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-932)

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

DEC 19 2018

Dear Ms. Bassi:

The Bureau of Land Management (BLM) is writing this letter to formally communicate its recommendation for an instream flow water right on Stout Creek, located in Water Division 2.

Location and Land Status. Stout Creek originates at Stout Creek Lakes in the Sangre de Christo Wilderness Area and flows into the Arkansas River approximately 2.5 miles southwest of the community of Howard. This recommendation addresses only the portion of Stout Creek that starts at the BLM – U.S. Forest Service boundary and ends at the confluence of Stout Creek with an unnamed tributary located in the SW ¼ NE ¼, Section 27, T48N R10E, New Mexico P.M. The BLM manages 0.3 miles of this reach, and approximately 0.3 miles are in private ownership.

Existing Instream Flow Water Rights. In 1977, the Colorado Water Conservation Board appropriated an instream flow water right on Stout Creek that begins at the outlet of Lower Stout Creek Lake and ends at the U.S. Forest Service boundary. The protected flow rate is 4.0 cfs, year round. The purpose of this recommendation is to extend instream flow protection from the BLM-Forest Service boundary across BLM lands. Protecting this additional segment of Stout Creek will provide protection for all parts of the creek that have unaltered natural hydrology.

Biological Summary. Stout Creek is a cold water, very high gradient stream. The reach that is the subject of this recommendation flows through alluvial fans on the northern slopes of the Sangre de Christo Range. This portion of Stout Creek has large substrate, with boulders up to four feet in diameter. The large substrate and steep gradient provide fish habitat consisting primarily of pools separated by large drops, with few riffles. Water quality is excellent for supporting salmonid fish species.

Fish surveys indicate that Stout Creek supports self-sustaining populations of brook trout and brown trout. Spot surveys indicated abundant populations of stonefly and caddisfly.

The creek also supports a vigorous riparian community comprised of white fir, maple, and aspen. The riparian community provides ample cover and shading for the creek, and contributes to substantial to bank stability.

R2Cross Analysis. The BLM collected the following R2Cross data from Stout 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)
07/10/2017 #1	3.48 cfs	18.03 feet	1.54 cfs	3.43 cfs
07/10/2017 #2	3.48 cfs	12.60 feet	Out of range	3.48 cfs
		Averages:	1.54 cfs	3.46 cfs

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

> 3.5 cubic feet per second is recommended during the snowmelt runoff period from May 1 to June 30. This recommendation is driven by the average velocity criteria. Given the small amount of riffle habitat in this reach, it is important to provide velocities that are suitable for spawning trout.
>
> 1.5 cubic feet per second is recommended during summer, from July 1 to August 31. This recommendation is driven by the wetted perimeter criteria. This flow rate will maintain sufficient physical habitat in the creek for the fish population to complete important parts of their life cycle before cold temperatures reduce fish activity for the winter.
>
> 0.6 cubic feet per second is recommended from September 1 to April 30. This recommendation is driven by limited water availability. This flow rate should prevent complete icing of the numerous pools in this reach, allowing the fish population to overwinter.

Water Availability. The BLM recommends relying upon Streamstats to estimate water availability because this creek has not been historically gaged. The BLM does not recommend reliance upon stream gages located along the Arkansas River and other nearby Arkansas River tributaries as an indicator of water availability, because those gages are heavily influenced by reservoir operations and irrigation diversions.

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

Relationship to Land Management Plans. The BLM land use plan calls for managing this creek to support riparian, wildlife, and water quality values and to continue meeting land health standards. Establishing an instream flow water right would assist in meeting these objectives.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2018. We thank both Colorado Parks and Wildlife and the Colorado 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,

Brian St. George
Deputy State Director
Resources and Fire

Cc: David Gilbert, Royal Gorge Field Office
Keith Berger, Royal Gorge Field Office
Cathy Cook, Rocky Mountain District Manager

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO WATER CONSERVATION BOARD

LOCATION INFORMATION

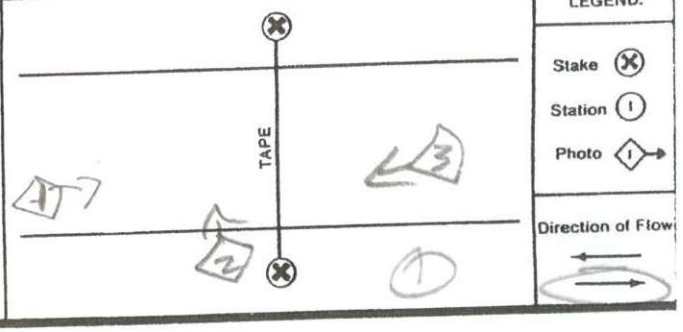
STREAM NAME: Stout Creek						CROSS-SECTION NO.: 1	
CROSS-SECTION LOCATION: At BLM-USFS boundary 13N 425087.8E 4248310.5N							
DATE: 7-10-17	OBSERVERS: R. Smith, D. Gilbert						
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 27	TOWNSHIP: 48 N/S	RANGE: 10 E/W	PM: NM		
COUNTY: Fremont	WATERSHED: Arkansas R	WATER DIVISION: 2	DOW WATER CODE: 30952				
MAP(S):	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: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: 4 in cobble - 4ft 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
WS @ Tape LB/RB	0.0 7.8 - 3.56	3.40
WS Upstream	7.0	3.08
WS Downstream	22.0	6.32
SLOPE	3.24 / 24.0 = 0.112	



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: Stream bed armored; high density of two species of stonefly and one species of caddisfly (very shaded)

COMMENTS

Stream is stacking on right bank because of boulder. White Fir, Maple, Aspen riparian zone. Very steep channel riffles difficult to find

LS+G

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Stout Creek	CROSS-SECTION NO.: 1	DATE: 7-10	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 11:40 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)
	2.5		2.74								
	3.5		2.94								
	6.2		3.22								
LW	7.8		3.55	Ø				Ø			
	8.7		3.65	Ø.1				Ø.76			
	9.2		3.65	Ø.1				Ø.89			
	9.6		3.85	Ø.3				2.05			
	10.Ø		3.85	Ø.3				1.35			
	10.4		3.85	Ø.3				1.09			
	10.8		3.80	Ø.25				1.82			
	11.2		3.95	Ø.4				Ø.58			
	11.6		3.95	Ø.4				Ø			
	12.Ø		3.95	Ø.4				Ø			
	12.4		3.85	Ø.3				Ø.06			
	12.8		4.0	Ø.45				Ø.25			
	13.2		4.0	Ø.45				Ø.53			
	13.6		3.65	Ø.1				Ø.47			
	14.Ø		3.85	Ø.3				Ø.41			
	14.4		4.05	Ø.5				Ø.80			
	14.7		4.05	Ø.5				Ø.85			
	15.Ø		4.00	Ø.45				1.07			
	15.3		3.90	Ø.35				Ø.54			
	15.6		3.90	Ø.35				1.26			
	15.9		4.00	Ø.45				2.13			
	16.2		3.80	Ø.4				1.52			
	16.5		3.75	Ø.35				2.34			
	16.8		3.75	Ø.35				1.58			
	17.1		3.70	Ø.3				1.34			
	17.4		3.75	Ø.35				1.47			
	17.7		3.85	Ø.45				1.23			
	18.0		3.80	Ø.4				1.52			
18.5	18.3	3.85	3.85	Ø.45				1.99			
RW	18.6		3.40	Ø	Ø.45			Ø	1.51		
	19.2		2.92								
G	20.1		2.54								
	23.0		2.46								
RS	25.0		1.46								
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:	Stout Creek
XS LOCATION:	At BLM-USFS boundary
XS NUMBER:	1
DATE:	10-Jul-17
OBSERVERS:	R. Smith, D. Gilbert
1/4 SEC:	SW
SECTION:	27
TWP:	48N
RANGE:	10W
PM:	NM
COUNTY:	Fremont
WATERSHED:	Arkansas R.
DIVISION:	4
DOW CODE:	30952
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:	0.112

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

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

STREAM NAME: Stout Creek
XS LOCATION: At BLM-USFS boundary
XS NUMBER: 1

DATA POINTS= 37

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	2.00	2.57			0.00		0.00	0.00	0.0%
		2.50	2.74			0.00		0.00	0.00	0.0%
		3.50	2.94			0.00		0.00	0.00	0.0%
		6.20	3.22			0.00		0.00	0.00	0.0%
	LW	7.80	3.55	0.00	0.00	0.00		0.00	0.00	0.0%
		8.70	3.65	0.10	0.76	0.91	0.10	0.07	0.05	1.5%
		9.20	3.65	0.10	0.89	0.50	0.10	0.05	0.04	1.1%
		9.60	3.85	0.30	2.05	0.45	0.30	0.12	0.25	7.1%
		10.00	3.85	0.30	1.35	0.40	0.30	0.12	0.16	4.6%
		10.40	3.85	0.30	1.09	0.40	0.30	0.12	0.13	3.8%
		10.80	3.80	0.25	1.82	0.40	0.25	0.10	0.18	5.2%
		11.20	3.95	0.40	0.58	0.43	0.40	0.16	0.09	2.7%
		11.60	3.95	0.40	0.00	0.40	0.40	0.16	0.00	0.0%
		12.00	3.95	0.40	0.00	0.40	0.40	0.16	0.00	0.0%
		12.40	3.85	0.30	0.06	0.41	0.30	0.12	0.01	0.2%
		12.80	4.00	0.45	0.25	0.43	0.45	0.18	0.04	1.3%
		13.20	4.00	0.45	0.53	0.40	0.45	0.18	0.10	2.7%
		13.60	3.65	0.10	0.47	0.53	0.10	0.04	0.02	0.5%
		14.00	3.85	0.30	0.41	0.45	0.30	0.12	0.05	1.4%
		14.40	4.05	0.50	0.80	0.45	0.50	0.18	0.14	4.0%
		14.70	4.05	0.50	0.85	0.30	0.50	0.15	0.13	3.7%
		15.00	4.00	0.45	1.07	0.30	0.45	0.14	0.14	4.1%
		15.30	3.90	0.35	0.54	0.32	0.35	0.11	0.06	1.6%
		15.60	3.90	0.35	1.26	0.30	0.35	0.11	0.13	3.8%
		15.90	4.00	0.45	2.13	0.32	0.45	0.14	0.29	8.3%
		16.20	3.80	0.40	1.52	0.36	0.40	0.12	0.18	5.2%
		16.50	3.50	0.25	2.34	0.42	0.25	0.08	0.18	5.0%
		16.80	3.75	0.35	1.58	0.39	0.35	0.11	0.17	4.8%
		17.10	3.70	0.30	1.34	0.30	0.30	0.09	0.12	3.5%
		17.40	3.75	0.35	1.47	0.30	0.35	0.11	0.15	4.4%
		17.70	3.85	0.45	1.23	0.32	0.45	0.14	0.17	4.8%
		18.00	3.80	0.40	1.52	0.30	0.40	0.12	0.18	5.2%
		18.30	3.85	0.45	1.99	0.30	0.45	0.11	0.22	6.4%
		18.50	3.85	0.45	1.51	0.20	0.45	0.07	0.10	2.9%
	RW	18.60	3.40	0.00	0.00	0.46		0.00	0.00	0.0%
		19.20	2.92			0.00		0.00	0.00	0.0%
1	G	20.10	2.54			0.00		0.00	0.00	0.0%
	TOTALS ----------					11.85	0.5 (Max.)	3.43	3.48	100.0%

Manning's n = 0.2142
Hydraulic Radius= 0.28934909

STREAM NAME: Stout Creek
XS LOCATION: At BLM-USFS boundary
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.43	3.83	11.6%
3.23	3.43	6.79	97.9%
3.25	3.43	6.54	90.6%
3.27	3.43	6.29	83.3%
3.29	3.43	6.04	76.2%
3.31	3.43	5.80	69.1%
3.33	3.43	5.56	62.1%
3.35	3.43	5.32	55.1%
3.37	3.43	5.08	48.2%
3.39	3.43	4.85	41.4%
3.41	3.43	4.62	34.7%
3.43	3.43	4.39	28.0%
3.44	3.43	4.28	24.7%
3.45	3.43	4.16	21.4%
3.46	3.43	4.05	18.1%
3.47	3.43	3.94	14.8%
3.48	3.43	3.83	11.6%
3.49	3.43	3.72	8.3%
3.50	3.43	3.60	5.1%
3.51	3.43	3.49	1.9%
3.52	3.43	3.39	-1.3%
3.53	3.43	3.28	-4.5%
3.55	3.43	3.06	-10.8%
3.57	3.43	2.85	-16.9%
3.59	3.43	2.64	-23.0%
3.61	3.43	2.44	-28.9%
3.63	3.43	2.24	-34.7%
3.65	3.43	2.05	-40.3%
3.67	3.43	1.86	-45.6%
3.69	3.43	1.69	-50.8%
3.71	3.43	1.52	-55.8%
3.73	3.43	1.35	-60.7%

WATERLINE AT ZERO
AREA ERROR = 3.511

STREAM NAME: Stout Creek
XS LOCATION: At BLM-USFS boundary
XS NUMBER: 1

Constant Manning's n

GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	2.57	18.03	0.95	1.48	17.08	19.42	100.0%	0.88	36.40	2.13
	2.61	17.81	0.92	1.44	16.35	19.19	98.8%	0.85	34.11	2.09
	2.66	17.55	0.88	1.39	15.46	18.90	97.3%	0.82	31.40	2.03
	2.71	17.28	0.84	1.34	14.59	18.62	95.9%	0.78	28.80	1.97
	2.76	16.97	0.81	1.29	13.73	18.29	94.2%	0.75	26.34	1.92
	2.81	16.60	0.78	1.24	12.90	17.91	92.2%	0.72	24.05	1.87
	2.86	16.24	0.74	1.19	12.07	17.53	90.3%	0.69	21.87	1.81
	2.91	15.87	0.71	1.14	11.27	17.14	88.3%	0.66	19.79	1.76
	2.96	15.45	0.68	1.09	10.49	16.70	86.0%	0.63	17.86	1.70
	3.01	14.90	0.65	1.04	9.73	16.14	83.1%	0.60	16.12	1.66
	3.06	14.36	0.63	0.99	9.00	15.57	80.2%	0.58	14.49	1.61
	3.11	13.81	0.60	0.94	8.29	15.01	77.3%	0.55	12.97	1.56
	3.16	13.27	0.57	0.89	7.62	14.44	74.4%	0.53	11.54	1.52
	3.21	12.72	0.55	0.84	6.97	13.88	71.5%	0.50	10.22	1.47
	3.26	12.38	0.51	0.79	6.34	13.51	69.6%	0.47	8.89	1.40
	3.31	12.07	0.47	0.74	5.73	13.18	67.9%	0.43	7.63	1.33
	3.36	11.77	0.44	0.69	5.13	12.85	66.2%	0.40	6.46	1.26
	3.41	11.47	0.40	0.64	4.55	12.53	64.5%	0.36	5.38	1.18
	3.46	11.22	0.36	0.59	3.98	12.23	63.0%	0.33	4.38	1.10
WL	3.51	10.94	0.31	0.54	3.43	11.90	61.3%	0.29	3.47	1.01
	3.56	10.53	0.27	0.49	2.89	11.41	58.8%	0.25	2.69	0.93
	3.61	9.96	0.24	0.44	2.38	10.76	55.4%	0.22	2.02	0.85
	3.66	8.93	0.21	0.39	1.90	9.64	49.6%	0.20	1.50	0.79
	3.71	8.42	0.17	0.34	1.46	9.00	46.4%	0.16	1.01	0.69
	3.76	7.56	0.14	0.29	1.07	8.01	41.3%	0.13	0.65	0.61
	3.81	6.83	0.10	0.24	0.70	7.18	37.0%	0.10	0.35	0.49
	3.86	4.41	0.09	0.19	0.41	4.64	23.9%	0.09	0.19	0.46
	3.91	3.35	0.06	0.14	0.21	3.50	18.0%	0.06	0.08	0.36
	3.96	1.62	0.05	0.09	0.08	1.69	8.7%	0.05	0.02	0.30
	4.01	0.61	0.03	0.04	0.02	0.63	3.2%	0.03	0.00	0.22

STREAM NAME: Stout Creek
XS LOCATION: At BLM-USFS boundary
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	3.48	cfs
CALCULATED FLOW (Qc)=	3.47	cfs
(Qm-Qc)/Qm * 100 =	0.3	%
MEASURED WATERLINE (WLm)=	3.48	ft
CALCULATED WATERLINE (WLc)=	3.51	ft
(WLm-WLc)/WLm * 100 =	-1.0	%
MAX MEASURED DEPTH (Dm)=	0.50	ft
MAX CALCULATED DEPTH (Dc)=	0.54	ft
(Dm-Dc)/Dm * 100	-7.8	%
MEAN VELOCITY=	1.01	ft/sec
MANNING'S N=	0.214	
SLOPE=	0.112	ft/ft
.4 * Qm =	1.4	cfs
2.5 * Qm=	8.7	cfs

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

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

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

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

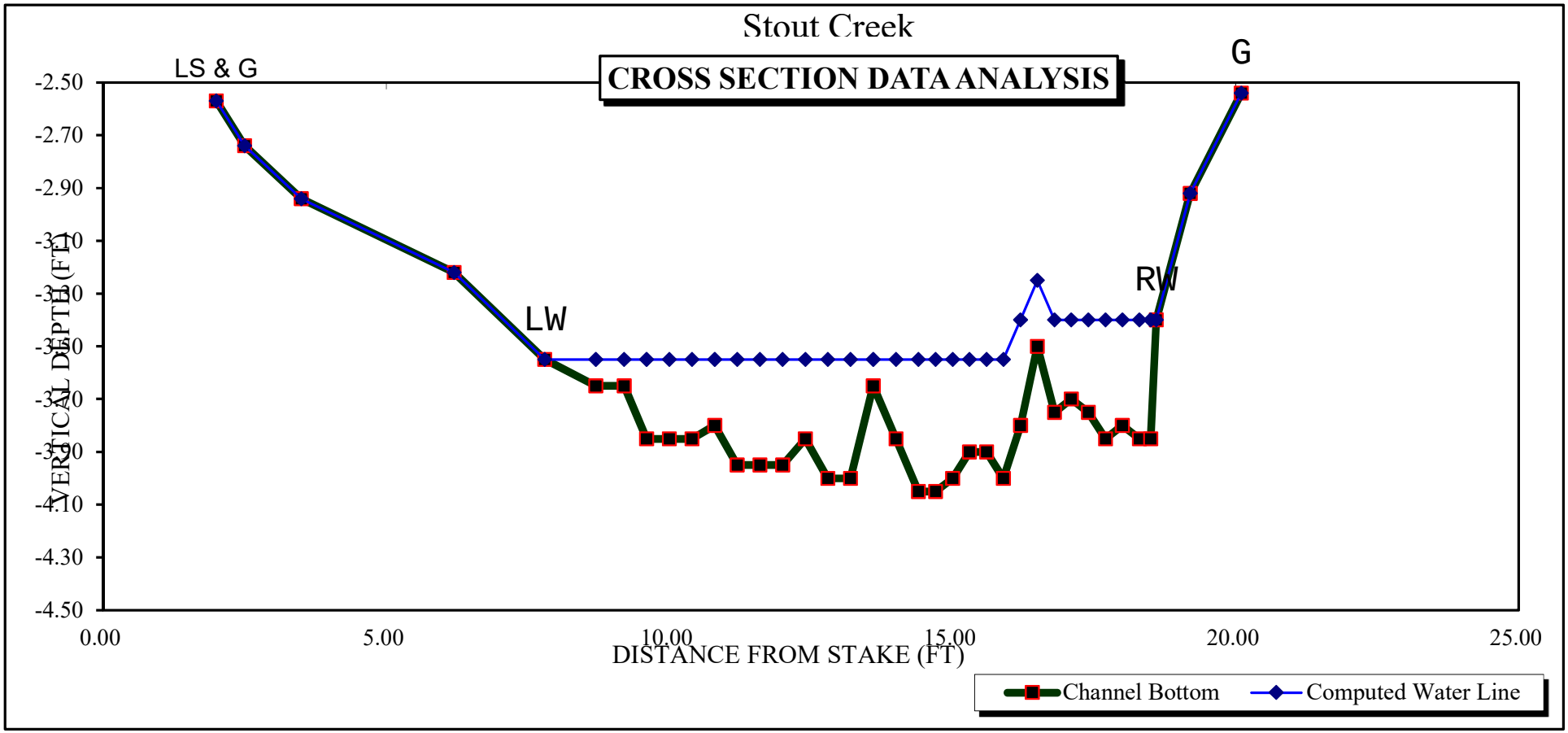
RECOMMENDATION BY: …….. AGENCY…….. DATE:……

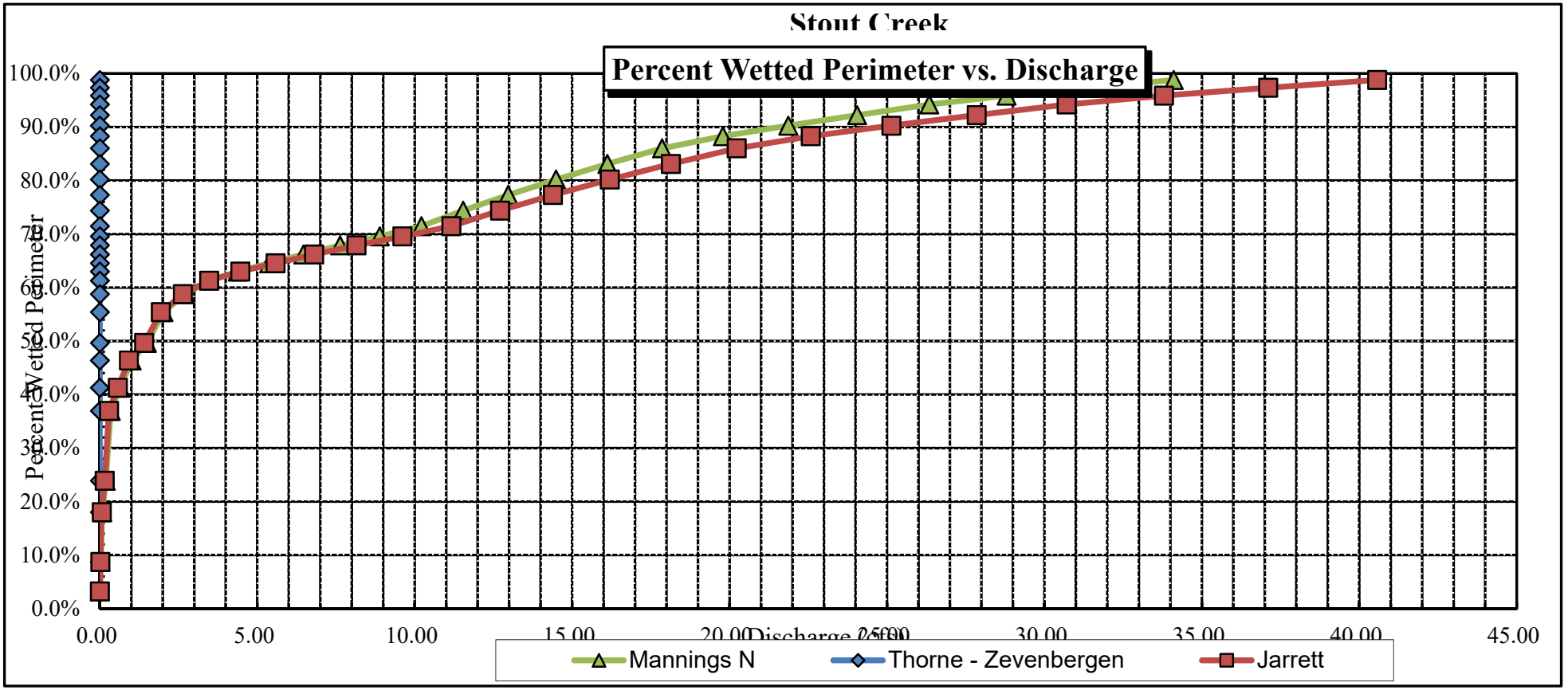
CWCB REVIEW BY: …….. DATE:……

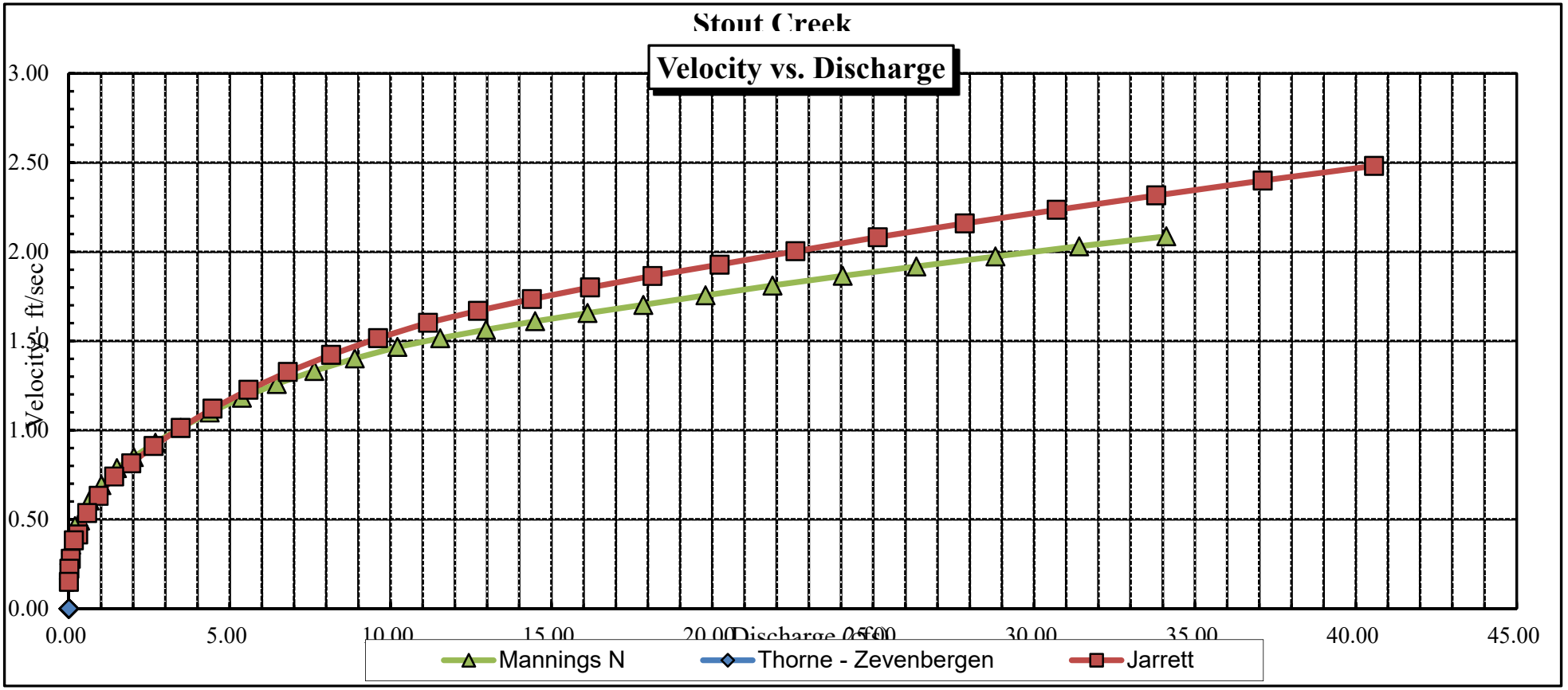
STREAM NAME: Stout Creek
XS LOCATION: At BLM-USFS boundary
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

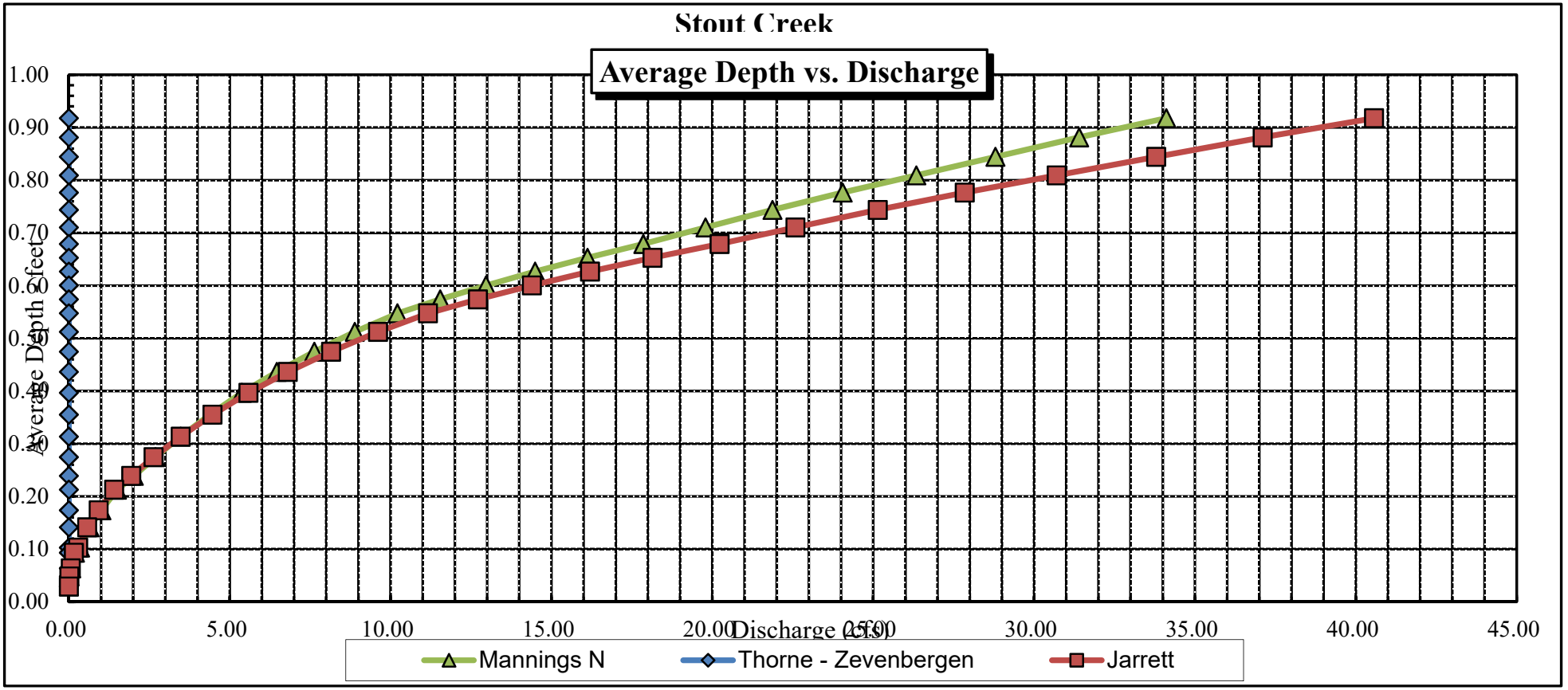
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

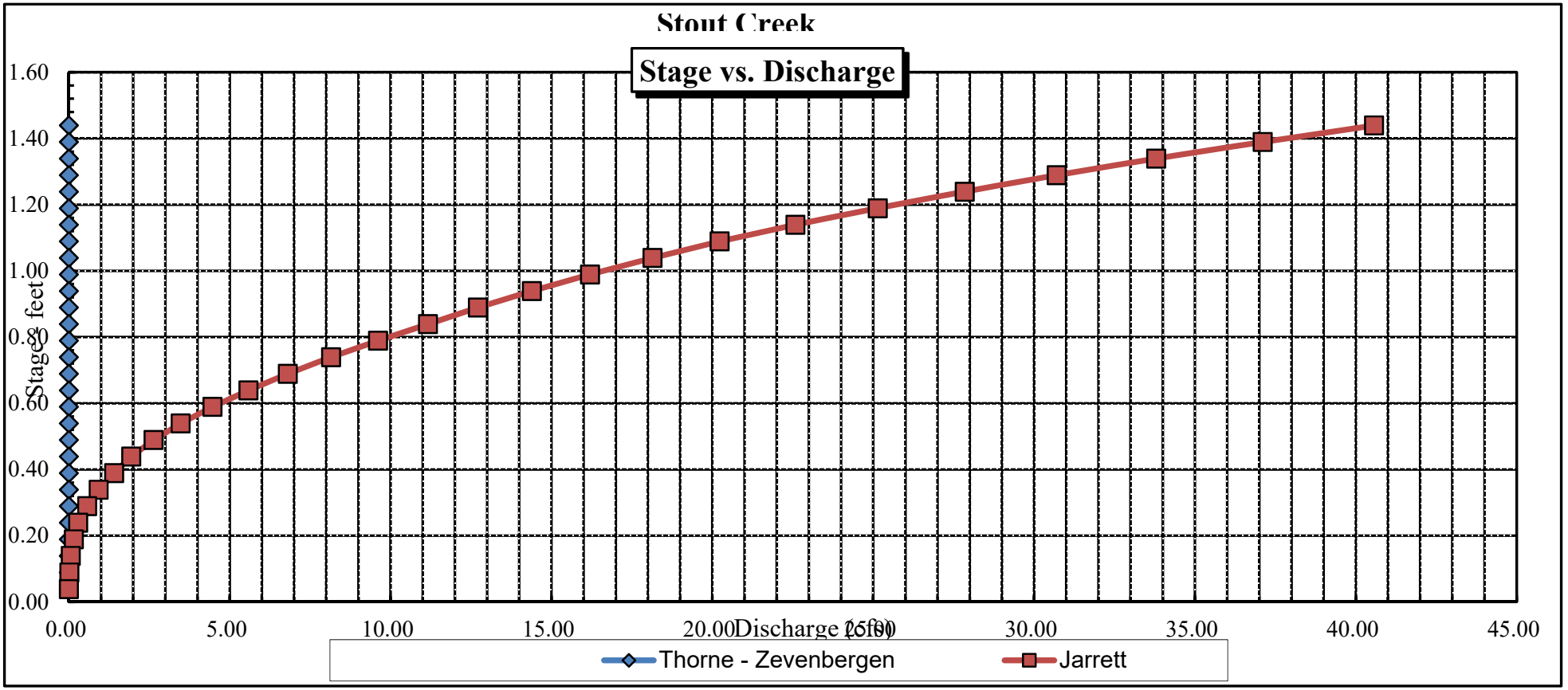
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	2.57	18.03	0.95	1.48	17.08	19.42	100.0%	0.88	43.52	2.55
	2.61	17.81	0.92	1.44	16.35	19.19	98.8%	0.85	40.57	2.48
	2.66	17.55	0.88	1.39	15.46	18.90	97.3%	0.82	37.11	2.40
	2.71	17.28	0.84	1.34	14.59	18.62	95.9%	0.78	33.80	2.32
	2.76	16.97	0.81	1.29	13.73	18.29	94.2%	0.75	30.70	2.24
	2.81	16.60	0.78	1.24	12.90	17.91	92.2%	0.72	27.85	2.16
	2.86	16.24	0.74	1.19	12.07	17.53	90.3%	0.69	25.14	2.08
	2.91	15.87	0.71	1.14	11.27	17.14	88.3%	0.66	22.58	2.00
	2.96	15.45	0.68	1.09	10.49	16.70	86.0%	0.63	20.22	1.93
	3.01	14.90	0.65	1.04	9.73	16.14	83.1%	0.60	18.14	1.86
	3.06	14.36	0.63	0.99	9.00	15.57	80.2%	0.58	16.20	1.80
	3.11	13.81	0.60	0.94	8.29	15.01	77.3%	0.55	14.39	1.74
	3.16	13.27	0.57	0.89	7.62	14.44	74.4%	0.53	12.71	1.67
	3.21	12.72	0.55	0.84	6.97	13.88	71.5%	0.50	11.16	1.60
	3.26	12.38	0.51	0.79	6.34	13.51	69.6%	0.47	9.61	1.52
	3.31	12.07	0.47	0.74	5.73	13.18	67.9%	0.43	8.15	1.42
	3.36	11.77	0.44	0.69	5.13	12.85	66.2%	0.40	6.81	1.33
	3.41	11.47	0.40	0.64	4.55	12.53	64.5%	0.36	5.58	1.23
	3.46	11.22	0.36	0.59	3.98	12.23	63.0%	0.33	4.47	1.12
WL	3.51	10.94	0.31	0.54	3.43	11.90	61.3%	0.29	3.47	1.01
	3.56	10.53	0.27	0.49	2.89	11.41	58.8%	0.25	2.64	0.91
	3.61	9.96	0.24	0.44	2.38	10.76	55.4%	0.22	1.94	0.81
	3.66	8.93	0.21	0.39	1.90	9.64	49.6%	0.20	1.41	0.74
	3.71	8.42	0.17	0.34	1.46	9.00	46.4%	0.16	0.92	0.63
	3.76	7.56	0.14	0.29	1.07	8.01	41.3%	0.13	0.57	0.54
	3.81	6.83	0.10	0.24	0.70	7.18	37.0%	0.10	0.29	0.42
	3.86	4.41	0.09	0.19	0.41	4.64	23.9%	0.09	0.16	0.38
	3.91	3.35	0.06	0.14	0.21	3.50	18.0%	0.06	0.06	0.28
	3.96	1.62	0.05	0.09	0.08	1.69	8.7%	0.05	0.02	0.22
	4.01	0.61	0.03	0.04	0.02	0.63	3.2%	0.03	0.00	0.15


Stout Creek
CROSS SECTION DATA ANALYSIS
LS & G
G
LW
RW
-2.50
-2.70
-2.90
-4.10
-4.30
-4.50
0.00
5.00
10.00
15.00
20.00
25.00
VERTICAL DEPTH (FT)
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


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


Stout Creek
Velocity vs. Discharge
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Velocity - ft/sec
0.00
5.00
10.00
15.00
20.00
30.00
35.00
40.00
45.00
Mannings N
Thorne - Zevenbergen
Jarrett


Stout 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
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


Stout 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
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

Data Input & Proofing

STREAM NAME:	Stout Creek
XS LOCATION:	At BLM-USFS boundary
XS NUMBER:	1
DATE:	7/10/2017
OBSERVERS:	R. Smith, D. Gilbert
1/4 SEC:	SW
SECTION:	27
TWP:	48N
RANGE:	10W
PM:	NM
COUNTY:	Fremont
WATERSHED:	Arkansas R.
DIVISION:	4
DOW CODE:	30952
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.112 ft / ft

CHECKED BY:.....DATE.....

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

Total Data Points = 37

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
1	LS & G	2.00	2.57			0.00	0.00	0.00
		2.50	2.74			0.00	0.00	0.00
		3.50	2.94			0.00	0.00	0.00
		6.20	3.22			0.00	0.00	0.00
	LW	7.80	3.55	0.00	0.00	0.00	0.00	0.00
		8.70	3.65	0.10	0.76	0.07	0.05	3.55
		9.20	3.65	0.10	0.89	0.05	0.04	3.55
		9.60	3.85	0.30	2.05	0.12	0.25	3.55
		10.00	3.85	0.30	1.35	0.12	0.16	3.55
		10.40	3.85	0.30	1.09	0.12	0.13	3.55
		10.80	3.80	0.25	1.82	0.10	0.18	3.55
		11.20	3.95	0.40	0.58	0.16	0.09	3.55
		11.60	3.95	0.40	0.00	0.16	0.00	3.55
		12.00	3.95	0.40	0.00	0.16	0.00	3.55
		12.40	3.85	0.30	0.06	0.12	0.01	3.55
		12.80	4.00	0.45	0.25	0.18	0.04	3.55
		13.20	4.00	0.45	0.53	0.18	0.10	3.55
		13.60	3.65	0.10	0.47	0.04	0.02	3.55
		14.00	3.85	0.30	0.41	0.12	0.05	3.55
		14.40	4.05	0.50	0.80	0.18	0.14	3.55
		14.70	4.05	0.50	0.85	0.15	0.13	3.55
		15.00	4.00	0.45	1.07	0.14	0.14	3.55
		15.30	3.90	0.35	0.54	0.11	0.06	3.55
		15.60	3.90	0.35	1.26	0.11	0.13	3.55
		15.90	4.00	0.45	2.13	0.14	0.29	3.55
		16.20	3.80	0.40	1.52	0.12	0.18	3.40
		16.50	3.50	0.25	2.34	0.08	0.18	3.25
		16.80	3.75	0.35	1.58	0.11	0.17	3.40
		17.10	3.70	0.30	1.34	0.09	0.12	3.40
		17.40	3.75	0.35	1.47	0.11	0.15	3.40
		17.70	3.85	0.45	1.23	0.14	0.17	3.40
		18.00	3.80	0.40	1.52	0.12	0.18	3.40
		18.30	3.85	0.45	1.99	0.11	0.22	3.40
		18.50	3.85	0.45	1.51	0.07	0.10	3.40
	RW	18.60	3.40	0.00	0.00	0.00	0.00	0.00
		19.20	2.92			0.00	0.00	0.00
1	G	20.10	2.54			0.00	0.00	0.00
					Totals	3.43	3.48	

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Stout Creek						CROSS-SECTION NO.: 2	
CROSS-SECTION LOCATION: At BLM-USFS Boundary 13N 425097.8E 4248312.8N							
DATE: 7-10-17	OBSERVERS: K. Smith, D. Gilbert						
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 07	TOWNSHIP: 48 (N)/S	RANGE: 10 E/W	PM: NM		
COUNTY: Fremont	WATERSHED: Arkansas R.	WATER DIVISION: 2	DOW WATER CODE: 30952				
MAP(S):	USGS:						
	USFS:						

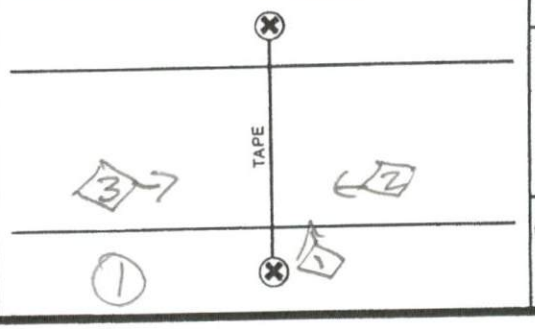
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) / NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: 4 inch cobble to 4-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	6.54/6.52
(2) WS Upstream	18.0	5.04
(3) WS Downstream	6.5	6.68
SLOPE	1.64 / 24.5 = .067	

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:

stonefly, caddisfly

COMMENTS

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Stout Creek	CROSS-SECTION NO.: 2	DATE: 7-10-17	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 1:05 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	11.3		5.83								
	13.0		6.02								
	14.4		6.13								
LW	14.6		6.55	0				0			
	15.0		6.75	0.2				0.44			
	15.4		6.75	0.2				0.52			
	15.8		6.80	0.25				0.66			
	16.2		6.90	0.35				1.48			
	16.6		6.90	0.35				1.78			
	17.0		6.95	0.4				1.71			
	17.4		6.95	0.4				1.44			
	17.8		6.90	0.35				1.49			
	18.2		7.00	0.45				1.56			
	18.6		7.1	0.55				1.67			
	19.0		6.95	0.4				0.78			
	19.4		6.95	0.45				0.07			
	19.8		6.90	0.4				0			
	20.2		6.80	0.3				0.11			
	20.6		6.90	0.4				0			
	21.0		7.00	0.5				0.66			
	21.4		7.05	0.55				2.46			
	21.8		6.95	0.45				1.58			
	22.2		7.0	0.5				1.36			
	22.6		7.05	0.55				0.03			
	23.0		6.95	0.45				0.69			
	23.4		6.75	0.25				0.07			
RW	23.7		6.50								
	23.9		6.31								
	25.5		6.13								
RS/G	27.4		5.80								
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:	Stout Creek
XS LOCATION:	At BLM-USFS boundary
XS NUMBER:	2
DATE:	10-Jul-17
OBSERVERS:	R. Smith, D. Gilbert
1/4 SEC:	SW
SECTION:	27
TWP:	48N
RANGE:	10E
PM:	NM
COUNTY:	Fremont
WATERSHED:	Arkansas
DIVISION:	2
DOW CODE:	0
USGS MAP:	0
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:	0.067

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

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

STREAM NAME: Stout Creek
XS LOCATION: At BLM-USFS boundary
XS NUMBER: 2

DATA POINTS= 28

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	11.30	5.83			0.00		0.00	0.00	0.0%
		13.00	6.02			0.00		0.00	0.00	0.0%
		14.40	6.13			0.00		0.00	0.00	0.0%
	LW	14.60	6.55	0.00	0.00	0.00		0.00	0.00	0.0%
		15.00	6.75	0.20	0.44	0.45	0.20	0.08	0.04	1.0%
		15.40	6.75	0.20	0.52	0.40	0.20	0.08	0.04	1.2%
		15.80	6.80	0.25	0.66	0.40	0.25	0.10	0.07	1.9%
		16.20	6.90	0.35	1.48	0.41	0.35	0.14	0.21	6.0%
		16.60	6.90	0.35	1.78	0.40	0.35	0.14	0.25	7.2%
		17.00	6.95	0.40	1.71	0.40	0.40	0.16	0.27	7.9%
		17.40	6.95	0.40	1.44	0.40	0.40	0.16	0.23	6.6%
		17.80	6.90	0.35	1.49	0.40	0.35	0.14	0.21	6.0%
		18.20	7.00	0.45	1.56	0.41	0.45	0.18	0.28	8.1%
		18.60	7.10	0.55	1.67	0.41	0.55	0.22	0.37	10.6%
		19.00	6.95	0.40	0.78	0.43	0.40	0.16	0.12	3.6%
		19.40	6.95	0.45	0.07	0.40	0.45	0.18	0.01	0.4%
		19.80	6.90	0.40	0.00	0.40	0.40	0.16	0.00	0.0%
		20.20	6.80	0.30	0.11	0.41	0.30	0.12	0.01	0.4%
		20.60	6.90	0.40	0.00	0.41	0.40	0.16	0.00	0.0%
		21.00	7.00	0.50	0.66	0.41	0.50	0.20	0.13	3.8%
		21.40	7.05	0.55	2.46	0.40	0.55	0.22	0.54	15.6%
		21.80	6.95	0.45	1.58	0.41	0.45	0.18	0.28	8.2%
		22.20	7.00	0.50	1.36	0.40	0.50	0.20	0.27	7.8%
		22.60	7.05	0.55	0.03	0.40	0.55	0.22	0.01	0.2%
		23.00	6.95	0.45	0.69	0.41	0.45	0.18	0.12	3.6%
		23.40	6.75	0.25	0.07	0.45	0.25	0.09	0.01	0.2%
	RW	23.70	6.50	0.00	0.00	0.39		0.00	0.00	0.0%
		23.90	6.31			0.00		0.00	0.00	0.0%
	TOTALS ----------					9.43	0.55 (Max.)	3.47	3.48	100.0%

Manning's n = 0.1968
Hydraulic Radius= 0.36761531

STREAM NAME: Stout Creek
XS LOCATION: At BLM-USFS boundary
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.47	3.47	0.1%
6.28	3.47	5.79	67.0%
6.30	3.47	5.60	61.5%
6.32	3.47	5.41	56.1%
6.34	3.47	5.22	50.7%
6.36	3.47	5.04	45.3%
6.38	3.47	4.85	39.9%
6.40	3.47	4.66	34.5%
6.42	3.47	4.48	29.2%
6.44	3.47	4.29	23.8%
6.46	3.47	4.11	18.5%
6.48	3.47	3.93	13.2%
6.49	3.47	3.84	10.6%
6.50	3.47	3.74	8.0%
6.51	3.47	3.65	5.3%
6.52	3.47	3.56	2.7%
6.53	3.47	3.47	0.1%
6.54	3.47	3.38	-2.5%
6.55	3.47	3.29	-5.1%
6.56	3.47	3.20	-7.7%
6.57	3.47	3.11	-10.3%
6.58	3.47	3.02	-12.9%
6.60	3.47	2.84	-18.1%
6.62	3.47	2.66	-23.2%
6.64	3.47	2.49	-28.3%
6.66	3.47	2.31	-33.3%
6.68	3.47	2.14	-38.3%
6.70	3.47	1.97	-43.3%
6.72	3.47	1.80	-48.2%
6.74	3.47	1.63	-53.1%
6.76	3.47	1.46	-57.9%
6.78	3.47	1.30	-62.4%

WATERLINE AT ZERO
AREA ERROR = 6.525

STREAM NAME: Stout Creek
XS LOCATION: At BLM-USFS 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	5.83	12.60	0.83	1.27	10.52	13.29	100.0%	0.79	17.58	1.67
	5.88	12.19	0.82	1.22	9.95	12.88	96.9%	0.77	16.38	1.65
	5.93	11.75	0.80	1.17	9.36	12.43	93.5%	0.75	15.13	1.62
	5.98	11.30	0.78	1.12	8.78	11.98	90.2%	0.73	13.94	1.59
	6.03	10.83	0.76	1.07	8.23	11.51	86.6%	0.71	12.85	1.56
	6.08	10.20	0.76	1.02	7.70	10.87	81.8%	0.71	11.96	1.55
	6.13	9.56	0.75	0.97	7.21	10.23	77.0%	0.70	11.15	1.55
	6.18	9.48	0.71	0.92	6.73	10.12	76.2%	0.66	10.02	1.49
	6.23	9.45	0.66	0.87	6.26	10.07	75.8%	0.62	8.91	1.42
	6.28	9.43	0.61	0.82	5.79	10.01	75.3%	0.58	7.84	1.36
	6.33	9.39	0.57	0.77	5.32	9.93	74.8%	0.53	6.84	1.29
	6.38	9.31	0.52	0.72	4.85	9.81	73.8%	0.49	5.92	1.22
	6.43	9.24	0.47	0.67	4.38	9.68	72.8%	0.45	5.05	1.15
	6.48	9.16	0.43	0.62	3.92	9.55	71.9%	0.41	4.24	1.08
WL	6.53	9.08	0.38	0.57	3.47	9.42	70.9%	0.37	3.48	1.00
	6.58	8.96	0.34	0.52	3.02	9.26	69.7%	0.33	2.79	0.93
	6.63	8.80	0.29	0.47	2.57	9.07	68.2%	0.28	2.17	0.84
	6.68	8.64	0.25	0.42	2.14	8.88	66.8%	0.24	1.61	0.76
	6.73	8.48	0.20	0.37	1.71	8.69	65.4%	0.20	1.13	0.66
	6.78	7.75	0.17	0.32	1.30	7.93	59.7%	0.16	0.76	0.59
	6.83	7.15	0.13	0.27	0.93	7.31	55.0%	0.13	0.46	0.49
	6.88	6.45	0.09	0.22	0.59	6.58	49.5%	0.09	0.23	0.39
	6.93	4.84	0.06	0.17	0.30	4.94	37.2%	0.06	0.09	0.30
	6.98	2.52	0.05	0.12	0.12	2.59	19.5%	0.05	0.03	0.25
	7.03	1.09	0.02	0.07	0.03	1.12	8.4%	0.02	0.00	0.16
	7.08	0.16	0.01	0.02	0.00	0.17	1.3%	0.01	0.00	0.10

STREAM NAME: Stout Creek
XS LOCATION: At BLM-USFS boundary
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	3.48	cfs
CALCULATED FLOW (Qc)=	3.48	cfs
(Qm-Qc)/Qm * 100 =	-0.1	%
MEASURED WATERLINE (WLm)=	6.53	ft
CALCULATED WATERLINE (WLc)=	6.53	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.55	ft
MAX CALCULATED DEPTH (Dc)=	0.57	ft
(Dm-Dc)/Dm * 100	-4.5	%
MEAN VELOCITY=	1.00	ft/sec
MANNING'S N=	0.197	
SLOPE=	0.067	ft/ft
.4 * Qm =	1.4	cfs
2.5 * Qm=	8.7	cfs

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

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

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

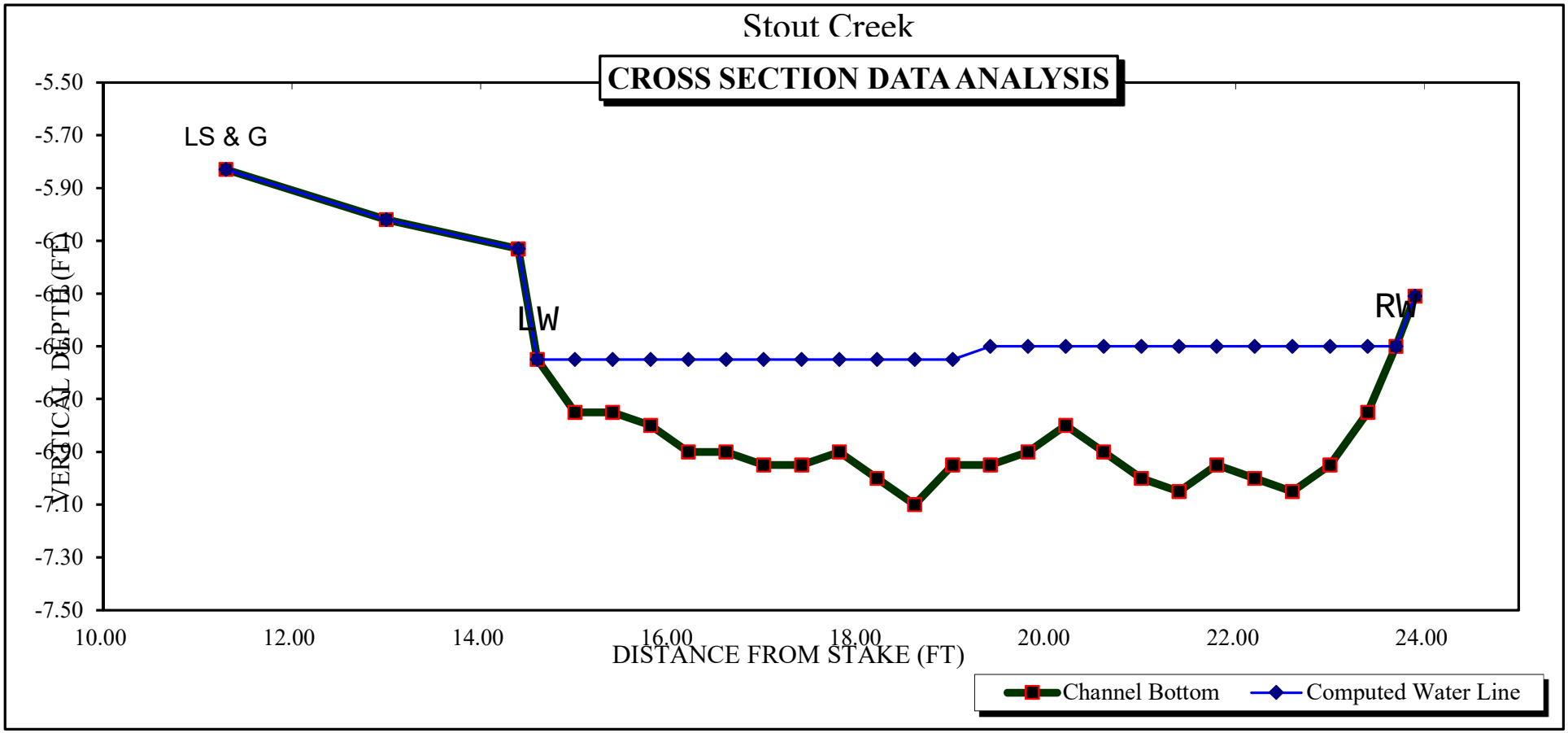
RECOMMENDATION BY: ..... AGENCY..... DATE:.....

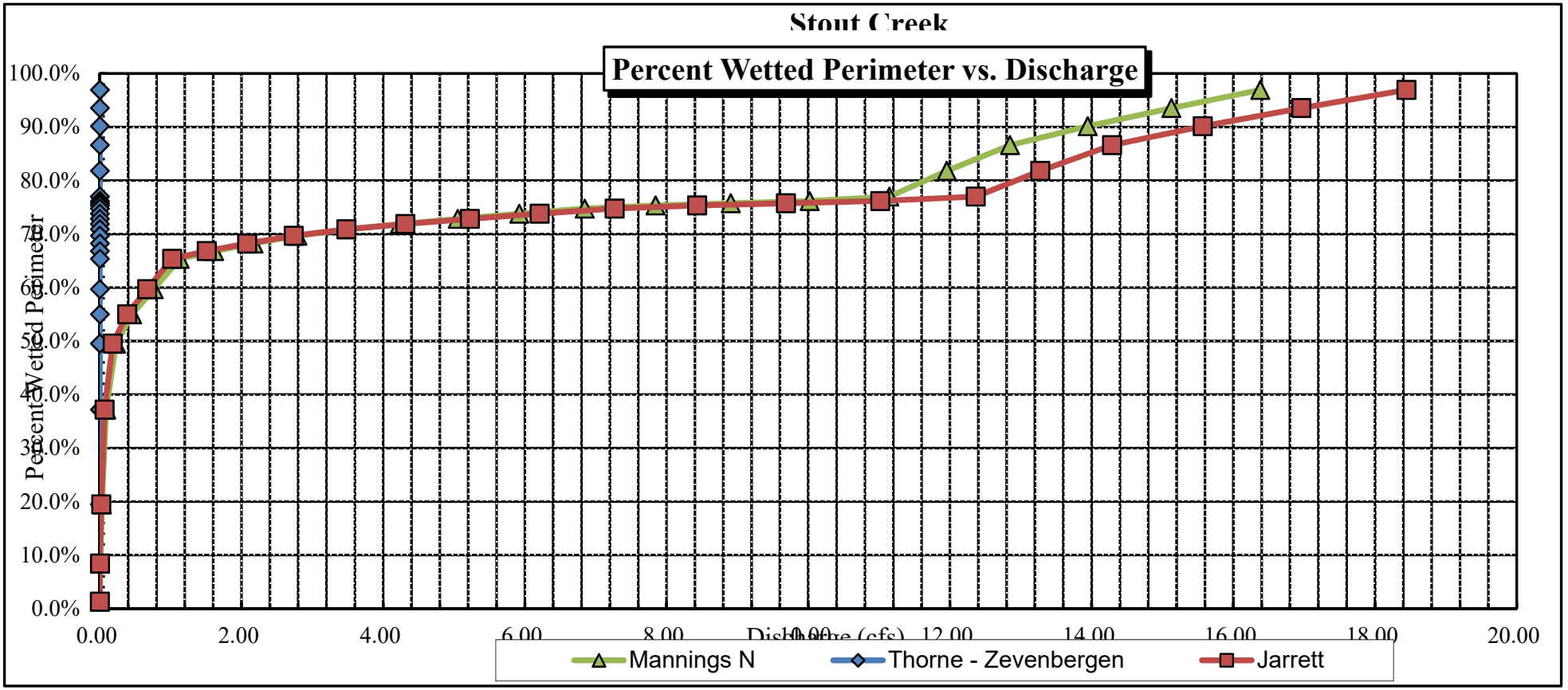
CWCB REVIEW BY: ..... DATE:.....

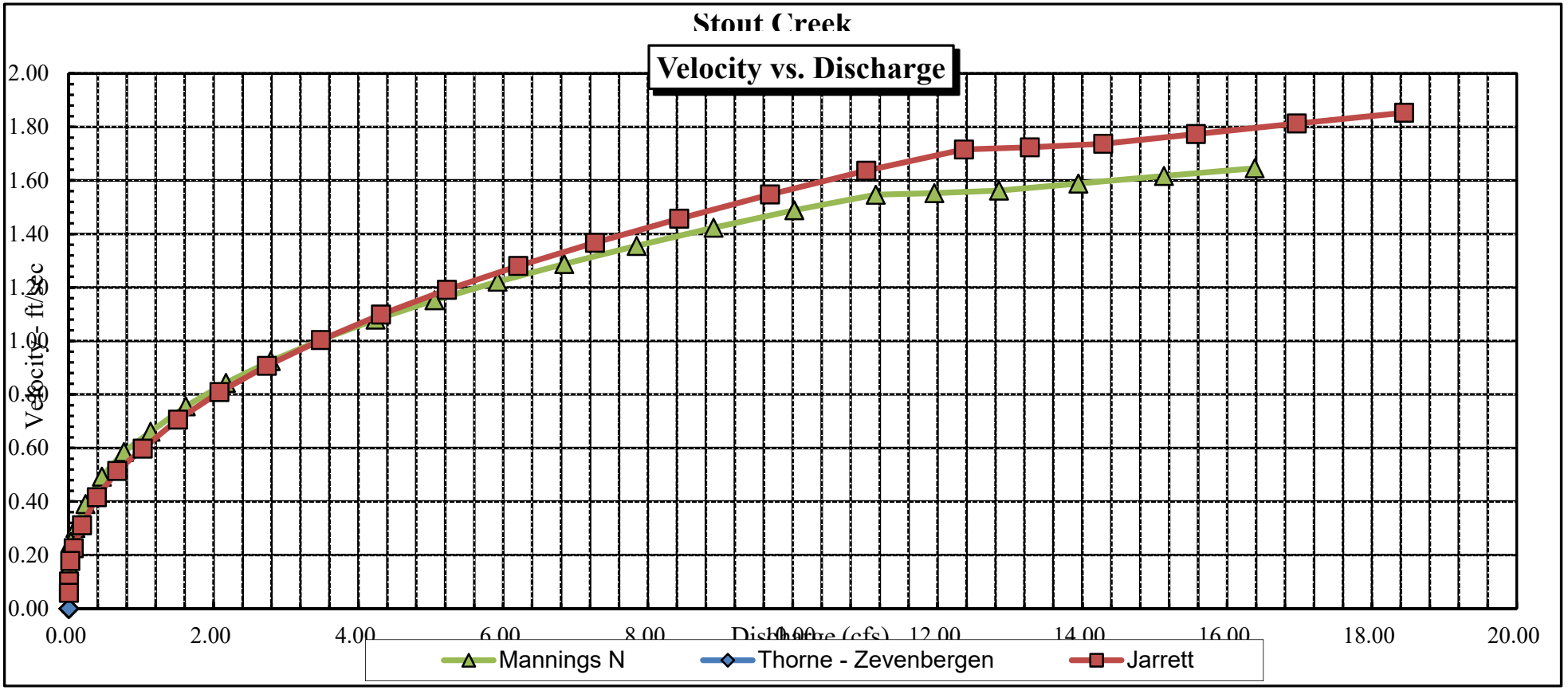
STREAM NAME: Stout Creek
XS LOCATION: At BLM-USFS boundary
XS NUMBER: 2 Jarrett Variable Manning's n Correction Applied

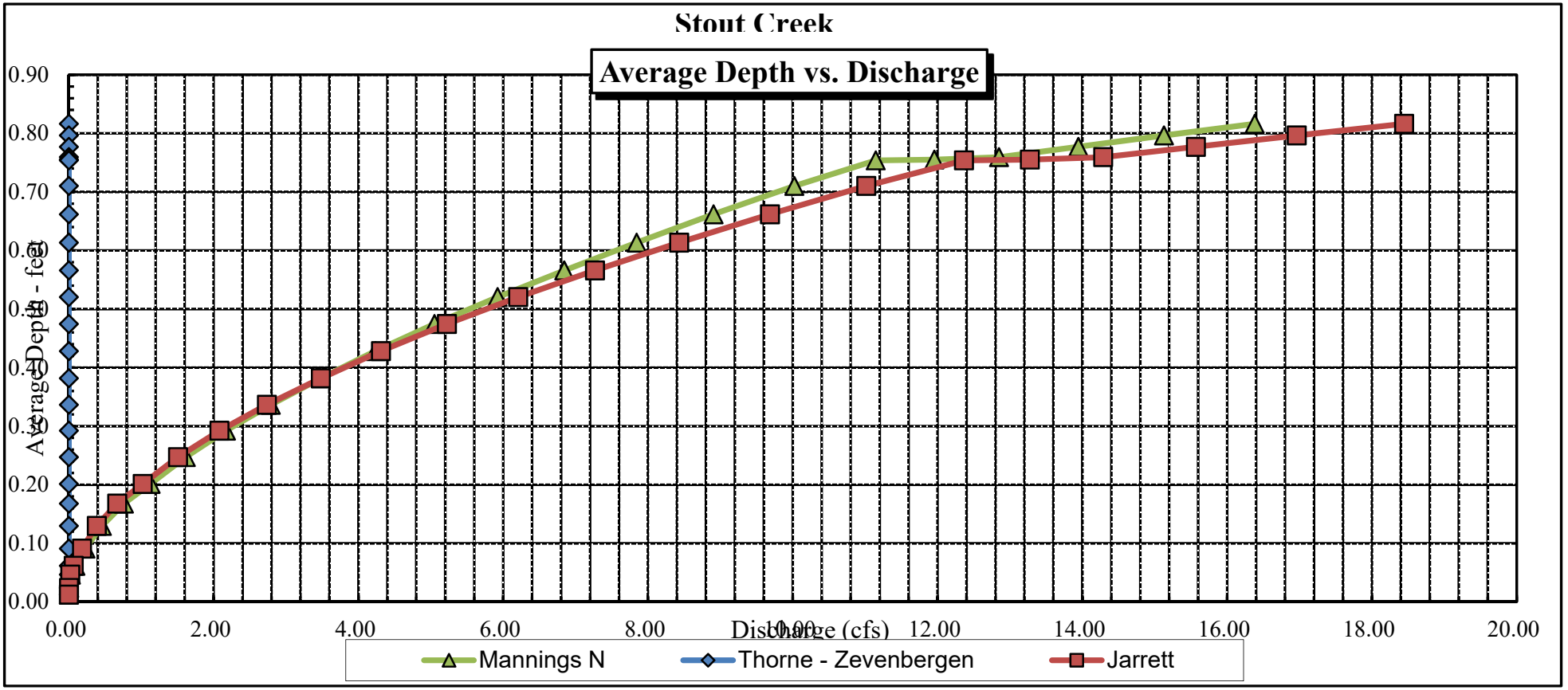
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

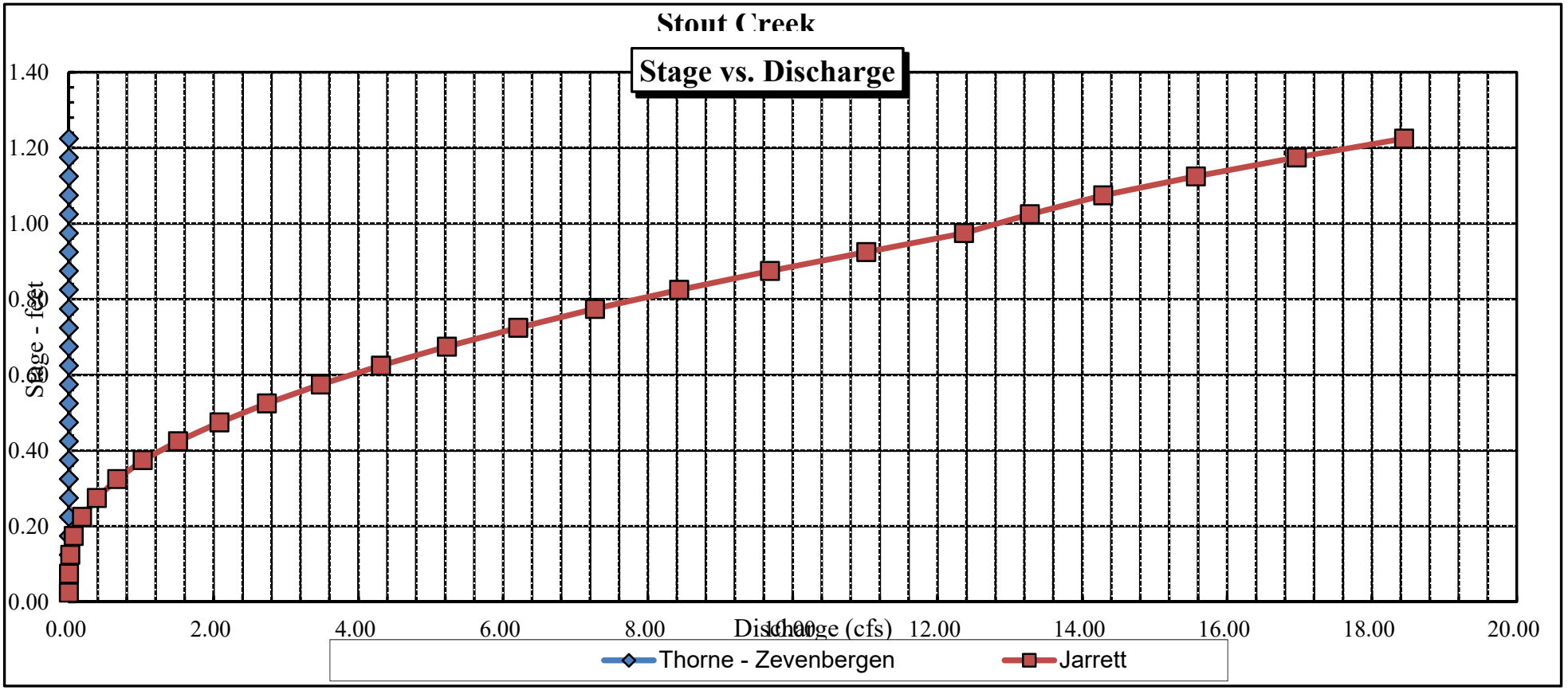
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.83	12.60	0.83	1.27	10.52	13.29	100.0%	0.79	19.87	1.89
	5.88	12.19	0.82	1.22	9.95	12.88	96.9%	0.77	18.44	1.85
	5.93	11.75	0.80	1.17	9.36	12.43	93.5%	0.75	16.96	1.81
	5.98	11.30	0.78	1.12	8.78	11.98	90.2%	0.73	15.57	1.77
	6.03	10.83	0.76	1.07	8.23	11.51	86.6%	0.71	14.29	1.74
	6.08	10.20	0.76	1.02	7.70	10.87	81.8%	0.71	13.28	1.72
	6.13	9.56	0.75	0.97	7.21	10.23	77.0%	0.70	12.36	1.72
	6.18	9.48	0.71	0.92	6.73	10.12	76.2%	0.66	11.02	1.64
	6.23	9.45	0.66	0.87	6.26	10.07	75.8%	0.62	9.69	1.55
	6.28	9.43	0.61	0.82	5.79	10.01	75.3%	0.58	8.43	1.46
	6.33	9.39	0.57	0.77	5.32	9.93	74.8%	0.53	7.27	1.37
	6.38	9.31	0.52	0.72	4.85	9.81	73.8%	0.49	6.21	1.28
	6.43	9.24	0.47	0.67	4.38	9.68	72.8%	0.45	5.22	1.19
	6.48	9.16	0.43	0.62	3.92	9.55	71.9%	0.41	4.31	1.10
WL	6.53	9.08	0.38	0.57	3.47	9.42	70.9%	0.37	3.48	1.00
	6.58	8.96	0.34	0.52	3.02	9.26	69.7%	0.33	2.74	0.91
	6.63	8.80	0.29	0.47	2.57	9.07	68.2%	0.28	2.08	0.81
	6.68	8.64	0.25	0.42	2.14	8.88	66.8%	0.24	1.51	0.71
	6.73	8.48	0.20	0.37	1.71	8.69	65.4%	0.20	1.02	0.60
	6.78	7.75	0.17	0.32	1.30	7.93	59.7%	0.16	0.67	0.51
	6.83	7.15	0.13	0.27	0.93	7.31	55.0%	0.13	0.39	0.42
	6.88	6.45	0.09	0.22	0.59	6.58	49.5%	0.09	0.18	0.31
	6.93	4.84	0.06	0.17	0.30	4.94	37.2%	0.06	0.07	0.23
	6.98	2.52	0.05	0.12	0.12	2.59	19.5%	0.05	0.02	0.18
	7.03	1.09	0.02	0.07	0.03	1.12	8.4%	0.02	0.00	0.10
	7.08	0.16	0.01	0.02	0.00	0.17	1.3%	0.01	0.00	0.06


Stout Creek
CROSS SECTION DATA ANALYSIS
LS & G
LW
RW
-5.50
-5.70
-5.90
-6.10
-6.30
-6.50
-6.70
-6.90
-7.10
-7.30
-7.50
VERTICAL DEPTH (FT)
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Stout Creek
Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Mannings N
Thorne - Zevenbergen
Jarrett


Stout Creek
Velocity vs. Discharge
Velocity- ft/sec
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Mannings N
Thorne - Zevenbergen
Jarrett


Stout Creek
Average Depth vs. Discharge
Average Depth - feet
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stout Creek
Stage vs. Discharge
Stage - feet
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

Data Input & Proofing

STREAM NAME:	Stout Creek
XS LOCATION:	At BLM-USFS boundary
XS NUMBER:	2
DATE:	7/10/2017
OBSERVERS:	R. Smith, D. Gilbert
1/4 SEC:	SW
SECTION:	27
TWP:	48N
RANGE:	10E
PM:	NM
COUNTY:	Fremont
WATERSHED:	Arkansas
DIVISION:	2
DOW CODE:	
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.067 ft / ft

CHECKED BY:.....DATE.....

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

Total Data Points = 28

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
1	LS & G	11.30	5.83			0.00	0.00	0.00
		13.00	6.02			0.00	0.00	0.00
		14.40	6.13			0.00	0.00	0.00
	LW	14.60	6.55	0.00	0.00	0.00	0.00	0.00
		15.00	6.75	0.20	0.44	0.08	0.04	6.55
		15.40	6.75	0.20	0.52	0.08	0.04	6.55
		15.80	6.80	0.25	0.66	0.10	0.07	6.55
		16.20	6.90	0.35	1.48	0.14	0.21	6.55
		16.60	6.90	0.35	1.78	0.14	0.25	6.55
		17.00	6.95	0.40	1.71	0.16	0.27	6.55
		17.40	6.95	0.40	1.44	0.16	0.23	6.55
		17.80	6.90	0.35	1.49	0.14	0.21	6.55
		18.20	7.00	0.45	1.56	0.18	0.28	6.55
		18.60	7.10	0.55	1.67	0.22	0.37	6.55
		19.00	6.95	0.40	0.78	0.16	0.12	6.55
		19.40	6.95	0.45	0.07	0.18	0.01	6.50
		19.80	6.90	0.40	0.00	0.16	0.00	6.50
		20.20	6.80	0.30	0.11	0.12	0.01	6.50
		20.60	6.90	0.40	0.00	0.16	0.00	6.50
		21.00	7.00	0.50	0.66	0.20	0.13	6.50
		21.40	7.05	0.55	2.46	0.22	0.54	6.50
		21.80	6.95	0.45	1.58	0.18	0.28	6.50
		22.20	7.00	0.50	1.36	0.20	0.27	6.50
		22.60	7.05	0.55	0.03	0.22	0.01	6.50
		23.00	6.95	0.45	0.69	0.18	0.12	6.50
		23.40	6.75	0.25	0.07	0.09	0.01	6.50
	RW	23.70	6.50	0.00	0.00	0.00	0.00	0.00
		23.90	6.31			0.00	0.00	0.00
		25.50	6.13					
					Totals	3.47	3.48	

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

CWCB ISF site visit notes
Collected using the ESRI Survey123 app on a Samsung tablet

Location description	Stout Creek on BLM land
Water division	2
Visit date	10/3/2018
Collected by	Jack Landers, Rob Viehl
General observations	Stream appears to be spring fed, stable flows, water occupied most of defined channel. Lots of wood forming habitat, good riparian shading. Very clear water with little fine sediment accumulation. Channel is braided in places, flows under deep undercut b
Wildlife observations	No fish observed, abundant macroinvertebrates. Elk and deer sign in riparian forest.
Location	13N 425729 4248715

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

CWCB discharge measurement data
Collected using the ESRI Survey123 app on a Samsung tablet

Stream name	Stout Creek
Location description	Stout Creek
Water division	2
Visit date	10/3/2018
Collected by CWCB staff	Jack Landers, Rob Viehl
Collected by non-CWCB staff	N/A
Non-CWCB entity	N/A
Measurement method	wadingADV
Equipment	Flowtracker2_sn_2H1747037
Site name	stoutcr
Measurement number	1003
Weather	Clear blue skies, sunny , approx 77 degrees
Wind	slight breeze, swirling
Cross-section description	Run gravel
Flow conditions	slightly turbulent
Measurement start time	14:31
Flow amount	0.026
Measurement rating	Poor(>8%)
Discharge comments:	Water temp 44.9 f, flow measurement location selection was challenging
Location	13N 425605 4248599

Discharge Measurement Summary

File Information

File name	StoutCr_20181003-144557.ft
Start date and time	10/3/2018 2:30 PM
Calculations engine	FlowTracker2
Data collection mode	Discharge

Discharge Summary

Start time	10/3/2018 2:32:13 PM		End time	10/3/2018 2:43:56 PM
# Stations	10		Avg interval	40
Mean depth	0.226	ft		
Mean velocity	0.0377	ft/s	Total width	3.100 ft
Mean SNR	33	dB	Total area	0.7000 ft²
Mean temp	44.938	°F	Total discharge	0.0264 ft³/s

System Information

Sensor type	Top Setting
Handheld serial number	FT2H1747037
Probe serial number	FT2P1747048
Probe firmware	1.23
Handheld software	1.4

Site Details

Site name	Stout Creek
Site number	1003
Operator(s)	Jack Landers
Comment	BLM land, middle of segment

Discharge Uncertainty

Category	ISO	IVE
Accuracy	1.0%	1.0%
Depth	3.3%	86.3%
Velocity	16.8%	293.4%
Width	1.1%	1.1%
Method	16.7%	
# Stations	5.1%	
Overall	24.5%	305.8%

Discharge Settings

Discharge equation	Mid Section
Discharge uncertainty	IVE
Discharge reference	Rated

Station Warning Settings

Station discharge caution	5.00	%
Station discharge warning	10.00	%
Maximum depth change	50.00	%
Maximum spacing change	100.00	%

Summary overview

No changes were made to this file
Quality control warnings

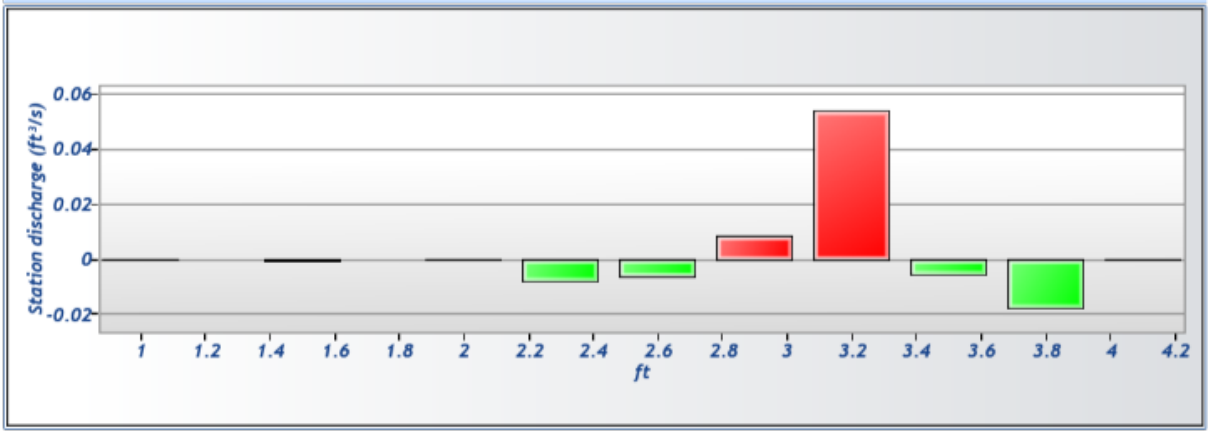
Data Collection Settings

Salinity	0.000	PSS-78
Temperature		°F
Sound speed		ft/s
Mounting correction	0.00	%

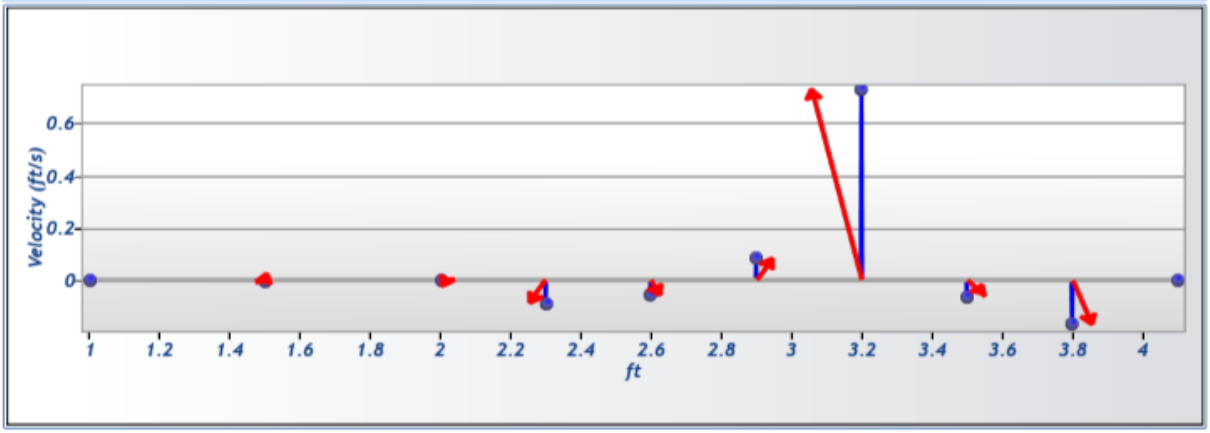
Quality Control Settings

SNR threshold	10	dB
Standard error threshold	0.0328	ft/s
Spike threshold	10.00	%
Maximum velocity angle	20.0	deg
Maximum tilt angle	5.0	deg

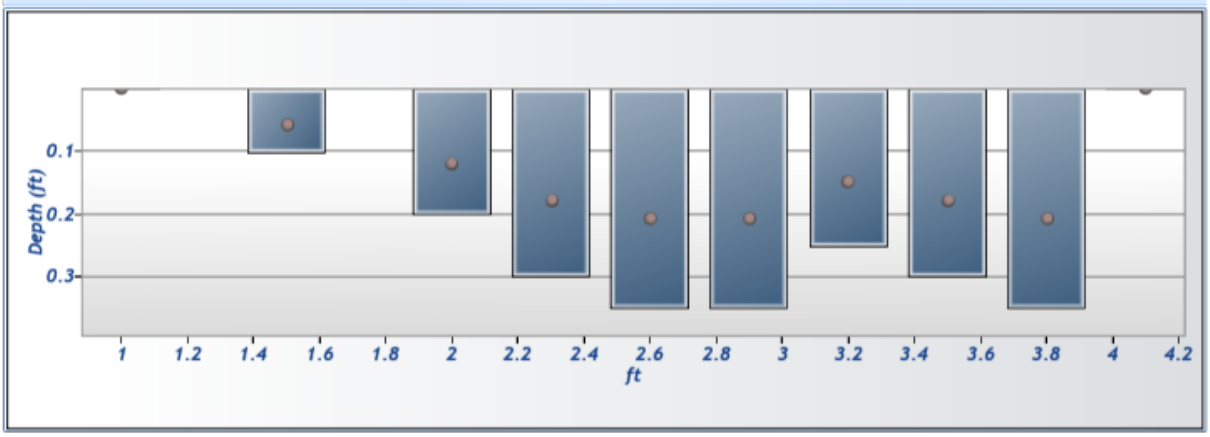
Discharge chart



Velocity chart



Depth chart



Measurement results

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Samples	Velocity (ft/s)	Correction	Mean Velocity (ft/s)	Area (ft^2)	Flow (ft^3/s)	%Q	
0	2:32 PM	1.000	None	0.000	0.0000	0.000	0	0.0000	1.0000	-0.0071	0.0000	0.0000	0.00	✓
1	2:32 PM	1.500	0.6	0.100	0.6000	0.060	80	-0.0071	1.0000	-0.0071	0.0500	-0.0004	-1.34	✓
2	2:34 PM	2.000	0.6	0.200	0.6000	0.120	80	0.0022	1.0000	0.0022	0.0800	0.0002	0.66	✓
3	2:35 PM	2.300	0.6	0.300	0.6000	0.180	80	-0.0859	1.0000	-0.0859	0.0900	-0.0077	-29.28	✓
4	2:37 PM	2.600	0.6	0.350	0.6000	0.210	80	-0.0550	1.0000	-0.0550	0.1050	-0.0058	-21.87	✓
5	2:38 PM	2.900	0.6	0.350	0.6000	0.210	80	0.0818	1.0000	0.0818	0.1050	0.0086	32.51	✓
6	2:39 PM	3.200	0.6	0.250	0.6000	0.150	80	0.7269	1.0000	0.7269	0.0750	0.0545	206.44	✓
7	2:41 PM	3.500	0.6	0.300	0.6000	0.180	80	-0.0619	1.0000	-0.0619	0.0900	-0.0056	-21.09	✓
8	2:42 PM	3.800	0.6	0.350	0.6000	0.210	80	-0.1661	1.0000	-0.1661	0.1050	-0.0174	-66.04	✓
9	2:43 PM	4.100	None	0.000	0.0000	0.000	0	0.0000	1.0000	-0.1661	0.0000	0.0000	0.00	✓

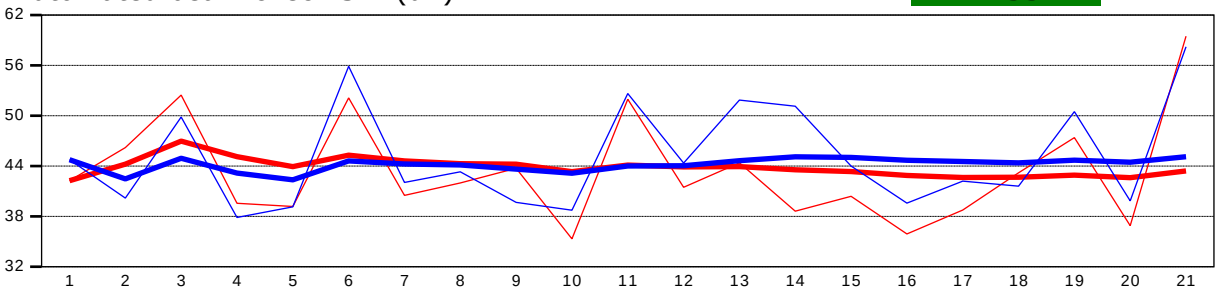
Quality control warnings

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Warnings	
1	2:32 PM	1.500	0.6	0.100	0.6000	0.060	Boundary Interference	
3	2:35 PM	2.300	0.6	0.300	0.6000	0.180	Velocity Angle > QC	
5	2:38 PM	2.900	0.6	0.350	0.6000	0.210	Velocity Angle > QC,High Stn % Discharge	
6	2:39 PM	3.200	0.6	0.250	0.6000	0.150	High Stn % Discharge	
7	2:41 PM	3.500	0.6	0.300	0.6000	0.180	Boundary Interference,SNR Threshold Variation	
8	2:42 PM	3.800	0.6	0.350	0.6000	0.210	Boundary Interference,Velocity Angle > QC	

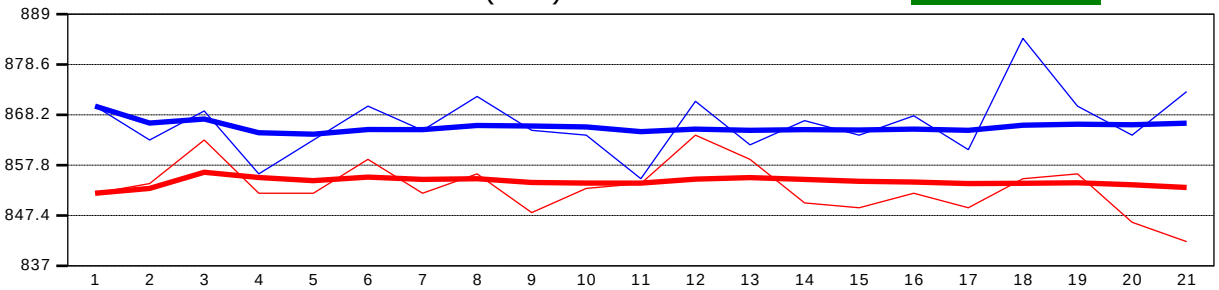
11/20/2018 12:08:05 PM

Automated beam check Start time 10/3/2018 2:31:22 PM

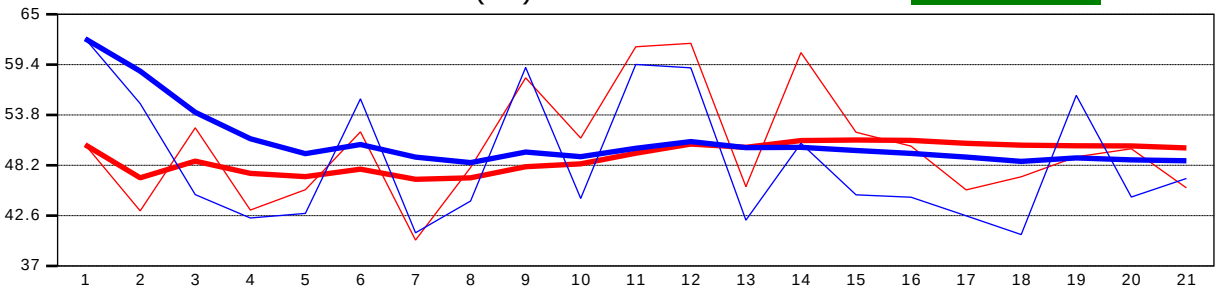
Automated beam check SNR(dB) PASS



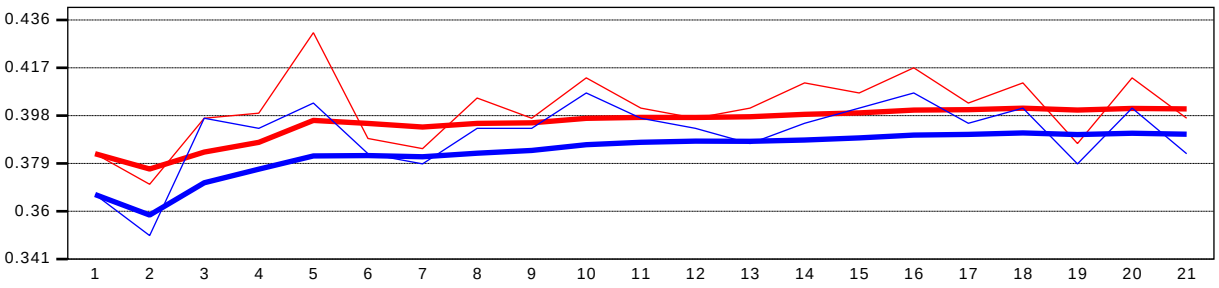
Automated beam check Noise level(cnts) PASS



Automated beam check Peak level(dB) PASS



Automated beam check Peak position(ft) PASS



Automated beam check Quality control warnings

No quality control warnings