately 0.94 miles are under private ownership.

Biological Summary: Stuck Creek is a cold-water stream with moderate gradient, functional floodplains, and active beaver dams. The stream has a good mix of riffle, run, and deep pool habitats. Fish surveys show that Stuck Creek supports naturally reproducing populations of brown trout and longnose sucker. Intensive macroinvertebrate surveys have not been conducted, but spot samples have revealed various species of mayfly, stonefly, caddisfly, and midges.

The riparian community occupies most of the floodplain area and is comprised primarily of willows, rushes, and sedges. The healthy riparian community has resulted in normal width-to-depth ratios, sinuosity, and bank stability.

R2Cross Analysis: The BLM collected the following R2Cross data from Stuck Creek:

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (meets 3 of 3 hydraulic criteria)
08/04/2010 #1	4.28 cfs	22.10 feet	2.54 cfs	3.37 cfs
08/04/2010 #2	4.11 cfs	14.37 feet	1.89 cfs	2.70 cfs
		Averages:	2.20 cfs	3.04 cfs

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

> An increase of 2.0 cubic feet per second is recommended for the higher temperature period, from May 1 through October 31. The enlargement will bring the total instream flow rate up to 3.0 cfs for this time period. This recommendation is driven by the average depth criteria. It is important to maintain adequate depth in the riffles in this creek, because the creek has limited riffle habitat available for spawning.
>
> An enlargement of 1.1 cubic feet per second is recommended during the cold temperature period, from November 1 to April 30. The increase will bring the total instream flow rate up to 2.1 cfs for this time period. This recommendation is driven by the wetted perimeter criteria and depth criteria. During winter, this flow rate should provide sufficient velocity and depth to prevent icing of all physical habitat within the stream.

Water Availability: For water availability analysis, the BLM recommends analysis of U.S. Geological Survey (USGS) stream gage 06657500 (Laramie River near Glendevey, CO). The USGS operated the gage between 1904 and 1982. The State of Colorado assumed operation of the gage in 1982 and has continued to operate the gage to the present. This gage is located in a different part of the Laramie River watershed than Stuck Creek. However, it should provide an excellent indication of the volume of runoff to be expected per acre within this watershed, along with an indication of the timing and distribution of that runoff. When utilizing this gage, it should be understood that the gage may have been affected by icing during the winter.

The BLM is not aware of any decreed water rights that operate within the recommended stream reach.

Rationale for Increase of Instream Flow Water Right: The BLM does not consider the current instream flow water to be protective of the natural environment in Stuck Creek. In the cross-sections analyzed by the BLM, a flow rate of 1.0 cfs does even meet the instream flow

criteria for a typical winter-period instream flow water right. If the current 1.0 cfs instream flow rate were to be maintained for extended periods during the summer, the BLM would anticipate significant stress on fish community, in the form of high stream temperatures and very limited physical habitat. The BLM deliberately surveyed riffles with a range of top widths, and the 1.0 cfs flow rate appears to be inadequate even in the narrowest riffles that are typical in this stream.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2011. We thank both Colorado Parks and 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,

Bruce H Rittenhouse

for Leigh D. Espy
Deputy State Director, Resources and Fire

cc: Dave Stout, Kremmling FO
Paula Belcher, Kremmling FO

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 enlargement of the existing instream flow water right on Stuck Creek, located in Water Division 1. In 1978, the Colorado Water Conservation Board appropriated an instream flow water right for 1.0 cubic feet per second on the entire length of this creek.

Location and Land Status. Stuck Creek is tributary to the Laramie River approximately one mile south of the Colorado-Wyoming border. This recommendation covers the stream reach beginning headwaters (40° 52' 53.37" N, 106° 7' 15.79" W) and extending downstream to the headgate of the Warren Ditch, a distance of approximately 10.93 miles. Approximately 3.44 miles of this stream reach are managed by the BLM, and 6.48 miles are managed by the U.S. Forest Service. Approximately 0.94 miles are under private ownership.

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08/04/2010 #2	4.11 cfs	14.37 feet	1.89 cfs	2.70 cfs
		Averages:	2.20 cfs	3.04 cfs

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 2.0 cubic feet per second is recommended for the higher temperature period, from April 1 through October 31. The enlargement will bring the total instream flow rate up to 3.0 cfs for this time period. This recommendation is driven by the average depth criteria. It is important to maintain adequate depth in the riffles in this creek, because the creek has limited riffle habitat available for spawning.

An enlargement of 1.2 cubic feet per second is recommended during the cold temperature period, from November 1 to March 31. The enlargement will bring the total instream flow rate up to 2.2 cfs for this time period. This recommendation is driven by the wetted perimeter criteria and depth criteria. During winter, this flow rate should provide sufficient velocity and depth to prevent icing of all physical habitat within the stream.

Water Availability. For water availability analysis, BLM recommends analysis of U.S. Geological Survey stream gage 06657500 (Laramie River near Glendevey, CO). The USGS operated the gage between 1904 and 1982. The State of Colorado assumed operation of the gage in 1982 and has continued to operate the gage to the present. This gage is located in a different part of the Laramie River watershed than Stuck Creek. However, it should provide an excellent indication of the volume of runoff to be expected per acre within this watershed, along with an indication of the timing and distribution of that runoff. When utilizing this gage, it should be understood that the gage may have been affected by icing during the winter.

BLM is not aware of any decreed water rights that operate within the recommended stream reach.

Rationale for Enlargement of Instream Flow Water Right. BLM does not consider the current instream flow water to be protective of the natural environment in Stuck Creek. In the cross-sections analyzed by BLM, a flow rate of 1.0 cfs does even meet the instream flow criteria for a typical winter-period instream flow water right. If the current 1.0 cfs instream flow rate were to be maintained for extended periods during the summer, BLM would anticipate significant stress on fish community, in the form of high stream temperatures and very limited physical habitat. BLM deliberately surveyed riffles with a range of top widths, and the 1.0 flow rate appears to be inadequate even in the narrowest riffles that are typical in this stream.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2011. 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,

Leigh Espy
Deputy State Director
Resources and Fire

Cc: Dave Stout, Kremmling FO
Paula Belcher, Kremmling FO

Kremmling Field Office Stream Surveys
August 2010

Stuck Creek - Water Code #12310

Stuck Creek, located northwest of Hohnholz Lakes State Wildlife Area on BLM lands managed by the Kremmling Field Office, was sampled on August 4, 2010. Stuck Creek is a tributary to the Laramie River. Sampling was done in support of the instream flow program. A two-pass removal population estimate was completed. Brown trout and longnose sucker were the only fish species collected or seen. Sampling was conducted via two backpack electro-shockers and a 302 foot station was sampled. Personnel present were Tom Fresques, Fish Biologist, and Gregor Dekleva and Kristy Wallner, Biological Technicians.

Stuck Creek

Stuck Creek

Stuck Creek – Riparian

STREAM SURVEY FISH SAMPLING FORM

WATER Stuck Creek H2O CODE 12310 DATE 8/4/2010

GEAR Backpack Shocker - 2 EFFORT _____ STATION # 1 PASS # 1 & 2

CREW Fresques, Wallner, Dekleva DRAINAGE Laramie River LOCATION GPS___

Pass	species	length	weight		Pass	species	length	weight
1	LOC	220	137		1	LOC	125	34
1	LNS	153	47		1	LOC	140	38
1	LOC	155	46					
1	LOC	131	40					
1	LOC	211	113					
1	LOC	150	48					
1	LOC	145	38					
1	LOC	140	46		**Pass**	**Species**	**Length**	**Weight**
1	LNS	132	43		2	LOC	220	130
1	LNS	140	50		2	LOC	148	49
1	LOC	155	46		2	LNS	150	54
1	LOC	142	47		2	LOC	145	43
1	LNS	132	36		2	LNS	130	42
1	LNS	134	42		2	LOC	135	43
1	LNS	132	39					
1	LNS	120	32					
1	LNS	120	24					
1	LNS	119	29					
1	LNS	118	31					
1	LNS	152	40					
1	LOC	150	40					
1	LOC	132	29					
1	LOC	140	43					
1	LOC	115	19					
1	LOC	128	31					

GPS Location:

Notes: Stream Width 11.9 ft. Sample Reach 302 ft.

Conductivity: ~100 ms Electroshocker settings

Discussion:

Stuck Creek contained good flow and consisted of a good mix of riffle, run, and pool habitats. The stream appeared to be a Rosgen C channel type. Riparian vegetation consisted of thick willows, sedge, rush, *poa*, tufted hairgrass, and redtop. The riparian area was approximately 75 feet wide. Some beaver activity was present. Stream substrates were moderately embedded. Based on limited visual observation, the stream contained midges, caddis flies, stoneflies, and mayflies.

Brown trout and longnose suckers of varying age classes were the only species collected or seen. Conductivity was very low (approximately 100 ms) which made shocking difficult as voltage was high and fish response was fair.

Recommendations:

- This stream would benefit from an instream flow recommendation. Periodically monitor to ensure that stream habitats remain in good condition.

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Stuck Creek						CROSS-SECTION NO.: 1	
CROSS-SECTION LOCATION: Approx 2 miles upstream from confluence with Laramie River							
DATE: 8-4-10	OBSERVERS: P. Belcher, R. Smith						
LEGAL DESCRIPTION	¼ SECTION: NENE	SECTION: 33	TOWNSHIP: 12(N)S	RANGE: 77 E(W)	PM: 6th		
COUNTY: Larimer	WATERSHED: Laramie R.	WATER DIVISION: 1	DOW WATER CODE: 12310				
MAP(S): USGS:	GPS 412859						
USFS:	4536335						

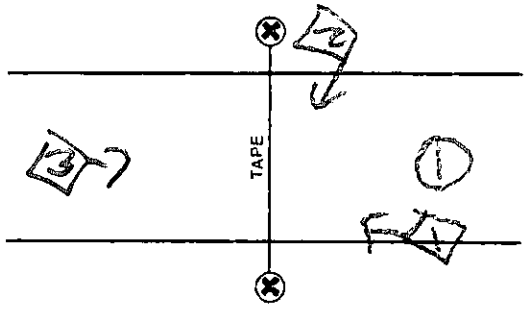
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES)/NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: 2" cobble to 1-foot boulders	PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	4.46 / 4.48
② WS Upstream	35.5	4.13
③ WS Downstream	28.0	4.96
SLOPE	0.86 / 63.5 = .014	

SKETCH



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
see report																	

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

mayfly, stonefly

COMMENTS

Ph= 8.1 TDS= 100 Temp= 16.5°

Willow - cottonwood riparian - mostly willow.

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Shuck Creek | CROSS-SECTION NO.: 1 | DATE: 8-4-10 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: ____ ft | TIME: 11 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)
RS	0.0		1.29								
G	1.0		2.46								
W	3.0		4.48								
	3.1		4.65	0.2				0.21			
	3.5		4.65	0.2	-			0.10			
	4.0		4.65	0.2				0.3			
	4.5		4.75	0.3				1.46			
	5.0		4.95	0.5				1.49			
	5.5		4.95	0.5				1.46			
	6.0		4.95	0.5				1.61			
	6.5		4.95	0.5				1.23			
	7.0		4.90	0.45				1.79			
	7.5		4.80	0.35				1.54			
	8.0		4.80	0.35				1.71			
	8.5		4.80	0.35				1.01			
	9.0		4.75	0.3				1.48			
	9.5		4.80	0.35				1.36			
	10.0		4.60	0.15				1.01			
	10.5		4.75	0.3				0.45			
	11.0		4.75	0.3				2.30			
	12.0		4.60	0.15				0.49			
	13.0		4.65	0.2				0.9			
	14.0		4.55	0.1				0.24			
	15.0		4.55	0.1				0.02			
	15.8		4.55	0.1				0.25			
W	17.1		4.46								
	21.5		4.16								
G	23.1		2.46								
LS	24.3		2.00								
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:	Stuck Creek
XS LOCATION:	3 miles u/s fr conf. w/ Laramie River
XS NUMBER:	1
DATE:	4-Aug-10
OBSERVERS:	R. Smith, P. Belcher
1/4 SEC:	NE NE
SECTION:	33
TWP:	12N
RANGE:	77W
PM:	6th
COUNTY:	Larimer
WATERSHED:	Laramie River
DIVISION:	1
DOW CODE:	12310
USGS MAP:	0
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:	0.014

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

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

STREAM NAME: Stuck Creek
XS LOCATION: 3 miles u/s fr conf. w/ Laramie River
XS NUMBER: 1

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
	RS	0.00	1.29			0.00		0.00	0.00	0.0%
1	G	1.00	2.46			0.00		0.00	0.00	0.0%
	W	3.00	4.48	0.00	0.00	0.00		0.00	0.00	0.0%
		3.10	4.65	0.20	0.21	0.20	0.20	0.05	0.01	0.2%
		3.50	4.65	0.20	0.10	0.40	0.20	0.09	0.01	0.2%
		4.00	4.65	0.20	0.30	0.50	0.20	0.10	0.03	0.7%
		4.50	4.75	0.30	1.46	0.51	0.30	0.15	0.22	5.1%
		5.00	4.95	0.50	1.49	0.54	0.50	0.25	0.37	8.7%
		5.50	4.95	0.50	1.46	0.50	0.50	0.25	0.37	8.5%
		6.00	4.95	0.50	1.61	0.50	0.50	0.25	0.40	9.4%
		6.50	4.95	0.50	1.23	0.50	0.50	0.25	0.31	7.2%
		7.00	4.90	0.45	1.79	0.50	0.45	0.23	0.40	9.4%
		7.50	4.80	0.35	1.54	0.51	0.35	0.18	0.27	6.3%
		8.00	4.80	0.35	1.71	0.50	0.35	0.18	0.30	7.0%
		8.50	4.80	0.35	1.01	0.50	0.35	0.18	0.18	4.1%
		9.00	4.75	0.30	1.48	0.50	0.30	0.15	0.22	5.2%
		9.50	4.80	0.34	1.36	0.50	0.34	0.17	0.23	5.4%
		10.00	4.60	0.15	1.01	0.54	0.15	0.08	0.08	1.8%
		10.50	4.75	0.30	0.45	0.52	0.30	0.15	0.07	1.6%
		11.00	4.75	0.30	2.30	0.50	0.30	0.23	0.52	12.1%
		12.00	4.60	0.15	0.49	1.01	0.15	0.15	0.07	1.7%
		13.00	4.65	0.20	0.90	1.00	0.20	0.20	0.18	4.2%
		14.00	4.55	0.10	0.24	1.00	0.10	0.10	0.02	0.6%
		15.00	4.55	0.10	0.02	1.00	0.10	0.09	0.00	0.0%
		15.80	4.55	0.10	0.25	0.80	0.10	0.11	0.03	0.6%
	W	17.10	4.46	0.00	0.00	1.30		0.00	0.00	0.0%
		21.50	4.16			0.00		0.00	0.00	0.0%
1	G	23.10	2.46			0.00		0.00	0.00	0.0%
	LS	24.30	2.00			0.00		0.00	0.00	0.0%
	TOTALS ----------					14.34	0.5 (Max.)	3.56	4.28	100.0%

Manning's n = 0.0576
Hydraulic Radius= 0.24783709

STREAM NAME: Stuck Creek
XS LOCATION: 3 miles u/s fr conf. w/ Laramie River
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.56	3.29	-7.5%
4.22	3.56	7.27	104.4%
4.24	3.56	6.91	94.4%
4.26	3.56	6.56	84.7%
4.28	3.56	6.22	75.0%
4.30	3.56	5.89	65.6%
4.32	3.56	5.56	56.3%
4.34	3.56	5.23	47.2%
4.36	3.56	4.92	38.3%
4.38	3.56	4.61	29.6%
4.40	3.56	4.30	21.0%
4.42	3.56	4.00	12.6%
4.43	3.56	3.86	8.5%
4.44	3.56	3.71	4.4%
4.45	3.56	3.57	0.4%
4.46	3.56	3.43	-3.6%
4.47	3.56	3.29	-7.5%
4.48	3.56	3.15	-11.5%
4.49	3.56	3.01	-15.3%
4.50	3.56	2.87	-19.1%
4.51	3.56	2.74	-22.9%
4.52	3.56	2.61	-26.7%
4.54	3.56	2.35	-34.0%
4.56	3.56	2.11	-40.7%
4.58	3.56	1.89	-46.7%
4.60	3.56	1.68	-52.7%
4.62	3.56	1.48	-58.3%
4.64	3.56	1.30	-63.4%
4.66	3.56	1.14	-67.9%
4.68	3.56	1.00	-71.8%
4.70	3.56	0.87	-75.6%
4.72	3.56	0.74	-79.1%

WATERLINE AT ZERO
AREA ERROR = 4.451

STREAM NAME: Stuck Creek
XS LOCATION: 3 miles u/s fr conf. w/ Laramie River
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	2.46	22.10	1.95	2.49	43.15	23.93	100.0%	1.80	195.21	4.52
	3.45	20.19	1.10	1.50	22.19	21.18	88.5%	1.05	69.94	3.15
	3.50	20.09	1.05	1.45	21.19	21.04	87.9%	1.01	65.02	3.07
	3.55	19.99	1.01	1.40	20.19	20.90	87.3%	0.97	60.24	2.98
	3.60	19.90	0.96	1.35	19.19	20.76	86.7%	0.92	55.61	2.90
	3.65	19.80	0.92	1.30	18.20	20.62	86.2%	0.88	51.13	2.81
	3.70	19.70	0.87	1.25	17.21	20.48	85.6%	0.84	46.80	2.72
	3.75	19.61	0.83	1.20	16.23	20.34	85.0%	0.80	42.62	2.63
	3.80	19.51	0.78	1.15	15.25	20.20	84.4%	0.75	38.60	2.53
	3.85	19.41	0.74	1.10	14.27	20.06	83.8%	0.71	34.74	2.43
	3.90	19.32	0.69	1.05	13.31	19.92	83.3%	0.67	31.05	2.33
	3.95	19.22	0.64	1.00	12.34	19.79	82.7%	0.62	27.52	2.23
	4.00	19.12	0.60	0.95	11.38	19.65	82.1%	0.58	24.16	2.12
	4.05	19.03	0.55	0.90	10.43	19.51	81.5%	0.53	20.98	2.01
	4.10	18.93	0.50	0.85	9.48	19.37	80.9%	0.49	17.99	1.90
	4.15	18.83	0.45	0.80	8.54	19.23	80.4%	0.44	15.17	1.78
	4.20	18.17	0.42	0.75	7.61	18.54	77.5%	0.41	12.83	1.69
	4.25	17.39	0.39	0.70	6.72	17.74	74.1%	0.38	10.75	1.60
	4.30	16.61	0.35	0.65	5.87	16.93	70.8%	0.35	8.85	1.51
	4.35	15.83	0.32	0.60	5.06	16.13	67.4%	0.31	7.13	1.41
	4.40	15.04	0.29	0.55	4.29	15.32	64.0%	0.28	5.60	1.31
WL	4.45	14.26	0.25	0.50	3.55	14.52	60.7%	0.24	4.25	1.20
	4.50	13.50	0.21	0.45	2.86	13.73	57.4%	0.21	3.07	1.07
	4.55	10.95	0.20	0.40	2.21	11.15	46.6%	0.20	2.29	1.04
	4.60	10.39	0.16	0.35	1.67	10.56	44.1%	0.16	1.50	0.89
	4.65	7.36	0.16	0.30	1.21	7.47	31.2%	0.16	1.10	0.91
	4.70	6.48	0.13	0.25	0.86	6.57	27.5%	0.13	0.68	0.79
	4.75	5.10	0.11	0.20	0.56	5.17	21.6%	0.11	0.39	0.69
	4.80	2.87	0.12	0.15	0.34	2.91	12.2%	0.12	0.25	0.73
	4.85	2.49	0.08	0.10	0.20	2.52	10.5%	0.08	0.12	0.57
	4.90	2.11	0.04	0.05	0.09	2.12	8.9%	0.04	0.03	0.37

STREAM NAME: Stuck Creek
XS LOCATION: 3 miles u/s fr conf. w/ Laramie River
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	4.28	cfs
CALCULATED FLOW (Qc)=	4.25	cfs
(Qm-Qc)/Qm * 100 =	0.8	%
MEASURED WATERLINE (WLm)=	4.47	ft
CALCULATED WATERLINE (WLc)=	4.45	ft
(WLm-WLc)/WLm * 100 =	0.4	%
MAX MEASURED DEPTH (Dm)=	0.50	ft
MAX CALCULATED DEPTH (Dc)=	0.50	ft
(Dm-Dc)/Dm * 100	0.2	%
MEAN VELOCITY=	1.20	ft/sec
MANNING'S N=	0.058	
SLOPE=	0.014	ft/ft
.4 * Qm =	1.7	cfs
2.5 * Qm=	10.7	cfs

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

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

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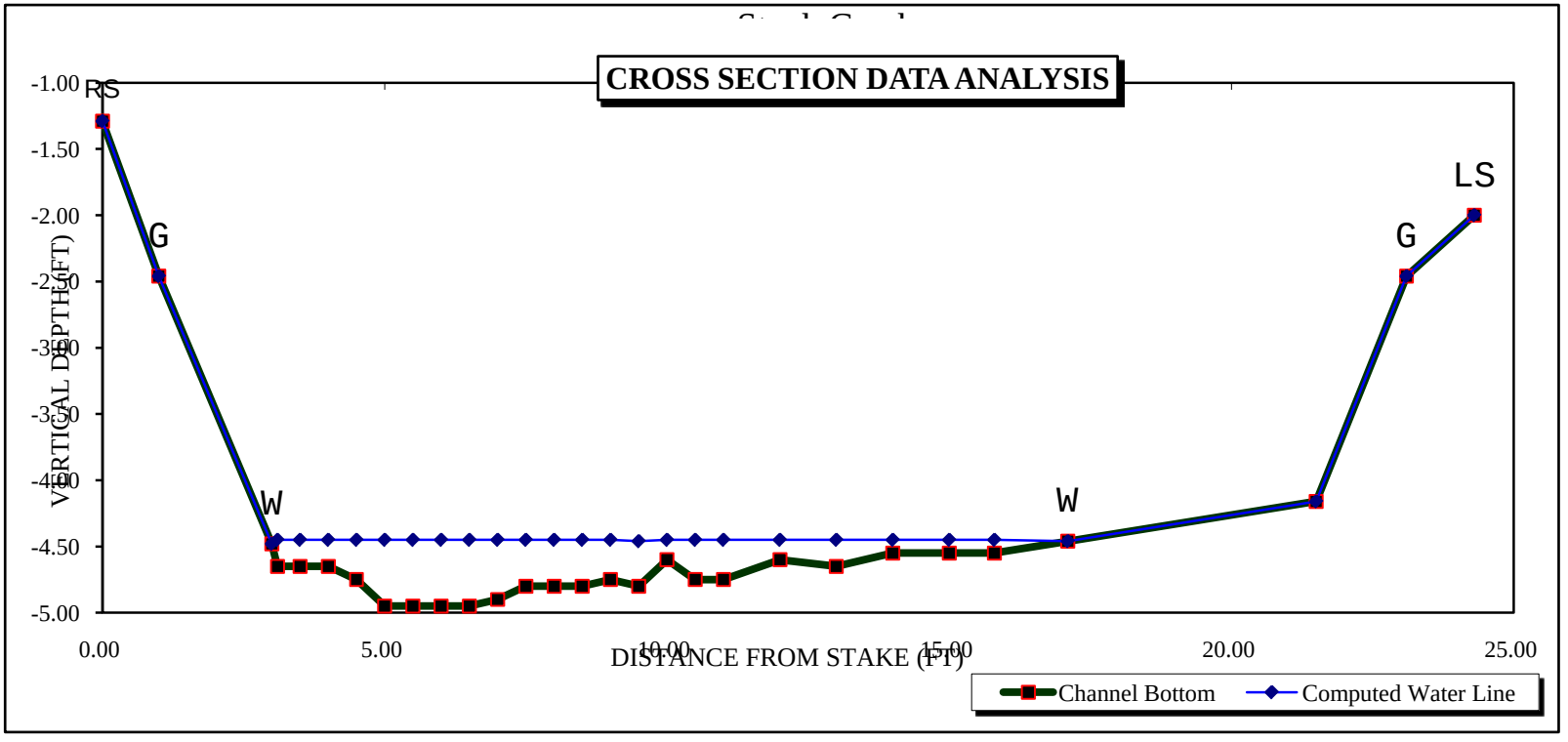
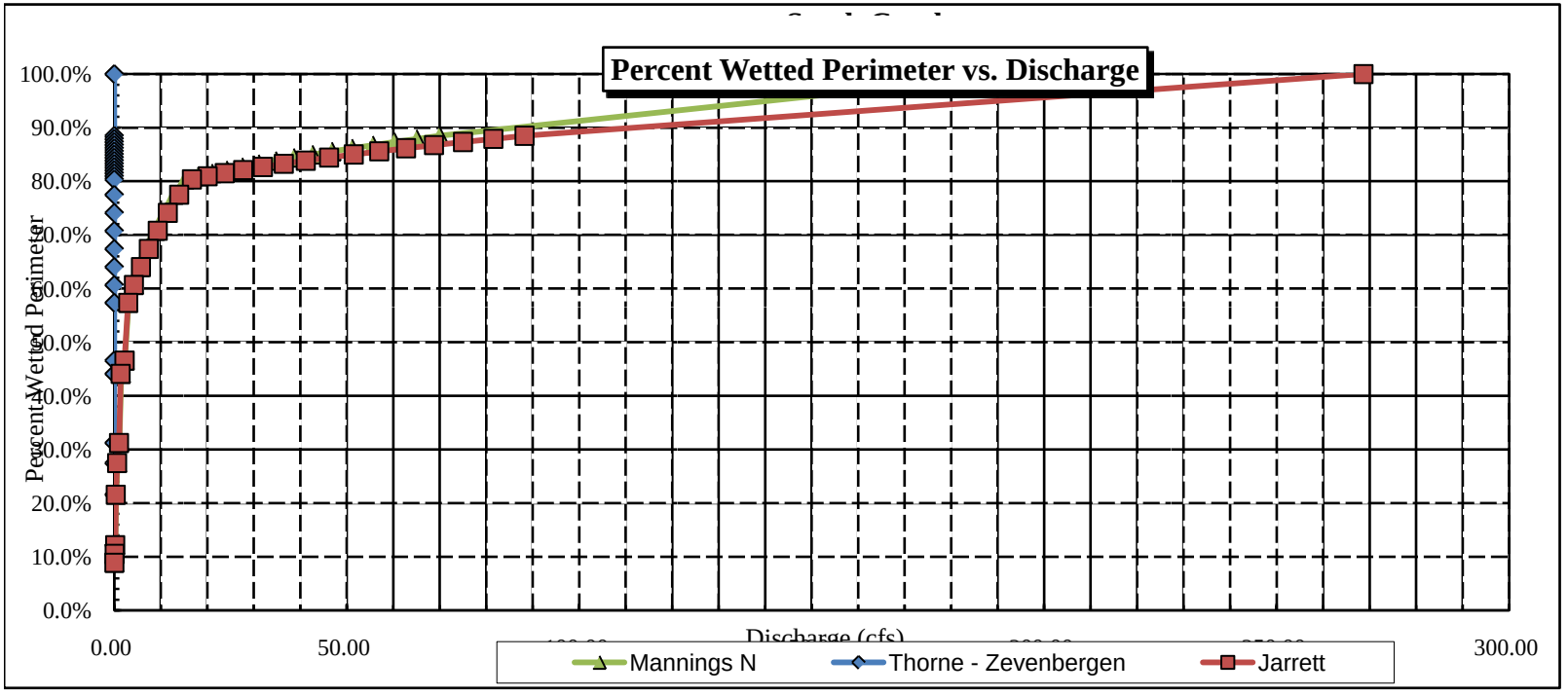
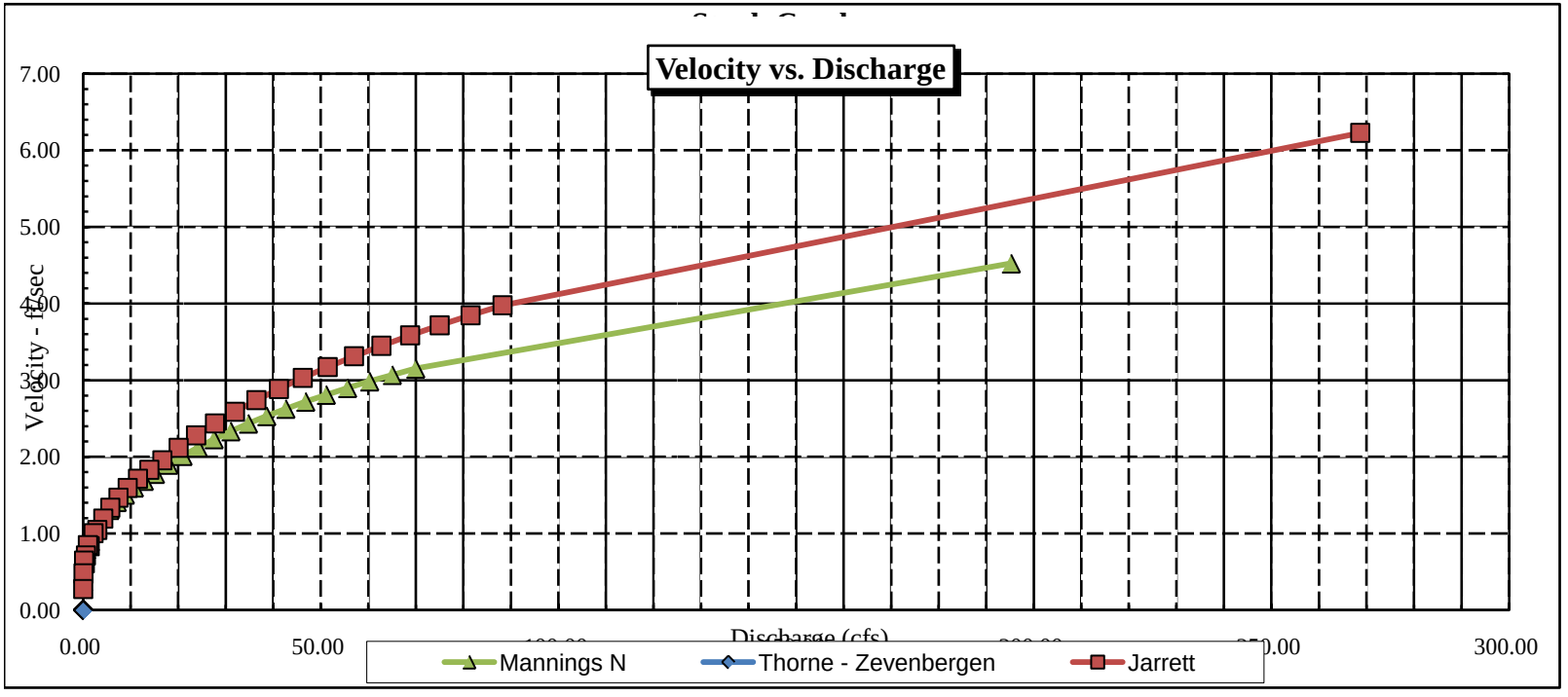
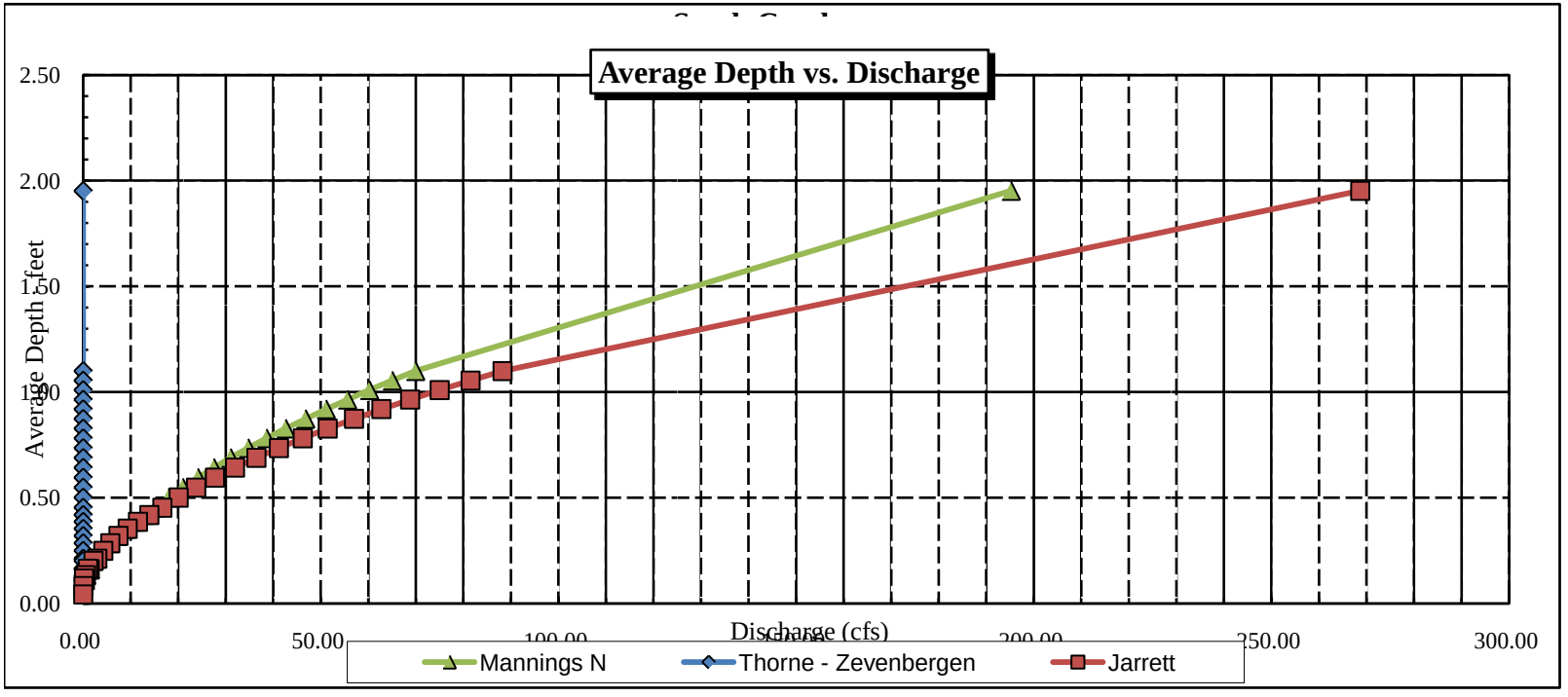
RECOMMENDATION BY: …………………...………..……............................... AGENCY..……………………….....…….....…...……...... DATE:......…...…......……………

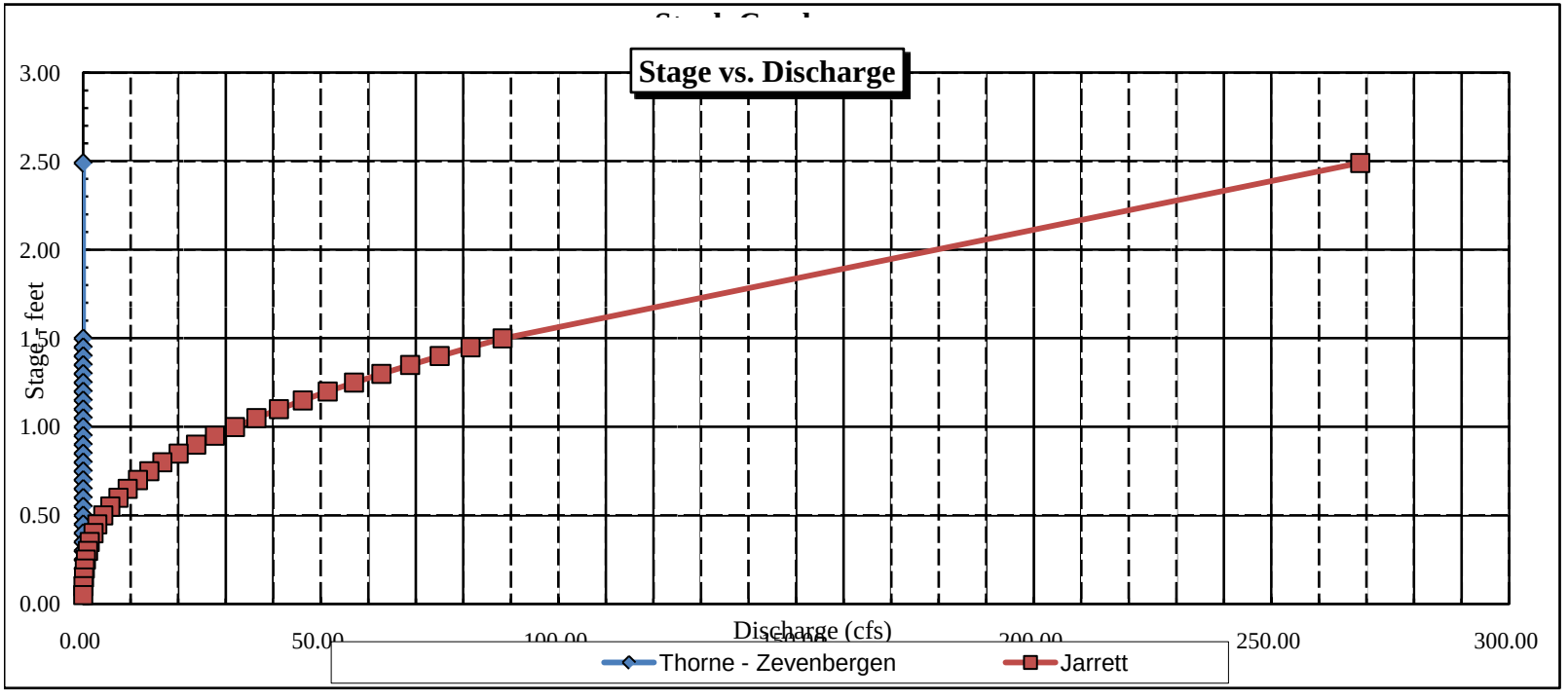
CWCB REVIEW BY: ..……………………………....……………………………………………………..…............ DATE:.................…………….....


CROSS SECTION DATA ANALYSIS
RS
G
W
W
G
LS
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


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
50.00
300.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
50.00
300.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth, feet
2.50
2.00
1.50
1.00
0.50
0.00
0.00
50.00
100.00
200.00
250.00
300.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Stage - feet
0.00
50.00
250.00
300.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Stuck Creek						CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: Approx 2 miles upstream from confluence with Laramie River						
DATE: 8-4-10	OBSERVERS: R. Smith, P. Belcher					
LEGAL DESCRIPTION	¼ SECTION: NENE	SECTION: 33	TOWNSHIP: 12 (N)/S	RANGE: 77 E/(W)	PM: 6 th	
COUNTY: Larimer	WATERSHED: Laramie R.	WATER DIVISION:	DOW WATER CODE: 12310			
MAPS,	USGS:					
	USFS:					

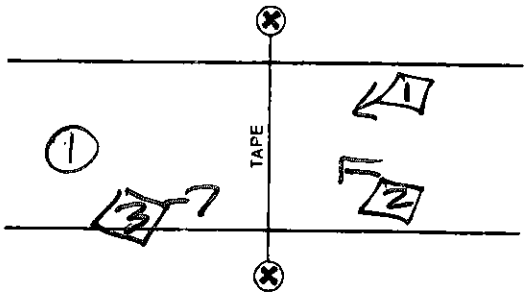
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO	METER TYPE: M-M			
METER NUMBER	DATE RATED:	CALIB/SPIN. ____ sec	TAPE WEIGHT: ____ lbs/foot	TAPE TENSION: ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: 2" cobble to 1-foot boulders	PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(X) Tape @ Stake LB	0.0	surveyed
(X) Tape @ Stake RB	0.0	surveyed
(1) WS @ Tape LB/RB	0.0	4.24 / 4.24
(2) WS Upstream	25.7	3.72
(3) WS Downstream	33.3	4.62
SLOPE	0.90 / 59.0 =	0.015

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
(NO)		(NO)	(YES)

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
see report																	

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

COMMENTS

pH = 8.1 TDS = 100 Temp = 16.5° C
Willow - cottonwood riparian - mostly willow.

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Stuck Creek	CROSS-SECTION NO.: 2	DATE: 8-4-10	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: ____ ft	TIME: 11:45 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)
RS	0.0		1.82								
	2.0		2.52								
G	2.3		2.74								
W	2.8		4.24		↓						
	3		4.30		—			—			
	4		4.30		0.05			—			
	4.5		4.35		0.10			0.08			
	5.5		4.45		0.2			0.48			
	6.5		4.35		0.1			0.4			
	(rock)										
	7.5		4.55		0.3			1.43			
	8.0		4.60		0.35			2.36			
	8.5		4.60		0.35			1.7			
	9.0		4.50		0.25			1.71			
	9.5		4.60		0.35			1.57			
	10.0		4.45		0.2			1.11			
	10.5		4.50		0.25			1.54			
	11.0		4.65		0.4			1.54			
	11.5		4.60		0.35			1.91			
	12.0		4.65		0.4			1.11			
	12.5		4.55		0.3			1.27			
rock	13.0		4.35		0.1			1.28			
	13.5		4.65		0.4			1.42			
	14.0		4.65		0.4			1.12			
	14.5		4.65		0.4			1.33			
	15.0		4.55		0.3			0.35			
	15.5		4.40		0.15			0.44			
	16.0		4.45		0.2			0.79			
W	16.4		4.24								
G	16.7		2.58								
	17.0		2.50								
LS	17.6		2.56								
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:	Stuck Creek
XS LOCATION:	3 miles upstream fr conf w Laramie R.
XS NUMBER:	2
DATE:	4-Aug-10
OBSERVERS:	R. Smith, P. Belcher
1/4 SEC:	NE NE
SECTION:	33
TWP:	12N
RANGE:	77W
PM:	6th
COUNTY:	Larimer
WATERSHED:	Laramie River
DIVISION:	1
DOW CODE:	12310
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:	0.015

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

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

STREAM NAME: Stuck Creek
XS LOCATION: 3 miles upstream fr conf w Laramie R.
XS NUMBER: 2

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
RS	0.00	1.82			0.00		0.00	0.00	0.0%
	2.00	2.52			0.00		0.00	0.00	0.0%
1 G	2.30	2.74			0.00		0.00	0.00	0.0%
W	2.80	4.24	0.00	0.00	0.00		0.00	0.00	0.0%
	3.00	4.30	0.00	0.00	0.00		0.00	0.00	0.0%
	4.00	4.30	0.05	0.00	1.00	0.05	0.04	0.00	0.0%
	4.50	4.35	0.10	0.08	0.50	0.10	0.08	0.01	0.1%
	5.50	4.45	0.20	0.48	1.00	0.20	0.20	0.10	2.3%
	6.50	4.35	0.10	0.40	1.00	0.10	0.10	0.04	1.0%
	7.50	4.55	0.30	1.43	1.02	0.30	0.23	0.32	7.8%
	8.00	4.60	0.35	2.36	0.50	0.35	0.18	0.41	10.1%
	8.50	4.60	0.35	1.70	0.50	0.35	0.18	0.30	7.2%
	9.00	4.50	0.25	1.71	0.51	0.25	0.13	0.21	5.2%
	9.50	4.60	0.35	1.57	0.51	0.35	0.18	0.27	6.7%
	10.00	4.45	0.20	1.11	0.52	0.20	0.10	0.11	2.7%
	10.50	4.50	0.25	1.54	0.50	0.25	0.13	0.19	4.7%
	11.00	4.65	0.40	1.54	0.52	0.40	0.20	0.31	7.5%
	11.50	4.60	0.35	1.94	0.50	0.35	0.18	0.34	8.3%
	12.00	4.65	0.40	1.10	0.50	0.40	0.20	0.22	5.4%
	12.50	4.55	0.30	1.87	0.51	0.30	0.15	0.28	6.8%
	13.00	4.35	0.10	1.28	0.54	0.10	0.05	0.06	1.6%
	13.50	4.65	0.40	1.42	0.58	0.40	0.20	0.28	6.9%
	14.00	4.65	0.40	1.12	0.50	0.40	0.20	0.22	5.5%
	14.50	4.65	0.40	1.33	0.50	0.40	0.20	0.27	6.5%
	15.00	4.55	0.30	0.35	0.51	0.30	0.15	0.05	1.3%
	15.50	4.40	0.15	0.44	0.52	0.15	0.08	0.03	0.8%
	16.00	4.45	0.20	0.79	0.50	0.20	0.09	0.07	1.7%
W	16.40	4.24	0.00	0.00	0.45		0.00	0.00	0.0%
1 G	16.70	2.58			0.00		0.00	0.00	0.0%
	17.00	2.50			0.00		0.00	0.00	0.0%
LS	17.60	2.56			0.00		0.00	0.00	0.0%
TOTALS ----------					13.72	0.4 (Max.)	3.20	4.11	100.0%

Manning's n = 0.0538
Hydraulic Radius= 0.23335405

STREAM NAME: Stuck Creek
XS LOCATION: 3 miles upstream fr conf w Laramie R.
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.20	2.96	-7.6%
4.02	3.20	6.37	98.9%
4.04	3.20	6.10	90.3%
4.06	3.20	5.82	81.8%
4.08	3.20	5.55	73.2%
4.10	3.20	5.27	64.7%
4.12	3.20	5.00	56.2%
4.14	3.20	4.73	47.6%
4.16	3.20	4.46	39.1%
4.18	3.20	4.18	30.6%
4.20	3.20	3.91	22.1%
4.22	3.20	3.64	13.6%
4.23	3.20	3.50	9.3%
4.24	3.20	3.37	5.1%
4.25	3.20	3.23	0.9%
4.26	3.20	3.09	-3.4%
4.27	3.20	2.96	-7.6%
4.28	3.20	2.83	-11.8%
4.29	3.20	2.69	-15.9%
4.30	3.20	2.56	-20.1%
4.31	3.20	2.44	-23.9%
4.32	3.20	2.32	-27.7%
4.34	3.20	2.08	-35.1%
4.36	3.20	1.84	-42.4%
4.38	3.20	1.62	-49.3%
4.40	3.20	1.41	-55.9%
4.42	3.20	1.22	-61.9%
4.44	3.20	1.04	-67.4%
4.46	3.20	0.88	-72.4%
4.48	3.20	0.74	-77.0%
4.50	3.20	0.60	-81.3%
4.52	3.20	0.47	-85.3%

WATERLINE AT ZERO
AREA ERROR = 4.252

STREAM NAME: Stuck Creek
XS LOCATION: 3 miles upstream fr conf w Laramie R.
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	2.74	14.37	1.69	1.91	24.34	17.04	100.0%	1.43	104.54	4.29
	3.25	14.11	1.21	1.40	17.05	15.98	93.8%	1.07	60.29	3.54
	3.30	14.08	1.16	1.35	16.35	15.87	93.2%	1.03	56.44	3.45
	3.35	14.06	1.11	1.30	15.64	15.77	92.6%	0.99	52.68	3.37
	3.40	14.03	1.06	1.25	14.94	15.67	92.0%	0.95	49.01	3.28
	3.45	14.01	1.02	1.20	14.24	15.56	91.3%	0.92	45.44	3.19
	3.50	13.98	0.97	1.15	13.54	15.46	90.7%	0.88	41.97	3.10
	3.55	13.95	0.92	1.10	12.84	15.36	90.1%	0.84	38.59	3.00
	3.60	13.93	0.87	1.05	12.15	15.25	89.5%	0.80	35.33	2.91
	3.65	13.90	0.82	1.00	11.45	15.15	88.9%	0.76	32.16	2.81
	3.70	13.88	0.78	0.95	10.76	15.05	88.3%	0.71	29.11	2.71
	3.75	13.85	0.73	0.90	10.06	14.94	87.7%	0.67	26.17	2.60
	3.80	13.83	0.68	0.85	9.37	14.84	87.1%	0.63	23.35	2.49
	3.85	13.80	0.63	0.80	8.68	14.74	86.5%	0.59	20.65	2.38
	3.90	13.77	0.58	0.75	7.99	14.63	85.9%	0.55	18.07	2.26
	3.95	13.75	0.53	0.70	7.30	14.53	85.3%	0.50	15.63	2.14
	4.00	13.72	0.48	0.65	6.62	14.43	84.7%	0.46	13.32	2.01
	4.05	13.70	0.43	0.60	5.93	14.32	84.1%	0.41	11.15	1.88
	4.10	13.67	0.38	0.55	5.25	14.22	83.5%	0.37	9.14	1.74
	4.15	13.65	0.33	0.50	4.56	14.11	82.8%	0.32	7.28	1.59
	4.20	13.62	0.29	0.45	3.88	14.01	82.2%	0.28	5.59	1.44
WL	4.25	13.54	0.24	0.40	3.20	13.86	81.4%	0.23	4.08	1.27
	4.30	12.26	0.21	0.35	2.53	12.57	73.8%	0.20	2.95	1.16
	4.35	11.63	0.17	0.30	1.94	11.92	70.0%	0.16	1.95	1.01
	4.40	10.05	0.14	0.25	1.39	10.29	60.4%	0.14	1.24	0.89
	4.45	7.86	0.12	0.20	0.95	8.06	47.3%	0.12	0.77	0.81
	4.50	6.57	0.09	0.15	0.59	6.71	39.4%	0.09	0.39	0.67
	4.55	5.09	0.06	0.10	0.29	5.17	30.4%	0.06	0.15	0.50
	4.60	2.68	0.03	0.05	0.09	2.71	15.9%	0.03	0.03	0.34

STREAM NAME: Stuck Creek
XS LOCATION: 3 miles upstream fr conf w Laramie R.
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	4.11	cfs
CALCULATED FLOW (Qc)=	4.08	cfs
(Qm-Qc)/Qm * 100 =	0.7	%
MEASURED WATERLINE (WLm)=	4.27	ft
CALCULATED WATERLINE (WLc)=	4.25	ft
(WLm-WLc)/WLm * 100 =	0.4	%
MAX MEASURED DEPTH (Dm)=	0.40	ft
MAX CALCULATED DEPTH (Dc)=	0.40	ft
(Dm-Dc)/Dm * 100	0.5	%
MEAN VELOCITY=	1.27	ft/sec
MANNING'S N=	0.054	
SLOPE=	0.015	ft/ft
.4 * Qm =	1.6	cfs
2.5 * Qm=	10.3	cfs

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

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

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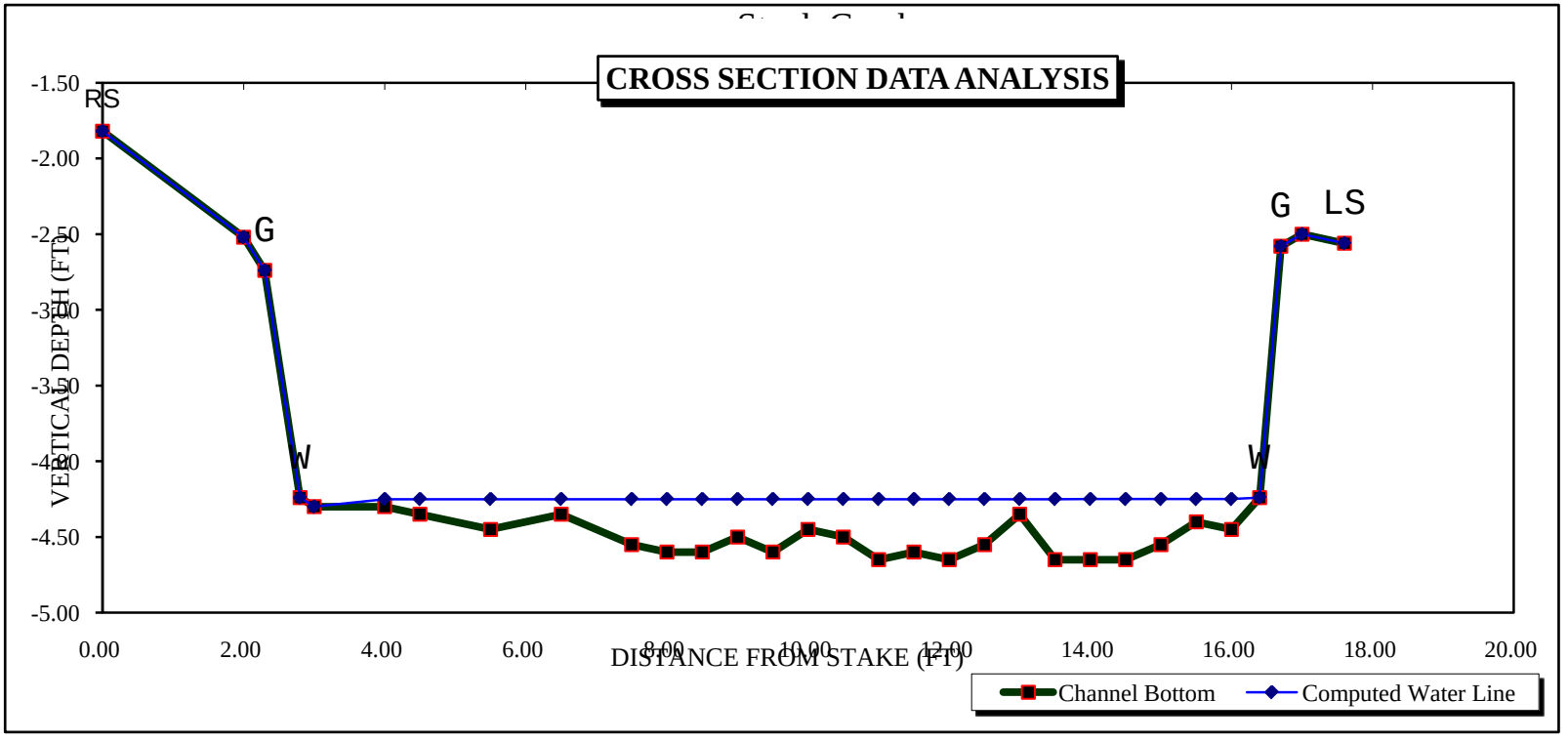
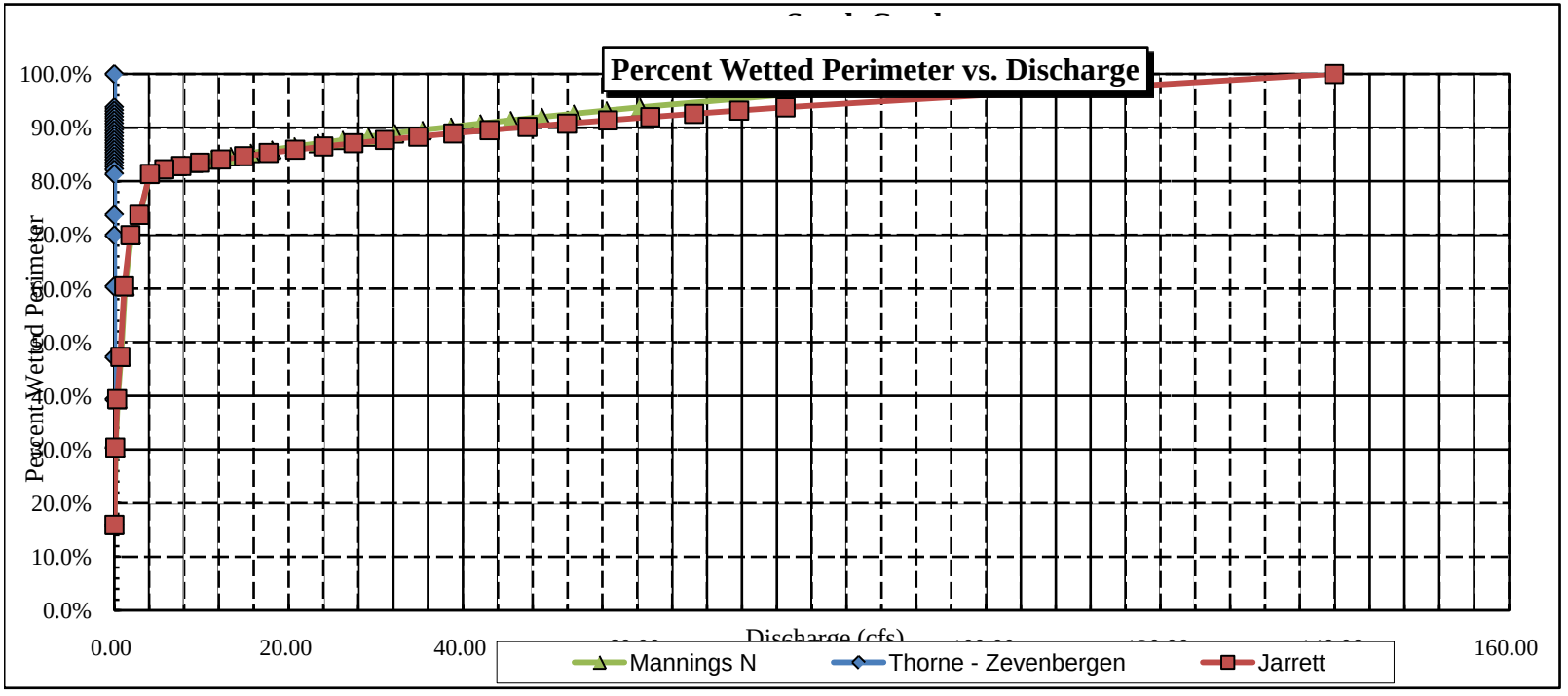
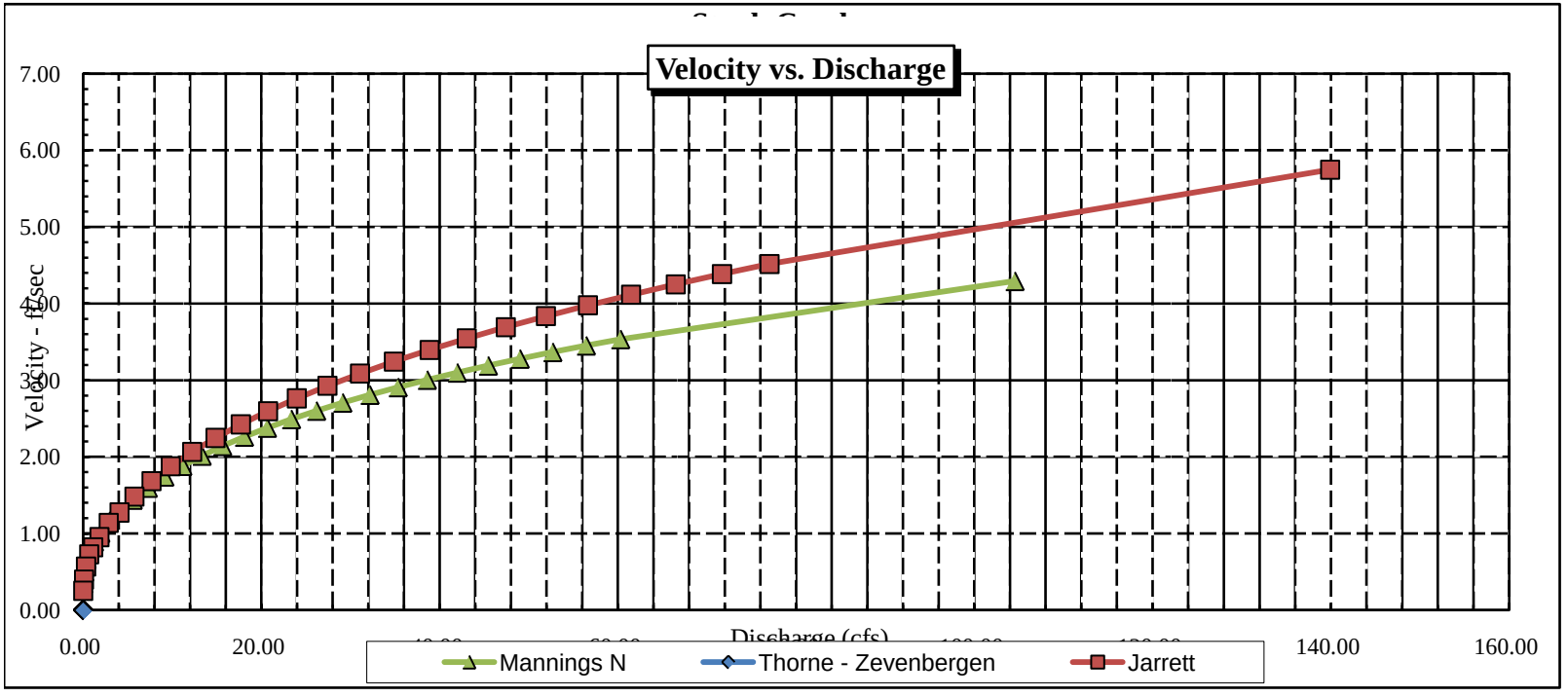
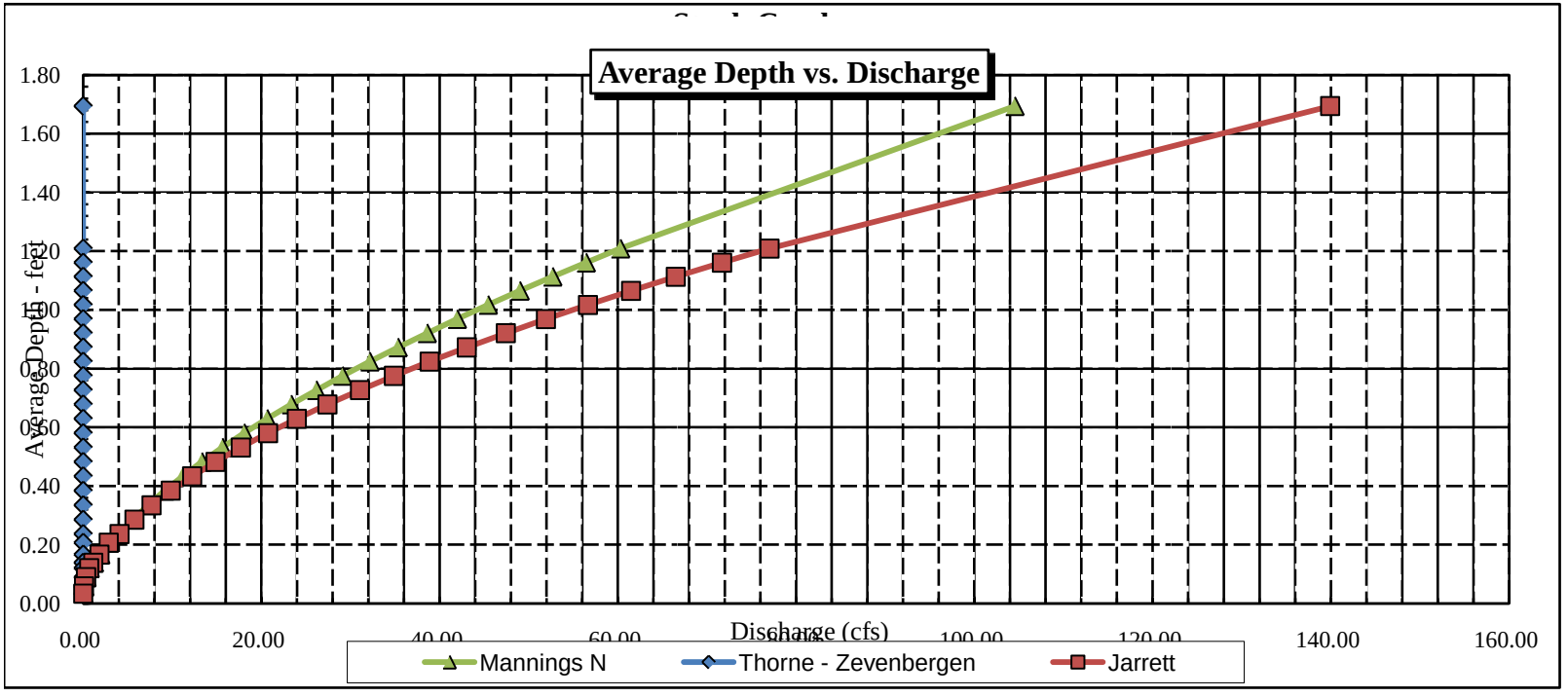
RECOMMENDATION BY: …………………...………..……............................... AGENCY...……………………......……....…....……...... DATE:......…...…......……………

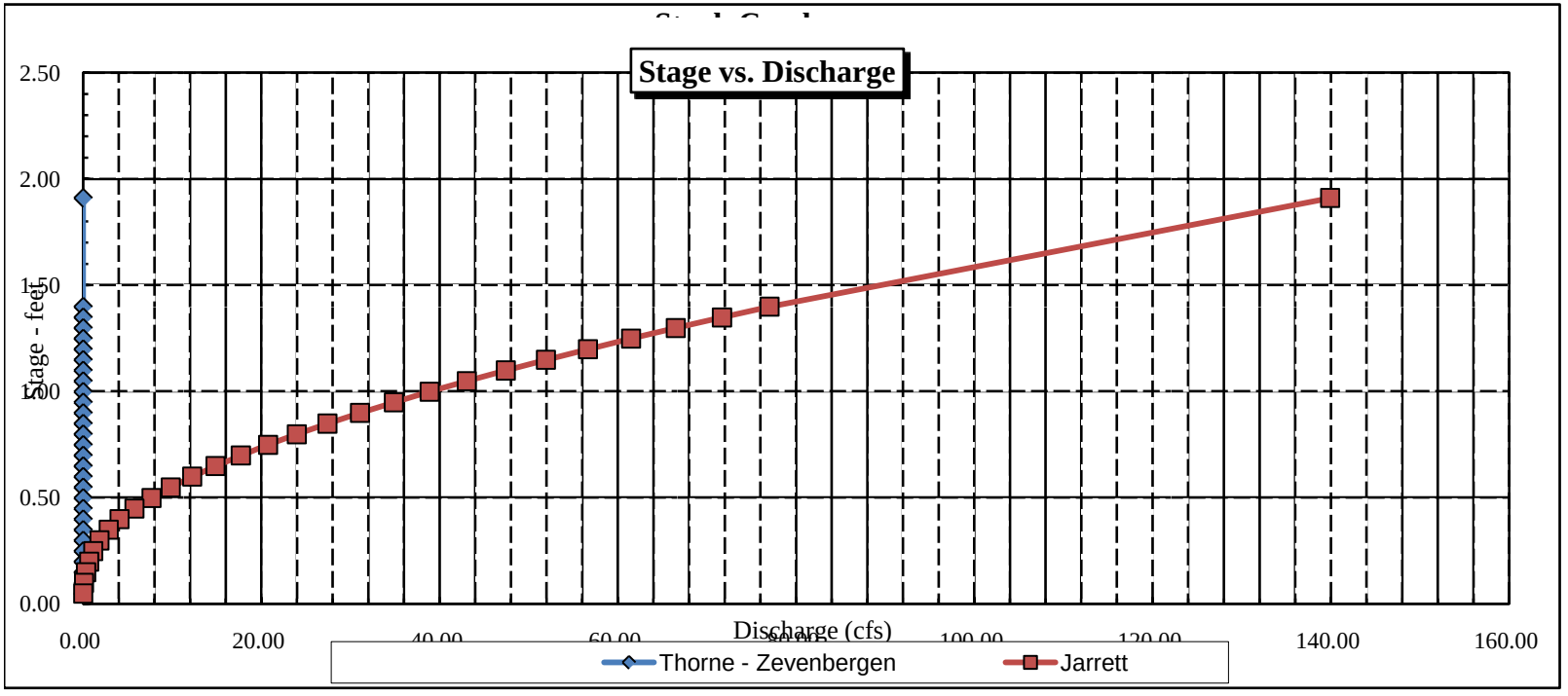
CWCB REVIEW BY: ..…………………………....………………………………………………...….............. DATE:.................…………….....


CROSS SECTION DATA ANALYSIS
RS
G
W
W
G
LS
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00
VERTICAL DEPTH (FT)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


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
160.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
20.00
140.00
160.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
20.00
40.00
60.00
100.00
120.00
140.00
160.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
2.50
2.00
1.50
1.00
0.50
0.00
Stage - feet
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett