United States Department of the Interior
BUREAU OF LAND MANAGEMENT
Colorado State Office
2850 Youngfield Street
Lakewood, Colorado 80215-7210
www.co.blm.gov

In Reply Refer To:
7250 (CO-930)

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 instream flow water rights on Left Fork Carr Creek, located in Water Division 5.

Location and Land Status. Left Fork Carr Creek originates between Henderson Ridge and Horse Ridge, approximately 11 miles east of Douglas Pass, and flows into Carr Creek. This recommendation covers the stream reach beginning at the headwaters and extends downstream to the headgate of the Franklin No. 2 Ditch, located within the SW ¼, Section 1, T6S R100W. This stream reach covers a distance of approximately 6.8 miles. BLM manages 3.36 miles of this stream reach, while 3.44 miles are in private ownership.

Biological Summary. Left Fork Carr Creek is a cold-water, high gradient stream in a narrow canyon. The stream is confined by bedrock and generally has large substrate. The stream has a good mix of riffle, run, and deep pool habitats to support a salmonid fishery.

Fisheries surveys have revealed self-sustaining population of genetically pure native cutthroat trout, which are a priority conservation species for the BLM. Intensive macro-invertebrate surveys have not been conducted, but spot samples have revealed various species of mayfly, caddisfly, and stonefly.

The riparian community along Left Fork Carr Creek is robust and recovering from historic grazing practices, providing good cover and shading for the stream. The riparian community is comprised mainly of narrowleaf cottonwood, willow, and dogwood.

R2Cross Analysis. The BLM collected the following R2Cross data from Left Fork Carr 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)
05/16/2012 #1	1.62 cfs	15.4 feet	1.35 cfs	2.20 cfs
05/16/2012 #2	1.82 cfs	10.7 feet	1.59 cfs	1.74 cfs
		Averages:	1.47 cfs	1.97 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.

> 2.0 cubic feet per second is recommended for the snowmelt runoff and high temperature period from April 1 through August 31. This recommendation is driven by the average velocity and depth criteria. This creek experiences consistently low flows during late summer and fall, so it is important to protect as much physical habitat as possible during the limited time when snowmelt runoff and early summer flows are available.
>
> 1.0 cubic feet per second is recommended for the fall period, from September 1 to October 31. This recommendation is driven by the wetted perimeter criteria. This flow rate is capable of maintaining pool habitat in the creek and preventing excessively water high temperatures.
>
> 0.75 cubic feet per second is recommended for the late fall and winter period from November 1 to March 31. This recommendation is driven by limited water availability. This flow rate meets the wetted perimeter criteria and provides an average velocity of 0.75 feet per second. It should provide sufficient flow to prevent pools from freezing and protect overwintering fish.

Water Availability. There are several sources of water availability information that could be used for this creek. The U.S. Geological Survey (USGS) Gage 09094400 on Clear Creek near DeBeque is located on another creek within the Roan Creek watershed that is similarly situated, in terms of elevation, aspect, and snowfall. Adjustments to this gage could be made based upon the relative sizes of the Left Fork Carr Creek watershed and the Clear Creek watershed. In addition, a basin apportionment analysis could be performed on USGS Gage 09094200 on Roan Creek above Clear Creek. The BLM also recommends consulting the StreamStats package developed jointly between the U.S. Geological Survey and the Colorado Water Conservation Board (CWCB).

The BLM is not aware of any decreed water rights within the proposed instream flow reach.

Relationship to Land Management Plans. The BLM's inventories of conditions in the Left Fork Carr Creek watershed indicate that it is in largely natural condition, with very little surface disturbance and very little development other than trails, two-track roads and limited livestock grazing infrastructure. The BLM intends to continue management of the watershed for natural conditions and processes. Appropriation of an instream flow water right would assist the BLM in long-term management of outstanding riparian values and important fishery values.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with the BLM's draft recommendation in February 2013. We thank both Colorado Parks and Wildlife and the CWCB for their cooperation in this effort.

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

Sincerely,

Leigh D. Espy
Deputy State Director, Resources and Fire

cc: Jim Cagney NW District
Katie Stevens, Grand Junction FO
Nate Dieterich, Grand Junction FO

DRAFT INSTREAM FLOW RECOMMENDATION

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>
> 1.5 cubic feet per second is recommended for the fall period, from September 1 to October 31. This recommendation is driven by the wetted perimeter criteria. This flow rate is capable of maintaining pool habitat in the creek and preventing excessively water high temperatures.
>
> 0.8 cubic feet per second is recommended for the late fall and winter period from September 1 to March 31. This recommendation is driven by limited water availability. This flow rate meets the wetted perimeter criteria and provides an average velocity of 0.75 feet per second. It should provide sufficient flow to prevent pools from freezing and protect overwintering fish.

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Relationship to Land Management Plans. BLM's inventories of conditions on BLM lands in the Left Fork Carr Creek watershed indicate that it is in largely natural condition, with very little surface disturbance and very little development other than trails, two-track roads and limited livestock grazing infrastructure. BLM intends to continue management of the watershed for natural conditions and processes. Appropriation of an instream flow water right would assist BLM in long-term management of outstanding riparian values and important fishery values.

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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: Catherine Robertson, Grand Junction FO
Nate Dieterich, Grand Junction FO

Water: Left Fork of Carr Creek
Date: 06/24/2009
Location:On Private land-just upstream of confluence with Bear Gulch
Drainage: Colorado
Water Code:19691
UTM Zone: 12
UTM X: 0713101
UTM Y: 4381691
Station Length = Not determined
Station Width = Not determined
Crew: L. Martin, D.Tremblay, A. Romero

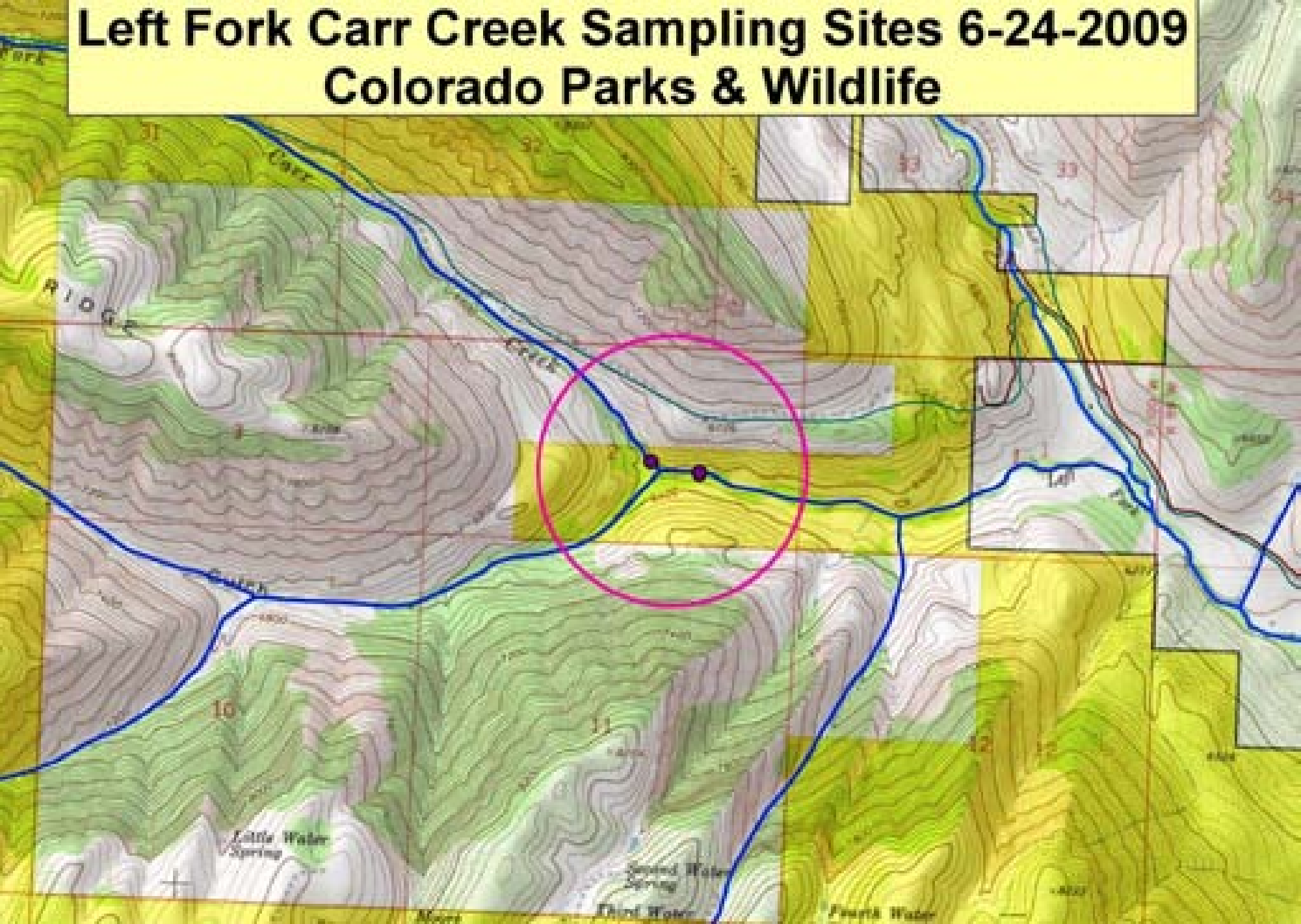
Notes: The objective of the sample was to determine fish species presence and composition, specifically related to cutthroat trout. The creek was spot electrofished with a Smith-Root LR 24 backpack electrofisher. Conductivity and salinity were not measured. Twelve upper caudal fin clips were collected for genetic analysis. Photos available.

Species	Count	Length (mr	Weight (g)	Status	Mark	TagID	
CRN	1	162	40.5	1			Fin clip #22
CRN	1	194	75.5	1			Fin clip #23
CRN	1	213	84	1			Fin clip #24
CRN	1	187	59	1			Fin clip #25
CRN	1	148	27.5	1			Fin clip #26
CRN	1	170	45	1			Fin clip #27
CRN	1	65	2.5	1			
CRN	1	117	14.5	1			
CRN	1	133	15.5	1			Left eye bulged
CRN	1	74	3.5	1			
CRN	1	155	35	1			Fin clip #28
CRN	1	135	22	1			Fin clip #29
CRN	1	78	2.5	1			
CRN	1	148	29.5	1			Fin clip #30
CRN	1	172	28	1			Fin clip #31
CRN	1	160	42	1			Fin clip #32
CRN	1	142	25	1			Fin clip #33
CRN	1	148	26.5	1			
CRN	1	149	30	1			
CRN	1	119	15.5	1			
CRN	1	130	18	1			

Water: Left Fork of Carr Creek
Date: 06/24/2009
Location: On Private land-Just downstream of confluence with Bear Gulch
Drainage: Colorado
Water Code:19691
UTM Zone: 12
UTM X: 0713311
UTM Y: 4381659
Station Length = 354.6 feet
Station Width = 21.7 feet
Crew: L. Martin, D. Tremblay, A. Romero
Notes: The objective of this sample was to determine fish species presence and composition, specifically related to cutthroat trout. The creek was electrofished with a Smith-Root LR 24 electrofisher. A two pass (depletion) was performed. At 10:00am, conductivity measured 441.8 microsiemens at 8.5 degrees C and 645 microsiemens at 25 degrees C. Salinity was measured at 0.3 parts per thousand. Twenty-one upper caudal fin clips were collected for genetic analysis. Photos available.

Species	Count	Length (mr	Weight (g)	Status	Mark	TagID	
CRN	1	184	70	1			Fin clip #1
CRN	1	154	34.5	1			Fin clip #2;deformed gill plate
CRN	1	139	28	1			Fin clip #3
CRN	1	224	90.5	1			Fin clip #4
CRN	1	240	144	1			Fin clip $5
CRN	1	177	62.5	1			Fin clip $#6
CRN	1	190	75	1			Fin clip #7
CRN	1	162	45	1			Fin clip #8
CRN	1	187	62.5	1			Fin clip #9
CRN	1	163	47	1			Fin clip #10
CRN	1	175	53	1			Fin clip #11
CRN	1	84	5.5	1			
CRN	1	155	33	1			Fin clip #12
CRN	1	164	49.5	1			Fin clip #13
CRN	1	190	59.5	1			Fin clip #14
CRN	1	139	24.5	1			Fin clip #15
CRN	1	143	31	1			Fin clip #16
CRN	1	155	37.5	1			Fin clip #17
CRN	1	134	22.5	2			Fin clip #18
CRN	1	95	8	2			
CRN	1	165	39.5	2			Fin clip #19;bent gill plate
CRN	1	183	58	2			Fin clip #20
CRN	1	203	90	2			Fin clip #21

Left Fork Carr Creek Sampling Sites 6-24-2009
Colorado Parks & Wildlife



COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Left Fork Carr Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: Approx. 1.25 miles upstream from conf. w/ Carr Creek						
DATE: 5-16-12	OBSERVERS: R. Smith, N. Diederich					
LEGAL DESCRIPTION	¼ SECTION: SW SW	SECTION: 1	TOWNSHIP: 6 N/S	RANGE: 100 E/W	PM: 6th	
COUNTY: Garfield	WATERSHED: Roan Creek	WATER DIVISION: 5	DOW WATER CODE: 19691			
MAP(S): USGS: Henderson Ridge 7.5'	GPS Zone 12S 713381					
USFS:	4381616					

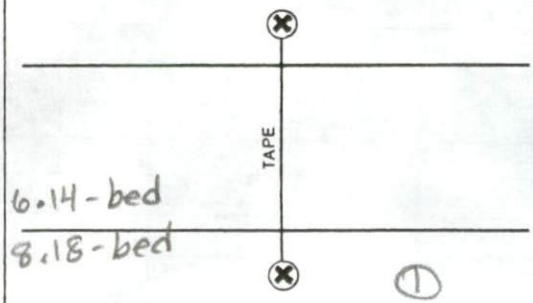
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES/NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: gravel to 6" cobbles	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	7.03/7.03
② WS Upstream	85.5	5.87
③ WS Downstream	53.0	7.83
SLOPE	1.96/138.5 =	

SKETCH



LEGEND:
Stake ⊗
Station ①
Photo ◇①
Direction of Flow

AQUATIC SAMPLING SUMMARY

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

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

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

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

mayfly, caddisfly, stonefly

COMMENTS

Ph = 8.13
Cond = 313 temp. corrected
Temp = 9.8° C
Salinity = 0.2

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Left Fork Carr Creek | CROSS-SECTION NO: 1 | DATE: 5-16-12 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 12:50 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	0.0		5.76								
	2.0		5.80								
	4.0		6.04								
G	4.8		6.06								
	6.5		6.79								
W	7.0		7.03								
	7.5		7.08	.05				.26			
	8		7.13	.10				.85			
	8.5		7.18	.15				.77			
	9		7.18	.15				.98			
	9.5		7.23	.20				.73			
	10		7.23	.20				.71			
	10.5		7.33	.30				.60			
	11		7.33	.30				.84			
	11.4		7.18	.15				1.04			
	11.8		7.28	.25				1.47			
	12.2		7.38	.35				1.41			
	12.6		7.33	.30				1.46			
	13		7.28	.25				1.55			
	13.4		7.33	.30				1.45			
	13.8		7.13	.10				1.16			
	14.2		7.23	.20				1.41			
	14.6		7.08	.05				0.73			
	15		7.08	.05				0.59			
	15.4		7.08	.05				∅			
	15.8		7.03	∅				∅			
W	16.0		7.03								
	17.5		6.80								
G	18.0		6.02								
	19.0		6.07								
RS	21.0		6.12								
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:	Left Fork Carr Creek
XS LOCATION:	1.25 mi upstream fr conf w/ Carr Creek
XS NUMBER:	1
DATE:	16-May-12
OBSERVERS:	R. Smith, N. Dieterich
1/4 SEC:	SW SW
SECTION:	1
TWP:	6S
RANGE:	100W
PM:	Sixth
COUNTY:	Garfield
WATERSHED:	Roan Creek
DIVISION:	5
DOW CODE:	19691
USGS MAP:	Henderson Ridge
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:	0.014

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

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

STREAM NAME: Left Fork Carr Creek
XS LOCATION: 1.25 mi upstream fr conf w/ Carr Creek
XS NUMBER: 1

DATA POINTS= 31

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
LS	0.00	5.76			0.00		0.00	0.00	0.0%
	2.00	5.80			0.00		0.00	0.00	0.0%
	4.00	6.04			0.00		0.00	0.00	0.0%
1 G	4.80	6.06			0.00		0.00	0.00	0.0%
	6.50	6.79			0.00		0.00	0.00	0.0%
W	7.00	7.03	0.00	0.00	0.00		0.00	0.00	0.0%
	7.50	7.08	0.05	0.26	0.50	0.05	0.03	0.01	0.4%
	8.00	7.13	0.10	0.85	0.50	0.10	0.05	0.04	2.6%
	8.50	7.18	0.15	0.77	0.50	0.15	0.08	0.06	3.6%
	9.00	7.18	0.15	0.98	0.50	0.15	0.08	0.07	4.5%
	9.50	7.23	0.20	0.73	0.50	0.20	0.10	0.07	4.5%
	10.00	7.23	0.20	0.71	0.50	0.20	0.10	0.07	4.4%
	10.50	7.33	0.30	0.60	0.51	0.30	0.15	0.09	5.5%
	11.00	7.33	0.30	0.84	0.50	0.30	0.14	0.11	7.0%
	11.40	7.18	0.15	1.04	0.43	0.15	0.06	0.06	3.8%
	11.80	7.28	0.25	1.47	0.41	0.25	0.10	0.15	9.1%
	12.20	7.38	0.35	1.41	0.41	0.35	0.14	0.20	12.2%
	12.60	7.33	0.30	1.46	0.40	0.30	0.12	0.18	10.8%
	13.00	7.28	0.25	1.55	0.40	0.25	0.10	0.16	9.5%
	13.40	7.33	0.30	1.45	0.40	0.30	0.12	0.17	10.7%
	13.80	7.13	0.10	1.16	0.45	0.10	0.04	0.05	2.9%
	14.20	7.23	0.20	1.41	0.41	0.20	0.08	0.11	6.9%
	14.60	7.08	0.05	0.73	0.43	0.05	0.02	0.01	0.9%
	15.00	7.08	0.05	0.59	0.40	0.05	0.02	0.01	0.7%
	15.40	7.08	0.05	0.00	0.40	0.05	0.02	0.00	0.0%
	15.80	7.03	0.00	0.00	0.40		0.00	0.00	0.0%
W	16.00	7.03	0.00	0.00	0.00		0.00	0.00	0.0%
	17.50	6.80			0.00		0.00	0.00	0.0%
1 G	18.00	6.02			0.00		0.00	0.00	0.0%
	19.00	6.07			0.00		0.00	0.00	0.0%
RS	21.00	6.12			0.00		0.00	0.00	0.0%
TOTALS ----------					8.97	0.35 (Max.)	1.53	1.62	100.0%

Manning's n = 0.0509
Hydraulic Radius= 0.17055194

STREAM NAME: Left Fork Carr Creek
XS LOCATION: 1.25 mi upstream fr conf w/ Carr Creek
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.53	1.53	0.0%
6.78	1.53	4.05	164.6%
6.80	1.53	3.83	150.2%
6.82	1.53	3.61	135.9%
6.84	1.53	3.40	121.9%
6.86	1.53	3.18	108.1%
6.88	1.53	2.98	94.6%
6.90	1.53	2.77	81.2%
6.92	1.53	2.57	68.1%
6.94	1.53	2.37	55.2%
6.96	1.53	2.18	42.6%
6.98	1.53	1.99	30.1%
6.99	1.53	1.90	24.0%
7.00	1.53	1.80	17.9%
7.01	1.53	1.71	11.9%
7.02	1.53	1.62	5.9%
7.03	1.53	1.53	0.0%
7.04	1.53	1.44	-5.7%
7.05	1.53	1.36	-11.3%
7.06	1.53	1.27	-16.7%
7.07	1.53	1.19	-22.1%
7.08	1.53	1.11	-27.3%
7.10	1.53	0.97	-36.4%
7.12	1.53	0.84	-45.2%
7.14	1.53	0.71	-53.6%
7.16	1.53	0.59	-61.6%
7.18	1.53	0.47	-69.1%
7.20	1.53	0.38	-75.3%
7.22	1.53	0.29	-80.9%
7.24	1.53	0.22	-85.5%
7.26	1.53	0.16	-89.4%
7.28	1.53	0.11	-93.0%

WATERLINE AT ZERO
AREA ERROR = 7.030

STREAM NAME: Left Fork Carr Creek
XS LOCATION: 1.25 mi upstream fr conf w/ Carr Creek
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	6.06	15.37	0.83	1.32	12.83	16.17	100.0%	0.79	37.98	2.96
	6.08	14.71	0.85	1.30	12.53	15.50	95.8%	0.81	37.55	3.00
	6.13	12.97	0.91	1.25	11.85	13.71	84.8%	0.86	37.11	3.13
	6.18	12.82	0.87	1.20	11.20	13.53	83.6%	0.83	34.11	3.04
	6.23	12.67	0.83	1.15	10.57	13.34	82.5%	0.79	31.23	2.96
	6.28	12.52	0.79	1.10	9.94	13.15	81.3%	0.76	28.45	2.86
	6.33	12.37	0.75	1.05	9.31	12.97	80.2%	0.72	25.79	2.77
	6.38	12.22	0.71	1.00	8.70	12.78	79.0%	0.68	23.24	2.67
	6.43	12.08	0.67	0.95	8.09	12.59	77.9%	0.64	20.80	2.57
	6.48	11.93	0.63	0.90	7.49	12.41	76.7%	0.60	18.48	2.47
	6.53	11.78	0.59	0.85	6.90	12.22	75.6%	0.56	16.27	2.36
	6.58	11.63	0.54	0.80	6.31	12.04	74.4%	0.52	14.18	2.25
	6.63	11.48	0.50	0.75	5.74	11.85	73.3%	0.48	12.21	2.13
	6.68	11.33	0.46	0.70	5.17	11.66	72.1%	0.44	10.36	2.01
	6.73	11.18	0.41	0.65	4.60	11.48	71.0%	0.40	8.64	1.88
	6.78	11.04	0.37	0.60	4.05	11.29	69.8%	0.36	7.05	1.74
	6.83	10.72	0.33	0.55	3.50	10.95	67.7%	0.32	5.65	1.61
	6.88	10.29	0.29	0.50	2.98	10.51	65.0%	0.28	4.43	1.49
	6.93	9.86	0.25	0.45	2.47	10.06	62.2%	0.25	3.35	1.35
	6.98	9.43	0.21	0.40	1.99	9.62	59.5%	0.21	2.40	1.21
WL	7.03	8.80	0.17	0.35	1.53	8.97	55.5%	0.17	1.62	1.06
	7.08	7.10	0.16	0.30	1.11	7.27	44.9%	0.15	1.10	0.99
	7.13	6.47	0.12	0.25	0.77	6.62	40.9%	0.12	0.64	0.82
	7.18	5.03	0.09	0.20	0.47	5.16	31.9%	0.09	0.33	0.70
	7.23	3.27	0.08	0.15	0.25	3.35	20.7%	0.08	0.16	0.62
	7.28	2.58	0.04	0.10	0.11	2.63	16.3%	0.04	0.04	0.41
	7.33	0.60	0.03	0.05	0.02	0.61	3.8%	0.02	0.00	0.29
	7.38	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Left Fork Carr Creek
XS LOCATION: 1.25 mi upstream fr conf w/ Carr Creek
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.62	cfs
CALCULATED FLOW (Qc)=	1.62	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	7.03	ft
CALCULATED WATERLINE (WLc)=	7.03	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.35	ft
MAX CALCULATED DEPTH (Dc)=	0.35	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.06	ft/sec
MANNING'S N=	0.051	
SLOPE=	0.014	ft/ft
.4 * Qm =	0.6	cfs
2.5 * Qm=	4.1	cfs

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

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

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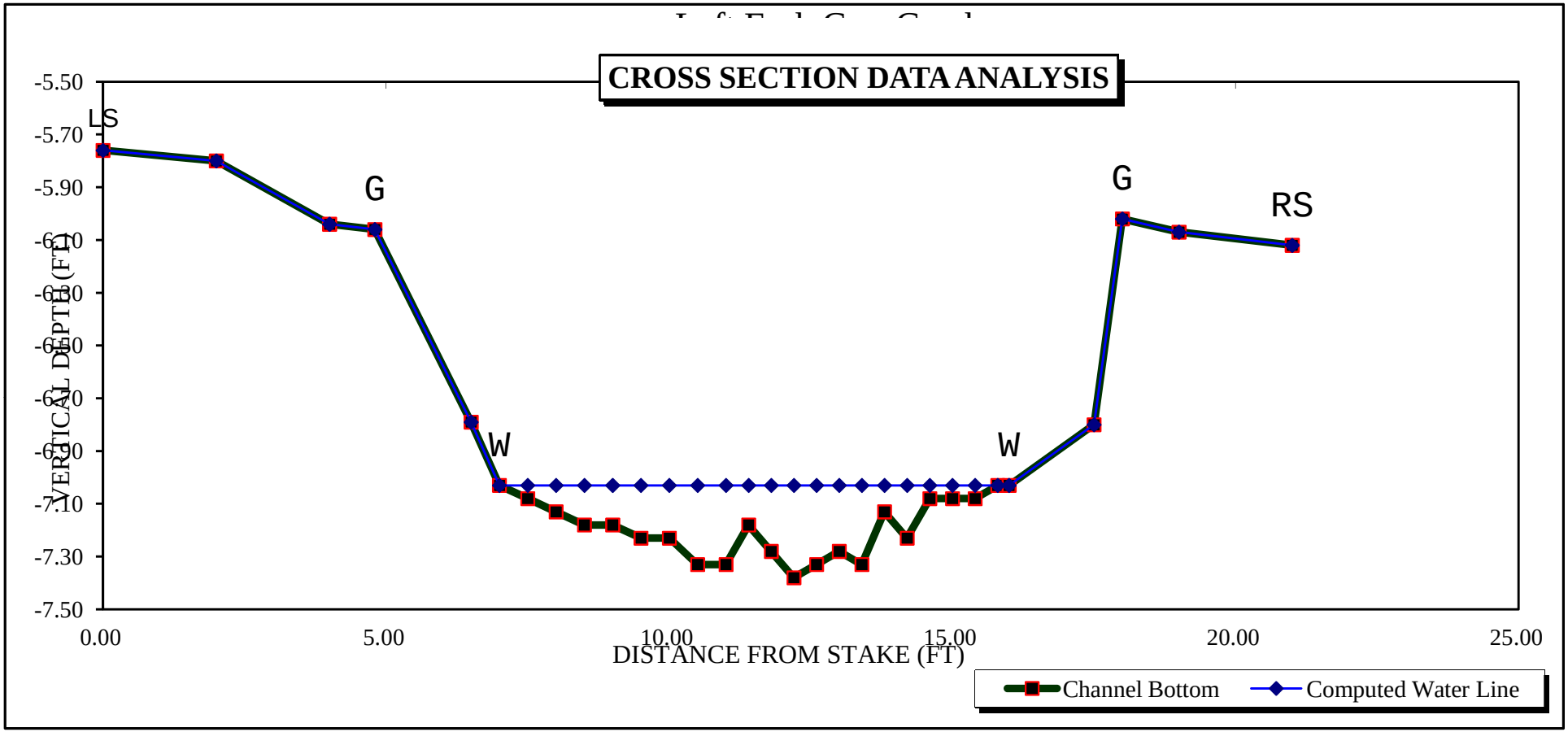
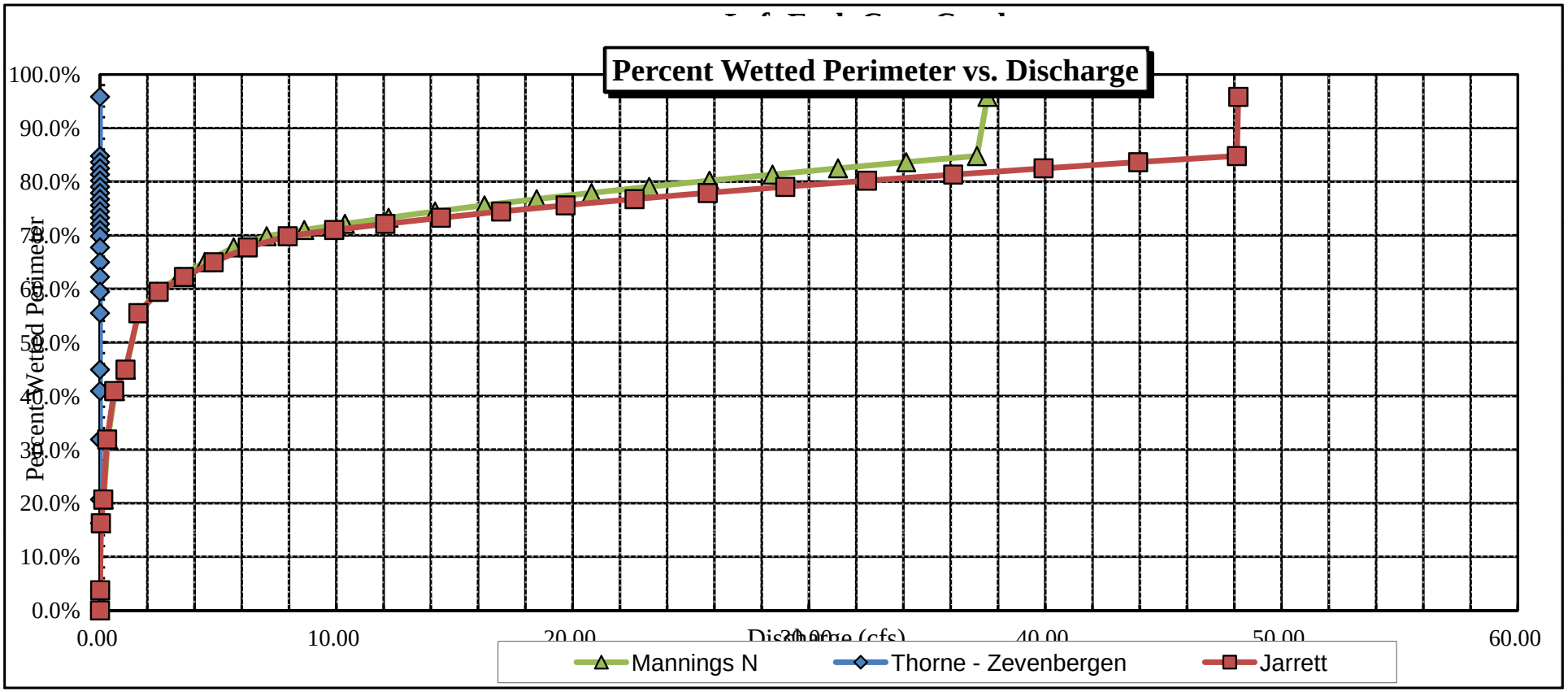
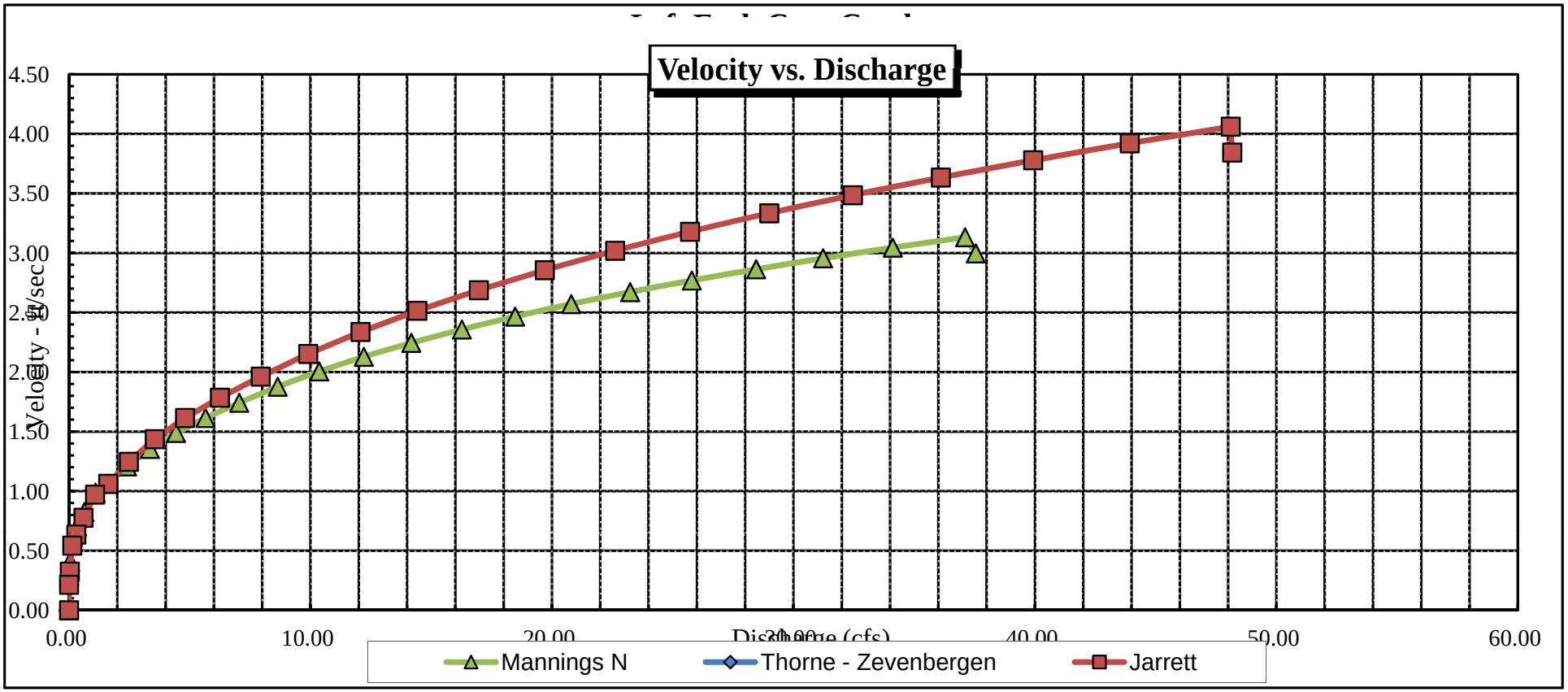
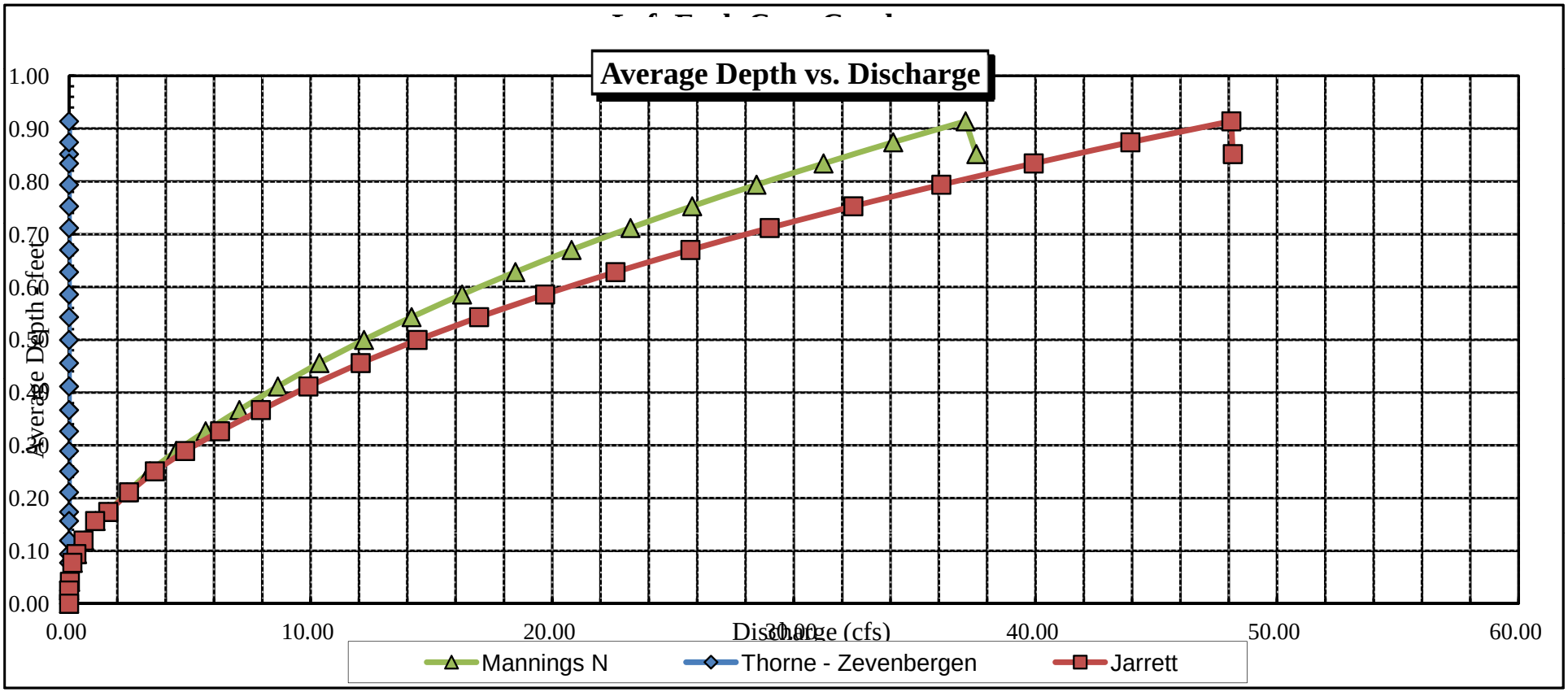
RECOMMENDATION BY: …………………...………..……............................... AGENCY..……………………......……...…...…….…...... DATE:......…...…......……………

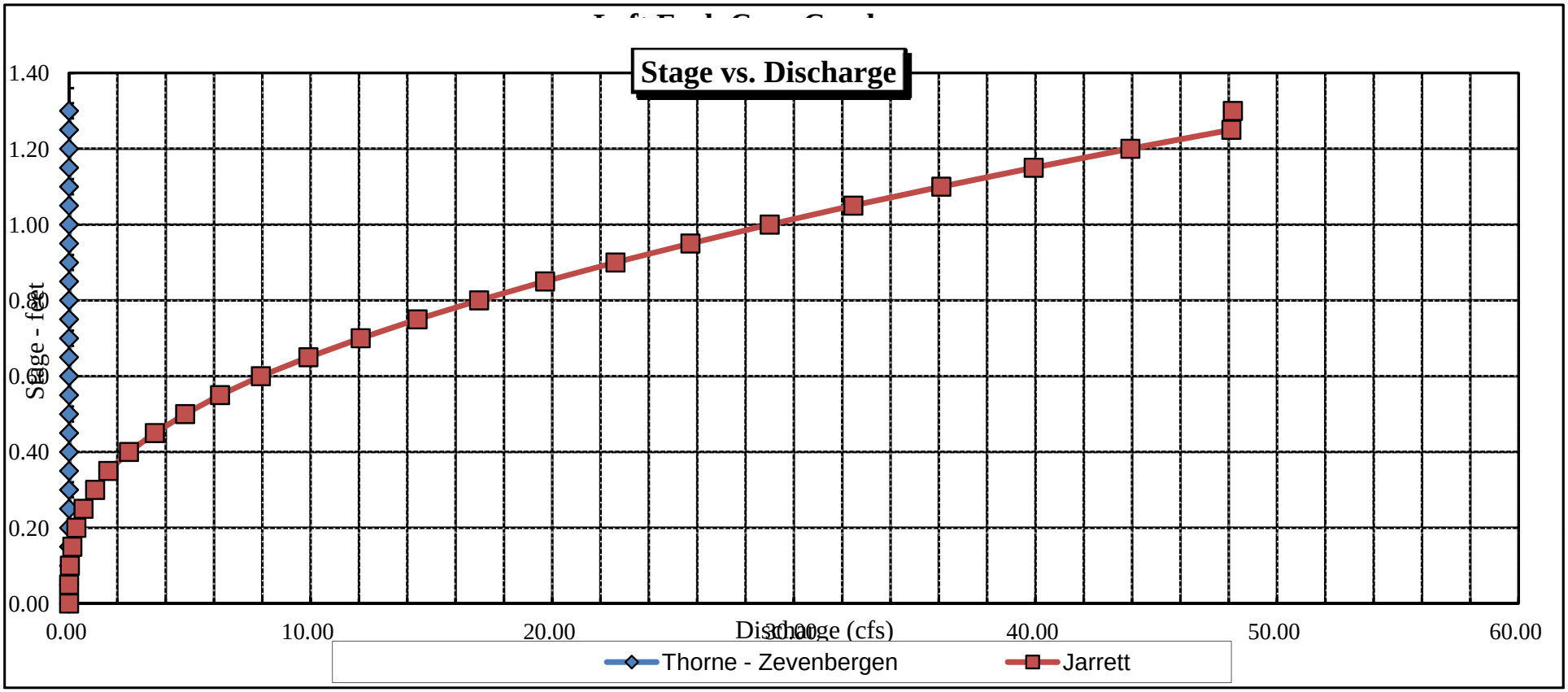
CWCB REVIEW BY: ..……………………………....……………………………………………………..…............. DATE:..................…………….....…


CROSS SECTION DATA ANALYSIS
-5.50
-5.70
-5.90
-6.10
-6.30
-6.50
-6.70
-6.90
-7.10
-7.30
-7.50
VERTICAL DEPTHS (FT)
LS
G
W
W
G
RS
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
10.00
20.00
40.00
50.00
60.00
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
10.00
20.00
40.00
50.00
60.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Average Depth (feet)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

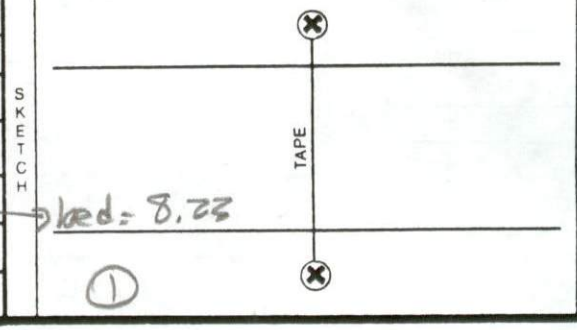
STREAM NAME: Left Fork Carr Creek						CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: Approx. 1.25 miles upstream from conf. w/ Carr Creek						
DATE: 5-16-12	OBSERVERS: R. Smith					
LEGAL DESCRIPTION	¼ SECTION: SW SW	SECTION: 1	TOWNSHIP: 6 N/S	RANGE: 100 E/W	PM: 6th	
COUNTY: Garfield	WATERSHED: Roan Ck.	WATER DIVISION: 5	DOW WATER CODE: 19691			
MAP(S): USGS: Henderson Ridge 7.5'						
USFS:						

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: gravel to 6" cobbles	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	7.61/7.58
② WS Upstream	34.0	8.00
③ WS Downstream	35.0	7.03
SLOPE	0.97/69.0 =	



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

AQUATIC SAMPLING SUMMARY

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

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

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

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

COMMENTS

Ph = 8.13
Cond = 313 dsmp
Temp = 9.8° C
Salinity = 0.2

Narrowleaf cottonwood - willow - dogwood riparian. Extensive cottonwood regeneration. Trout sighted.

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Left Fork Carr Creek	CROSS-SECTION NO.: 2	DATE: 5-16-12	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)
RS	0.0		6.20								
G	2.5		6.63								
	2.6		7.41								
W	3.1		7.58								
	3.5		7.7	.10				.03			
	3.9		7.75	.15				0			
	4.3		7.85	.25				1.55			
	4.7		7.90	.30				1.31			
	5.1		7.85	.25				1.21			
	5.5		7.90	.30				.66			
	5.9		7.85	.25				.70			
	6.3		7.80	.20				1.22			
	6.7		7.90	.30				1.14			
	7.1		7.95	.35				1.09			
	7.5		7.85	.25				0.78			
	7.9		7.80	.20				1.17			
	8.3		7.90	.30				1.22			
	8.7		7.85	.25				1.75			
	9.1		7.70	.10				1.38			
	9.5		7.85	.25				1.46			
	9.9		7.75	.15				1.12			
	10.3		7.80	.20				0.38			
	10.7		7.85	.25				0.60			
	11.1		7.70	.10				0.06			
W	11.5		7.61								
	12.0		7.34								
	13.0		6.71								
G	13.3		6.55								
LS	13.8		5.56								
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:	Left Fork Carr Creek
XS LOCATION:	1.25 mi upstream fr conf w/ Carr Creek
XS NUMBER:	2
DATE:	16-May-12
OBSERVERS:	R. Smith, N. Dieterich
1/4 SEC:	SW SW
SECTION:	1
TWP:	6S
RANGE:	100W
PM:	Sixth
COUNTY:	Garfield
WATERSHED:	Roan Creek
DIVISION:	5
DOW CODE:	19691
USGS MAP:	Henderson Ridge
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:	0.014

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

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

STREAM NAME: Left Fork Carr Creek
XS LOCATION: 1.25 mi upstream fr conf w/ Carr Creek
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
	RS	0.00	6.20			0.00		0.00	0.00	0.0%
1	G	2.50	6.63			0.00		0.00	0.00	0.0%
		2.60	7.41			0.00		0.00	0.00	0.0%
	W	3.10	7.58	0.00	0.00	0.00		0.00	0.00	0.0%
		3.50	7.70	0.10	0.03	0.42	0.10	0.04	0.00	0.1%
		3.90	7.75	0.15	0.00	0.40	0.15	0.06	0.00	0.0%
		4.30	7.85	0.25	1.55	0.41	0.25	0.10	0.16	8.5%
		4.70	7.90	0.30	1.31	0.40	0.30	0.12	0.16	8.6%
		5.10	7.85	0.25	1.21	0.40	0.25	0.10	0.12	6.6%
		5.50	7.90	0.30	0.66	0.40	0.30	0.12	0.08	4.3%
		5.90	7.85	0.25	0.70	0.40	0.25	0.10	0.07	3.8%
		6.30	7.80	0.20	1.22	0.40	0.20	0.08	0.10	5.3%
		6.70	7.90	0.30	1.14	0.41	0.30	0.12	0.14	7.5%
		7.10	7.95	0.35	1.09	0.40	0.35	0.14	0.15	8.4%
		7.50	7.85	0.25	0.78	0.41	0.25	0.10	0.08	4.3%
		7.90	7.80	0.20	1.17	0.40	0.20	0.08	0.09	5.1%
		8.30	7.90	0.30	1.22	0.41	0.30	0.12	0.15	8.0%
		8.70	7.85	0.25	1.75	0.40	0.25	0.10	0.18	9.6%
		9.10	7.70	0.10	1.38	0.43	0.10	0.04	0.06	3.0%
		9.50	7.85	0.25	1.46	0.43	0.25	0.10	0.15	8.0%
		9.90	7.75	0.15	1.12	0.41	0.15	0.06	0.07	3.7%
		10.30	7.80	0.20	0.38	0.40	0.20	0.08	0.03	1.7%
		10.70	7.85	0.25	0.60	0.40	0.25	0.10	0.06	3.3%
		11.10	7.70	0.10	0.06	0.43	0.10	0.04	0.00	0.1%
	W	11.50	7.61	0.00	0.00	0.41		0.00	0.00	0.0%
		12.00	7.34			0.00		0.00	0.00	0.0%
		13.00	6.77			0.00		0.00	0.00	0.0%
1	G	13.30	6.55			0.00		0.00	0.00	0.0%
	LS	13.80	5.56			0.00		0.00	0.00	0.0%
	TOTALS ----------					8.61	0.35 (Max.)	1.80	1.82	100.0%

Manning's n = 0.0611
Hydraulic Radius= 0.20918053

STREAM NAME: Left Fork Carr Creek
XS LOCATION: 1.25 mi upstream fr conf w/ Carr Creek
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.80	1.84	2.3%
7.35	1.80	4.08	126.7%
7.37	1.80	3.89	116.3%
7.39	1.80	3.71	105.9%
7.41	1.80	3.52	95.6%
7.43	1.80	3.34	85.3%
7.45	1.80	3.15	75.1%
7.47	1.80	2.97	65.1%
7.49	1.80	2.79	55.1%
7.51	1.80	2.61	45.2%
7.53	1.80	2.44	35.5%
7.55	1.80	2.27	25.9%
7.56	1.80	2.18	21.1%
7.57	1.80	2.09	16.3%
7.58	1.80	2.01	11.6%
7.59	1.80	1.92	6.9%
7.60	1.80	1.84	2.3%
7.61	1.80	1.76	-2.4%
7.62	1.80	1.67	-7.0%
7.63	1.80	1.59	-11.6%
7.64	1.80	1.51	-16.1%
7.65	1.80	1.43	-20.6%
7.67	1.80	1.27	-29.4%
7.69	1.80	1.11	-38.1%
7.71	1.80	0.96	-46.5%
7.73	1.80	0.82	-54.7%
7.75	1.80	0.67	-62.5%
7.77	1.80	0.54	-70.0%
7.79	1.80	0.42	-76.8%
7.81	1.80	0.30	-83.2%
7.83	1.80	0.21	-88.6%
7.85	1.80	0.13	-93.0%

WATERLINE AT ZERO
AREA ERROR = 7.600

STREAM NAME: Left Fork Carr Creek
XS LOCATION: 1.25 mi upstream fr conf w/ Carr Creek
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	6.63	10.69	1.05	1.32	11.28	11.88	100.0%	0.95	31.35	2.78
	6.65	10.66	1.04	1.30	11.07	11.82	99.5%	0.94	30.47	2.75
	6.70	10.59	1.00	1.25	10.54	11.69	98.4%	0.90	28.28	2.68
	6.75	10.51	0.95	1.20	10.01	11.55	97.3%	0.87	26.17	2.61
	6.80	10.43	0.91	1.15	9.48	11.41	96.1%	0.83	24.13	2.54
	6.85	10.33	0.87	1.10	8.97	11.26	94.8%	0.80	22.16	2.47
	6.90	10.24	0.83	1.05	8.45	11.10	93.5%	0.76	20.27	2.40
	6.95	10.14	0.78	1.00	7.94	10.95	92.2%	0.73	18.44	2.32
	7.00	10.05	0.74	0.95	7.44	10.80	91.0%	0.69	16.68	2.24
	7.05	9.96	0.70	0.90	6.94	10.65	89.7%	0.65	14.99	2.16
	7.10	9.86	0.65	0.85	6.44	10.50	88.4%	0.61	13.38	2.08
	7.15	9.77	0.61	0.80	5.95	10.35	87.1%	0.58	11.84	1.99
	7.20	9.67	0.56	0.75	5.46	10.20	85.9%	0.54	10.37	1.90
	7.25	9.58	0.52	0.70	4.98	10.04	84.6%	0.50	8.98	1.80
	7.30	9.48	0.48	0.65	4.51	9.89	83.3%	0.46	7.68	1.70
	7.35	9.39	0.43	0.60	4.03	9.74	82.0%	0.41	6.45	1.60
	7.40	9.29	0.38	0.55	3.57	9.59	80.7%	0.37	5.31	1.49
	7.45	9.08	0.34	0.50	3.11	9.35	78.7%	0.33	4.29	1.38
	7.50	8.84	0.30	0.45	2.66	9.09	76.5%	0.29	3.37	1.27
	7.55	8.60	0.26	0.40	2.22	8.83	74.3%	0.25	2.55	1.15
WL	7.60	8.35	0.22	0.35	1.80	8.56	72.1%	0.21	1.83	1.02
	7.65	7.99	0.17	0.30	1.39	8.18	68.9%	0.17	1.23	0.88
	7.70	7.60	0.13	0.25	1.00	7.78	65.5%	0.13	0.73	0.73
	7.75	6.80	0.09	0.20	0.64	6.95	58.5%	0.09	0.38	0.59
	7.80	5.61	0.06	0.15	0.33	5.71	48.1%	0.06	0.14	0.43
	7.85	3.21	0.03	0.10	0.11	3.25	27.4%	0.03	0.03	0.30
	7.90	0.60	0.03	0.05	0.02	0.61	5.1%	0.02	0.00	0.24
	7.95	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Left Fork Carr Creek
XS LOCATION: 1.25 mi upstream fr conf w/ Carr Creek
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.82	cfs
CALCULATED FLOW (Qc)=	1.83	cfs
(Qm-Qc)/Qm * 100 =	-0.4	%
MEASURED WATERLINE (WLm)=	7.60	ft
CALCULATED WATERLINE (WLc)=	7.60	ft
(WLm-WLc)/WLm * 100 =	-0.1	%
MAX MEASURED DEPTH (Dm)=	0.35	ft
MAX CALCULATED DEPTH (Dc)=	0.35	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.02	ft/sec
MANNING'S N=	0.061	
SLOPE=	0.014	ft/ft
.4 * Qm =	0.7	cfs
2.5 * Qm=	4.6	cfs

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

FLOW (CFS)	PERIOD
==========	========
_____	_____
_____	_____
_____	_____
_____	_____

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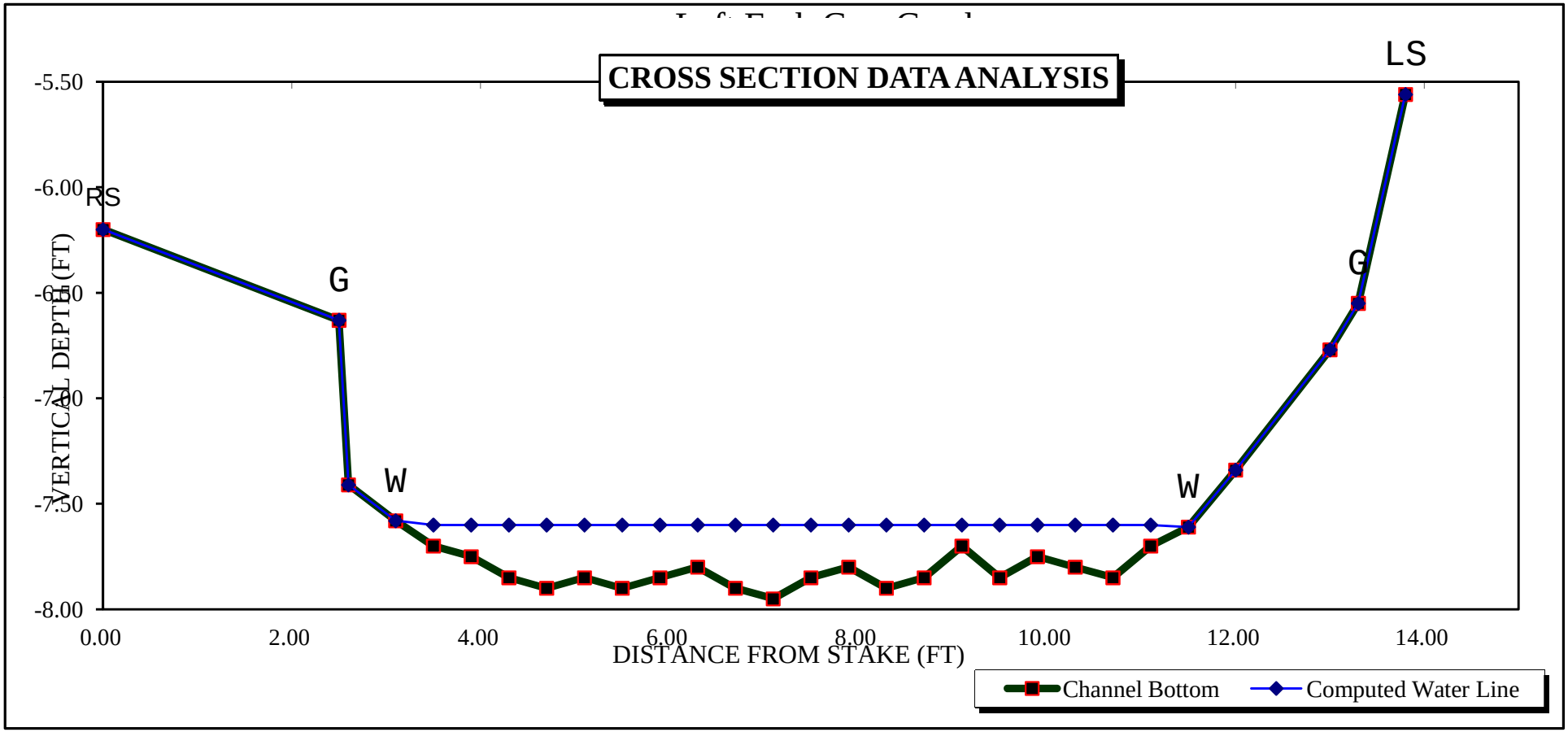
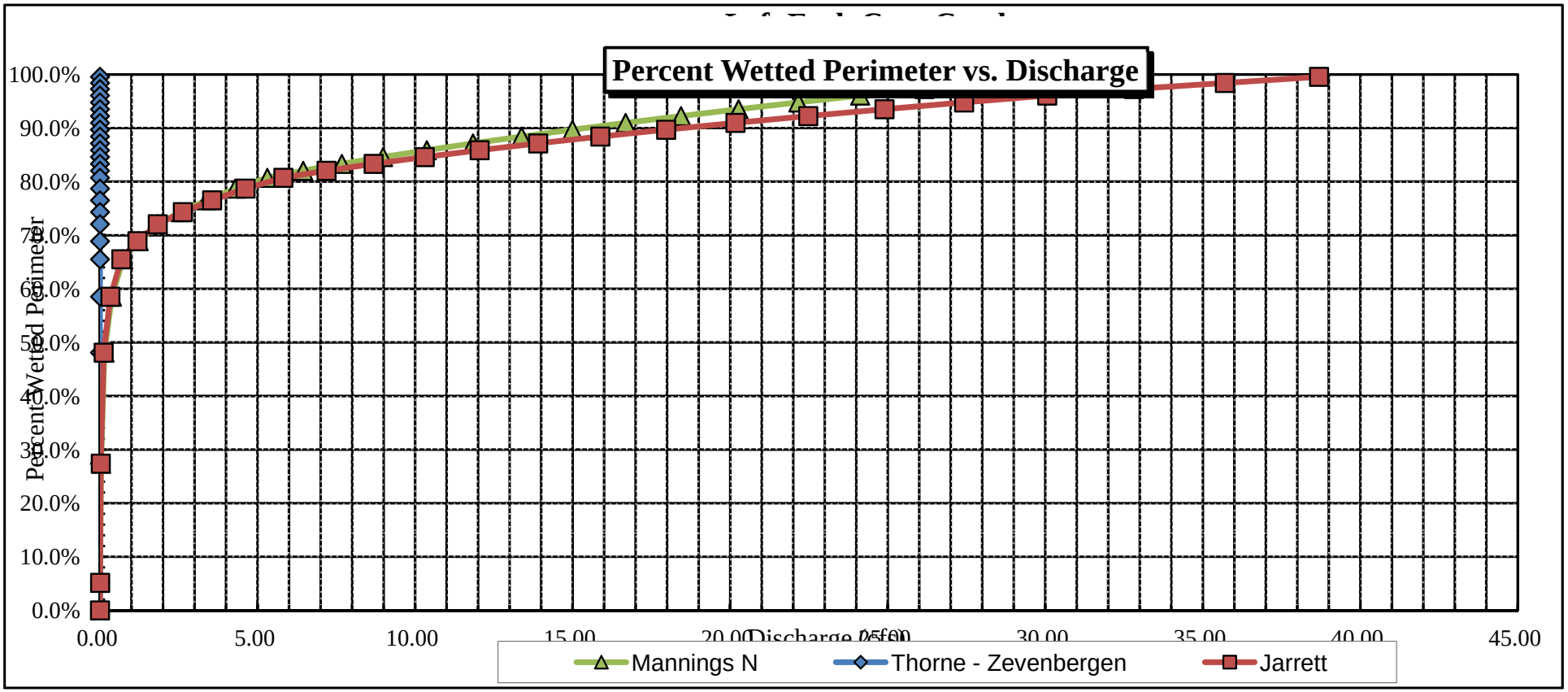
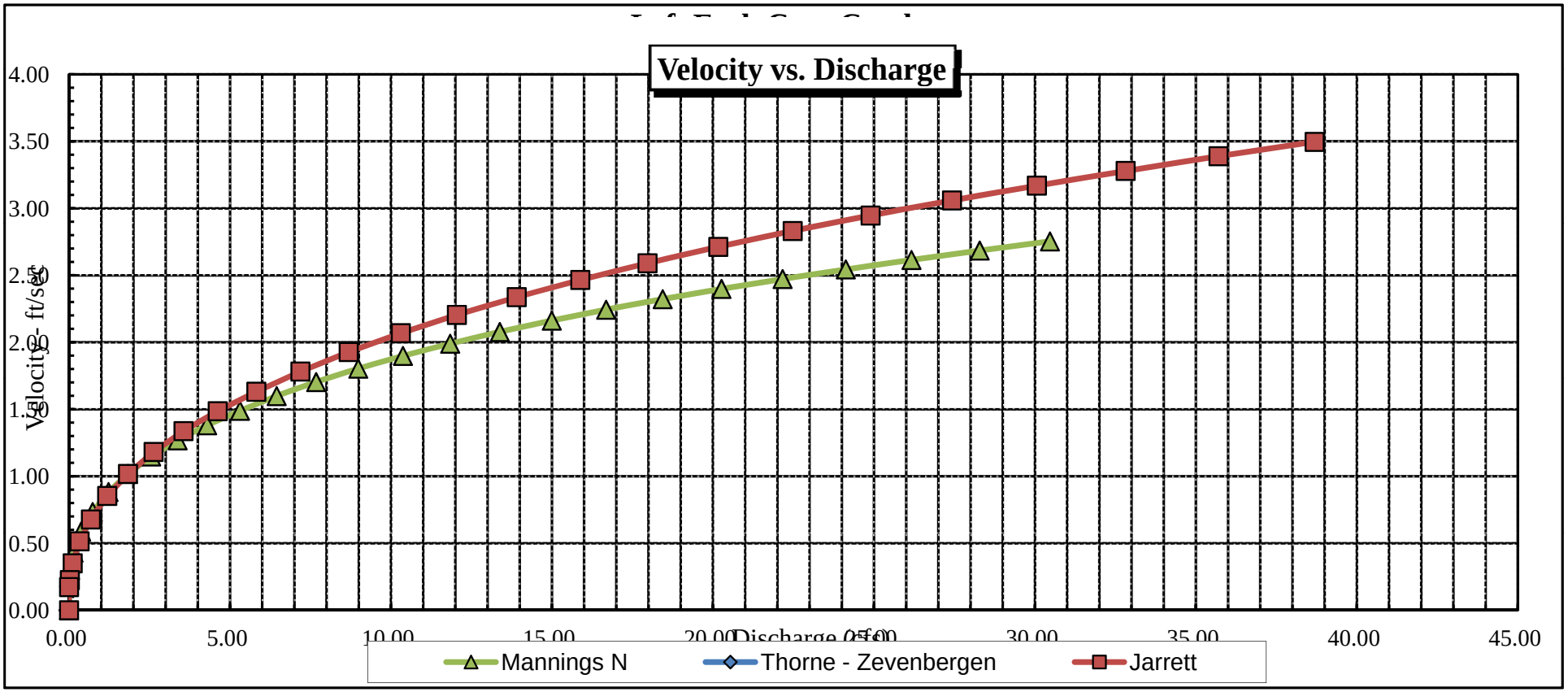
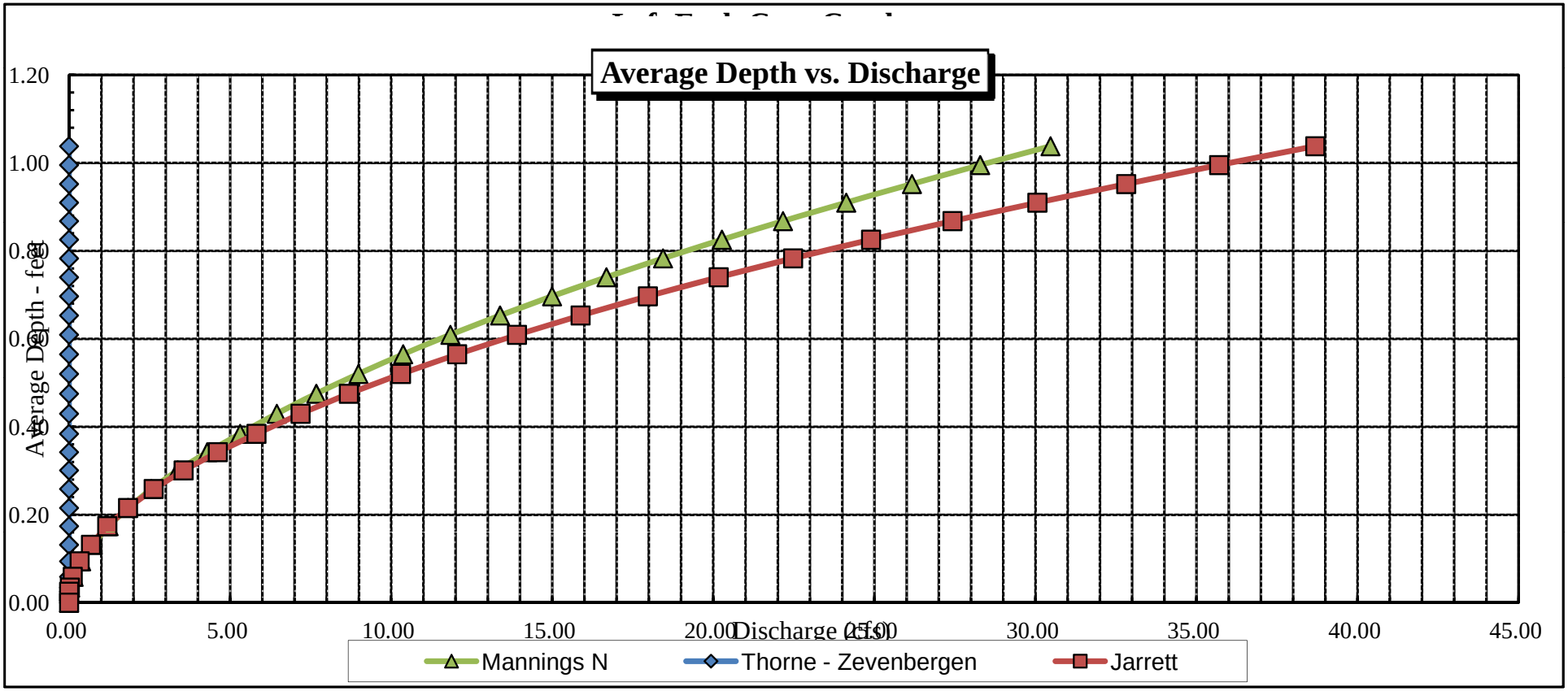
RECOMMENDATION BY: ..... AGENCY..... DATE:.....

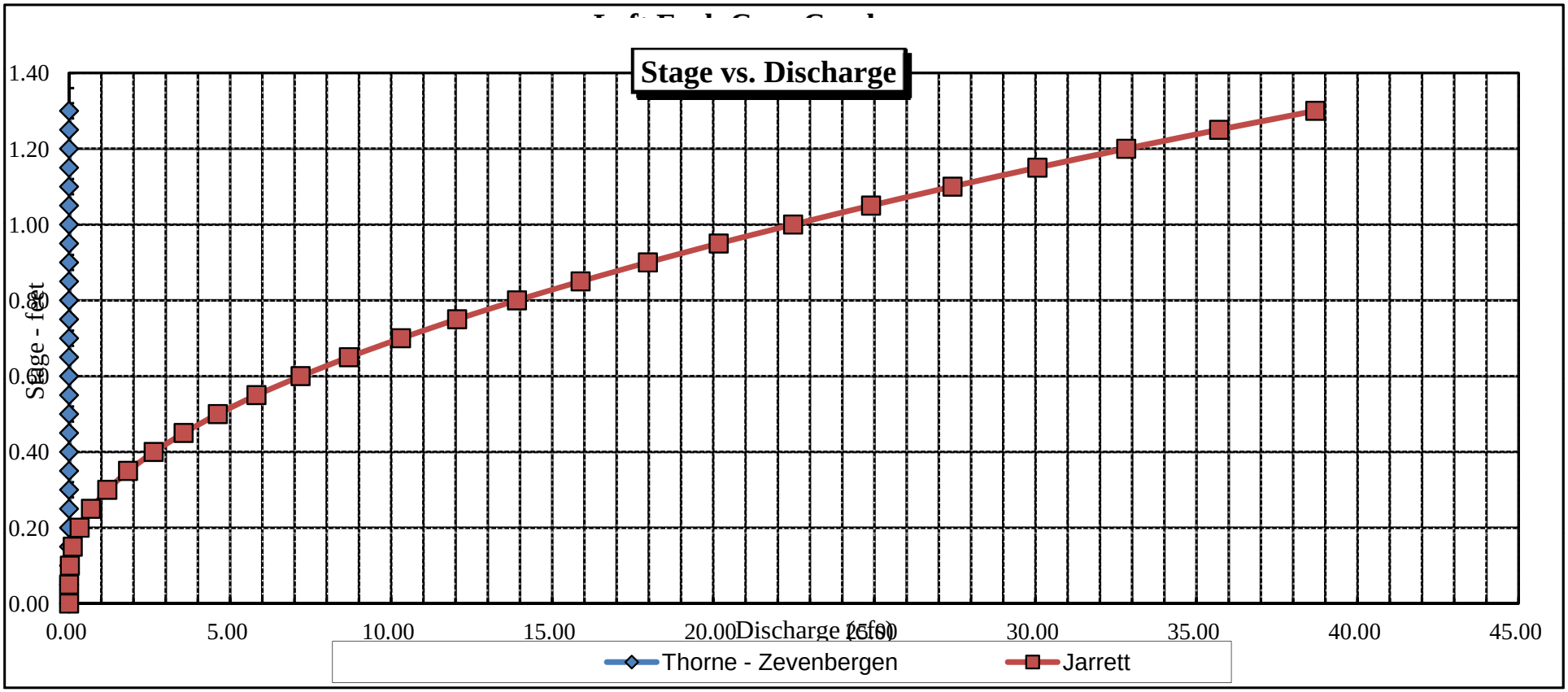
CWCB REVIEW BY: ..... DATE:.....


CROSS SECTION DATA ANALYSIS
LS
RS
G
G
W
W
-5.50
-6.00
-6.50
-7.00
-7.50
-8.00
VERTICAL DEPTH (FT)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
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
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


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
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Stage - feet
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett