AGENDA ITEM or FINAL CONTRACT REVIEW SUBMITTAL FORM

Agenda Item: Visitor; Colorado Water Conservation Board, Deputy

Action Requested: Discussion

Parties to the Agreement:

Term Begins: **Term Ends:** **Grant Contract #:**

Summary:

Please see the attached documentation that was provided by Jeff Baessler, Deputy Chief of the Stream and Lake Protection Section of the Colorado Water Conservation Board. Mr. Baessler will be present for the work session discussion.

Fiscal Impact:

Submitted by: Katherine Haase **Submitter's Email Address:** khaase@gunnisoncounty.org

Finance Review: ○ Required ◉ Not Required

Comments:

Reviewed by: Discharge Date:

County Attorney Review: ◉ Required ○ Not Required

Comments:
I will attend the session. db

Reveiwed by: Discharge Date: 8/14/2015 Certificate of Insurance Required Yes ○ No ◉

County Manager Review:

Comments:

Reveiwed by: GUNCOUNTY1\mbirnie Discharge Date: 8/17/2015

○ Consent Agenda ○ Regular Agenda ◉ Worksession Time Allotted: 45 m

Agenda Date: 10/13/2015

Revised April 2015

DRAFT RECOMMENDATION– January 2015 Version

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

Dear Ms. Bassi:

The Bureau of Land Management (BLM) is writing this letter to formally communicate its recommendation for an instream flow water right on Fourth of July Creek, located in Water Division 4.

Location and Land Status. Fourth of July Creek originates near Powderhorn Lakes within the Powderhorn Wilderness Area, approximately 23 miles south of Blue Mesa Reservoir. This reach begins at the headwaters of the creek and extends downstream to the headgate of the Carris Thompson Ditch, a distance of approximately 5.8 miles. The BLM manages approximately 4.6 miles of this reach, while 1.2 miles are in private ownership.

Biological Summary. Fourth of July Creek is a cold-water, high gradient stream. It flows through a canyon with a valley floor approximately one-eighth mile in width. The stream cuts through alluvial deposits in the narrow valley and is confined by bedrock in many locations. The stream generally has small-sized substrate, consisting of gravels and small cobbles, and small boulders. The stream has a good mix of pools, small riffles, and runs. While deep pool habitat is absent, the existing pools are sufficient for overwintering fish.

Fisheries surveys have revealed a self-sustaining population of brook trout. Intensive macro-invertebrate surveys have not been conducted, but spot samples have revealed various species of mayfly, caddisfly, and stonefly.

The riparian community is generally comprised of blue spruce, aspen, willow species, and alder. The riparian community is in very good condition, and provides abundant shading and cover for fish habitat.

R2Cross Analysis. The BLM collected the following R2Cross data from Fourth of July 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)
07/18/2013 #1	0.42 cfs	8.56 feet	Out of range	0.79 cfs
07/18/2013 #2	0.37 cfs	6.00 feet	0.40 cfs	Out of range
07/25/2014 #1	0.40 cfs	10.14 feet	0.65 cfs	Out of range
07/25/2014 #2	0.39 cfs	9.00 feet	0.81 cfs	Out of range
		Averages:	0.62 cfs	0.79 cfs

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.

> 0.8 cubic feet per second is recommended during the snowmelt runoff period from April 1 to June 30. This recommendation is driven by the average velocity criteria. This creek is narrow and has limited physical habitat, so it is important to protect a flow rate that makes most of this habitat available to the fish population while they are completing critical life history functions during the warm weather months.
>
> 0.6 cubic feet per second is recommended from July 1 to March 31. This recommendation is driven by the average velocity criteria. This flow rate should prevent pools from freezing, allowing the fish population to successfully overwinter. Even though the base flow in this creek is small, it is extremely consistent, allowing the fishery to persist.

Water Availability. The BLM recommends relying upon three sources of data for water availability analysis. USGS Gage 09122000 (Cebolla Creek at Powderhorn, CO) measures flow from the next watershed to the east of Fourth of July Creek. Elevation and precipitation patterns for the Cebolla Creek watershed are very similar to the Fourth of July Creek watershed. A basin apportionment analysis could be performed to derive flow rates for Fourth of July Creek. In addition, Streamstats should be consulted. The Streamstats model produces similar estimates of baseflow as basin apportionment calculation, but BLM believes the Streamstats model may overestimate snowmelt runoff flows. Finally, diversion records for the Carris Thompson Ditch can be consulted to help confirm the duration of the snowmelt runoff period.

The BLM is aware of two water rights within the proposed instream flow reach:

Fourth of July Feeder Pipeline – 2.0 cfs
Fourth of July Pond – 1.8 acre feet

The feeder pipeline maintains the off-channel pond at full capacity and maintains the water quality within the pond. The pond appears to be operated on an inflow equals outflow basis, so any water that is not consumed by pond evaporation is immediately returned to Fourth of July Creek.

Relationship to Land Management Plans. The headwaters of this creek are located within the Powderhorn Wilderness Area. BLM manages the wilderness area to maintain stream habitats in a pristine and unimpaired condition. In addition, the portion of the creek within the wilderness area has been determined to be an "Outstanding Water of The State of Colorado" because of its excellent water quality. Establishing an instream flow water right would assist in meeting these objectives. Appropriation of an instream flow water right would also assist BLM in long-term management of riparian values and important fishery values.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2015. 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,

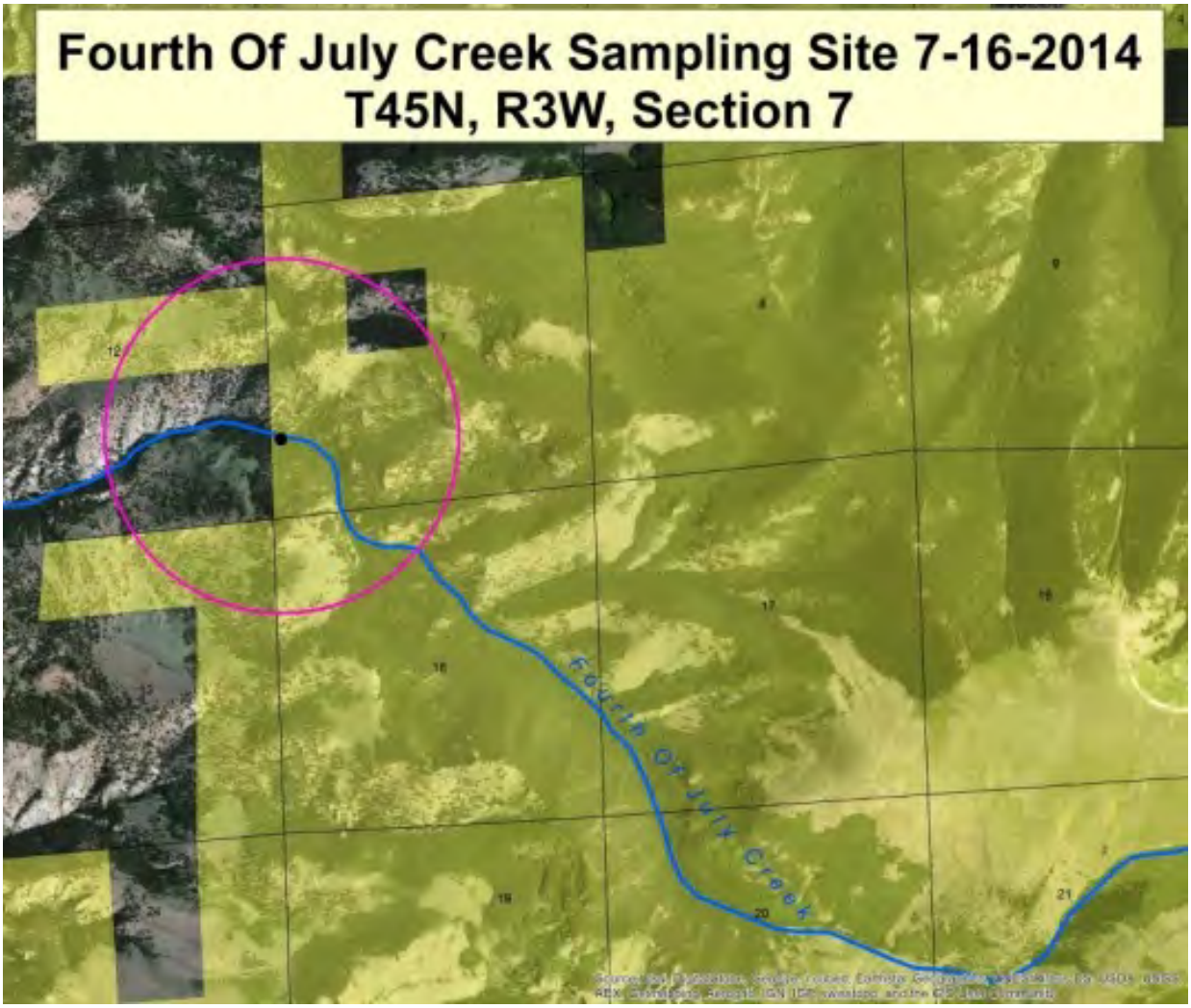
Brian St. George
Deputy State Director
Resources and Fire

Cc: Field Office Manager, Gunnison Field Office
Lori Armstrong, Southwest District Office
Andrew Breibart, Gunnison Field Office

Gunnison Field Office Stream Surveys
July 2014

Fourth of July Creek – Water Code: #45351

Fourth of July Creek, located on BLM lands administered by the Gunnison Field Office, was sampled on July 16, 2014. Fourth of July Creek is tributary to the Lake Fork Gunnison River. Sampling was done to determine species composition and obtain a population estimate. A two-pass removal population estimate was completed. The stream was sampled using one backpack electroshocking unit. Brook trout (*Salvelinus fontinalis*), was the only species seen or collected. Personnel present included Dan Brauch (CPW), Gregor Dekleva, Tom Fresques, and Kristen Doyle (BLM).



Fourth of July Creek

Fourth of July Creek

STREAM SURVEY FISH SAMPLING FORM 2014									
WATER: 4th of July				**DATE: 7/16/14**			**GEAR: BPE-1**		
Crew: Braugh, Dekleva, Fresques, Doyle					**Location:**				
#	**Pass**	**Species**	**Length**	**Weight**	**#**	**Pass**	**Species**	**Length**	**Weight**
1	1	BRK	148	36	26	2	BRK	137	28
2	1	BRK	139	25	27	2	BRK	130	20
3	1	BRK	118	20	28	2	BRK	88	6.5
4	1	BRK	116	19	29	2	BRK	131	24.9
5	1	BRK	154	42	30	2	BRK	176	68.8
6	1	BRK	172	58	31	2	BRK	138	24.2
7	1	BRK	127	20	32	2	BRK	88	6.3
8	1	BRK	164	54	33				
9	1	BRK	184	67	34				
10	1	BRK	132	28	35				
11	1	BRK	139	36	36				
12	1	BRK	142	33	37				
13	1	BRK	174	54	38				
14	1	BRK	128	22	39				
15	1	BRK	93	8	40				
16	1	BRK	92	5	41				
17	1	BRK	138	27	42				
18	1	BRK	136	25	43				
19	1	BRK	128	23	44				
20	1	BRK	164	48	45				
21	1	BRK	90	8	46				
22	1	BRK	122	18	47				
23	1	BRK	91	7	48				
24	1	BRK	84	8	49				
25	1	BRK	33	1	50				
GPS Coordinates: Start: 13S 301467, 4226150 End: 13S 301519, 4226516									
H2O Temp: 55°F				**Reach Length**: 300’			**Stream Widths**:		1.4.4’
Conductivity: 83µs				**Shocker Settings**: 385					2.3.9’
Habitat (Riparian): Diverse, dense, lush vegetation. Spruce, ponderosa pine, rocky mountain juniper, aspen, alder, willow, sedge									3.2’
									4.8.2’
									5.6.2’
									Avg:
Habitat (Stream): Channel type A, lots of woody debris, some good pools about 1.5 deep. Gravel, cobble, and rock substrate.									

Discussion:
This small stream contained a good mix of small pools, riffles and runs. Large deep pools were absent but existing pools are sufficient to overwinter and oversummer resident brook trout. Abundant woody debris helps to form and maintain some of the better pools. Substrate consists of some gravels and cobbles with rock. Riparian habitat is dense and lush consisting of blue spruce, ponderosa pine, rocky mountain juniper, aspen, alder, willow, and sedges. The stream is steep gradient and appears to be a Rosgen A/B channel type.

Sampling on this stream was conducted to determine species composition and obtain a population estimate. In addition, an Instream Flow recommendation may be pursued on this stream. Based on the sampling, the site specific population estimate of fish ≥120 mm Total Length within the sample reach (300 feet) is 24 fish + or – 5 at the 95% confidence interval. The extrapolated population estimate of fish ≥120mm Total Length is 417 fish + or – 96 fish per mile at the 95% confidence interval.

Recommendations:

- Consider sampling further up the drainage to determine upstream distribution limits and look for upstream movement barriers – the stream, although small, could be a candidate for future cutthroat trout reclamation

- Periodically monitor stream and riparian habitats

- Consider instream flow recommendation for this stream

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

LOCATION INFORMATION

STREAM NAME:	Fourth of July Creek
XS LOCATION:	Approx. 1 mile upst. From Lake Fork Gunnison
XS NUMBER:	2
DATE:	18-Jul-13
OBSERVERS:	R. Smith, A. Breibart
1/4 SEC:	SE
SECTION:	12
TWP:	45N
RANGE:	4W
PM:	New Mexico
COUNTY:	Gunnison
WATERSHED:	Lake Fork Gunnison River
DIVISION:	4
DOW CODE:	45351
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:	0.088

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

ASSIGNED TO: ….....…….....DATE.....

STREAM NAME: Fourth of July Creek
XS LOCATION: Approx. 1 mile upst. From Lake Fork Gunnison
XS NUMBER: 2

DATA POINTS= 23

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
LS	0.00	5.36			0.00		0.00	0.00	0.0%
1 G	1.10	5.83			0.00		0.00	0.00	0.0%
W	2.00	6.90	0.00	0.00	0.00		0.00	0.00	0.0%
	2.20	7.10	0.20	0.51	0.28	0.20	0.05	0.03	7.0%
	2.50	7.10	0.20	0.34	0.30	0.20	0.06	0.02	5.6%
	2.80	7.15	0.25	0.05	0.30	0.25	0.08	0.00	1.0%
	3.10	7.00	0.10	0.43	0.34	0.10	0.03	0.01	3.5%
	3.40	7.00	0.10	0.30	0.30	0.10	0.03	0.01	2.5%
	3.70	7.00	0.10	0.00	0.30	0.10	0.03	0.00	0.0%
	4.00	7.00	0.10	0.03	0.30	0.10	0.03	0.00	0.2%
	4.30	7.10	0.20	0.22	0.32	0.20	0.06	0.01	3.6%
	4.60	7.10	0.20	0.48	0.30	0.20	0.06	0.03	7.9%
	4.90	7.10	0.20	0.63	0.30	0.20	0.06	0.04	10.3%
	5.20	7.15	0.25	1.05	0.30	0.25	0.08	0.08	21.5%
	5.50	7.15	0.25	0.78	0.30	0.25	0.08	0.06	16.0%
	5.80	7.15	0.25	0.33	0.30	0.25	0.08	0.02	6.8%
	6.10	7.10	0.20	0.35	0.30	0.20	0.06	0.02	5.7%
	6.40	7.20	0.30	0.28	0.32	0.30	0.09	0.03	6.9%
	6.70	7.25	0.35	0.08	0.30	0.35	0.07	0.01	1.5%
W	6.80	6.90	0.00	0.00	0.36		0.00	0.00	0.0%
1 G	7.10	5.83			0.00		0.00	0.00	0.0%
	7.60	5.24			0.00		0.00	0.00	0.0%
RS	8.80	5.23			0.00		0.00	0.00	0.0%
TOTALS ----------					5.23	0.35 (Max.)	0.93	0.37	100.0%

Manning's n = 0.3541
Hydraulic Radius= 0.17777722

STREAM NAME: Fourth of July Creek
XS LOCATION: Approx. 1 mile upst. From Lake Fork Gunnison
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.93	0.93	0.0%
6.65	0.93	2.17	132.8%
6.67	0.93	2.06	121.9%
6.69	0.93	1.96	111.0%
6.71	0.93	1.86	100.2%
6.73	0.93	1.76	89.5%
6.75	0.93	1.66	78.8%
6.77	0.93	1.56	68.1%
6.79	0.93	1.46	57.5%
6.81	0.93	1.37	46.9%
6.83	0.93	1.27	36.4%
6.85	0.93	1.17	26.0%
6.86	0.93	1.12	20.7%
6.87	0.93	1.07	15.5%
6.88	0.93	1.03	10.3%
6.89	0.93	0.98	5.2%
6.90	0.93	0.93	0.0%
6.91	0.93	0.88	-5.2%
6.92	0.93	0.83	-10.3%
6.93	0.93	0.79	-15.4%
6.94	0.93	0.74	-20.5%
6.95	0.93	0.69	-25.6%
6.97	0.93	0.60	-35.8%
6.99	0.93	0.50	-45.9%
7.01	0.93	0.42	-54.9%
7.03	0.93	0.35	-62.8%
7.05	0.93	0.28	-70.4%
7.07	0.93	0.21	-77.7%
7.09	0.93	0.14	-84.7%
7.11	0.93	0.09	-90.4%
7.13	0.93	0.05	-94.2%
7.15	0.93	0.03	-97.0%

WATERLINE AT ZERO
AREA ERROR = 6.900

STREAM NAME: Fourth of July Creek
XS LOCATION: Approx. 1 mile upst. From Lake Fork Gunnison
XS NUMBER: 2 Constant Manning's n

STAGING TABLE

GL = lowest Grassline elevation corrected for sag
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	6.00	1.12	1.42	6.71	7.74	100.0%	0.87	7.59	1.13
	5.90	5.92	1.06	1.35	6.29	7.58	97.9%	0.83	6.92	1.10
	5.95	5.87	1.02	1.30	6.00	7.46	96.4%	0.80	6.45	1.08
	6.00	5.81	0.98	1.25	5.70	7.34	94.8%	0.78	6.00	1.05
	6.05	5.75	0.94	1.20	5.42	7.22	93.3%	0.75	5.56	1.03
	6.10	5.70	0.90	1.15	5.13	7.11	91.8%	0.72	5.14	1.00
	6.15	5.64	0.86	1.10	4.85	6.99	90.3%	0.69	4.72	0.98
	6.20	5.59	0.82	1.05	4.56	6.87	88.8%	0.66	4.33	0.95
	6.25	5.53	0.78	1.00	4.29	6.76	87.3%	0.63	3.94	0.92
	6.30	5.47	0.73	0.95	4.01	6.64	85.8%	0.60	3.57	0.89
	6.35	5.42	0.69	0.90	3.74	6.52	84.2%	0.57	3.21	0.86
	6.40	5.36	0.65	0.85	3.47	6.40	82.7%	0.54	2.87	0.83
	6.45	5.30	0.60	0.80	3.20	6.29	81.2%	0.51	2.54	0.79
	6.50	5.25	0.56	0.75	2.94	6.17	79.7%	0.48	2.23	0.76
	6.55	5.19	0.52	0.70	2.68	6.05	78.2%	0.44	1.94	0.72
	6.60	5.14	0.47	0.65	2.42	5.93	76.7%	0.41	1.66	0.68
	6.65	5.08	0.43	0.60	2.17	5.82	75.2%	0.37	1.39	0.64
	6.70	5.02	0.38	0.55	1.91	5.70	73.6%	0.34	1.15	0.60
	6.75	4.97	0.33	0.50	1.66	5.58	72.1%	0.30	0.92	0.56
	6.80	4.91	0.29	0.45	1.42	5.47	70.6%	0.26	0.72	0.51
	6.85	4.86	0.24	0.40	1.17	5.35	69.1%	0.22	0.53	0.45
WL	6.90	4.80	0.19	0.35	0.93	5.23	67.6%	0.18	0.37	0.39
	6.95	4.74	0.15	0.30	0.69	5.11	66.0%	0.14	0.23	0.33
	7.00	3.77	0.12	0.25	0.46	4.09	52.8%	0.11	0.13	0.29
	7.05	3.46	0.08	0.20	0.28	3.69	47.7%	0.07	0.06	0.22
	7.10	2.24	0.05	0.15	0.11	2.40	31.0%	0.05	0.02	0.16
	7.15	0.48	0.06	0.10	0.03	0.57	7.3%	0.05	0.00	0.17
	7.20	0.31	0.02	0.05	0.01	0.36	4.6%	0.02	0.00	0.10

STREAM NAME: Fourth of July Creek
XS LOCATION: Approx. 1 mile upst. From Lake Fork Gunnison
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.37	cfs
CALCULATED FLOW (Qc)=	0.37	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	6.90	ft
CALCULATED WATERLINE (WLc)=	6.90	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=	0.39	ft/sec
MANNING'S N=	0.354	
SLOPE=	0.088	ft/ft
.4 * Qm =	0.1	cfs
2.5 * Qm=	0.9	cfs

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

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

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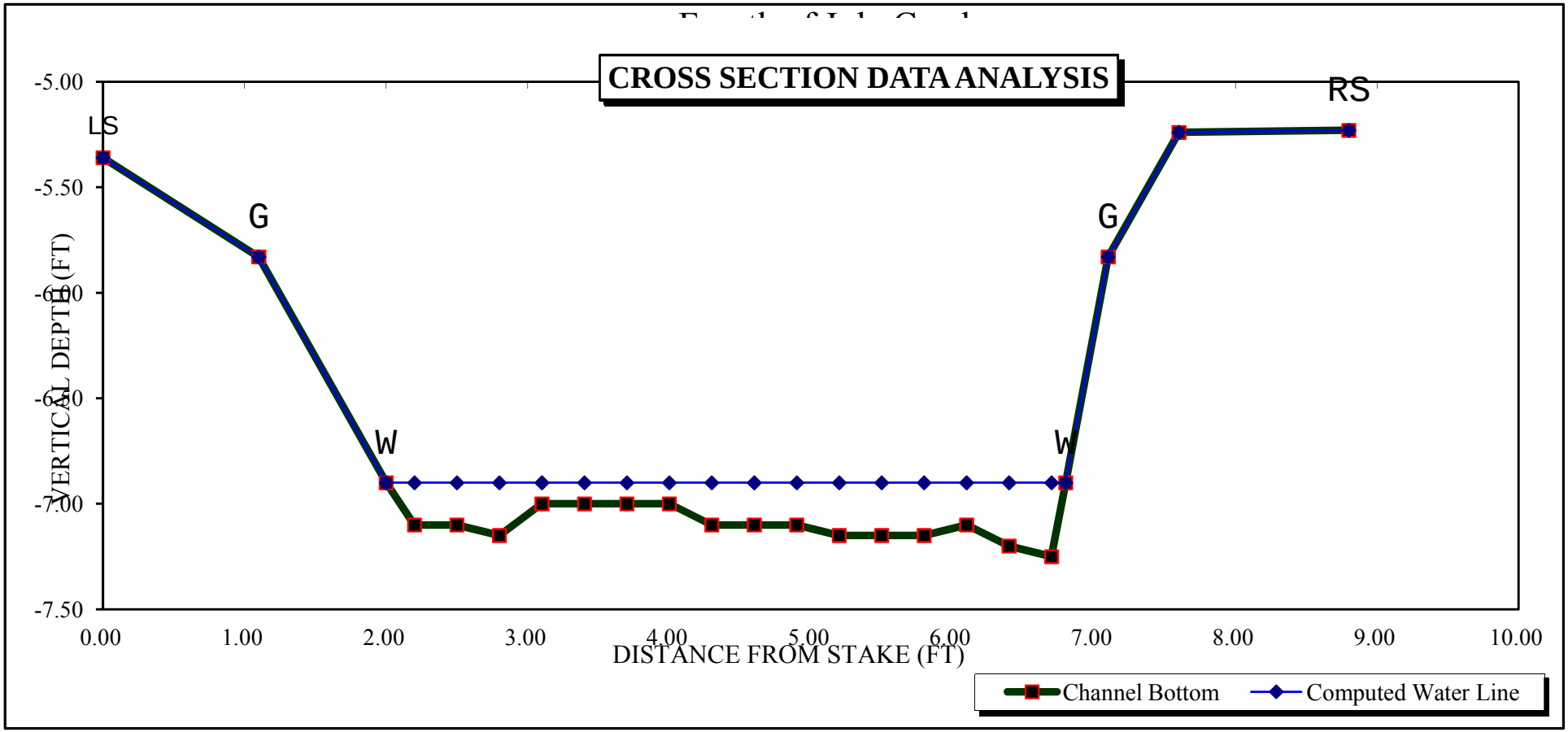
RECOMMENDATION BY: …….…….…..... AGENCY..……...……..……..…..... DATE:.....…..…....……

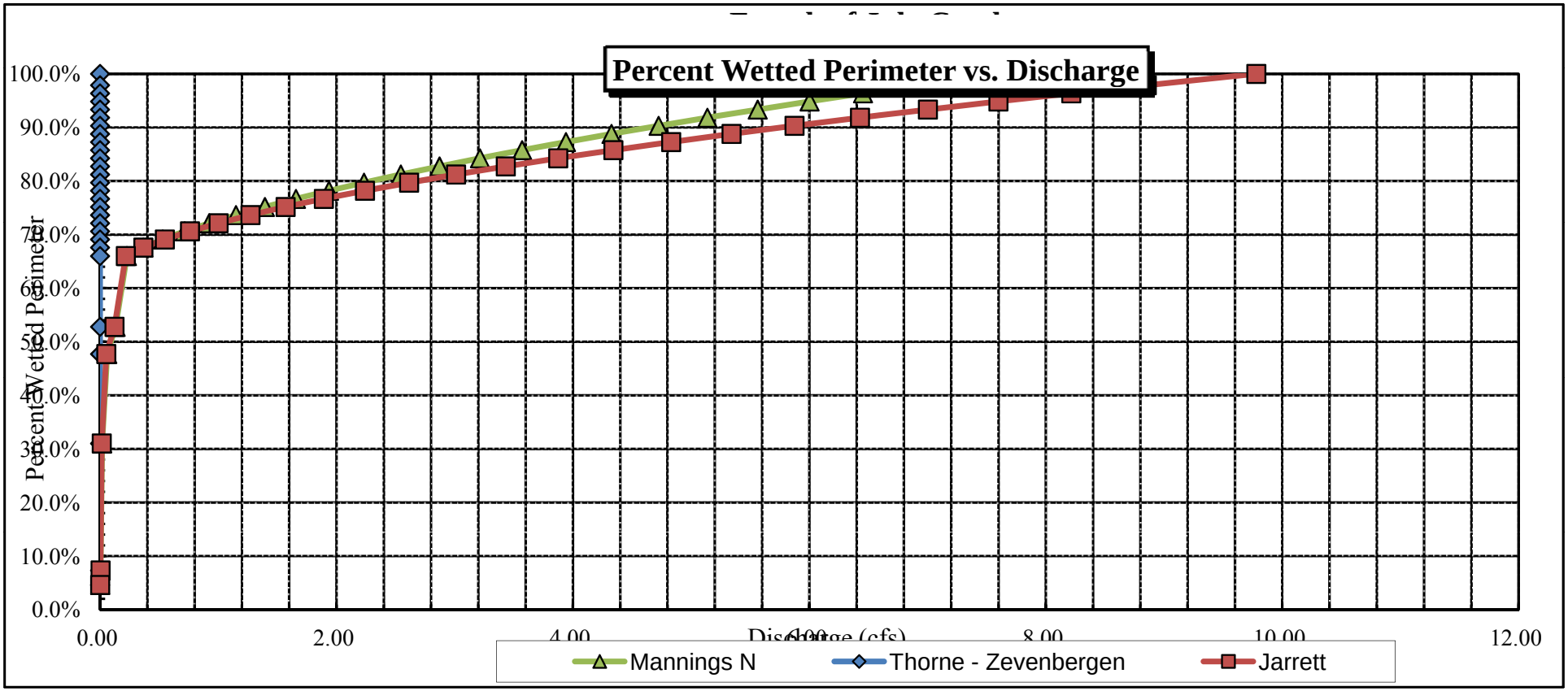
CWCB REVIEW BY: ..……...…….....…….....…..... DATE:.....……..…

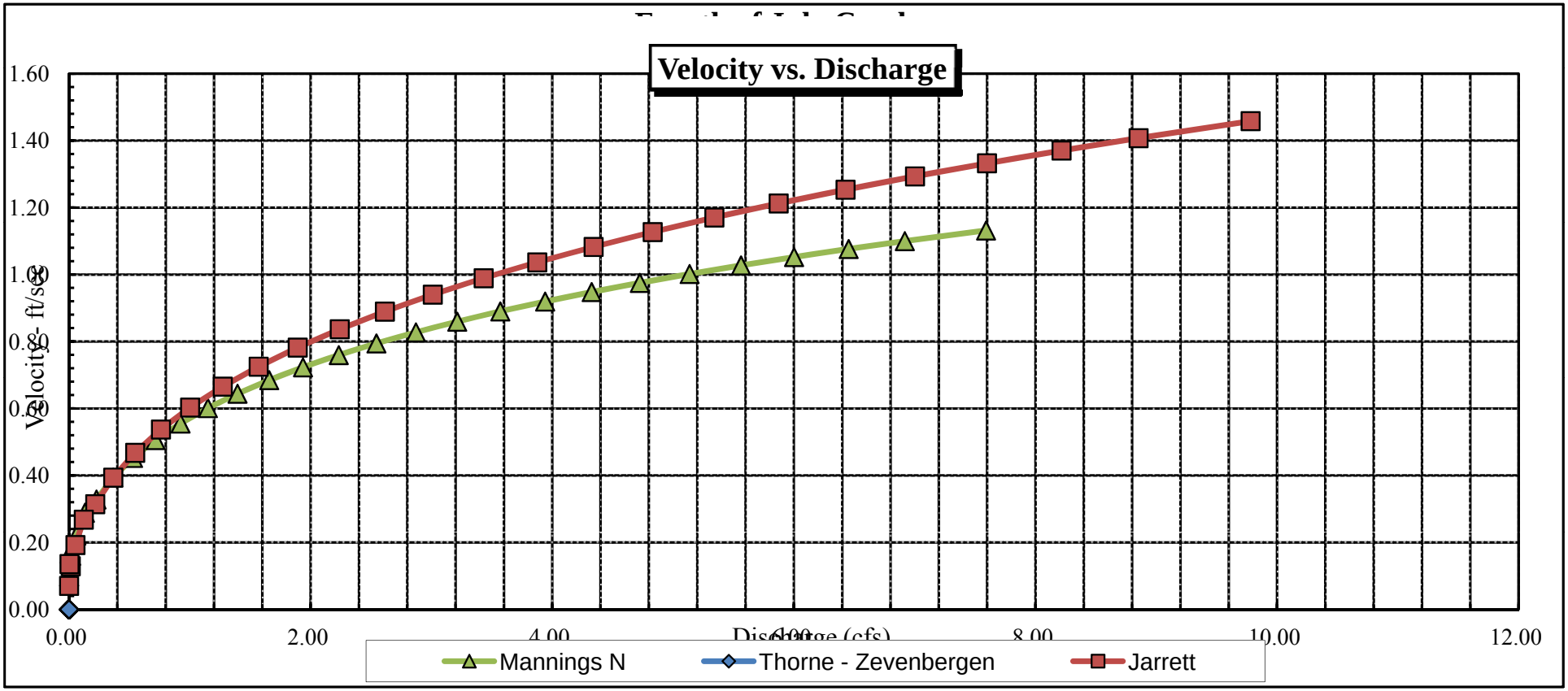
STREAM NAME: Fourth of July Creek
XS LOCATION: Approx. 1 mile upst. From Lake Fork Gunnison
XS NUMBER: 2 Jarrett Variable Manning's n Correction Applied

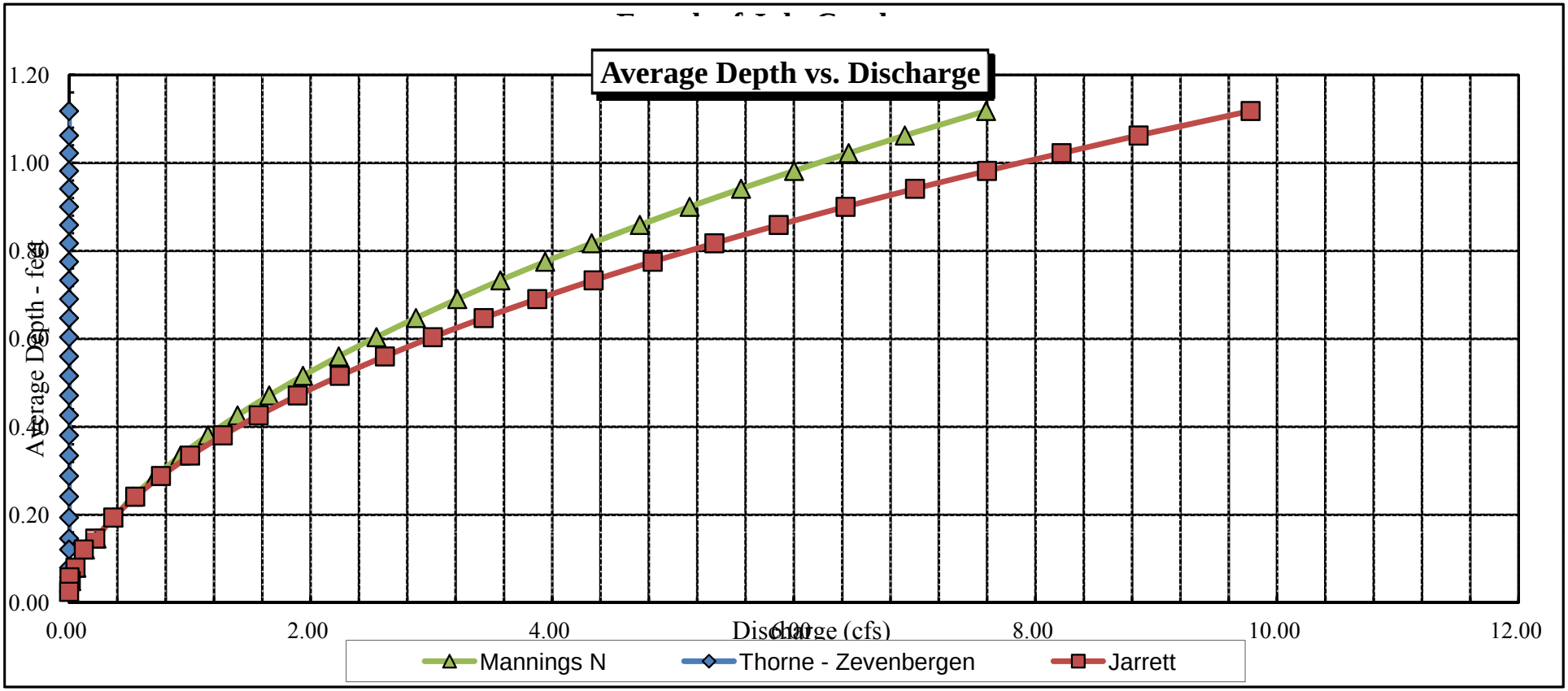
STAGING TABLE *GL* = lowest Grassline elevation corrected for sag
WL = Waterline corrected for variations in field measured water surface elevations and sag

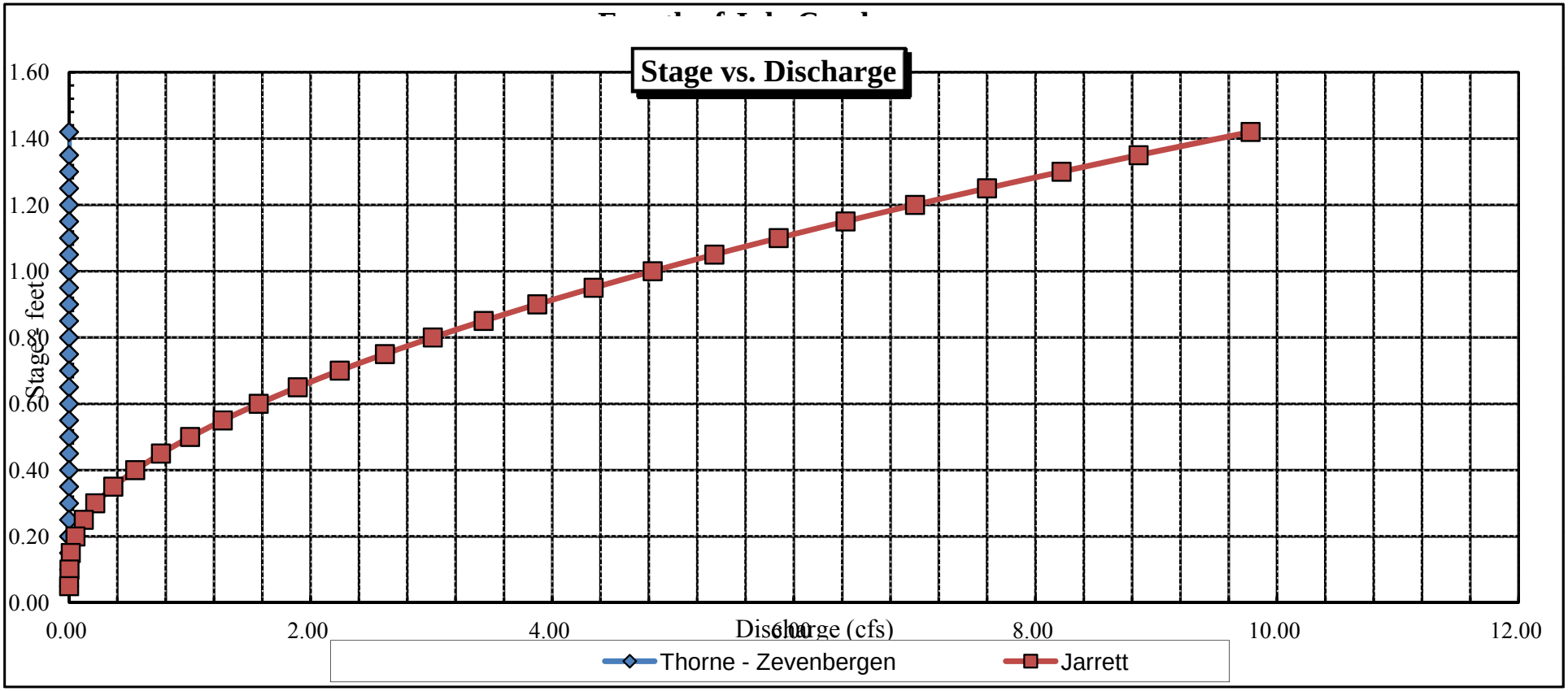
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.83	6.00	1.12	1.42	6.71	7.74	100.0%	0.87	9.78	1.46
	5.90	5.92	1.06	1.35	6.29	7.58	97.9%	0.83	8.85	1.41
	5.95	5.87	1.02	1.30	6.00	7.46	96.4%	0.80	8.22	1.37
	6.00	5.81	0.98	1.25	5.70	7.34	94.8%	0.78	7.60	1.33
	6.05	5.75	0.94	1.20	5.42	7.22	93.3%	0.75	7.00	1.29
	6.10	5.70	0.90	1.15	5.13	7.11	91.8%	0.72	6.43	1.25
	6.15	5.64	0.86	1.10	4.85	6.99	90.3%	0.69	5.87	1.21
	6.20	5.59	0.82	1.05	4.56	6.87	88.8%	0.66	5.34	1.17
	6.25	5.53	0.78	1.00	4.29	6.76	87.3%	0.63	4.83	1.13
	6.30	5.47	0.73	0.95	4.01	6.64	85.8%	0.60	4.34	1.08
	6.35	5.42	0.69	0.90	3.74	6.52	84.2%	0.57	3.88	1.04
	6.40	5.36	0.65	0.85	3.47	6.40	82.7%	0.54	3.43	0.99
	6.45	5.30	0.60	0.80	3.20	6.29	81.2%	0.51	3.01	0.94
	6.50	5.25	0.56	0.75	2.94	6.17	79.7%	0.48	2.61	0.89
	6.55	5.19	0.52	0.70	2.68	6.05	78.2%	0.44	2.24	0.84
	6.60	5.14	0.47	0.65	2.42	5.93	76.7%	0.41	1.89	0.78
	6.65	5.08	0.43	0.60	2.17	5.82	75.2%	0.37	1.57	0.72
	6.70	5.02	0.38	0.55	1.91	5.70	73.6%	0.34	1.27	0.67
	6.75	4.97	0.33	0.50	1.66	5.58	72.1%	0.30	1.00	0.60
	6.80	4.91	0.29	0.45	1.42	5.47	70.6%	0.26	0.76	0.54
	6.85	4.86	0.24	0.40	1.17	5.35	69.1%	0.22	0.55	0.47
WL	6.90	4.80	0.19	0.35	0.93	5.23	67.6%	0.18	0.37	0.39
	6.95	4.74	0.15	0.30	0.69	5.11	66.0%	0.14	0.22	0.31
	7.00	3.77	0.12	0.25	0.46	4.09	52.8%	0.11	0.12	0.27
	7.05	3.46	0.08	0.20	0.28	3.69	47.7%	0.07	0.05	0.19
	7.10	2.24	0.05	0.15	0.11	2.40	31.0%	0.05	0.01	0.13
	7.15	0.48	0.06	0.10	0.03	0.57	7.3%	0.05	0.00	0.14
	7.20	0.31	0.02	0.05	0.01	0.36	4.6%	0.02	0.00	0.07


CROSS SECTION DATA ANALYSIS
LS
G
W
W
G
RS
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
VERTICAL DEPTH (FT)
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Percent Wetted Perimeter vs. Discharge
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Percent Wetted Perimeter
0.00
2.00
4.00
6.00
8.00
10.00
12.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Velocity - ft/sec
0.00
2.00
4.00
6.00
8.00
10.00
12.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Average Depth - feet
0.00
2.00
4.00
6.00
8.00
10.00
12.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Stage, feet
0.00
2.00
4.00
6.00
8.00
10.00
12.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

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

LOCATION INFORMATION

STREAM NAME:	Fourth of July Creek
XS LOCATION:	Approx. 1 mile upst. From Lake Fork Gunnison
XS NUMBER:	1
DATE:	18-Jul-13
OBSERVERS:	R. Smith, A. Breibart
1/4 SEC:	SE
SECTION:	12
TWP:	45N
RANGE:	4W
PM:	New Mexico
COUNTY:	Gunnison
WATERSHED:	Lake Fork Gunnison River
DIVISION:	4
DOW CODE:	45351
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:	0.076

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

ASSIGNED TO: ….....…….....DATE.....

STREAM NAME: Fourth of July Creek
XS LOCATION: Approx. 1 mile upst. From Lake Fork Gunnison
XS NUMBER: 1

DATA POINTS= 21

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
1	RS & G	6.00	5.10			0.00		0.00	0.00	0.0%
		6.90	5.76			0.00		0.00	0.00	0.0%
	W	7.90	6.20	0.00	0.00	0.00		0.00	0.00	0.0%
		8.50	6.30	0.10	0.07	0.61	0.10	0.05	0.00	0.7%
		8.80	6.30	0.10	0.51	0.30	0.10	0.03	0.02	3.6%
		9.10	6.30	0.10	0.99	0.30	0.10	0.03	0.03	7.1%
		9.40	6.40	0.20	1.04	0.32	0.20	0.06	0.06	14.8%
		9.70	6.40	0.20	0.90	0.30	0.20	0.06	0.05	12.8%
		10.00	6.40	0.20	0.61	0.30	0.20	0.06	0.04	8.7%
		10.30	6.35	0.15	0.69	0.30	0.15	0.05	0.03	7.4%
		10.60	6.40	0.20	0.44	0.30	0.20	0.06	0.03	6.3%
		10.90	6.40	0.20	0.17	0.30	0.20	0.06	0.01	2.4%
		11.20	6.40	0.20	1.03	0.30	0.20	0.06	0.06	14.7%
		11.50	6.40	0.20	0.99	0.30	0.20	0.06	0.06	14.1%
		11.80	6.40	0.20	0.51	0.30	0.20	0.06	0.03	7.3%
	W	12.10	6.20	0.00	0.00	0.36		0.00	0.00	0.0%
		12.60	5.84			0.00		0.00	0.00	0.0%
		13.40	5.50			0.00		0.00	0.00	0.0%
		14.00	5.28			0.00		0.00	0.00	0.0%
1	G	14.60	5.13			0.00		0.00	0.00	0.0%
	LS	18.00	4.32			0.00		0.00	0.00	0.0%
	TOTALS ----------					4.29	0.2 (Max.)	0.63	0.42	100.0%

Manning's n = 0.1707
Hydraulic Radius= 0.14673906

STREAM NAME: Fourth of July Creek
XS LOCATION: Approx. 1 mile upst. From Lake Fork Gunnison
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.63	0.63	0.0%
5.95	0.63	1.79	184.8%
5.97	0.63	1.69	168.7%
5.99	0.63	1.59	152.8%
6.01	0.63	1.49	137.2%
6.03	0.63	1.40	121.7%
6.05	0.63	1.30	106.5%
6.07	0.63	1.21	91.6%
6.09	0.63	1.11	76.8%
6.11	0.63	1.02	62.4%
6.13	0.63	0.93	48.1%
6.15	0.63	0.84	34.1%
6.16	0.63	0.80	27.1%
6.17	0.63	0.76	20.3%
6.18	0.63	0.71	13.4%
6.19	0.63	0.67	6.7%
6.20	0.63	0.63	0.0%
6.21	0.63	0.59	-6.6%
6.22	0.63	0.55	-13.1%
6.23	0.63	0.51	-19.5%
6.24	0.63	0.47	-25.7%
6.25	0.63	0.43	-31.8%
6.27	0.63	0.35	-43.7%
6.29	0.63	0.28	-55.2%
6.31	0.63	0.22	-65.2%
6.33	0.63	0.16	-74.0%
6.35	0.63	0.11	-82.4%
6.37	0.63	0.06	-90.2%
6.39	0.63	0.02	-97.0%
6.41	0.63	0.00	-100.0%
6.43	0.63	0.00	-100.0%
6.45	0.63	0.00	-100.0%

WATERLINE AT ZERO
AREA ERROR = 6.200

STREAM NAME: Fourth of July Creek
XS LOCATION: Approx. 1 mile upst. From Lake Fork Gunnison
XS NUMBER: 1 Constant Manning's n

STAGING TABLE *GL* = lowest Grassline elevation corrected for sag
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	5.13	8.56	0.86	1.27	7.32	9.19	100.0%	0.80	15.10	2.06
	5.20	8.18	0.82	1.20	6.74	8.79	95.6%	0.77	13.54	2.01
	5.25	7.92	0.80	1.15	6.33	8.50	92.4%	0.75	12.50	1.97
	5.30	7.67	0.77	1.10	5.94	8.23	89.5%	0.72	11.49	1.93
	5.35	7.47	0.75	1.05	5.57	8.00	87.0%	0.70	10.49	1.88
	5.40	7.26	0.72	1.00	5.20	7.77	84.5%	0.67	9.54	1.84
	5.45	7.06	0.69	0.95	4.84	7.54	82.0%	0.64	8.64	1.79
	5.50	6.85	0.66	0.90	4.49	7.31	79.5%	0.61	7.79	1.73
	5.55	6.67	0.62	0.85	4.15	7.10	77.2%	0.59	6.97	1.68
	5.60	6.48	0.59	0.80	3.83	6.89	74.9%	0.56	6.20	1.62
	5.65	6.30	0.56	0.75	3.51	6.67	72.6%	0.53	5.48	1.56
	5.70	6.11	0.52	0.70	3.20	6.46	70.3%	0.49	4.80	1.50
	5.75	5.93	0.49	0.65	2.89	6.25	68.0%	0.46	4.16	1.44
	5.80	5.70	0.46	0.60	2.60	6.00	65.3%	0.43	3.58	1.37
	5.85	5.48	0.42	0.55	2.32	5.76	62.7%	0.40	3.05	1.31
	5.90	5.30	0.39	0.50	2.05	5.55	60.4%	0.37	2.54	1.24
	5.95	5.12	0.35	0.45	1.79	5.34	58.1%	0.34	2.08	1.16
	6.00	4.93	0.31	0.40	1.54	5.13	55.8%	0.30	1.66	1.08
	6.05	4.75	0.27	0.35	1.30	4.92	53.5%	0.26	1.29	0.99
	6.10	4.57	0.23	0.30	1.07	4.71	51.3%	0.23	0.95	0.89
	6.15	4.38	0.19	0.25	0.84	4.50	49.0%	0.19	0.66	0.79
WL	6.20	4.20	0.15	0.20	0.63	4.29	46.7%	0.15	0.42	0.67
	6.25	3.82	0.11	0.15	0.43	3.90	42.4%	0.11	0.24	0.55
	6.30	2.85	0.09	0.10	0.25	2.90	31.6%	0.09	0.12	0.46
	6.35	2.63	0.04	0.05	0.11	2.66	28.9%	0.04	0.03	0.29
	6.40	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Fourth of July Creek
XS LOCATION: Approx. 1 mile upst. From Lake Fork Gunnison
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.42	cfs
CALCULATED FLOW (Qc)=	0.42	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	6.20	ft
CALCULATED WATERLINE (WLc)=	6.20	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.20	ft
MAX CALCULATED DEPTH (Dc)=	0.20	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	0.67	ft/sec
MANNING'S N=	0.171	
SLOPE=	0.076	ft/ft
.4 * Qm =	0.2	cfs
2.5 * Qm=	1.1	cfs

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

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

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

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

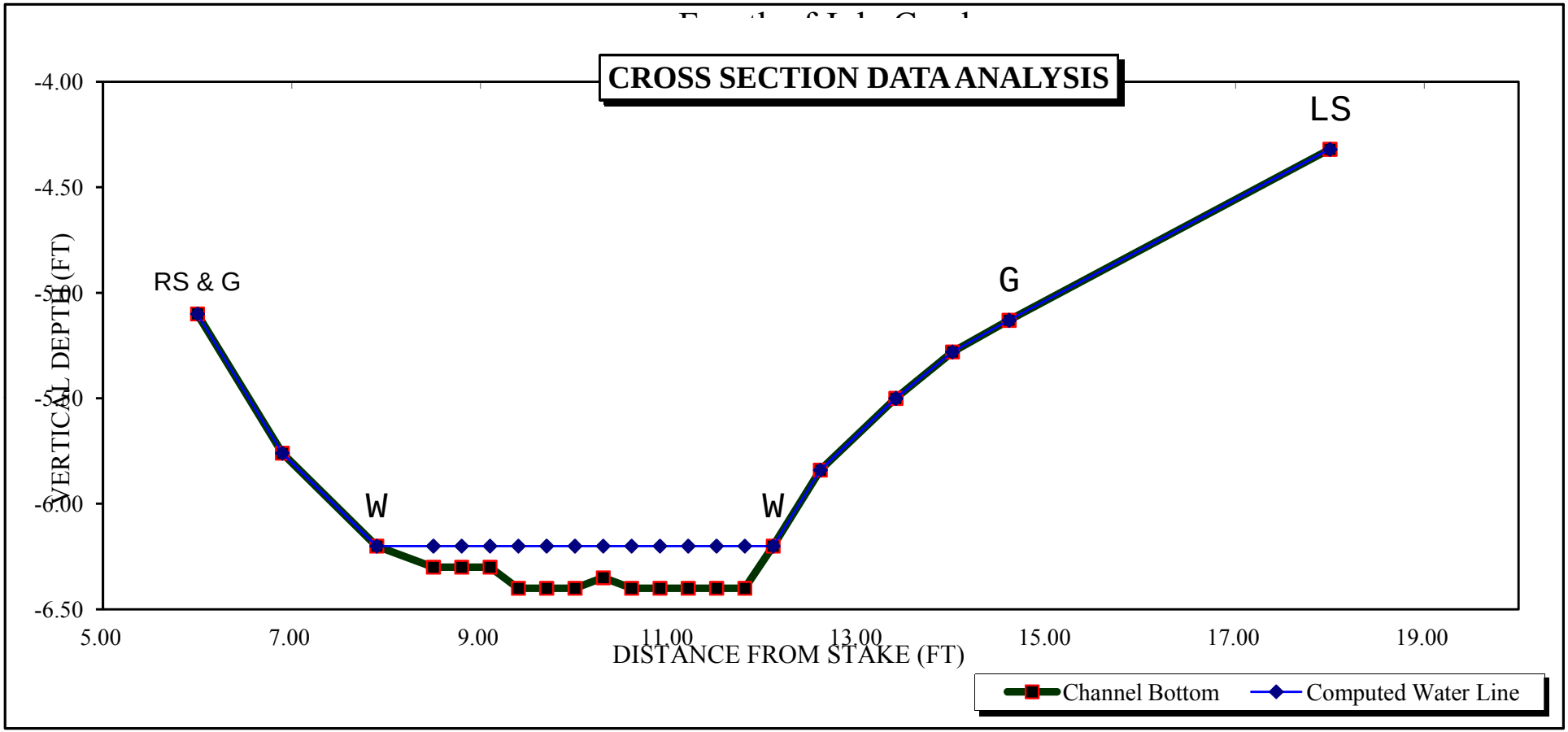
RECOMMENDATION BY: …….…….…..... AGENCY..……...……..……..…..... DATE:.....…….....……

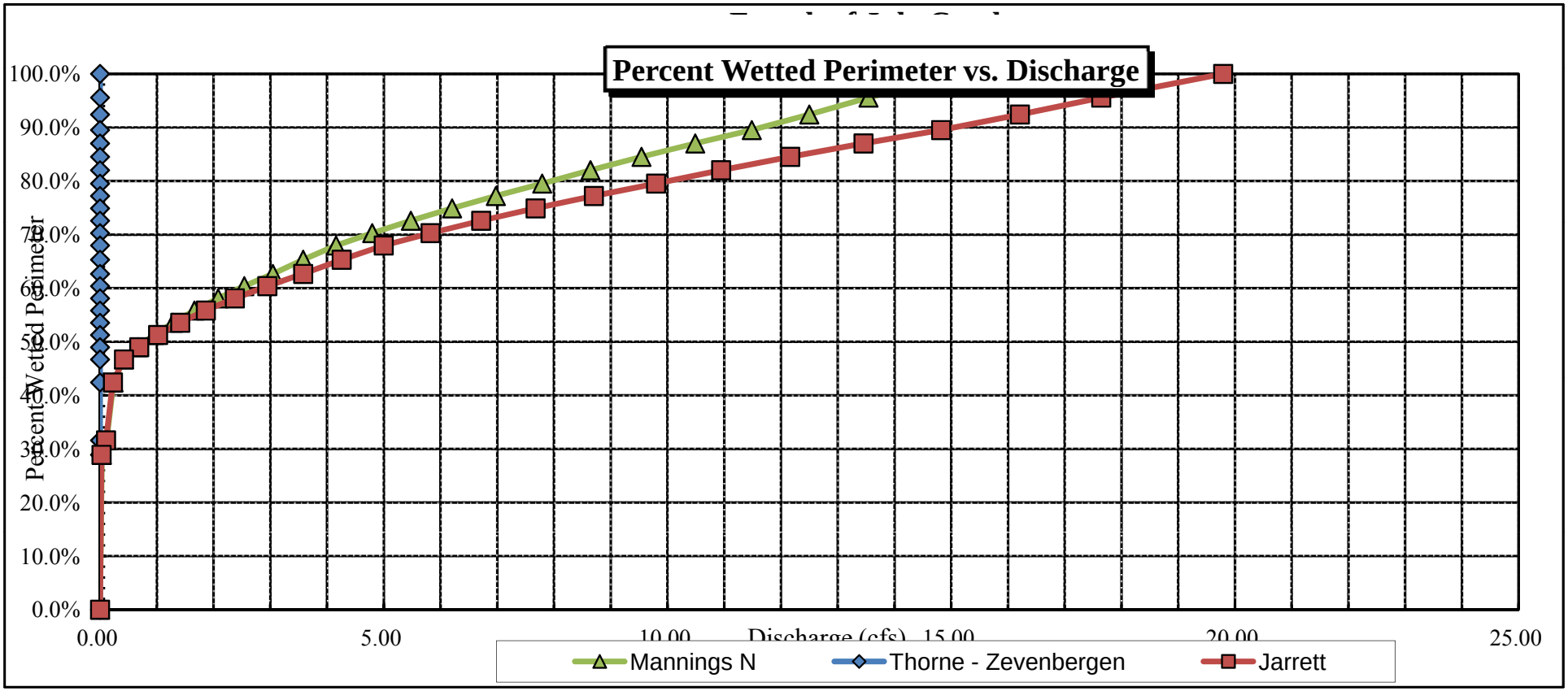
CWCB REVIEW BY: ..……....…….....…….....…..... DATE:.....……..…

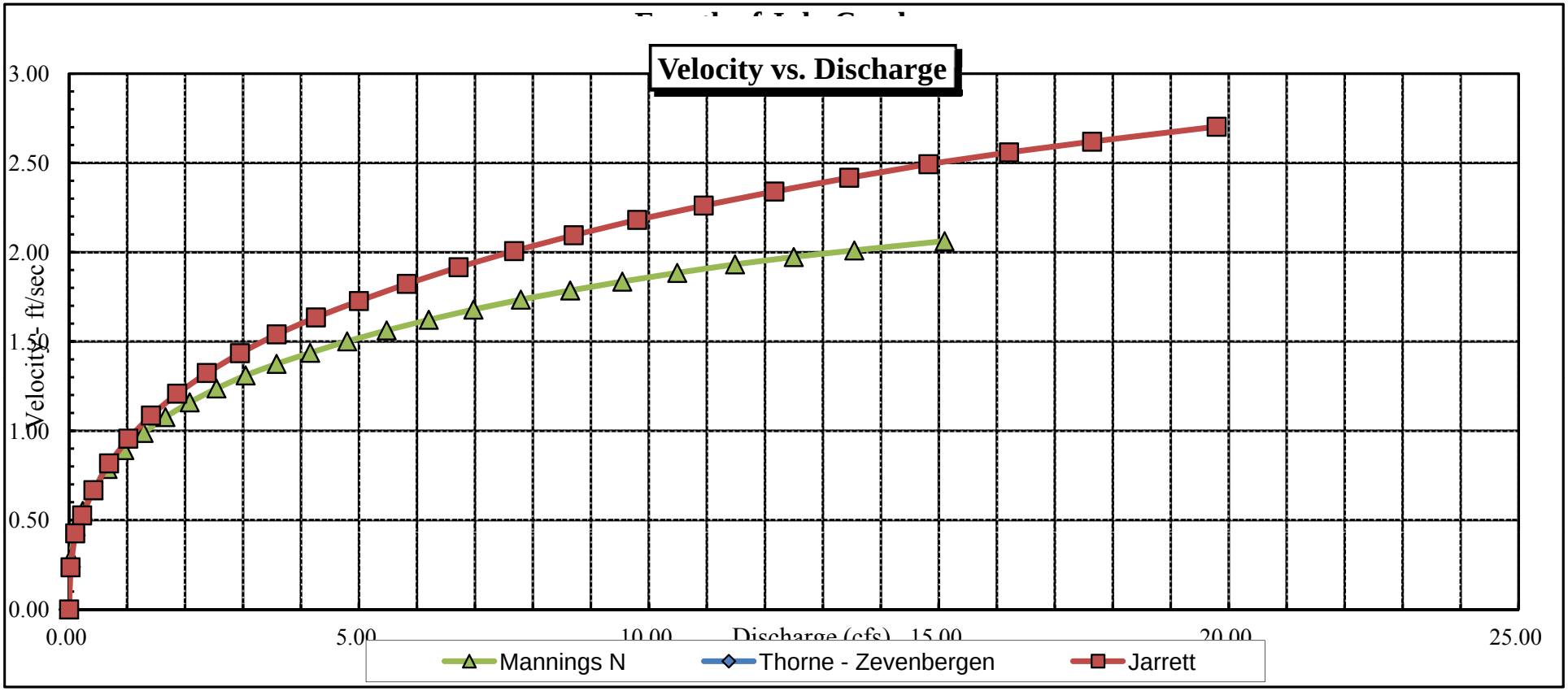
STREAM NAME: Fourth of July Creek
XS LOCATION: Approx. 1 mile upst. From Lake Fork Gunnison
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

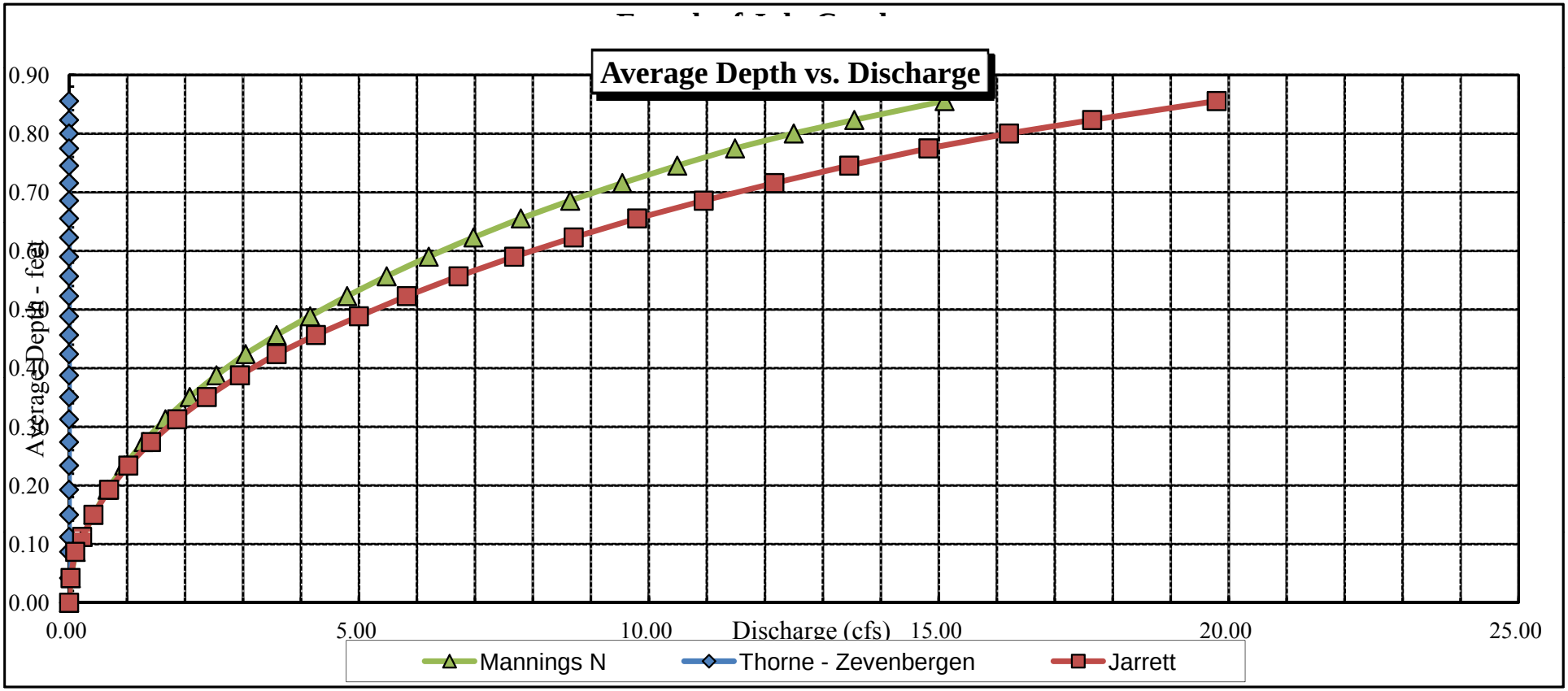
STAGING TABLE *GL* = lowest Grassline elevation corrected for sag
WL = Waterline corrected for variations in field measured water surface elevations and sag

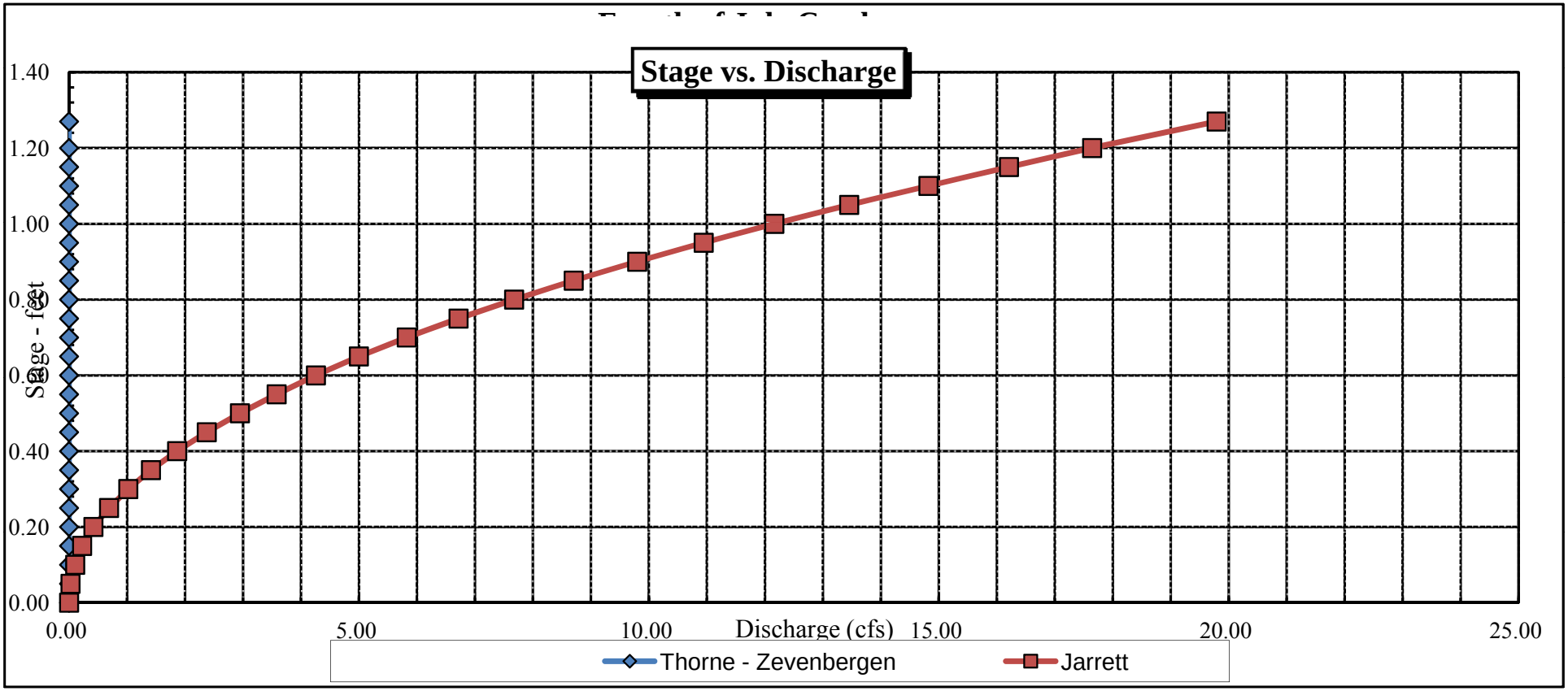
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.13	8.56	0.86	1.27	7.32	9.19	100.0%	0.80	19.79	2.70
	5.20	8.18	0.82	1.20	6.74	8.79	95.6%	0.77	17.64	2.62
	5.25	7.92	0.80	1.15	6.33	8.50	92.4%	0.75	16.21	2.56
	5.30	7.67	0.77	1.10	5.94	8.23	89.5%	0.72	14.82	2.49
	5.35	7.47	0.75	1.05	5.57	8.00	87.0%	0.70	13.45	2.42
	5.40	7.26	0.72	1.00	5.20	7.77	84.5%	0.67	12.16	2.34
	5.45	7.06	0.69	0.95	4.84	7.54	82.0%	0.64	10.94	2.26
	5.50	6.85	0.66	0.90	4.49	7.31	79.5%	0.61	9.80	2.18
	5.55	6.67	0.62	0.85	4.15	7.10	77.2%	0.59	8.70	2.09
	5.60	6.48	0.59	0.80	3.83	6.89	74.9%	0.56	7.68	2.01
	5.65	6.30	0.56	0.75	3.51	6.67	72.6%	0.53	6.72	1.92
	5.70	6.11	0.52	0.70	3.20	6.46	70.3%	0.49	5.82	1.82
	5.75	5.93	0.49	0.65	2.89	6.25	68.0%	0.46	5.00	1.73
	5.80	5.70	0.46	0.60	2.60	6.00	65.3%	0.43	4.26	1.64
	5.85	5.48	0.42	0.55	2.32	5.76	62.7%	0.40	3.58	1.54
	5.90	5.30	0.39	0.50	2.05	5.55	60.4%	0.37	2.95	1.43
	5.95	5.12	0.35	0.45	1.79	5.34	58.1%	0.34	2.38	1.32
	6.00	4.93	0.31	0.40	1.54	5.13	55.8%	0.30	1.86	1.21
	6.05	4.75	0.27	0.35	1.30	4.92	53.5%	0.26	1.41	1.09
	6.10	4.57	0.23	0.30	1.07	4.71	51.3%	0.23	1.02	0.96
	6.15	4.38	0.19	0.25	0.84	4.50	49.0%	0.19	0.69	0.82
WL	6.20	4.20	0.15	0.20	0.63	4.29	46.7%	0.15	0.42	0.67
	6.25	3.82	0.11	0.15	0.43	3.90	42.4%	0.11	0.23	0.53
	6.30	2.85	0.09	0.10	0.25	2.90	31.6%	0.09	0.11	0.43
	6.35	2.63	0.04	0.05	0.11	2.66	28.9%	0.04	0.03	0.24
	6.40	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


CROSS SECTION DATA ANALYSIS
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
VERTICAL DEPTH (FT)
RS & G
W
W
G
LS
5.00
7.00
9.00
11.00
13.00
15.00
17.00
19.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Percent Wetted Perimeter vs. Discharge
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Percent Wetted Perimeter
0.00
5.00
10.00
15.00
20.00
25.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


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
25.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


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
5.00
10.00
15.00
20.00
25.00
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
Discharge (cfs)
15.00
20.00
25.00
Thorne - Zevenbergen
Jarrett

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

LOCATION INFORMATION

STREAM NAME:	Fourth of July Creek
XS LOCATION:	170' upst fr Powderhorn Wild boundary
XS NUMBER:	2
DATE:	25-Jul-14
OBSERVERS:	R. Smith, A. Breibart
1/4 SEC:	SW
SECTION:	13
TWP:	45N
RANGE:	4W
PM:	NM
COUNTY:	Gunnison
WATERSHED:	Lake Fork Gunnison River
DIVISION:	4
DOW CODE:	45351
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:	0.095

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

ASSIGNED TO: ….....…….....DATE.....

STREAM NAME: Fourth of July Creek
XS LOCATION: 170' upst fr Powderhorn Wild boundary
XS NUMBER: 2

DATA POINTS= 22

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	5.03			0.00		0.00	0.00	0.0%
1	G	0.80	6.48			0.00		0.00	0.00	0.0%
		2.10	7.24			0.00		0.00	0.00	0.0%
		3.80	7.75	0.00	0.00	0.00		0.00	0.00	0.0%
	W	4.40	7.85	0.10	0.01	0.61	0.10	0.05	0.00	0.1%
		4.70	7.85	0.10	0.23	0.30	0.10	0.03	0.01	1.8%
		5.00	7.90	0.15	0.53	0.30	0.15	0.05	0.02	6.1%
		5.30	7.90	0.15	0.84	0.30	0.15	0.05	0.04	9.6%
		5.60	7.85	0.10	0.82	0.30	0.10	0.03	0.02	6.3%
		5.90	7.90	0.15	0.83	0.30	0.15	0.05	0.04	9.5%
		6.20	7.95	0.20	0.62	0.30	0.20	0.06	0.04	9.5%
		6.50	7.95	0.20	0.84	0.30	0.20	0.06	0.05	12.8%
		6.80	7.90	0.15	1.23	0.30	0.15	0.05	0.06	14.1%
		7.10	7.95	0.20	0.96	0.30	0.20	0.06	0.06	14.6%
		7.40	7.95	0.20	1.03	0.30	0.20	0.06	0.06	15.7%
		7.70	7.90	0.15	0.00	0.30	0.15	0.05	0.00	0.0%
		8.00	7.85	0.10	0.00	0.30	0.10	0.03	0.00	0.0%
		8.30	7.85	0.10	0.00	0.30	0.10	0.03	0.00	0.0%
	W	8.50	7.75	0.00	0.00	0.22		0.00	0.00	0.0%
		9.00	7.10			0.00		0.00	0.00	0.0%
1	G	9.90	6.54			0.00		0.00	0.00	0.0%
	RS	11.80	4.87			0.00		0.00	0.00	0.0%
	TOTALS ----------					4.76	0.2 (Max.)	0.63	0.39	100.0%

Manning's n = 0.1879
Hydraulic Radius= 0.13116507

STREAM NAME: Fourth of July Creek
XS LOCATION: 170' upst fr Powderhorn Wild boundary
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.63	0.63	0.0%
7.50	0.63	1.93	208.5%
7.52	0.63	1.81	190.3%
7.54	0.63	1.70	172.4%
7.56	0.63	1.59	154.7%
7.58	0.63	1.48	137.3%
7.60	0.63	1.38	120.2%
7.62	0.63	1.27	103.3%
7.64	0.63	1.17	86.7%
7.66	0.63	1.06	70.3%
7.68	0.63	0.96	54.2%
7.70	0.63	0.87	38.4%
7.71	0.63	0.82	30.6%
7.72	0.63	0.77	22.9%
7.73	0.63	0.72	15.2%
7.74	0.63	0.67	7.6%
7.75	0.63	0.63	0.0%
7.76	0.63	0.58	-7.5%
7.77	0.63	0.53	-14.8%
7.78	0.63	0.49	-22.0%
7.79	0.63	0.44	-29.1%
7.80	0.63	0.40	-36.0%
7.82	0.63	0.32	-49.5%
7.84	0.63	0.23	-62.5%
7.86	0.63	0.16	-73.9%
7.88	0.63	0.11	-82.9%
7.90	0.63	0.06	-90.4%
7.92	0.63	0.03	-95.4%
7.94	0.63	0.01	-98.8%
7.96	0.63	0.00	-100.0%
7.98	0.63	0.00	-100.0%
8.00	0.63	0.00	-100.0%

WATERLINE AT ZERO
AREA ERROR = 7.750

STREAM NAME: Fourth of July Creek
XS LOCATION: 170' upst fr Powderhorn Wild 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	6.54	9.00	1.01	1.41	9.05	9.81	100.0%	0.92	20.91	2.31
	6.75	8.30	0.87	1.20	7.23	8.99	91.7%	0.80	15.25	2.11
	6.80	8.13	0.84	1.15	6.82	8.80	89.7%	0.78	14.03	2.06
	6.85	7.97	0.81	1.10	6.42	8.61	87.8%	0.75	12.87	2.01
	6.90	7.80	0.77	1.05	6.03	8.41	85.8%	0.72	11.76	1.95
	6.95	7.64	0.74	1.00	5.64	8.22	83.8%	0.69	10.69	1.90
	7.00	7.47	0.70	0.95	5.26	8.02	81.8%	0.66	9.68	1.84
	7.05	7.31	0.67	0.90	4.89	7.83	79.9%	0.62	8.71	1.78
	7.10	7.14	0.63	0.85	4.53	7.64	77.9%	0.59	7.80	1.72
	7.15	7.02	0.60	0.80	4.18	7.48	76.2%	0.56	6.91	1.65
	7.20	6.89	0.56	0.75	3.83	7.31	74.6%	0.52	6.06	1.58
	7.25	6.75	0.52	0.70	3.49	7.14	72.8%	0.49	5.28	1.51
	7.30	6.55	0.48	0.65	3.16	6.90	70.3%	0.46	4.57	1.45
	7.35	6.34	0.45	0.60	2.83	6.66	67.9%	0.43	3.91	1.38
	7.40	6.14	0.41	0.55	2.52	6.42	65.5%	0.39	3.29	1.31
	7.45	5.93	0.37	0.50	2.22	6.19	63.1%	0.36	2.73	1.23
	7.50	5.73	0.34	0.45	1.93	5.95	60.7%	0.32	2.22	1.15
	7.55	5.52	0.30	0.40	1.65	5.71	58.3%	0.29	1.75	1.06
	7.60	5.32	0.26	0.35	1.38	5.48	55.8%	0.25	1.34	0.97
	7.65	5.11	0.22	0.30	1.12	5.24	53.4%	0.21	0.97	0.87
	7.70	4.91	0.18	0.25	0.87	5.00	51.0%	0.17	0.65	0.76
WL	7.75	4.70	0.13	0.20	0.62	4.76	48.6%	0.13	0.39	0.63
	7.80	4.30	0.09	0.15	0.40	4.35	44.3%	0.09	0.20	0.50
	7.85	3.30	0.06	0.10	0.20	3.33	34.0%	0.06	0.07	0.37
	7.90	1.80	0.03	0.05	0.06	1.82	18.5%	0.03	0.02	0.25
	7.95	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Fourth of July Creek
XS LOCATION: 170' upst fr Powderhorn Wild boundary
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.39	cfs
CALCULATED FLOW (Qc)=	0.39	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	7.75	ft
CALCULATED WATERLINE (WLc)=	7.75	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.20	ft
MAX CALCULATED DEPTH (Dc)=	0.20	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	0.63	ft/sec
MANNING'S N=	0.188	
SLOPE=	0.095	ft/ft
.4 * Qm =	0.2	cfs
2.5 * Qm=	1.0	cfs

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

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

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

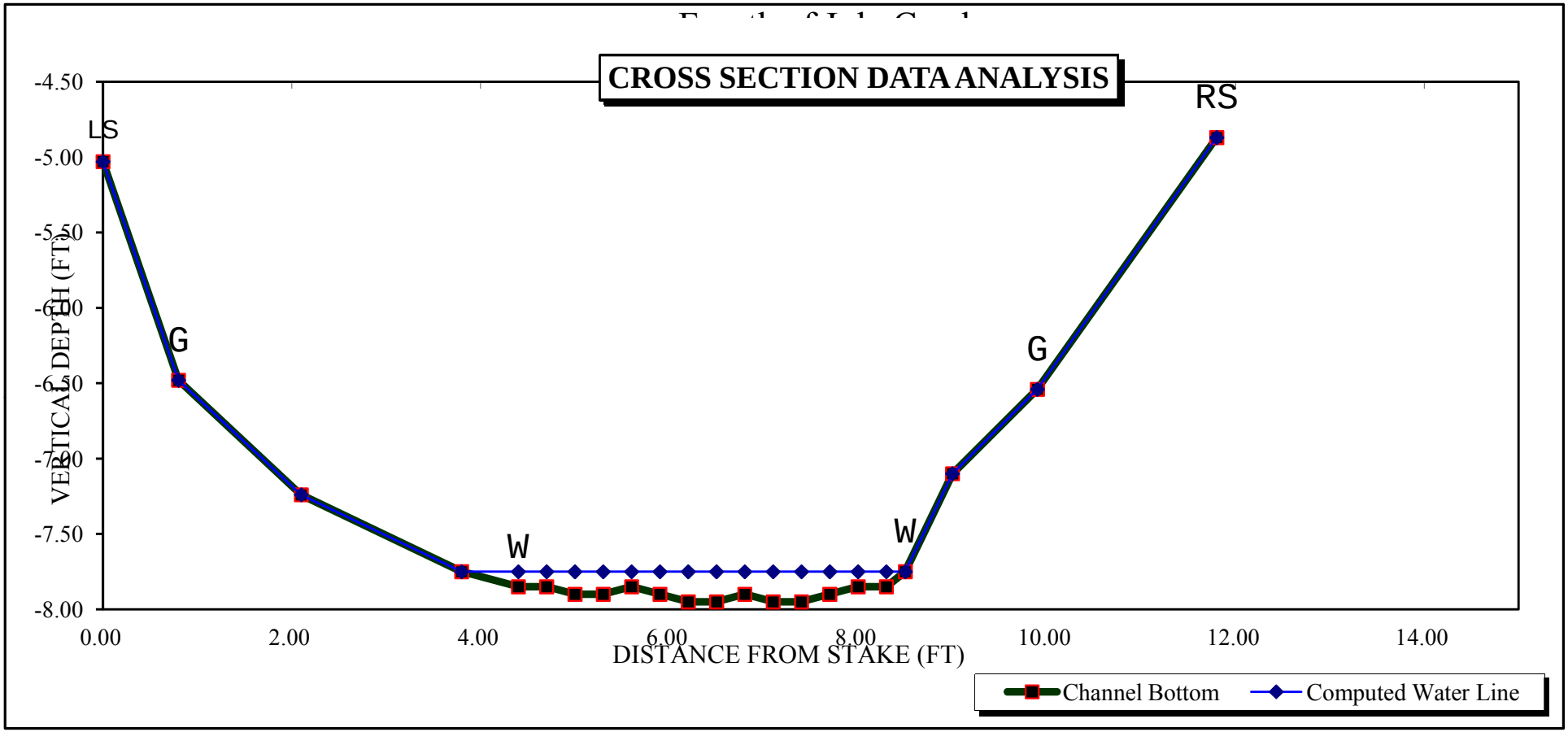
RECOMMENDATION BY: ..... AGENCY..... DATE:.....

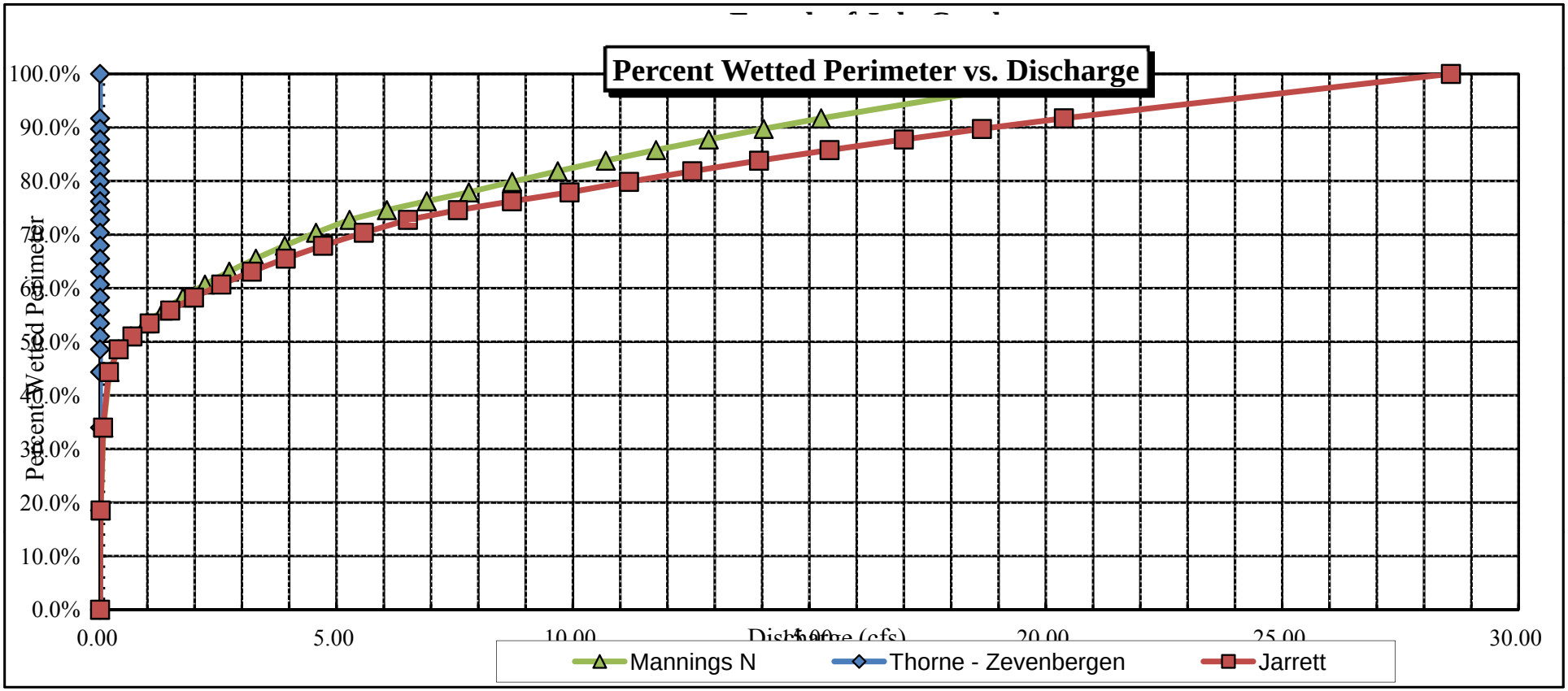
CWCB REVIEW BY: ..... DATE:.....

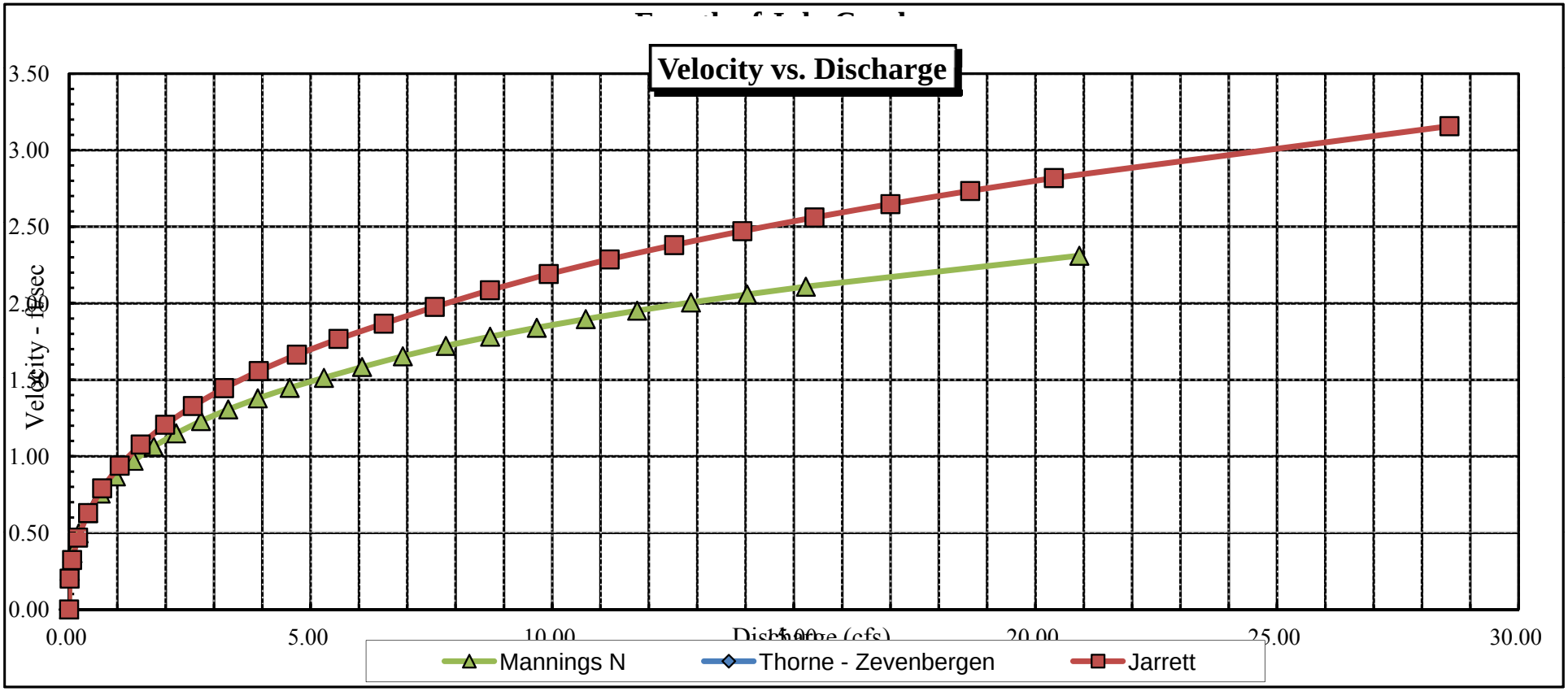
STREAM NAME: Fourth of July Creek
XS LOCATION: 170' upst fr Powderhorn Wild boundary
XS NUMBER: 2 Jarrett Variable Manning's n Correction Applied

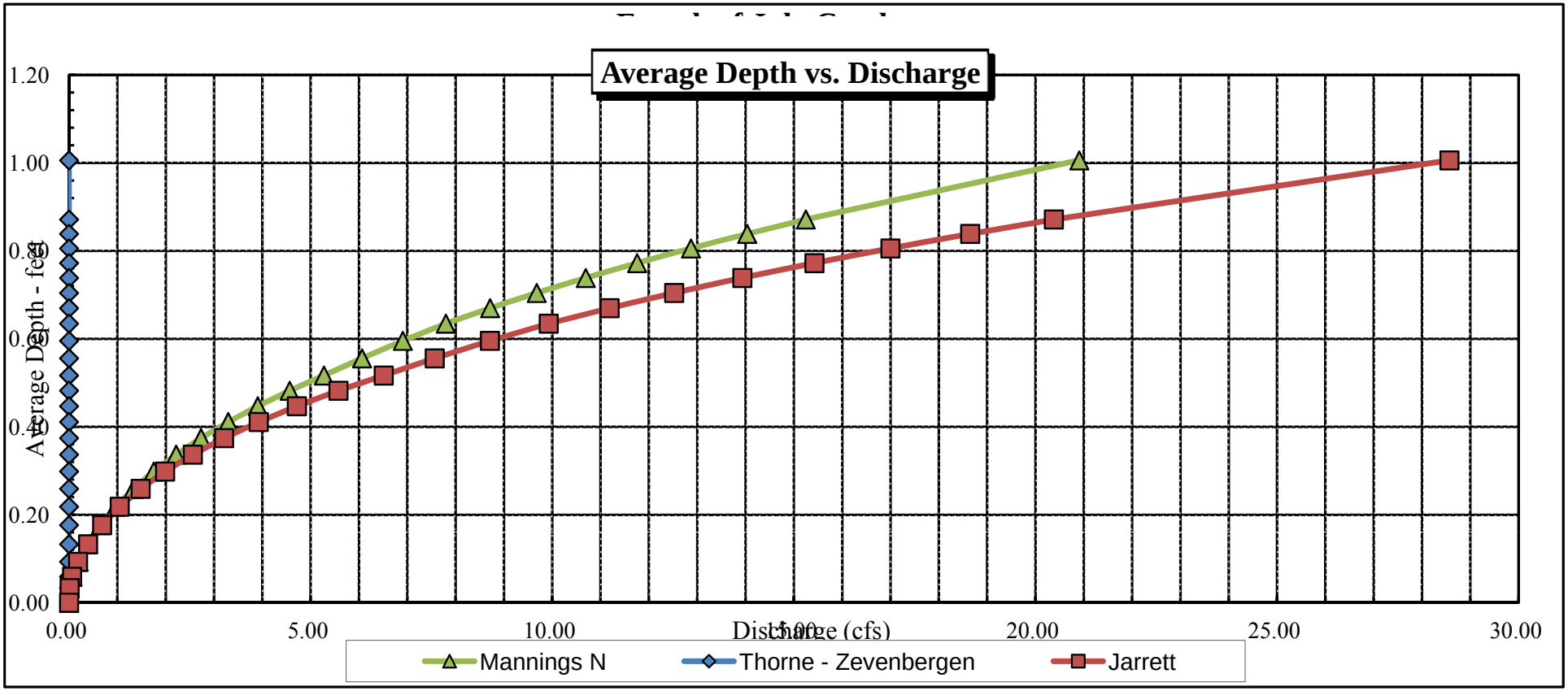
STAGING TABLE *GL* = lowest Grassline elevation corrected for sag
WL = Waterline corrected for variations in field measured water surface elevations and sag

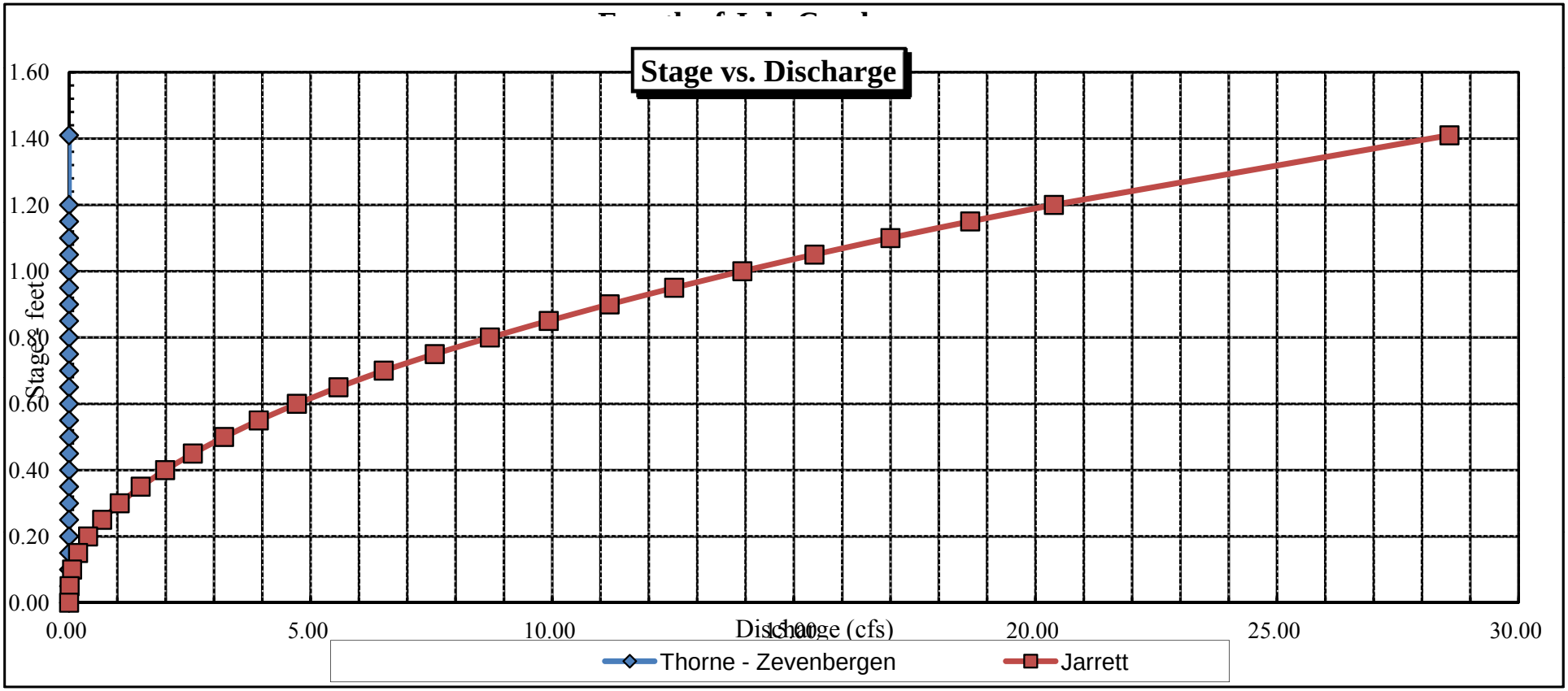
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	6.54	9.00	1.01	1.41	9.05	9.81	100.0%	0.92	28.57	3.16
	6.75	8.30	0.87	1.20	7.23	8.99	91.7%	0.80	20.38	2.82
	6.80	8.13	0.84	1.15	6.82	8.80	89.7%	0.78	18.65	2.73
	6.85	7.97	0.81	1.10	6.42	8.61	87.8%	0.75	17.00	2.65
	6.90	7.80	0.77	1.05	6.03	8.41	85.8%	0.72	15.43	2.56
	6.95	7.64	0.74	1.00	5.64	8.22	83.8%	0.69	13.94	2.47
	7.00	7.47	0.70	0.95	5.26	8.02	81.8%	0.66	12.52	2.38
	7.05	7.31	0.67	0.90	4.89	7.83	79.9%	0.62	11.19	2.29
	7.10	7.14	0.63	0.85	4.53	7.64	77.9%	0.59	9.93	2.19
	7.15	7.02	0.60	0.80	4.18	7.48	76.2%	0.56	8.71	2.09
	7.20	6.89	0.56	0.75	3.83	7.31	74.6%	0.52	7.57	1.98
	7.25	6.75	0.52	0.70	3.49	7.14	72.8%	0.49	6.51	1.87
	7.30	6.55	0.48	0.65	3.16	6.90	70.3%	0.46	5.58	1.77
	7.35	6.34	0.45	0.60	2.83	6.66	67.9%	0.43	4.71	1.66
	7.40	6.14	0.41	0.55	2.52	6.42	65.5%	0.39	3.93	1.56
	7.45	5.93	0.37	0.50	2.22	6.19	63.1%	0.36	3.21	1.45
	7.50	5.73	0.34	0.45	1.93	5.95	60.7%	0.32	2.56	1.33
	7.55	5.52	0.30	0.40	1.65	5.71	58.3%	0.29	1.99	1.21
	7.60	5.32	0.26	0.35	1.38	5.48	55.8%	0.25	1.48	1.08
	7.65	5.11	0.22	0.30	1.12	5.24	53.4%	0.21	1.05	0.94
	7.70	4.91	0.18	0.25	0.87	5.00	51.0%	0.17	0.68	0.79
WL	7.75	4.70	0.13	0.20	0.62	4.76	48.6%	0.13	0.39	0.63
	7.80	4.30	0.09	0.15	0.40	4.35	44.3%	0.09	0.19	0.47
	7.85	3.30	0.06	0.10	0.20	3.33	34.0%	0.06	0.06	0.32
	7.90	1.80	0.03	0.05	0.06	1.82	18.5%	0.03	0.01	0.20
	7.95	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


CROSS SECTION DATA ANALYSIS
LS
G
W
W
G
RS
-4.50
-5.00
-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
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
3.50
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
25.00
30.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


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


Stage vs. Discharge
1.60
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
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

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

LOCATION INFORMATION

STREAM NAME:	Fourth of July Creek
XS LOCATION:	200 ft upstr fr Powderhorn Wilderness bndry
XS NUMBER:	1
DATE:	25-Jul-14
OBSERVERS:	R. Smith, A. Breibart
1/4 SEC:	SW
SECTION:	13
TWP:	45N
RANGE:	4W
PM:	NM
COUNTY:	Gunnison
WATERSHED:	Lake Fork Gunnison River
DIVISION:	4
DOW CODE:	45351
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:	0.092

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

ASSIGNED TO: ….....…….....DATE.....

STREAM NAME: Fourth of July Creek
XS LOCATION: 200 ft upstr fr Powderhorn Wilderness bndry
XS NUMBER: 1

DATA POINTS= 21

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	1.26			0.00		0.00	0.00	0.0%
1	G	3.30	3.33			0.00		0.00	0.00	0.0%
		4.30	4.29			0.00		0.00	0.00	0.0%
	W	5.40	4.60	0.00	0.00	0.00		0.00	0.00	0.0%
		5.70	4.70	0.10	0.56	0.32	0.10	0.03	0.02	4.2%
		6.00	4.85	0.25	0.88	0.34	0.25	0.08	0.07	16.5%
		6.30	4.80	0.20	0.40	0.30	0.20	0.06	0.02	6.0%
		6.60	4.70	0.10	0.43	0.32	0.10	0.03	0.01	3.2%
		6.90	4.80	0.20	0.52	0.32	0.20	0.06	0.03	7.8%
		7.20	4.80	0.20	0.73	0.30	0.20	0.06	0.04	10.9%
		7.50	4.90	0.30	0.40	0.32	0.30	0.09	0.04	9.0%
		7.80	4.85	0.25	0.91	0.30	0.25	0.08	0.07	17.0%
		8.10	4.80	0.20	0.46	0.30	0.20	0.06	0.03	6.9%
		8.40	4.90	0.30	0.19	0.32	0.30	0.09	0.02	4.3%
		8.70	4.85	0.25	0.66	0.30	0.25	0.08	0.05	12.4%
		9.00	4.70	0.10	0.19	0.34	0.10	0.03	0.01	1.4%
		9.30	4.65	0.05	0.15	0.30	0.05	0.01	0.00	0.5%
	W	9.50	4.60			0.21		0.00	0.00	0.0%
		13.50	4.35			0.00		0.00	0.00	0.0%
1	G	13.60	3.48			0.00		0.00	0.00	0.0%
	RS	14.80	3.00			0.00		0.00	0.00	0.0%
	TOTALS ----------					4.28	0.3 (Max.)	0.75	0.40	100.0%

Manning's n = 0.2627
Hydraulic Radius= 0.1746983

STREAM NAME: Fourth of July Creek
XS LOCATION: 200 ft upstr fr Powderhorn Wilderness bndry
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.75	0.75	0.0%
4.35	0.75	2.38	218.8%
4.37	0.75	2.21	195.3%
4.39	0.75	2.04	172.8%
4.41	0.75	1.88	151.4%
4.43	0.75	1.73	131.0%
4.45	0.75	1.58	111.7%
4.47	0.75	1.45	93.4%
4.49	0.75	1.32	76.2%
4.51	0.75	1.20	60.0%
4.53	0.75	1.08	44.8%
4.55	0.75	0.98	30.7%
4.56	0.75	0.93	24.0%
4.57	0.75	0.88	17.6%
4.58	0.75	0.83	11.5%
4.59	0.75	0.79	5.6%
4.60	0.75	0.75	0.0%
4.61	0.75	0.71	-5.4%
4.62	0.75	0.67	-10.8%
4.63	0.75	0.63	-16.0%
4.64	0.75	0.59	-21.2%
4.65	0.75	0.55	-26.3%
4.67	0.75	0.48	-36.0%
4.69	0.75	0.41	-45.4%
4.71	0.75	0.34	-54.2%
4.73	0.75	0.28	-62.5%
4.75	0.75	0.22	-70.2%
4.77	0.75	0.17	-77.5%
4.79	0.75	0.12	-84.1%
4.81	0.75	0.08	-89.8%
4.83	0.75	0.04	-94.0%
4.85	0.75	0.02	-97.0%

WATERLINE AT ZERO
AREA ERROR = 4.600

STREAM NAME: Fourth of July Creek
XS LOCATION: 200 ft upstr fr Powderhorn Wilderness bndry
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	3.48	10.14	1.06	1.42	10.77	11.47	100.0%	0.94	17.70	1.64
	3.60	10.00	0.96	1.30	9.56	11.18	97.4%	0.85	14.77	1.55
	3.65	9.95	0.91	1.25	9.06	11.06	96.4%	0.82	13.61	1.50
	3.70	9.89	0.87	1.20	8.56	10.94	95.3%	0.78	12.48	1.46
	3.75	9.83	0.82	1.15	8.07	10.81	94.2%	0.75	11.39	1.41
	3.80	9.77	0.78	1.10	7.58	10.69	93.2%	0.71	10.34	1.36
	3.85	9.72	0.73	1.05	7.09	10.57	92.1%	0.67	9.33	1.31
	3.90	9.66	0.68	1.00	6.61	10.45	91.0%	0.63	8.35	1.26
	3.95	9.60	0.64	0.95	6.13	10.32	90.0%	0.59	7.42	1.21
	4.00	9.54	0.59	0.90	5.65	10.20	88.9%	0.55	6.53	1.16
	4.05	9.48	0.55	0.85	5.17	10.08	87.8%	0.51	5.69	1.10
	4.10	9.43	0.50	0.80	4.70	9.96	86.8%	0.47	4.89	1.04
	4.15	9.37	0.45	0.75	4.23	9.83	85.7%	0.43	4.13	0.98
	4.20	9.31	0.40	0.70	3.76	9.71	84.6%	0.39	3.43	0.91
	4.25	9.25	0.36	0.65	3.30	9.59	83.6%	0.34	2.78	0.84
	4.30	9.17	0.31	0.60	2.84	9.44	82.3%	0.30	2.18	0.77
	4.35	8.99	0.27	0.55	2.38	9.21	80.2%	0.26	1.66	0.70
	4.40	8.01	0.24	0.50	1.96	8.22	71.7%	0.24	1.29	0.66
	4.45	7.03	0.23	0.45	1.58	7.24	63.1%	0.22	0.99	0.62
	4.50	6.05	0.21	0.40	1.26	6.25	54.5%	0.20	0.74	0.59
	4.55	5.08	0.19	0.35	0.98	5.26	45.9%	0.19	0.55	0.56
WL	4.60	4.10	0.18	0.30	0.75	4.28	37.3%	0.17	0.40	0.54
	4.65	3.75	0.15	0.25	0.55	3.91	34.1%	0.14	0.26	0.46
	4.70	3.30	0.11	0.20	0.38	3.45	30.1%	0.11	0.15	0.39
	4.75	2.80	0.08	0.15	0.22	2.91	25.4%	0.08	0.07	0.31
	4.80	2.00	0.05	0.10	0.10	2.07	18.1%	0.05	0.02	0.22
	4.85	0.90	0.03	0.05	0.02	0.92	8.1%	0.02	0.00	0.14
	4.90	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Fourth of July Creek
XS LOCATION: 200 ft upstr fr Powderhorn Wilderness bndry
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.40	cfs
CALCULATED FLOW (Qc)=	0.40	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	4.60	ft
CALCULATED WATERLINE (WLc)=	4.60	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.30	ft
MAX CALCULATED DEPTH (Dc)=	0.30	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	0.54	ft/sec
MANNING'S N=	0.263	
SLOPE=	0.092	ft/ft
.4 * Qm =	0.2	cfs
2.5 * Qm=	1.0	cfs

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

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

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

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

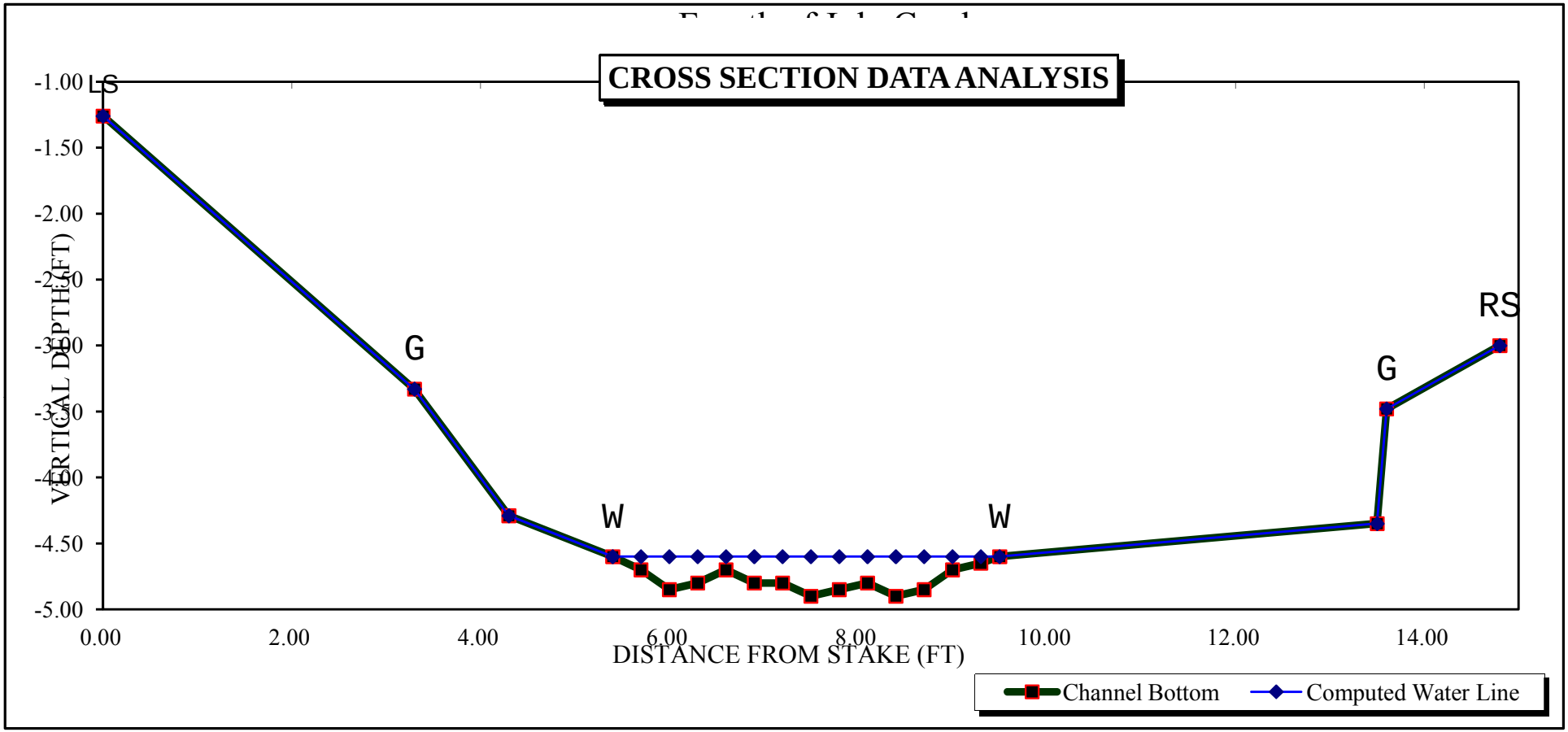
RECOMMENDATION BY: …….…….…..... AGENCY..……...……..……..…..... DATE:.....…..…....……

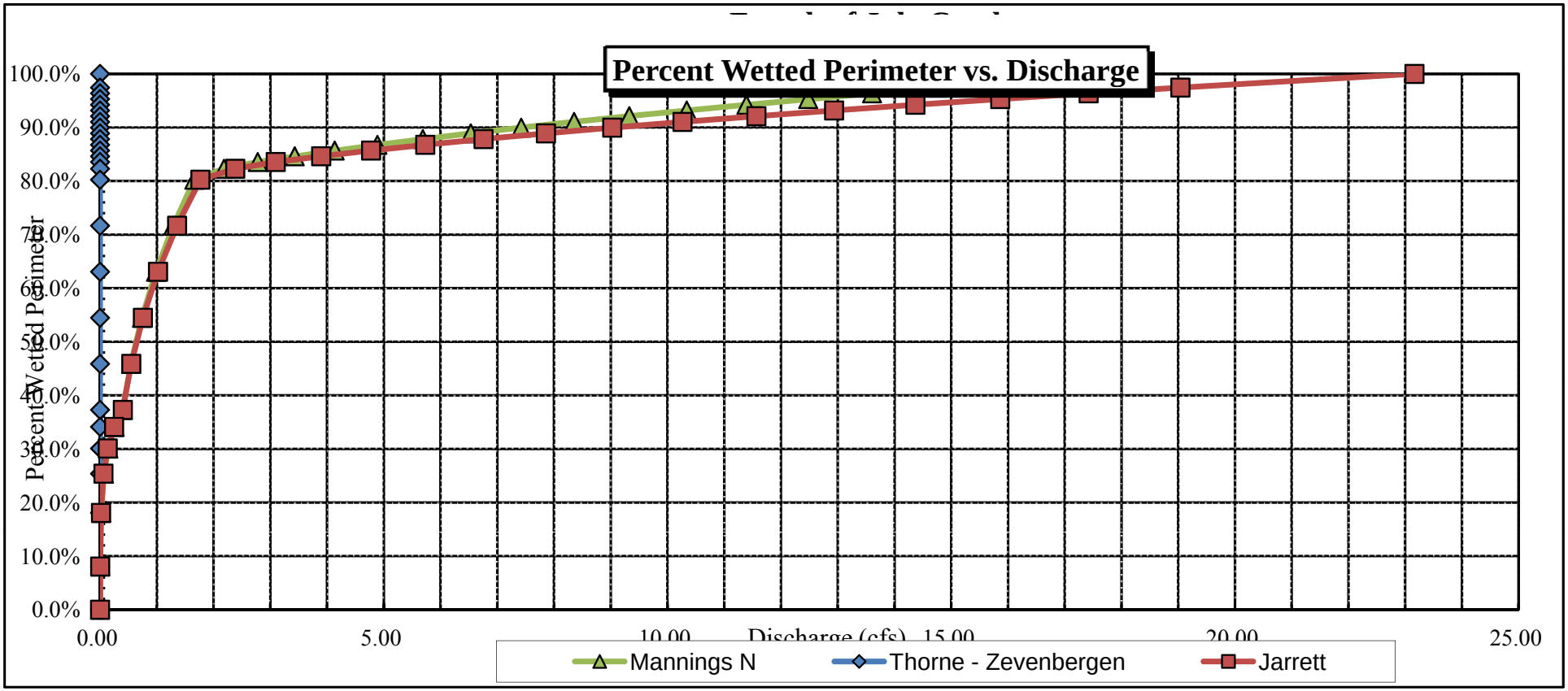
CWCB REVIEW BY: ..……....…….....…….....…..... DATE:.....……..…

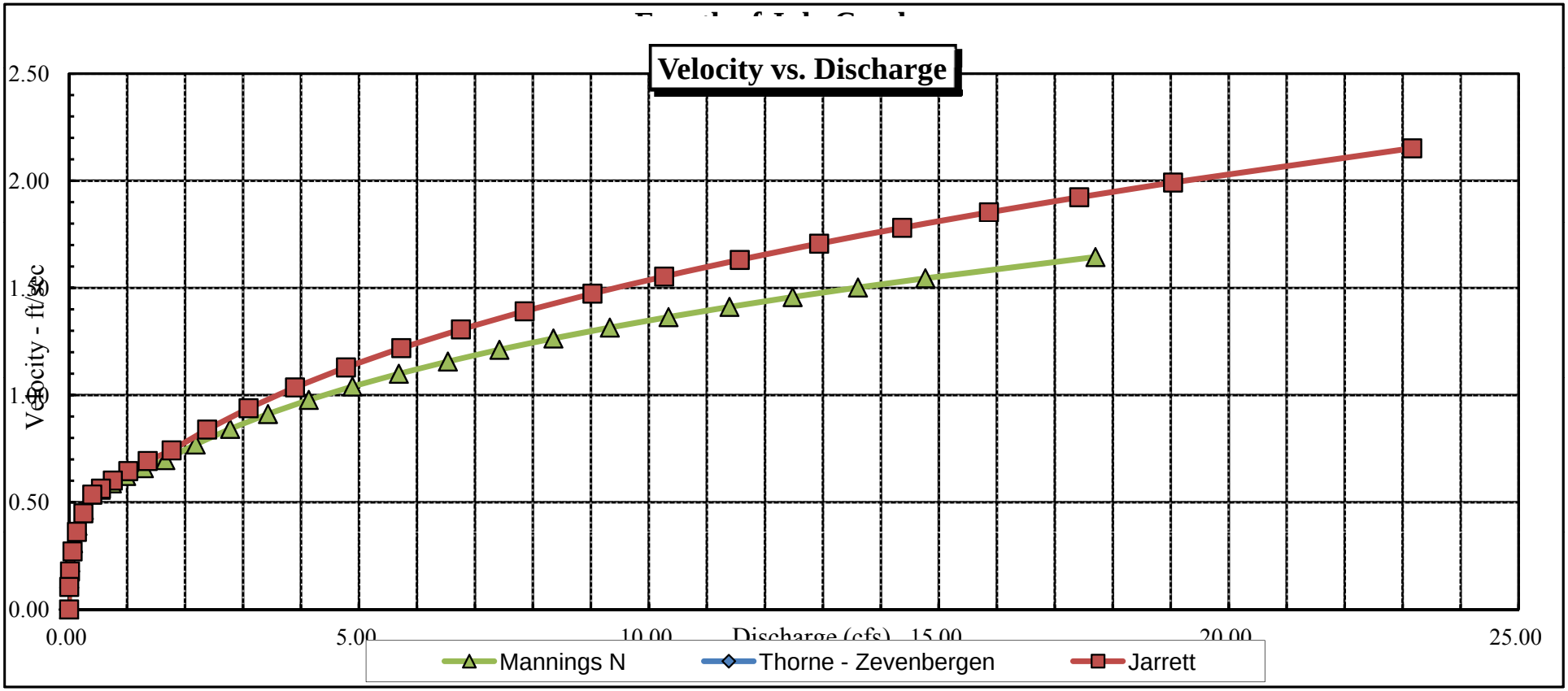
STREAM NAME: Fourth of July Creek
XS LOCATION: 200 ft upstr fr Powderhorn Wilderness bndry
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

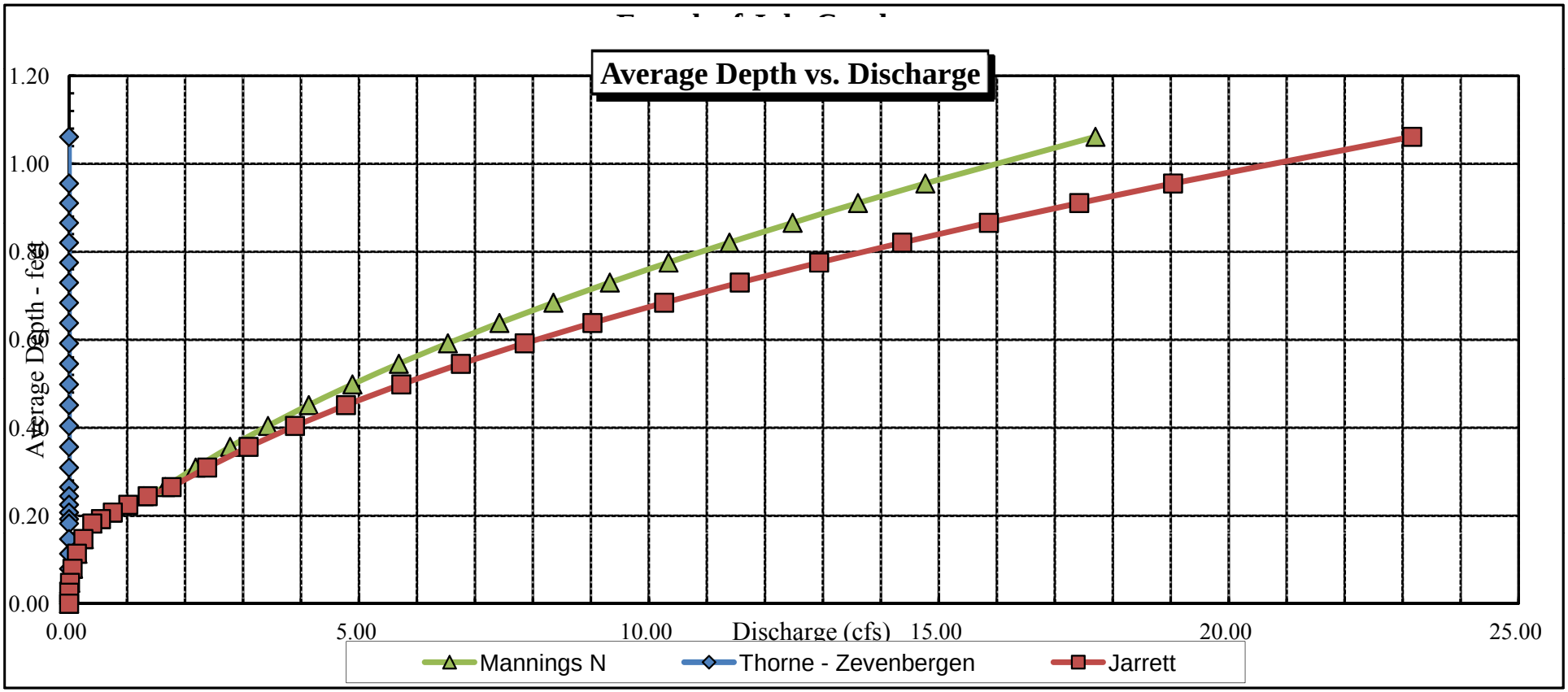
STAGING TABLE *GL* = lowest Grassline elevation corrected for sag
WL = Waterline corrected for variations in field measured water surface elevations and sag

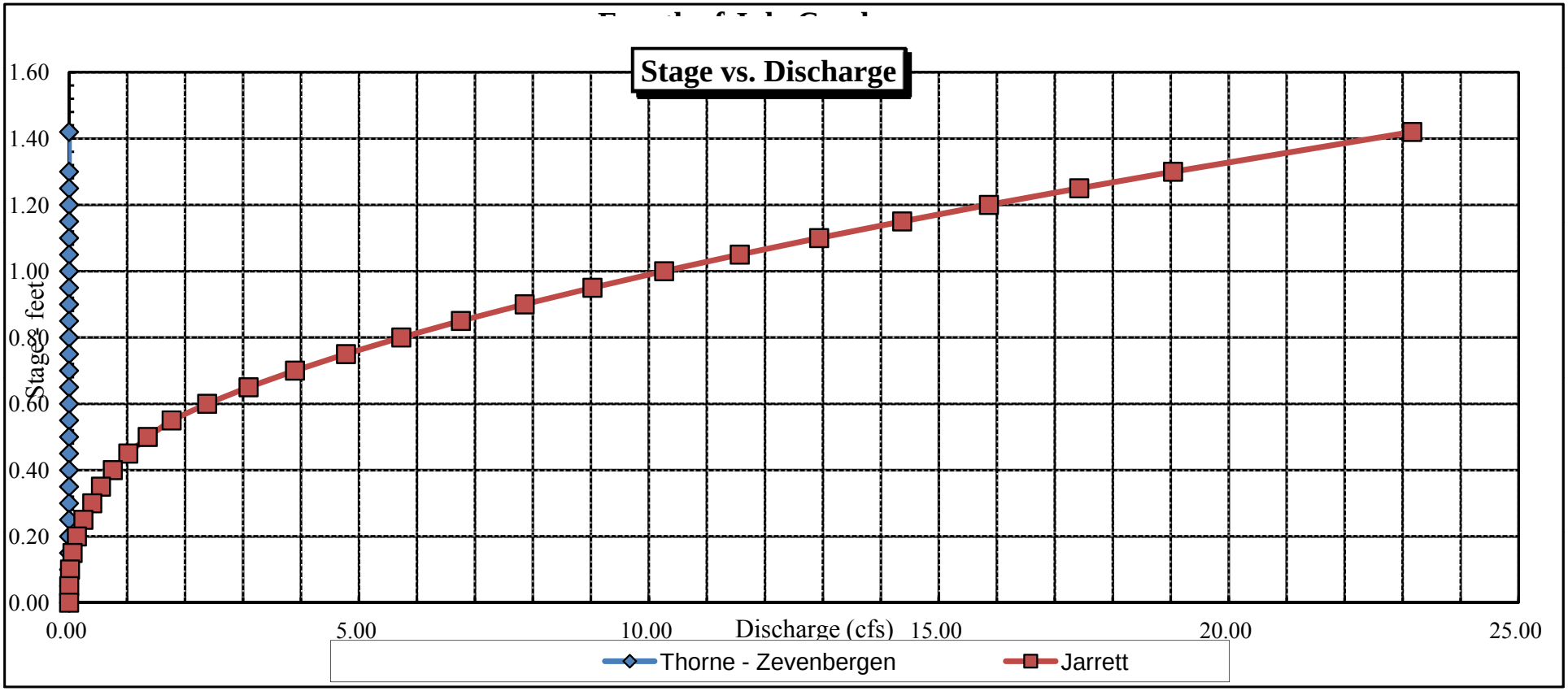
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	3.48	10.14	1.06	1.42	10.77	11.47	100.0%	0.94	23.16	2.15
	3.60	10.00	0.96	1.30	9.56	11.18	97.4%	0.85	19.04	1.99
	3.65	9.95	0.91	1.25	9.06	11.06	96.4%	0.82	17.42	1.92
	3.70	9.89	0.87	1.20	8.56	10.94	95.3%	0.78	15.86	1.85
	3.75	9.83	0.82	1.15	8.07	10.81	94.2%	0.75	14.37	1.78
	3.80	9.77	0.78	1.10	7.58	10.69	93.2%	0.71	12.94	1.71
	3.85	9.72	0.73	1.05	7.09	10.57	92.1%	0.67	11.57	1.63
	3.90	9.66	0.68	1.00	6.61	10.45	91.0%	0.63	10.26	1.55
	3.95	9.60	0.64	0.95	6.13	10.32	90.0%	0.59	9.03	1.47
	4.00	9.54	0.59	0.90	5.65	10.20	88.9%	0.55	7.86	1.39
	4.05	9.48	0.55	0.85	5.17	10.08	87.8%	0.51	6.76	1.31
	4.10	9.43	0.50	0.80	4.70	9.96	86.8%	0.47	5.73	1.22
	4.15	9.37	0.45	0.75	4.23	9.83	85.7%	0.43	4.78	1.13
	4.20	9.31	0.40	0.70	3.76	9.71	84.6%	0.39	3.90	1.04
	4.25	9.25	0.36	0.65	3.30	9.59	83.6%	0.34	3.10	0.94
	4.30	9.17	0.31	0.60	2.84	9.44	82.3%	0.30	2.38	0.84
	4.35	8.99	0.27	0.55	2.38	9.21	80.2%	0.26	1.77	0.74
	4.40	8.01	0.24	0.50	1.96	8.22	71.7%	0.24	1.36	0.69
	4.45	7.03	0.23	0.45	1.58	7.24	63.1%	0.22	1.02	0.65
	4.50	6.05	0.21	0.40	1.26	6.25	54.5%	0.20	0.76	0.60
	4.55	5.08	0.19	0.35	0.98	5.26	45.9%	0.19	0.55	0.56
WL	4.60	4.10	0.18	0.30	0.75	4.28	37.3%	0.17	0.40	0.54
	4.65	3.75	0.15	0.25	0.55	3.91	34.1%	0.14	0.25	0.45
	4.70	3.30	0.11	0.20	0.38	3.45	30.1%	0.11	0.14	0.36
	4.75	2.80	0.08	0.15	0.22	2.91	25.4%	0.08	0.06	0.27
	4.80	2.00	0.05	0.10	0.10	2.07	18.1%	0.05	0.02	0.18
	4.85	0.90	0.03	0.05	0.02	0.92	8.1%	0.02	0.00	0.11
	4.90	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


CROSS SECTION DATA ANALYSIS
LS
G
W
W
G
RS
-1.00
-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
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
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
2.50
2.00
1.50
1.00
0.50
0.00
0.00
5.00
10.00
15.00
20.00
25.00
Discharge (cfs)
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
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
1.60
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
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Fourth of July Creek							CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: Approx. 170 ft. upstream from Powderhorn Wilderness boundary							
DATE: 7-25-14	OBSERVERS: R. Smith, A. Breibart						
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 13	TOWNSHIP: 45 N/S	RANGE: 4 E/W	PM: NM		
COUNTY: Gunnison	WATERSHED: Lake Fk. Gunnison	WATER DIVISION: 4	DOW WATER CODE: 45351				
MAP(S):	USGS:						
	USFS:						

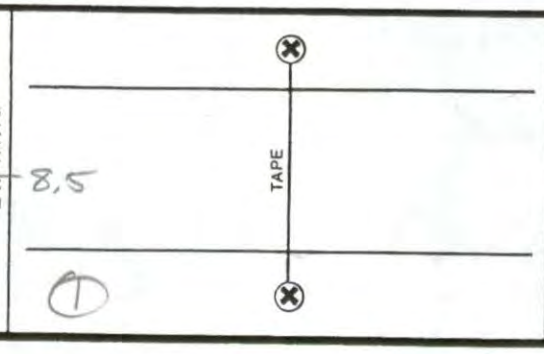
SUPPLEMENTAL DATA

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: gravel to 2-foot boulders	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS: 2		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0 3.8	7.75 / 7.75
② WS Upstream	13.5'	6.40
③ WS Downstream	16.0'	9.20
SLOPE	2.80 / 29.5' = .095	

SKETCH



LEGEND:
Stake ⊗
Station ①
Photo ◇
Direction of Flow

AQUATIC SAMPLING SUMMARY

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

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

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

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

COMMENTS

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Fourth of July Creek | CROSS-SECTION NO.: 2 | DATE: 7-25-14 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: ____ ft | TIME: 10 am

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		5.03								
G	0.8		6.48								
	2.1		7.24								
W	3.8		7.75								
	4.4		7.85	0.1				.01			
	4.7		7.85	0.1				.23			
	5.0		7.90	0.15				.53			
	5.3		7.90	0.15				.84			
	5.6		7.85	0.10				.82			
	5.9		7.90	0.15				.83			
	6.2		7.95	0.20				.62			
	6.5		7.95	0.20				.84			
	6.8		7.90	0.15				1.23			
	7.1		7.95	0.20				0.96			
	7.4		7.95	0.20				1.03			
	7.7		7.90	0.15				Ø			
	8.0		7.85	0.10				Ø			
	8.3		7.85	0.10				Ø			
W	8.5		7.75								
W	9.0		7.10								
G	9.9		6.54								
RS	11.8		4.87								
TOTALS:											

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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Fourth of July Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: Approx. 200 ft upstream from Powderhorn Wilderness boundary						
DATE: 7-25-14	OBSERVERS: R. Smith, A. Breibart					
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 13	TOWNSHIP: 45 (N)/S	RANGE: 4 E/(W)	PM: NM	
COUNTY: Gunnison	WATERSHED: Lake Fork Gunnison	WATER DIVISION: 4	DOW WATER CODE:			
MAP(S):	USGS: Zone 13 301561					
	USFS: 4226153					

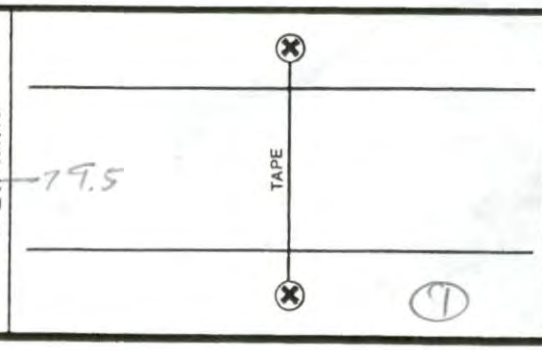
SUPPLEMENTAL DATA

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 2-foot boulders	PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0 5.4	4.60 / 4.60
② WS Upstream	14.7	3.20
③ WS Downstream	16.7	6.08
SLOPE	2.88 / 31.4 = .092	

SKETCH



LEGEND:

Stake ⊗

Station ①

Photo ◇①→

Direction of Flow ← →

AQUATIC SAMPLING SUMMARY

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

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

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

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

COMMENTS

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: 4th of July Creek	CROSS-SECTION NO.: 1	DATE: 7-25-14	SHEET ___ OF ___

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE)	LEFT / RIGHT	Gage Reading: ____ ft	TIME:

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		1.26								
G	3.3		3.33								
	4.3		4.29								
W	5.4		4.60								
	5.7		4.70	0.10				0.56			
	6.0		4.85	0.25				0.88			
	6.3		4.80	0.20				0.40			
	6.6		4.70	0.10				0.43			
	6.9		4.80	0.20				0.52			
	7.2		4.80	0.20				0.73			
	7.5		4.90	0.30				0.40			
	7.8		4.85	0.25				0.91			
	8.1		4.80	0.20				0.46			
	8.4		4.90	0.30				0.19			
	8.7		4.85	0.25				0.66			
	9.0		4.70	0.10				0.19			
	9.3		4.65	0.05				0.15			
W	9.5		4.60								
	13.5		4.35								
G	13.6		3.48								
RS	14.8		3.00								
TOTALS:											

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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Fourth of July Creek	CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: Approx. 1.0 miles upstream from confluence with Lake Fork Gunnison River	
DATE: 7-18-13	OBSERVERS: K. Smith, A. Breibart

LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP:	RANGE:	PM:
	SE	12	45 (N)/S	4 E(W)	6th

COUNTY:	WATERSHED:	WATER DIVISION:	DOW WATER CODE:
Gunnison	Lake Fork Gunnison	4	45351

MAP(S):	
USGS:	
USFS:	

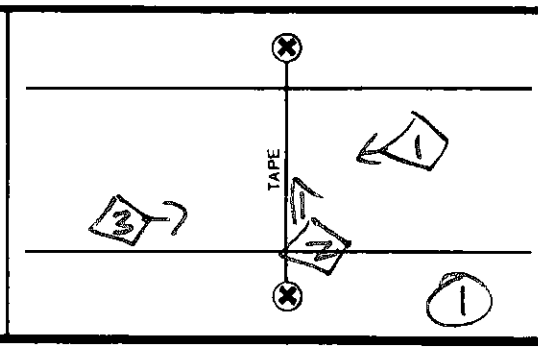
SUPPLEMENTAL DATA

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: gravel to 8" 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	6.90 / 6.90
② WS Upstream	39.0	3.15
③ WS Downstream	10.5'	7.60
SLOPE	4.45 / 50.5' = .088	

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

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Fourth of July Creek	CROSS-SECTION NO.: 2	DATE: 7-18-13	SHEET ___ OF ___

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE)	LEFT / RIGHT	Gage Reading: ____ ft	TIME 11:30 am

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		5.36								
G	1.1		5.83								
W	2.0		6.90								
	2.2		7.10	.2				0.51			
	2.5		7.10	.2				0.34			
	2.8		7.15	.25				0.05			
	3.1		7.00	.10				0.43			
	3.4		7.00	.10				0.30			
	3.7		7.00	.10				ϕ			
	4.0		7.00	.10				0.03			
	4.3		7.10	.20				0.22			
	4.6		7.10	.20				0.48			
	4.9		7.10	.20				0.63			
	5.2		7.15	.25				1.05			
	5.5		7.15	.25				0.78			
	5.8		7.15	.25				0.33			
	6.1		7.10	.20				0.35			
	6.4		7.20	.30				0.28			
	6.7		7.25	.35				0.08			
W	6.8		6.90								
G	7.1		5.83								
	7.6		5.24								
RS	8.8		5.23								
TOTALS:											

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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Fourth of July Creek					CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: Approx. 1 mile upstream from confluence with Lake Fork Gunnison					
DATE: 7-18-13	OBSERVERS: R. Smith, A. Breibart				
LEGAL DESCRIPTION	¼ SECTION: SE	SECTION: 12	TOWNSHIP: 45 N/S	RANGE: 4 E/W	PM: 6th
COUNTY: Gunnison	WATERSHED: Lake Fork Gunnison	WATER DIVISION: 4		DOW WATER CODE: 45351	
MAP(S): USGS: GPS Zone 13 301145					
USFS: 4226263					

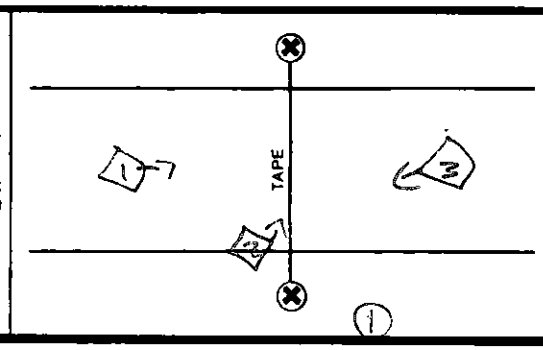
SUPPLEMENTAL DATA

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 4" 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	6.20/6.20
② WS Upstream	12.5'	6.02
③ WS Downstream	39.0'	7.95
SLOPE	3.93/51.5' = .076	

SKETCH



LEGEND:
Stake ⊗
Station ①
Photo ◇
Direction of Flow

AQUATIC SAMPLING SUMMARY

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

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

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

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

COMMENTS

pH = 7.77 Air Temp: 69.4° F Alder - Willow
Temp: 10.5°C Riparian
Cond = 71.2
DO = 7.69 mg/l 93.6 saturation

FORM #ISF ED 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Fourth of July Creek | CROSS-SECTION NO.: | DATE 7-18-13 | SHEET ___ OF ___

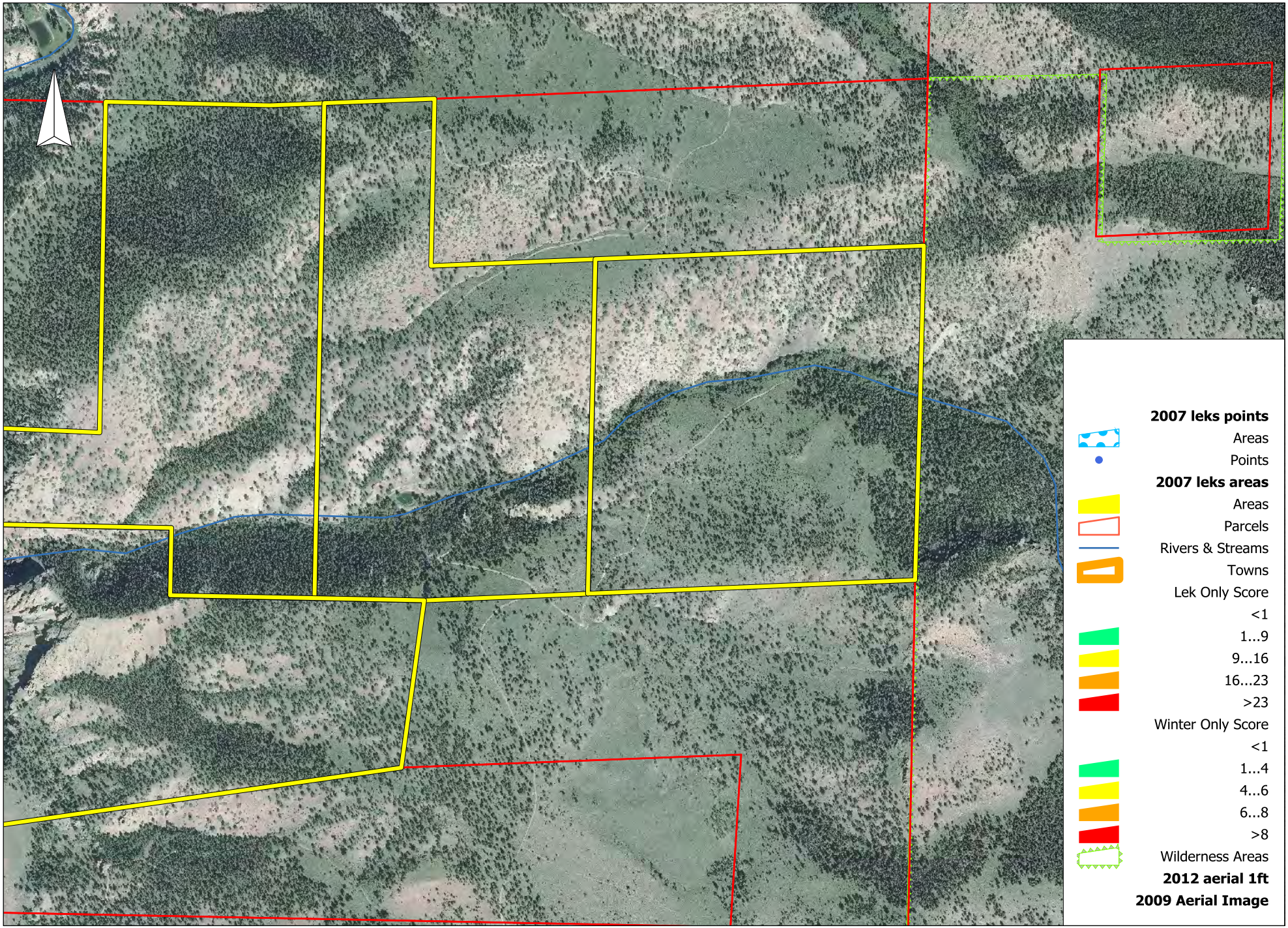
BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) | LEFT / RIGHT | Gage Reading: _____ ft | TIME: 10:30 am

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS&G	6.0		5.10								
	6.9		5.76								
W	7.9		6.20								
	8.5		6.30	.10				0.07			
	8.8		6.30	.10				0.51			
	9.1		6.30	.10				0.99			
	9.4		6.40	.20				1.04			
	9.7		6.40	.20				0.90			
	10.0		6.40	.20				0.61			
	10.3		6.35	.15				0.69			
	10.6		6.40	.20				0.44			
	10.9		6.40	.20				0.17			
	11.2		6.40	.20				1.03			
	11.5		6.40	.20				0.99			
	11.8		6.40	.20				0.51			
W	12.1		6.20								
	12.6		5.84								
	13.4		5.50								
	14.0		5.28								
G	14.6		5.13								
LS	18.0		4.32								
TOTALS:											

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

WILDERNESS
BOUNDARY
BEHIND
THIS SIGN

WILDERNESS
BOUNDARY
BEHIND
THIS SIGN
CLOSED TO
MOTOR VEHICLES,
MOTORIZED
EQUIPMENT,
BICYCLES, AND
HANG-GLIDERS.
VIOLATIONS
PUNISHABLE
FOR FURTHER
INFORMATION
CONTACT YOUR
LOCAL BLM OFFICE



Scale = 1:12000

Tuesday, July 21, 2015

DRAFT RECOMMENDATION– January 2015 Version

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 an existing instream flow water right on a portion of the Little Cimarron River, located in Water Division 4.

Location and Land Status. The Little Cimarron River originates near Silver Mountain within the Uncompahgre Wilderness Area, approximately 23 miles south of Morrow Point Reservoir. This subject of this recommendation is a reach that begins at confluence with Firebox Creek and extends to the confluence with East Fork Little Cimarron River, a distance of approximately 7.0 miles. The BLM manages approximately 1.5 miles of this reach, the U.S. Forest Service manages 2.5 miles, and 3.0 miles are in private ownership.

Existing Instream Flow Water Rights. The Colorado Water Conservation Board appropriated an instream flow water right on the Little Cimarron River in 1984. The water right extends from the headwaters to the headgate of the Butte Ditch, a distance of approximately 16.4 miles. The instream flow water right is for 2.0 cfs, year round.

Biological Summary. The Little Cimarron River is a cold-water, high gradient stream. It flows through a canyon with a valley floor approximately one-fourth mile in width. The stream cuts through alluvial deposits in the narrow valley and is confined by bedrock in many locations. The stream generally has large substrate, consisting of mostly of small cobbles and boulders of up to three feet in size. The stream has a good mix of large pools in meander bends, riffles, and runs with some large woody debris.

Fisheries surveys have revealed a self-sustaining population of brook trout, with small numbers of lake trout. Intensive macro-invertebrate surveys have not been conducted, but spot samples have revealed various species of mayfly, caddisfly, and stonefly.

The riparian community is generally comprised of blue spruce and willow species. The riparian community is in very good condition, and provides abundant shading and cover for fish habitat.

R2Cross Analysis. The BLM collected the following R2Cross data from Little Cimarron River:

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)
07/24/2014 #1	20.7 cfs	37.70 feet	9.64 cfs	10.26 cfs
07/24/2014 #2	22.38 cfs	35.8 feet	Out of range	12.34 cfs
		Averages:	9.64 cfs	11.30 cfs

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.

> 11.00 cubic feet per second is recommended during warm weather period from April 1 to October 31. Protecting this flow rate would require an increase of 9.0 cfs to the existing instream flow water right. This recommendation is driven by the average depth criteria. This portion of the river is at high altitude and within a dark canyon, so it experiences significant icing during the winter months. It is important to protect a flow rate that makes most of this habitat available to the fish population while they are completing critical life history functions during the warm weather months.
>
> 9.6 cubic feet per second is recommended during cold weather period from November 1 to March 31. Protecting this flow rate would require an increase of 7.6 cfs to the existing instream flow water right. This recommendation is driven by the average velocity criteria. This flow rate should prevent pools from freezing, allowing the fish population to successfully overwinter.

Rationale for Instream Flow Increase. BLM believes an instream flow increase for Little Cimarron River is warranted for because of physical habitat characteristics. The R2Cross data summarized below clearly indicates that the current instream flow water right does not provide sufficient physical habitat during the warm weather portions of the year when the fish populations are feeding, growing, and spawning. When the existing instream flow rights are applied to the cross sections that were collected, the stream would exhibit between 20% and 45% wetted perimeter, so a significant portion of the potential habitat is not available. The available habitat is further reduced when the existing instream flow rates are applied to the cross sections collected, because 2.0 cfs produces average depths ranging from 0.16 to 0.28 feet. These depths occur in a stream that averages 35 feet in width. While 0.28 feet is sufficient for fish passage, 0.16 feet is not. In many portions of the channel, depths may not be usable by the fish population. During the warm weather season, the fish population needs to have access to as much of the stream channel as possible for feeding, resting, and spawning if it to survive the pronounced cold winters in this location.

Water Availability. The BLM recommends relying upon three sources of data for water

availability analysis. A basin apportionment analysis could be performed on USGS Gage 09126000 (Cimarron River near Cimarron, CO) to derive flow rates for this stream reach. In addition, Streamstats should be consulted because it provides similar estimates of flows. Finally, diversion records for downstream diversions can be consulted to help confirm the duration of the snowmelt runoff period.

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

Relationship to Land Management Plans. BLM's land use plan calls for the Little Cimarron River to be managed to maintain, restore, or improve riparian conditions, such that proper functioning conditions are achieved. It also specifies that instream flow appropriations will pursued on fishery streams to ensure sufficient flows rates for fisheries protection. Appropriation of an instream flow water right would assist 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 BLM's draft recommendation in February 2015. 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,

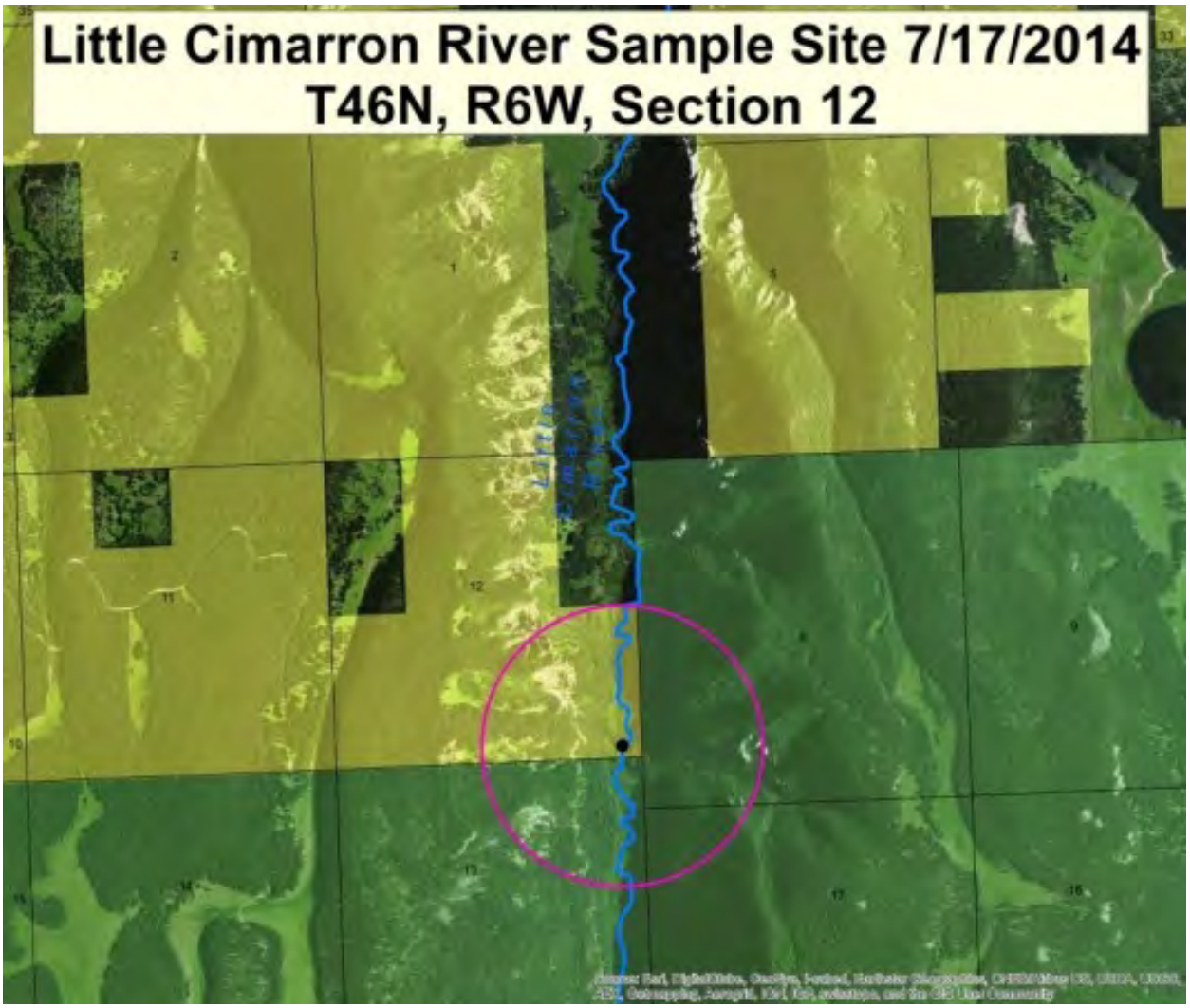
Brian St. George
Deputy State Director
Resources and Fire

Cc: Field Office Manager, Gunnison Field Office
Lori Armstrong, Southwest District Office
Andrew Breibart, Gunnison Field Office

Gunnison Field Office Stream Surveys
July, 2014

Little Cimarron River: Water Code – 39051

The Little Cimarron River, located on BLM lands managed by the Gunnison Field Office, was sampled on July 17, 2014. The Little Cimarron River is tributary to the Cimarron River, which leads to the Gunnison River. The stream was sampled using one backpack electroshocker to determine species presence. The stream was too wide to effectively complete a two-pass population estimate with one shocker. Brook trout (*Salvelinus fontinalis*) and lake trout (*Salvelinus namaycush*) were the only species seen or collected. Personnel present included Tom Fresques, Gregor Dekleva, and Kristen Doyle BLM.



Little Cimarron River

Lake Trout on Left Brook Trout on Right

STREAM SURVEY FISH SAMPLING FORM 2014									
WATER: Little Cimarron River				**DATE: 7/17/14**			**GEAR: BPE-1**		
Crew: Fresques, Dekleva, Doyle					**Location: Upper BLM at USFS boundary**				
#	**Pass**	**Species**	**Length**	**Weight**	**#**	**Pass**	**Species**	**Length**	**Weight**
1		BRK	157	37	26				
2		BRK	143	27	27				
3		BRK	200	88	28				
4		BRK	191	72	29				
5		BRK	221	110	30				
6		BRK	151	36	31				
7		BRK	126	20	32				
8		BRK	178	58	33				
9		BRK	137	21	34				
10		BRK	135	22	35				
11		BRK	124	18	36				
12		BRK	142	30	37				
13		BRK	153	39	38				
14		BRK	128	21	39				
15		BRK	155	41	40				
16		MAC	142	30	41				
17		BRK	87	8	42				
18		BRK	146	30	43				
19		BRK	122	19	44				
20		BRK	136	23	45				
21		BRK	89	6	46				
22		BRK	29	19	47				
23		BRK	101	12	48				
24		BRK	84	7	49				
25					50				
GPS Coordinates: 13S 0284037, 4236071									
H2O Temp:				**Reach Length**: 241’			**Stream Widths**:	1. 27.4	
Conductivity:				**Shocker Settings**:				2. 29.2	
Habitat (Riparian): Dense willow, spruce, fir, sedge, indian paint brush, elephant’s nose, mayflie, caddisfly, solidago, blue bells, clover, mare’s tail, geranium								3. 23.2	
								4. 20.3	
								5. 31.2	
								Avg: 26.26	
Habitat (Stream): B/C Rosgen type, good sinuosity, mostly gravel and cobble, dense riparian, several age classes of brook trout, not much sediment, large woody debris, undercut banks									

Discussion:

The river was sampled to determine species composition on the BLM reach. The river is in good condition and is comprised of a good mix of large meander bend pools, riffles, and runs. Stream substrate is primarily gravels and cobbles with some large woody debris. Riparian vegetation is

dense and consists of willow, blue spruce, sedge, clover, marestail, geranium, and elephant's nose. Brook trout and lake trout were the only species collected or seen. It is interesting that a lake trout was collected in the sample as there is no obvious lake or reservoir habitat in the Little Cimarron River watershed.

Recommendations:

- Consider sampling the site with CPW with additional shockers to effectively determine population status.

- Periodically sample and monitor stream and riparian habitats

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

LOCATION INFORMATION

STREAM NAME:	Little Cimarron River
XS LOCATION:	Approx 0.7 mi upst fr conf w Van Boxel Cr
XS NUMBER:	2
DATE:	22-Jul-14
OBSERVERS:	R. Smith, A. Breibart
1/4 SEC:	NW
SECTION:	29
TWP:	47N
RANGE:	5W
PM:	NM
COUNTY:	Gunnison
WATERSHED:	Gunnison River
DIVISION:	4
DOW CODE:	39051
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:	0.028

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

ASSIGNED TO: ….....…….....DATE.....

STREAM NAME: Little Cimarron River
XS LOCATION: Approx 0.7 mi upst fr conf w Van Boxel Cr
XS NUMBER: 2

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
	LS	0.00	3.00			0.00		0.00	0.00	0.0%
1	G	2.70	3.85			0.00		0.00	0.00	0.0%
	W	3.10	5.05	0.00	0.00	0.00		0.00	0.00	0.0%
		4.00	5.25	0.20	0.10	0.92	0.20	0.19	0.02	0.1%
		5.00	5.45	0.40	0.48	1.02	0.40	0.40	0.19	0.9%
		6.00	5.80	0.75	1.25	1.06	0.75	0.75	0.94	4.2%
		7.00	5.60	0.55	1.31	1.02	0.55	0.55	0.72	3.2%
		8.00	5.85	0.80	1.40	1.03	0.80	0.80	1.12	5.0%
		9.00	5.75	0.70	0.36	1.00	0.70	0.70	0.25	1.1%
		10.00	5.35	0.30	1.95	1.08	0.30	0.30	0.59	2.6%
		11.00	5.80	0.75	1.53	1.10	0.75	0.75	1.15	5.1%
		12.00	5.25	0.20	1.84	1.14	0.20	0.20	0.37	1.6%
		13.00	5.85	0.80	2.61	1.17	0.80	0.80	2.09	9.3%
		14.00	5.85	0.80	1.98	1.00	0.80	0.80	1.58	7.1%
		15.00	5.80	0.75	1.63	1.00	0.75	0.75	1.22	5.5%
		16.00	5.85	0.80	1.48	1.00	0.80	0.80	1.18	5.3%
		17.00	5.70	0.65	2.08	1.01	0.65	0.65	1.35	6.0%
		18.00	5.50	0.45	2.23	1.02	0.45	0.45	1.00	4.5%
		19.00	5.60	0.55	2.60	1.00	0.55	0.55	1.43	6.4%
		20.00	5.15	0.10	0.00	1.10	0.10	0.10	0.00	0.0%
		21.00	5.60	0.50	0.00	1.10	0.50	0.50	0.00	0.0%
		22.00	5.65	0.55	0.05	1.00	0.55	0.55	0.03	0.1%
		23.00	5.85	0.75	0.00	1.02	0.75	0.75	0.00	0.0%
		24.00	5.80	0.70	2.63	1.00	0.70	0.70	1.84	8.2%
		25.00	5.50	0.40	2.90	1.04	0.40	0.40	1.16	5.2%
		26.00	5.60	0.50	1.10	1.00	0.50	0.50	0.55	2.5%
		27.00	5.65	0.55	2.95	1.00	0.55	0.55	1.62	7.2%
		28.00	5.45	0.35	2.47	1.02	0.35	0.35	0.86	3.9%
		29.00	5.45	0.35	1.69	1.00	0.35	0.35	0.59	2.6%
		30.00	5.45	0.35	1.34	1.00	0.35	0.35	0.47	2.1%
		31.00	5.30	0.20	0.26	1.01	0.20	0.20	0.05	0.2%
		32.00	5.10	0.00	0.00	1.02		0.00	0.00	0.0%
		33.00	5.15	0.05	0.00	1.00	0.05	0.06	0.00	0.0%
	W	34.50	5.10	0.00	0.00	1.50		0.00	0.00	0.0%
		36.20	4.52			0.00		0.00	0.00	0.0%
1	G	38.50	3.85			0.00		0.00	0.00	0.0%
	RS	43.00	3.75			0.00		0.00	0.00	0.0%
	TOTALS ----------					32.39	0.8 (Max.)	14.80	22.38	100.0%

Manning's n = 0.0976
Hydraulic Radius= 0.45693804

STREAM NAME: Little Cimarron River
XS LOCATION: Approx 0.7 mi upst fr conf w Van Boxel Cr
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	14.80	13.94	-5.8%
4.85	14.80	21.88	47.8%
4.87	14.80	21.24	43.5%
4.89	14.80	20.60	39.1%
4.91	14.80	19.95	34.8%
4.93	14.80	19.32	30.5%
4.95	14.80	18.68	26.2%
4.97	14.80	18.04	21.9%
4.99	14.80	17.40	17.6%
5.01	14.80	16.77	13.3%
5.03	14.80	16.14	9.0%
5.05	14.80	15.51	4.8%
5.06	14.80	15.19	2.6%
5.07	14.80	14.88	0.5%
5.08	14.80	14.56	-1.6%
5.09	14.80	14.25	-3.7%
5.10	14.80	13.94	-5.8%
5.11	14.80	13.63	-7.9%
5.12	14.80	13.33	-10.0%
5.13	14.80	13.03	-12.0%
5.14	14.80	12.74	-13.9%
5.15	14.80	12.45	-15.9%
5.17	14.80	11.89	-19.7%
5.19	14.80	11.34	-23.4%
5.21	14.80	10.79	-27.1%
5.23	14.80	10.24	-30.8%
5.25	14.80	9.70	-34.4%
5.27	14.80	9.17	-38.0%
5.29	14.80	8.65	-41.6%
5.31	14.80	8.13	-45.1%
5.33	14.80	7.62	-48.5%
5.35	14.80	7.11	-51.9%

WATERLINE AT ZERO
AREA ERROR = 5.072

STREAM NAME: Little Cimarron River
XS LOCATION: Approx 0.7 mi upst fr conf w Van Boxel Cr
XS NUMBER: 2 Constant Manning's n

STAGING TABLE *GL* = lowest Grassline elevation corrected for sag
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	3.85	35.80	1.56	2.00	55.83	37.85	100.0%	1.47	184.37	3.30
	4.07	34.96	1.37	1.78	47.96	36.82	97.3%	1.30	145.79	3.04
	4.12	34.77	1.33	1.73	46.21	36.59	96.7%	1.26	137.64	2.98
	4.17	34.59	1.29	1.68	44.48	36.36	96.1%	1.22	129.69	2.92
	4.22	34.40	1.24	1.63	42.76	36.13	95.4%	1.18	121.93	2.85
	4.27	34.21	1.20	1.58	41.04	35.90	94.8%	1.14	114.38	2.79
	4.32	34.02	1.16	1.53	39.33	35.66	94.2%	1.10	107.03	2.72
	4.37	33.83	1.11	1.48	37.64	35.43	93.6%	1.06	99.88	2.65
	4.42	33.64	1.07	1.43	35.95	35.20	93.0%	1.02	92.93	2.59
	4.47	33.46	1.02	1.38	34.27	34.97	92.4%	0.98	86.20	2.52
	4.52	33.27	0.98	1.33	32.61	34.74	91.8%	0.94	79.67	2.44
	4.57	33.11	0.93	1.28	30.95	34.53	91.2%	0.90	73.32	2.37
	4.62	32.94	0.89	1.23	29.29	34.32	90.7%	0.85	67.19	2.29
	4.67	32.78	0.84	1.18	27.65	34.12	90.1%	0.81	61.27	2.22
	4.72	32.62	0.80	1.13	26.02	33.91	89.6%	0.77	55.58	2.14
	4.77	32.45	0.75	1.08	24.39	33.70	89.0%	0.72	50.11	2.05
	4.82	32.29	0.71	1.03	22.77	33.49	88.5%	0.68	44.88	1.97
	4.87	32.13	0.66	0.98	21.16	33.29	87.9%	0.64	39.88	1.88
	4.92	31.96	0.61	0.93	19.56	33.08	87.4%	0.59	35.12	1.80
	4.97	31.80	0.56	0.88	17.97	32.87	86.8%	0.55	30.61	1.70
	5.02	31.64	0.52	0.83	16.38	32.66	86.3%	0.50	26.35	1.61
WL	5.07	31.38	0.47	0.78	14.80	32.38	85.5%	0.46	22.39	1.51
	5.12	29.84	0.44	0.73	13.26	30.83	81.4%	0.43	19.25	1.45
	5.17	27.89	0.42	0.68	11.83	28.85	76.2%	0.41	16.63	1.41
	5.22	27.19	0.38	0.63	10.45	28.12	74.3%	0.37	13.77	1.32
	5.27	26.40	0.34	0.58	9.11	27.29	72.1%	0.33	11.17	1.23
	5.32	25.47	0.31	0.53	7.81	26.30	69.5%	0.30	8.86	1.13
	5.37	24.39	0.27	0.48	6.56	25.15	66.4%	0.26	6.83	1.04
	5.42	23.17	0.23	0.43	5.37	23.86	63.0%	0.23	5.07	0.94
	5.47	20.04	0.21	0.38	4.29	20.65	54.5%	0.21	3.84	0.89
	5.52	18.38	0.18	0.33	3.32	18.90	49.9%	0.18	2.66	0.80
	5.57	15.94	0.15	0.28	2.46	16.36	43.2%	0.15	1.78	0.72
	5.62	12.95	0.13	0.23	1.73	13.27	35.1%	0.13	1.14	0.66
	5.67	10.17	0.11	0.18	1.17	10.41	27.5%	0.11	0.69	0.59
	5.72	8.46	0.08	0.13	0.70	8.62	22.8%	0.08	0.34	0.48
	5.77	6.54	0.05	0.08	0.32	6.62	17.5%	0.05	0.11	0.34
	5.82	3.41	0.02	0.03	0.06	3.43	9.1%	0.02	0.01	0.17

STREAM NAME: Little Cimarron River
XS LOCATION: Approx 0.7 mi upst fr conf w Van Boxel Cr
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	22.38	cfs
CALCULATED FLOW (Qc)=	22.39	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	5.10	ft
CALCULATED WATERLINE (WLc)=	5.07	ft
(WLm-WLc)/WLm * 100 =	0.5	%
MAX MEASURED DEPTH (Dm)=	0.80	ft
MAX CALCULATED DEPTH (Dc)=	0.78	ft
(Dm-Dc)/Dm * 100	2.8	%
MEAN VELOCITY=	1.51	ft/sec
MANNING'S N=	0.098	
SLOPE=	0.028	ft/ft
.4 * Qm =	9.0	cfs
2.5 * Qm=	56.0	cfs

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

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

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

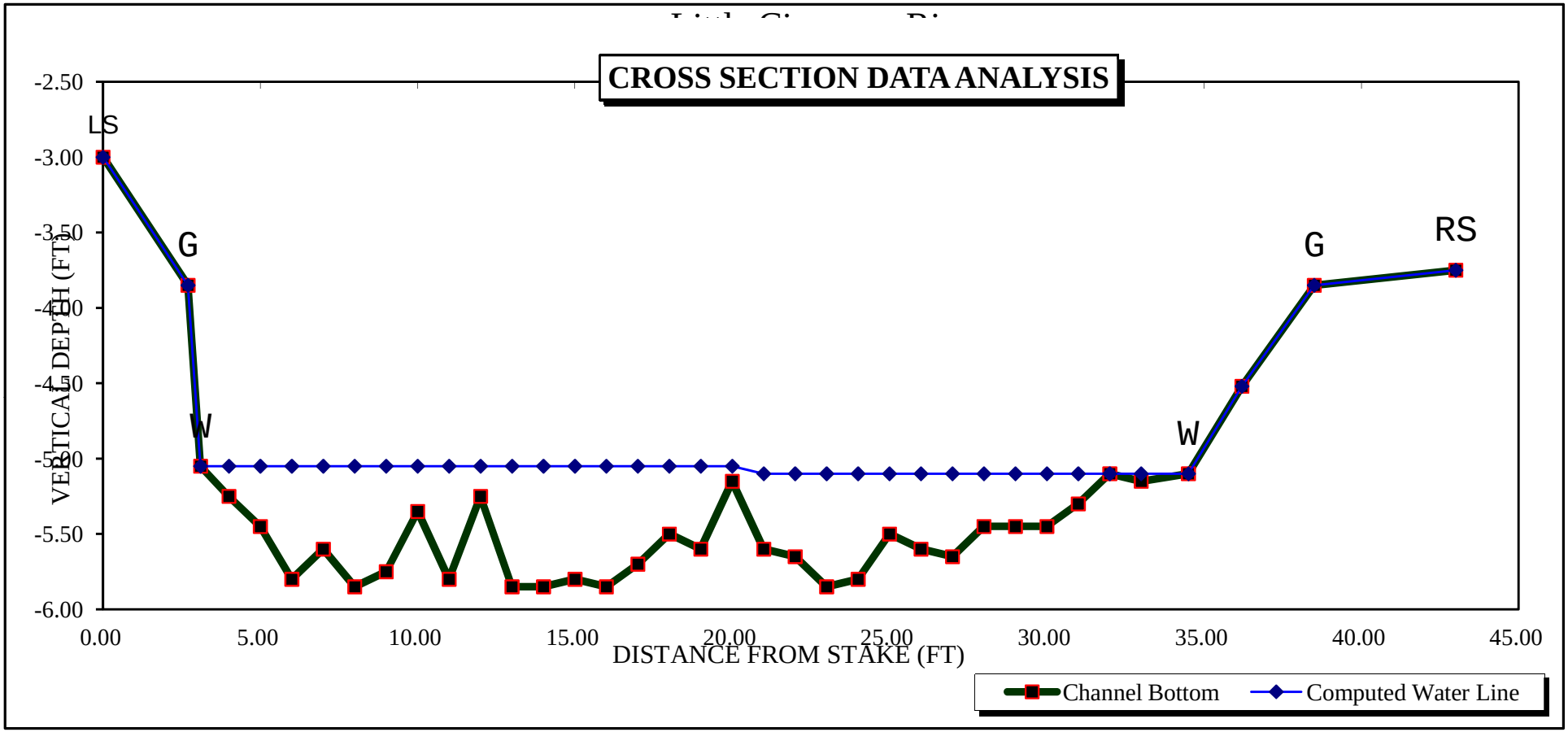
RECOMMENDATION BY: ..... AGENCY..... DATE:.....

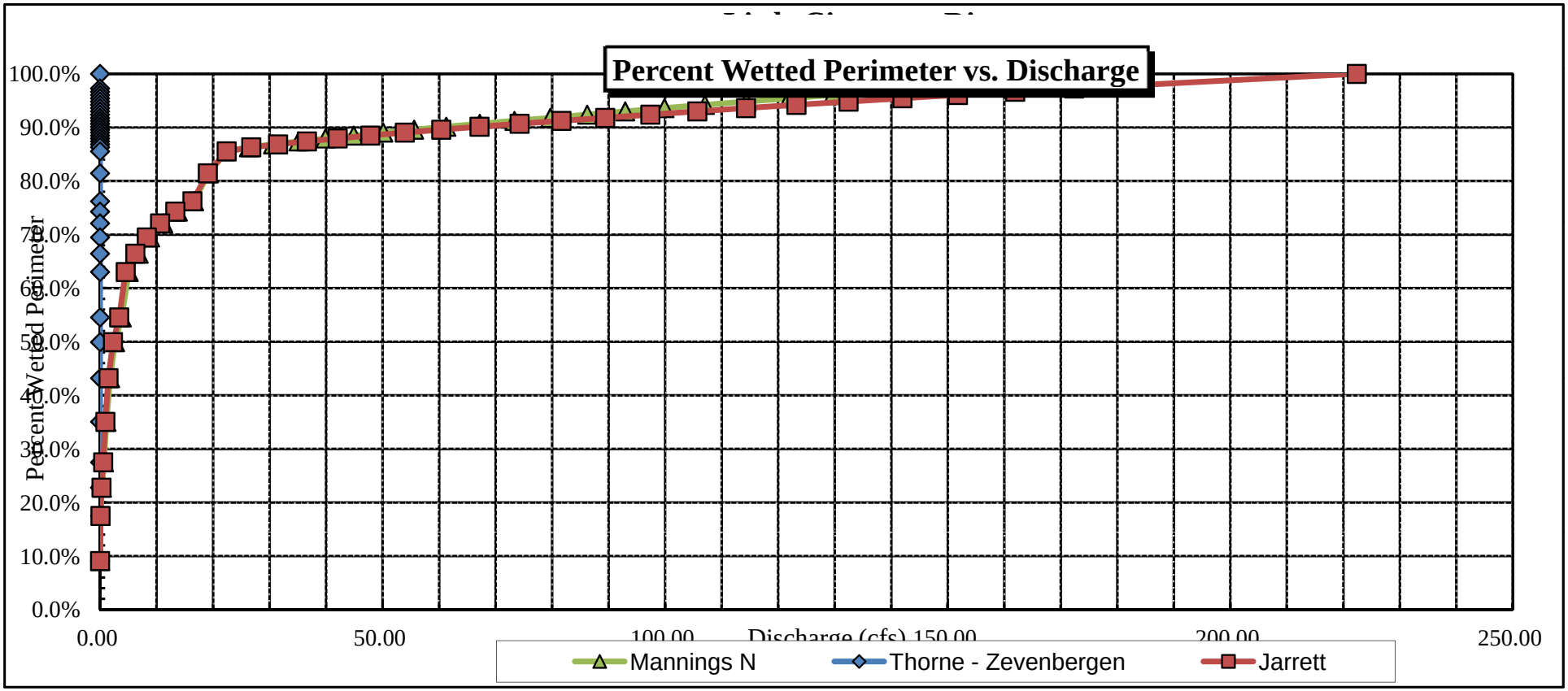
CWCB REVIEW BY: ..... DATE:.....

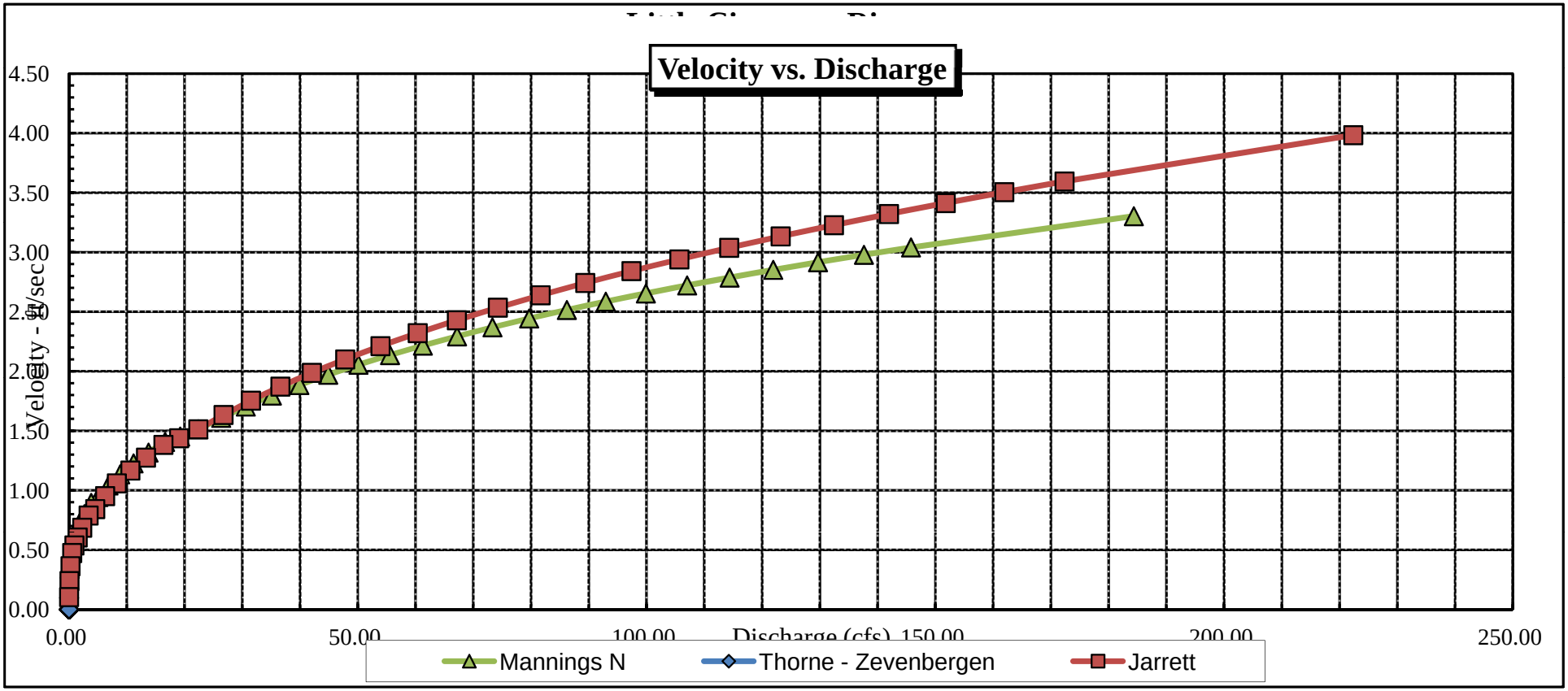
STREAM NAME: Little Cimarron River
XS LOCATION: Approx 0.7 mi upst fr conf w Van Boxel Cr
XS NUMBER: 2 Jarrett Variable Manning's n Correction Applied

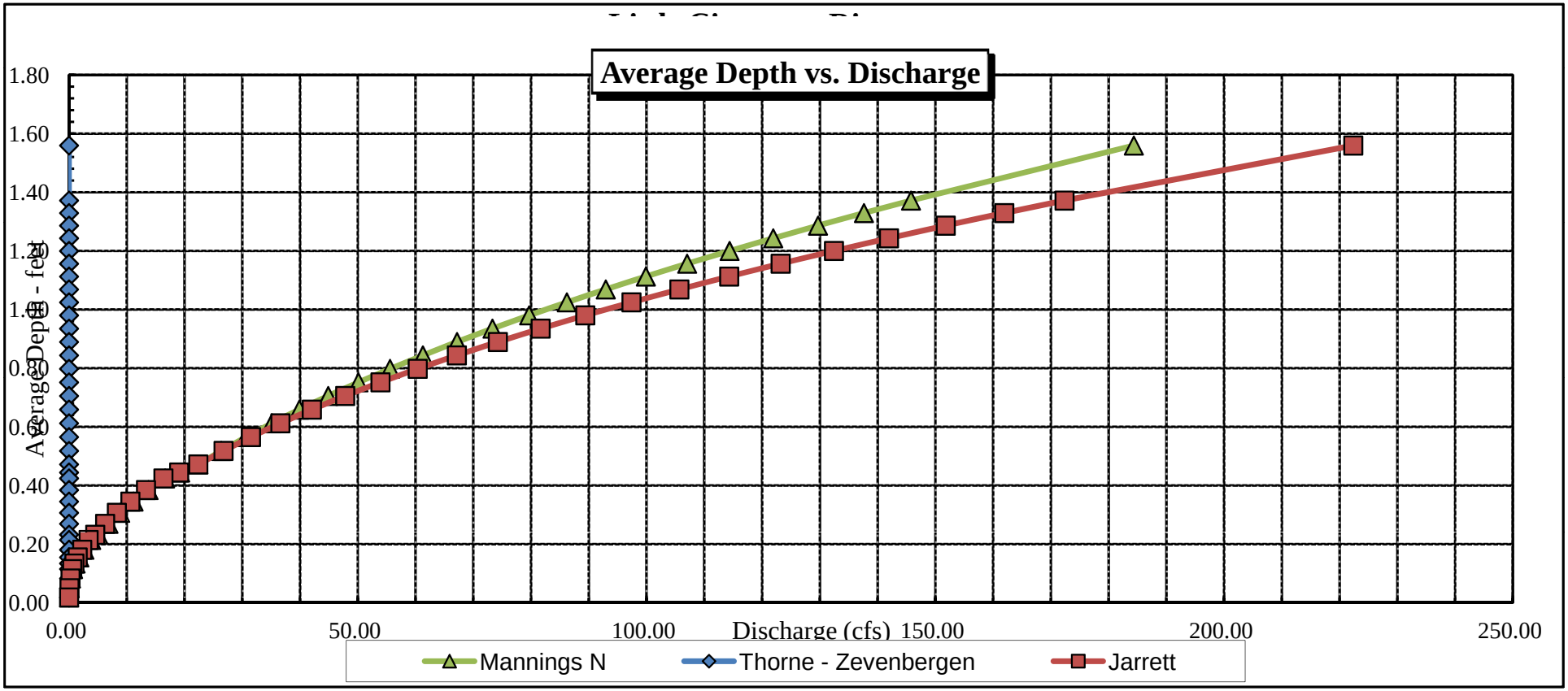
STAGING TABLE *GL* = lowest Grassline elevation corrected for sag
WL = Waterline corrected for variations in field measured water surface elevations and sag

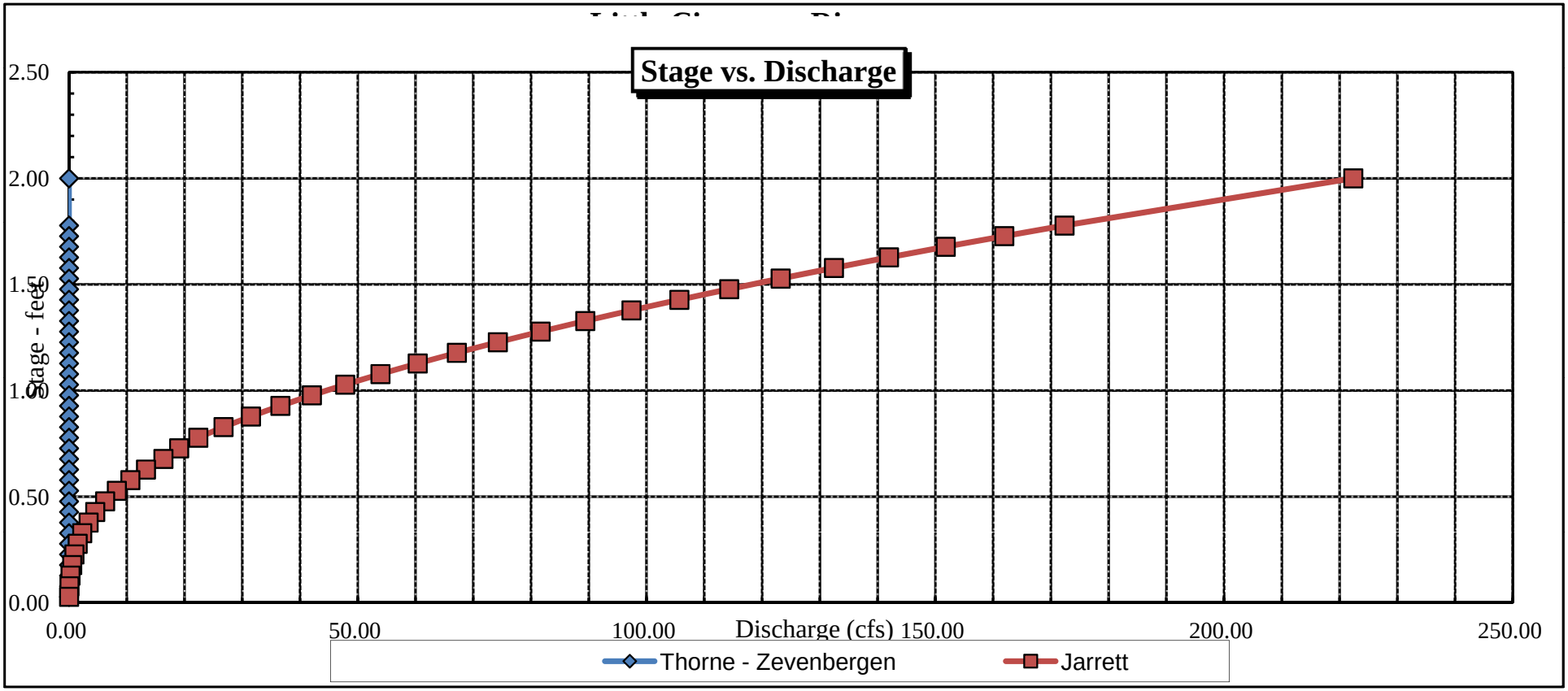
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	3.85	35.80	1.56	2.00	55.83	37.85	100.0%	1.47	222.37	3.98
	4.07	34.96	1.37	1.78	47.96	36.82	97.3%	1.30	172.37	3.59
	4.12	34.77	1.33	1.73	46.21	36.59	96.7%	1.26	161.94	3.50
	4.17	34.59	1.29	1.68	44.48	36.36	96.1%	1.22	151.81	3.41
	4.22	34.40	1.24	1.63	42.76	36.13	95.4%	1.18	141.98	3.32
	4.27	34.21	1.20	1.58	41.04	35.90	94.8%	1.14	132.45	3.23
	4.32	34.02	1.16	1.53	39.33	35.66	94.2%	1.10	123.22	3.13
	4.37	33.83	1.11	1.48	37.64	35.43	93.6%	1.06	114.30	3.04
	4.42	33.64	1.07	1.43	35.95	35.20	93.0%	1.02	105.69	2.94
	4.47	33.46	1.02	1.38	34.27	34.97	92.4%	0.98	97.38	2.84
	4.52	33.27	0.98	1.33	32.61	34.74	91.8%	0.94	89.39	2.74
	4.57	33.11	0.93	1.28	30.95	34.53	91.2%	0.90	81.66	2.64
	4.62	32.94	0.89	1.23	29.29	34.32	90.7%	0.85	74.24	2.53
	4.67	32.78	0.84	1.18	27.65	34.12	90.1%	0.81	67.15	2.43
	4.72	32.62	0.80	1.13	26.02	33.91	89.6%	0.77	60.38	2.32
	4.77	32.45	0.75	1.08	24.39	33.70	89.0%	0.72	53.93	2.21
	4.82	32.29	0.71	1.03	22.77	33.49	88.5%	0.68	47.82	2.10
	4.87	32.13	0.66	0.98	21.16	33.29	87.9%	0.64	42.04	1.99
	4.92	31.96	0.61	0.93	19.56	33.08	87.4%	0.59	36.60	1.87
	4.97	31.80	0.56	0.88	17.97	32.87	86.8%	0.55	31.50	1.75
	5.02	31.64	0.52	0.83	16.38	32.66	86.3%	0.50	26.74	1.63
WL	5.07	31.38	0.47	0.78	14.80	32.38	85.5%	0.46	22.39	1.51
	5.12	29.84	0.44	0.73	13.26	30.83	81.4%	0.43	19.06	1.44
	5.17	27.89	0.42	0.68	11.83	28.85	76.2%	0.41	16.35	1.38
	5.22	27.19	0.38	0.63	10.45	28.12	74.3%	0.37	13.32	1.27
	5.27	26.40	0.34	0.58	9.11	27.29	72.1%	0.33	10.62	1.17
	5.32	25.47	0.31	0.53	7.81	26.30	69.5%	0.30	8.27	1.06
	5.37	24.39	0.27	0.48	6.56	25.15	66.4%	0.26	6.25	0.95
	5.42	23.17	0.23	0.43	5.37	23.86	63.0%	0.23	4.53	0.84
	5.47	20.04	0.21	0.38	4.29	20.65	54.5%	0.21	3.38	0.79
	5.52	18.38	0.18	0.33	3.32	18.90	49.9%	0.18	2.28	0.69
	5.57	15.94	0.15	0.28	2.46	16.36	43.2%	0.15	1.49	0.60
	5.62	12.95	0.13	0.23	1.73	13.27	35.1%	0.13	0.93	0.54
	5.67	10.17	0.11	0.18	1.17	10.41	27.5%	0.11	0.55	0.47
	5.72	8.46	0.08	0.13	0.70	8.62	22.8%	0.08	0.25	0.36
	5.77	6.54	0.05	0.08	0.32	6.62	17.5%	0.05	0.08	0.24
	5.82	3.41	0.02	0.03	0.06	3.43	9.1%	0.02	0.01	0.10


CROSS SECTION DATA ANALYSIS
LS
G
W
W
G
RS
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00
-5.50
-6.00
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Percent Wetted Perimeter vs. Discharge
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Percent Wetted Perimeter
0.00
50.00
100.00
Discharge (cfs)
150.00
200.00
250.00
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
Velocity - ft/sec
0.00
50.00
100.00
150.00
200.00
250.00
Discharge (cfs)
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
50.00
100.00
150.00
200.00
250.00
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
50.00
100.00
150.00
200.00
250.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

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

LOCATION INFORMATION

STREAM NAME:	Little Cimarron River
XS LOCATION:	Approx. 1 mi upst from conf Van Boxel Cr
XS NUMBER:	1
DATE:	24-Jul-14
OBSERVERS:	R. Smith, A. Breibart
1/4 SEC:	SW
SECTION:	29
TWP:	47N
RANGE:	5W
PM:	NM
COUNTY:	Gunnison
WATERSHED:	Gunnison River
DIVISION:	4
DOW CODE:	39051
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:	0.058

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

ASSIGNED TO: ….....…….....DATE.....

STREAM NAME: Little Cimarron River
XS LOCATION: Approx. 1 mi upst from conf Van Boxel Cr
XS NUMBER: 1

DATA POINTS= 39

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	0.00			0.00		0.00	0.00	0.0%
		3.00	0.72			0.00		0.00	0.00	0.0%
1	G	3.20	2.25			0.00		0.00	0.00	0.0%
	W	3.25	4.25	0.00	0.00	0.00		0.00	0.00	0.0%
		4.00	4.35	0.10	0.78	0.76	0.10	0.09	0.07	0.3%
		5.00	4.55	0.30	0.00	1.02	0.30	0.30	0.00	0.0%
		6.00	4.65	0.40	0.79	1.00	0.40	0.40	0.32	1.5%
		7.00	4.45	0.20	0.00	1.02	0.20	0.20	0.00	0.0%
		8.00	4.70	0.45	0.13	1.03	0.45	0.45	0.06	0.3%
		9.00	4.85	0.60	0.43	1.01	0.60	0.60	0.26	1.2%
		10.00	4.65	0.40	1.76	1.02	0.40	0.40	0.70	3.4%
		11.00	4.60	0.35	1.79	1.00	0.35	0.35	0.63	3.0%
		12.00	5.05	0.80	0.98	1.10	0.80	0.80	0.78	3.8%
		13.00	4.65	0.40	2.26	1.08	0.40	0.40	0.90	4.4%
		14.00	5.05	0.80	2.80	1.08	0.80	0.80	2.24	10.8%
		15.00	5.05	0.80	2.72	1.00	0.80	0.80	2.18	10.5%
		16.00	4.85	0.60	3.33	1.02	0.60	0.60	2.00	9.7%
		17.00	4.95	0.70	1.76	1.00	0.70	0.70	1.23	6.0%
		18.00	5.60	1.35	1.45	1.19	1.35	1.35	1.96	9.5%
		19.00	5.75	1.50	1.73	1.01	1.50	1.50	2.60	12.5%
		20.00	5.35	1.10	1.07	1.08	1.10	1.10	1.18	5.7%
		21.00	5.00	0.75	1.23	1.06	0.75	0.75	0.92	4.5%
		22.00	4.70	0.45	1.80	1.04	0.45	0.45	0.81	3.9%
		23.00	4.75	0.50	1.65	1.00	0.50	0.50	0.83	4.0%
		24.00	4.65	0.40	0.81	1.00	0.40	0.40	0.32	1.6%
		25.00	4.55	0.30	0.14	1.00	0.30	0.30	0.04	0.2%
		26.00	4.60	0.35	0.18	1.00	0.35	0.35	0.06	0.3%
		27.00	4.65	0.40	0.25	1.00	0.40	0.40	0.10	0.5%
		28.00	4.85	0.60	0.03	1.02	0.60	0.60	0.02	0.1%
		29.00	5.20	0.95	0.30	1.06	0.95	0.95	0.29	1.4%
		30.00	5.00	0.75	0.00	1.02	0.75	0.75	0.00	0.0%
		31.00	4.30	0.05	0.00	1.22	0.05	0.04	0.00	0.0%
		31.50	4.55	0.30	1.43	0.56	0.30	0.15	0.21	1.0%
		32.00	4.30	0.05	0.00	0.56	0.05	0.04	0.00	0.0%
		33.00	4.45	0.20	0.00	1.01	0.20	0.20	0.00	0.0%
	W	34.00	4.25	0.00	0.00	1.02		0.00	0.00	0.0%
		39.00	3.45			0.00		0.00	0.00	0.0%
1	G	40.90	2.40			0.00		0.00	0.00	0.0%
	RS	43.50	1.71			0.00		0.00	0.00	0.0%
	TOTALS ----------					32.01	1.5 (Max.)	16.71	20.70	100.0%

Manning's n = 0.1874
Hydraulic Radius= 0.52215788

STREAM NAME: Little Cimarron River
XS LOCATION: Approx. 1 mi upst from conf Van Boxel Cr
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	16.71	16.71	0.0%
4.00	16.71	24.60	47.2%
4.02	16.71	23.95	43.3%
4.04	16.71	23.31	39.5%
4.06	16.71	22.67	35.6%
4.08	16.71	22.03	31.8%
4.10	16.71	21.40	28.0%
4.12	16.71	20.76	24.2%
4.14	16.71	20.13	20.5%
4.16	16.71	19.51	16.7%
4.18	16.71	18.88	13.0%
4.20	16.71	18.26	9.2%
4.21	16.71	17.95	7.4%
4.22	16.71	17.64	5.5%
4.23	16.71	17.33	3.7%
4.24	16.71	17.02	1.8%
4.25	16.71	16.71	0.0%
4.26	16.71	16.41	-1.8%
4.27	16.71	16.10	-3.7%
4.28	16.71	15.80	-5.5%
4.29	16.71	15.49	-7.3%
4.30	16.71	15.19	-9.1%
4.32	16.71	14.59	-12.7%
4.34	16.71	14.01	-16.2%
4.36	16.71	13.43	-19.7%
4.38	16.71	12.86	-23.1%
4.40	16.71	12.30	-26.4%
4.42	16.71	11.75	-29.7%
4.44	16.71	11.20	-33.0%
4.46	16.71	10.67	-36.2%
4.48	16.71	10.14	-39.3%
4.50	16.71	9.63	-42.4%

WATERLINE AT ZERO
AREA ERROR = 4.250

STREAM NAME: Little Cimarron River
XS LOCATION: Approx. 1 mi upst from conf Van Boxel Cr
XS NUMBER: 1 Constant Manning's n

STAGING TABLE *GL* = lowest Grassline elevation corrected for sag
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	2.40	37.70	2.17	3.35	81.89	41.09	100.0%	1.99	247.71	3.02
	3.25	36.14	1.40	2.50	50.51	38.48	93.7%	1.31	115.66	2.29
	3.30	36.05	1.35	2.45	48.71	38.33	93.3%	1.27	109.14	2.24
	3.35	35.95	1.30	2.40	46.91	38.18	92.9%	1.23	102.78	2.19
	3.40	35.86	1.26	2.35	45.11	38.02	92.5%	1.19	96.56	2.14
	3.45	35.77	1.21	2.30	43.32	37.87	92.2%	1.14	90.50	2.09
	3.50	35.46	1.17	2.25	41.54	37.50	91.3%	1.11	84.94	2.04
	3.55	35.14	1.13	2.20	39.77	37.14	90.4%	1.07	79.53	2.00
	3.60	34.83	1.09	2.15	38.03	36.77	89.5%	1.03	74.27	1.95
	3.65	34.51	1.05	2.10	36.29	36.40	88.6%	1.00	69.18	1.91
	3.70	34.20	1.01	2.05	34.57	36.04	87.7%	0.96	64.24	1.86
	3.75	33.89	0.97	2.00	32.87	35.67	86.8%	0.92	59.46	1.81
	3.80	33.57	0.93	1.95	31.19	35.30	85.9%	0.88	54.84	1.76
	3.85	33.26	0.89	1.90	29.51	34.94	85.0%	0.84	50.38	1.71
	3.90	32.95	0.85	1.85	27.86	34.57	84.1%	0.81	46.08	1.65
	3.95	32.63	0.80	1.80	26.22	34.21	83.2%	0.77	41.95	1.60
	4.00	32.32	0.76	1.75	24.60	33.84	82.4%	0.73	37.98	1.54
	4.05	32.00	0.72	1.70	22.99	33.47	81.5%	0.69	34.18	1.49
	4.10	31.69	0.68	1.65	21.40	33.11	80.6%	0.65	30.55	1.43
	4.15	31.38	0.63	1.60	19.82	32.74	79.7%	0.61	27.09	1.37
	4.20	31.06	0.59	1.55	18.26	32.37	78.8%	0.56	23.80	1.30
WL	4.25	30.75	0.54	1.50	16.71	32.01	77.9%	0.52	20.70	1.24
	4.30	30.12	0.50	1.45	15.19	31.37	76.3%	0.48	17.89	1.18
	4.35	28.90	0.47	1.40	13.72	30.09	73.2%	0.46	15.51	1.13
	4.40	27.79	0.44	1.35	12.30	28.93	70.4%	0.43	13.28	1.08
	4.45	26.69	0.41	1.30	10.94	27.78	67.6%	0.39	11.22	1.03
	4.50	25.71	0.37	1.25	9.63	26.75	65.1%	0.36	9.30	0.97
	4.55	24.74	0.34	1.20	8.36	25.72	62.6%	0.33	7.55	0.90
	4.60	22.22	0.32	1.15	7.19	23.17	56.4%	0.31	6.30	0.88
	4.65	18.59	0.33	1.10	6.17	19.49	47.4%	0.32	5.47	0.89
	4.70	16.96	0.31	1.05	5.28	17.79	43.3%	0.30	4.49	0.85
	4.75	14.02	0.32	1.00	4.51	14.79	36.0%	0.30	3.90	0.86
	4.80	12.59	0.31	0.95	3.84	13.29	32.3%	0.29	3.21	0.83
	4.85	11.16	0.29	0.90	3.25	11.79	28.7%	0.28	2.63	0.81
	4.90	9.67	0.28	0.85	2.73	10.23	24.9%	0.27	2.16	0.79
	4.95	8.17	0.28	0.80	2.28	8.67	21.1%	0.26	1.79	0.78
	5.00	7.11	0.27	0.75	1.90	7.52	18.3%	0.25	1.45	0.76
	5.05	4.88	0.32	0.70	1.57	5.22	12.7%	0.30	1.35	0.86
	5.10	4.27	0.32	0.65	1.35	4.58	11.1%	0.29	1.14	0.84
	5.15	3.66	0.31	0.60	1.15	3.93	9.6%	0.29	0.97	0.84
	5.20	3.04	0.32	0.55	0.98	3.28	8.0%	0.30	0.84	0.85
	5.25	2.82	0.30	0.50	0.83	3.03	7.4%	0.27	0.67	0.81
	5.30	2.60	0.27	0.45	0.70	2.79	6.8%	0.25	0.53	0.76
	5.35	2.38	0.24	0.40	0.57	2.55	6.2%	0.23	0.40	0.71
	5.40	2.18	0.21	0.35	0.46	2.32	5.6%	0.20	0.30	0.65
	5.45	1.98	0.18	0.30	0.35	2.09	5.1%	0.17	0.21	0.58
	5.50	1.78	0.15	0.25	0.26	1.87	4.5%	0.14	0.13	0.51
	5.55	1.58	0.11	0.20	0.18	1.64	4.0%	0.11	0.08	0.43
	5.60	1.38	0.08	0.15	0.10	1.42	3.4%	0.07	0.03	0.33
	5.65	0.92	0.05	0.10	0.05	0.94	2.3%	0.05	0.01	0.25
	5.70	0.46	0.03	0.05	0.01	0.47	1.1%	0.02	0.00	0.16
	5.75	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Little Cimarron River
XS LOCATION: Approx. 1 mi upst from conf Van Boxel Cr
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	20.70	cfs
CALCULATED FLOW (Qc)=	20.70	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	4.25	ft
CALCULATED WATERLINE (WLc)=	4.25	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	1.50	ft
MAX CALCULATED DEPTH (Dc)=	1.50	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.24	ft/sec
MANNING'S N=	0.187	
SLOPE=	0.058	ft/ft
.4 * Qm =	8.3	cfs
2.5 * Qm=	51.7	cfs

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

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

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

_____
_____
_____
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_____

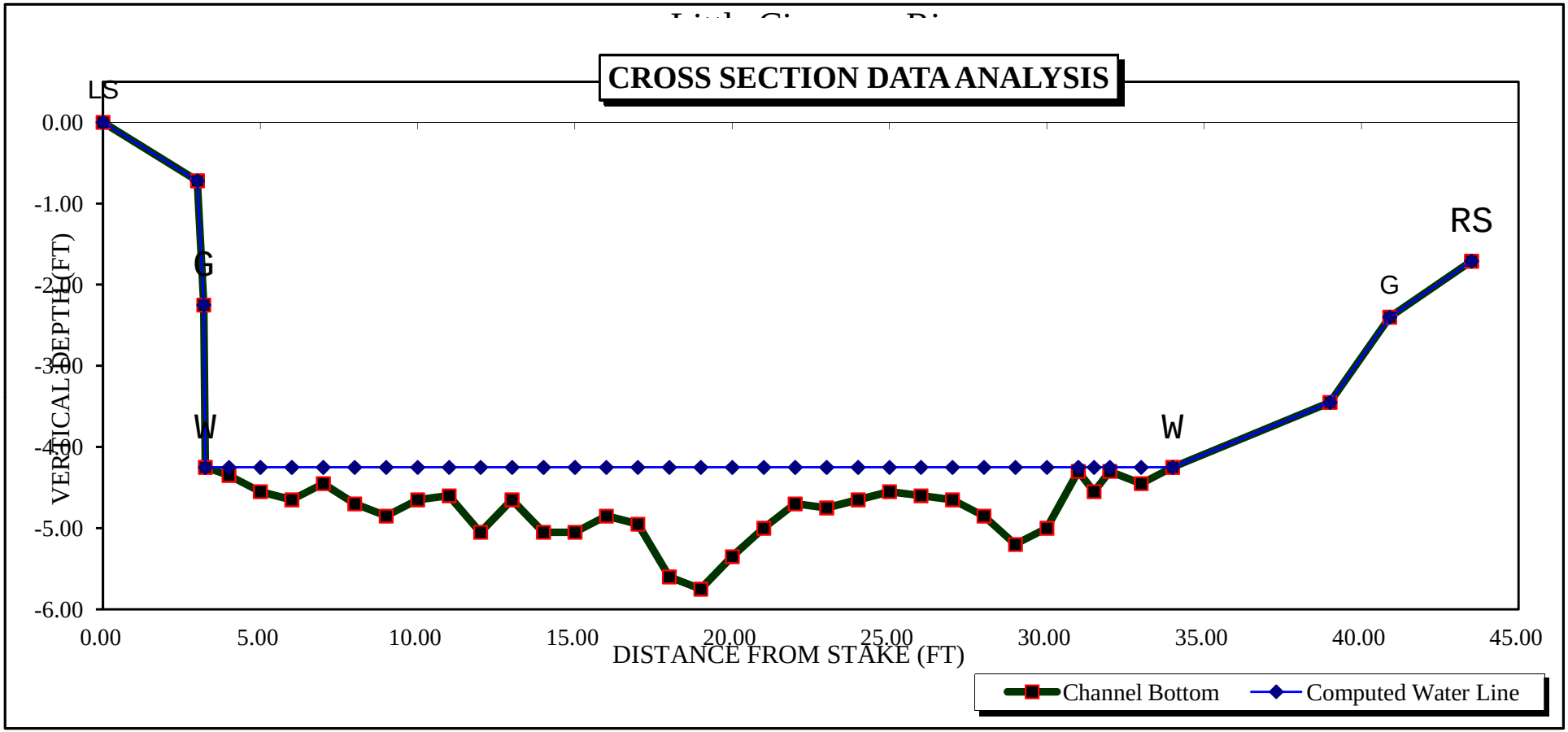
RECOMMENDATION BY: …….…….…….…..... AGENCY..……..……..……..…….…..... DATE:.....…….…….....……

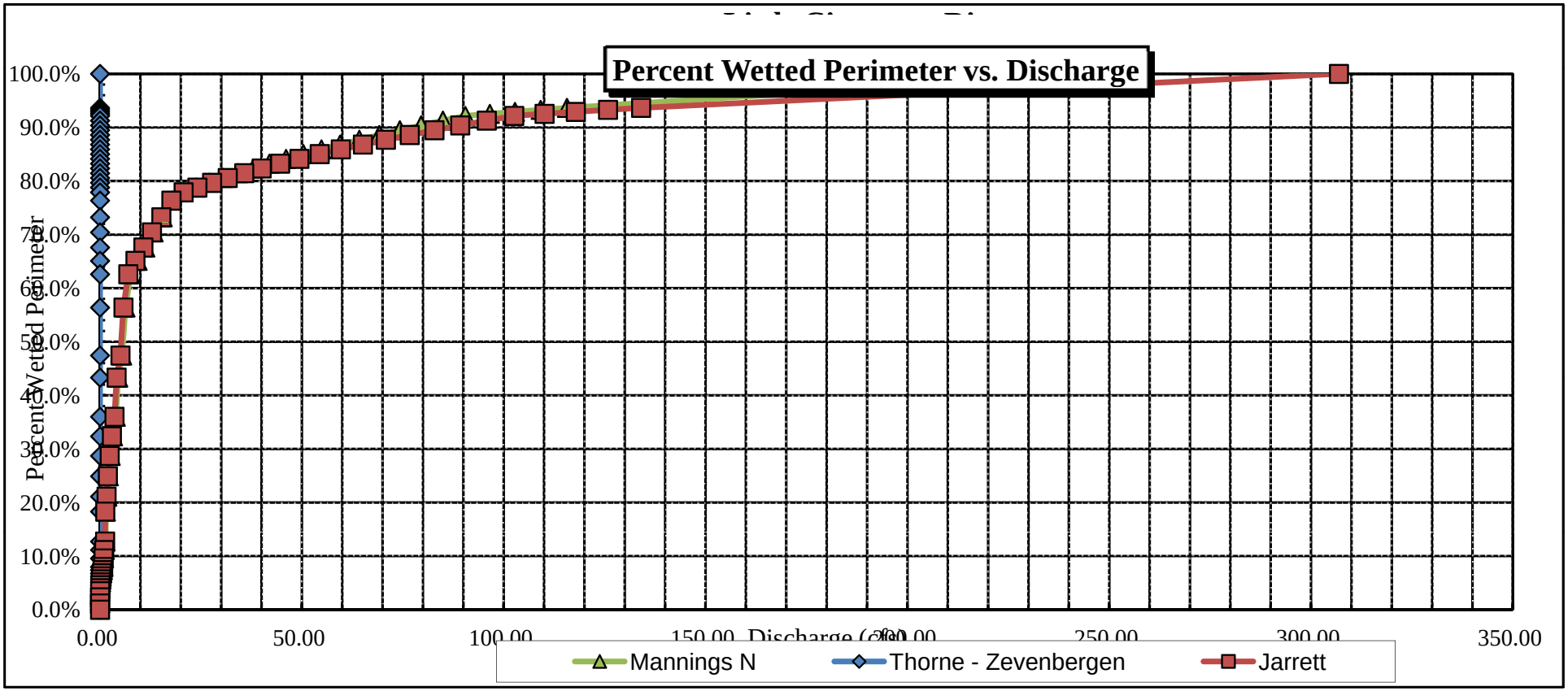
CWCB REVIEW BY: ..……....…….....…….....…….....…..... DATE:.....……..…

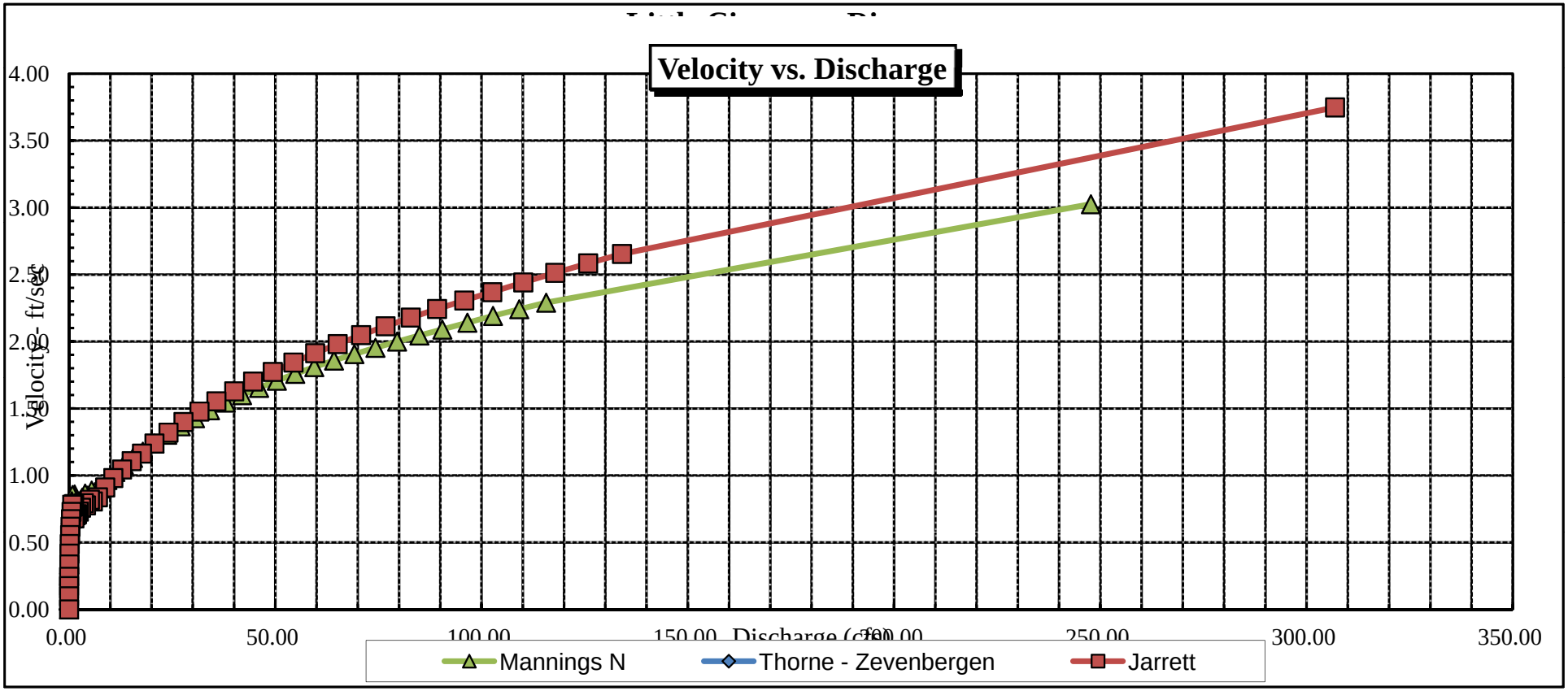
STREAM NAME: Little Cimarron River
XS LOCATION: Approx. 1 mi upst from conf Van Boxel Cr
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

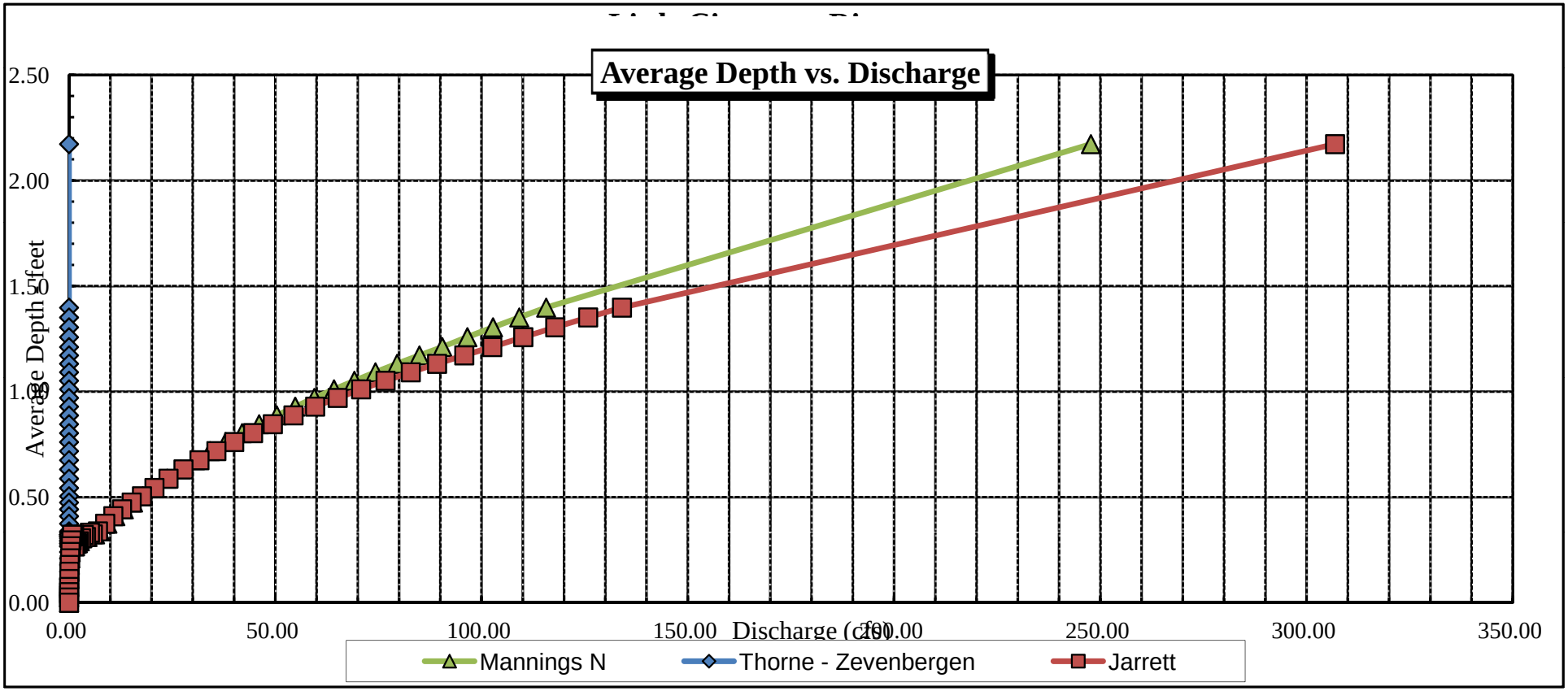
STAGING TABLE *GL* = lowest Grassline elevation corrected for sag
WL = Waterline corrected for variations in field measured water surface elevations and sag

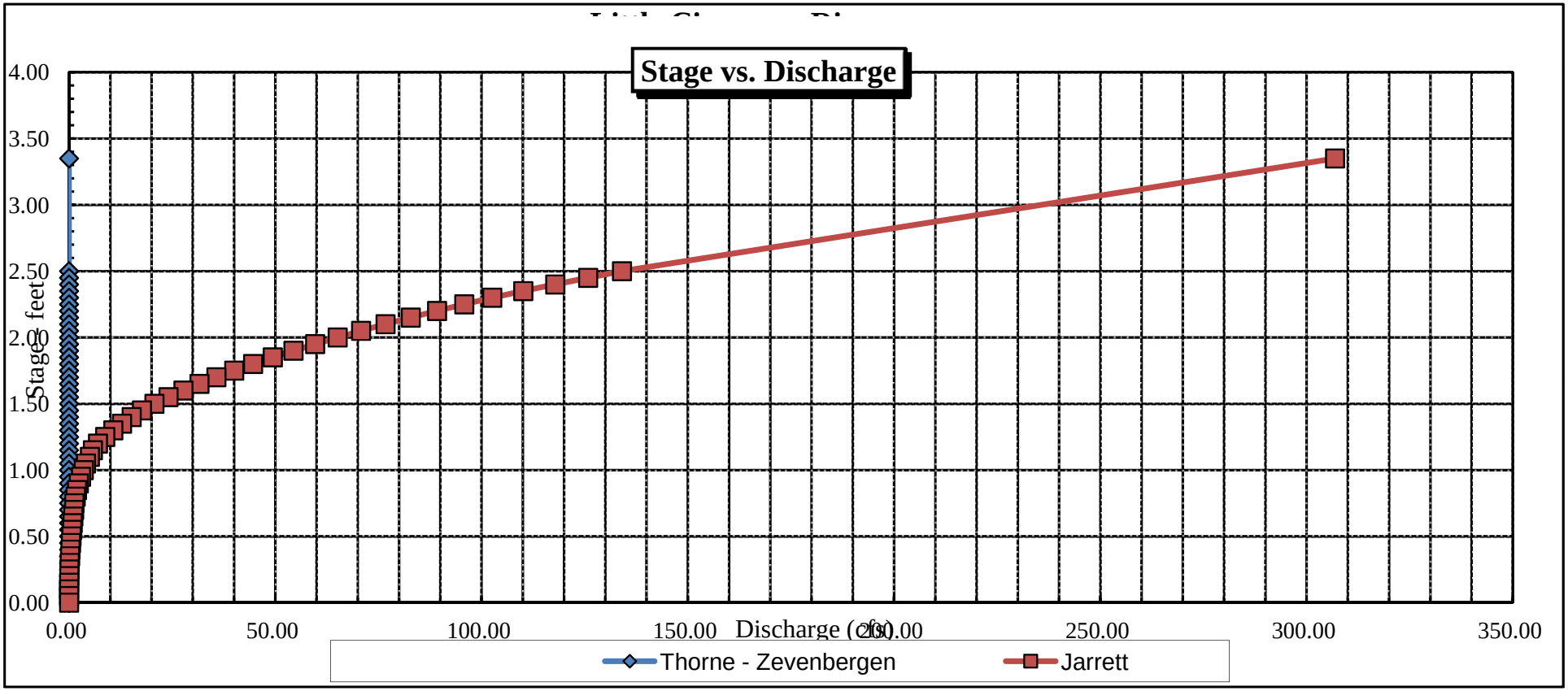
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	2.40	37.70	2.17	3.35	81.89	41.09	100.0%	1.99	306.91	3.75
	3.25	36.14	1.40	2.50	50.51	38.48	93.7%	1.31	134.04	2.65
	3.30	36.05	1.35	2.45	48.71	38.33	93.3%	1.27	125.83	2.58
	3.35	35.95	1.30	2.40	46.91	38.18	92.9%	1.23	117.86	2.51
	3.40	35.86	1.26	2.35	45.11	38.02	92.5%	1.19	110.11	2.44
	3.45	35.77	1.21	2.30	43.32	37.87	92.2%	1.14	102.60	2.37
	3.50	35.46	1.17	2.25	41.54	37.50	91.3%	1.11	95.80	2.31
	3.55	35.14	1.13	2.20	39.77	37.14	90.4%	1.07	89.21	2.24
	3.60	34.83	1.09	2.15	38.03	36.77	89.5%	1.03	82.85	2.18
	3.65	34.51	1.05	2.10	36.29	36.40	88.6%	1.00	76.72	2.11
	3.70	34.20	1.01	2.05	34.57	36.04	87.7%	0.96	70.80	2.05
	3.75	33.89	0.97	2.00	32.87	35.67	86.8%	0.92	65.11	1.98
	3.80	33.57	0.93	1.95	31.19	35.30	85.9%	0.88	59.65	1.91
	3.85	33.26	0.89	1.90	29.51	34.94	85.0%	0.84	54.41	1.84
	3.90	32.95	0.85	1.85	27.86	34.57	84.1%	0.81	49.39	1.77
	3.95	32.63	0.80	1.80	26.22	34.21	83.2%	0.77	44.60	1.70
	4.00	32.32	0.76	1.75	24.60	33.84	82.4%	0.73	40.04	1.63
	4.05	32.00	0.72	1.70	22.99	33.47	81.5%	0.69	35.71	1.55
	4.10	31.69	0.68	1.65	21.40	33.11	80.6%	0.65	31.61	1.48
	4.15	31.38	0.63	1.60	19.82	32.74	79.7%	0.61	27.74	1.40
	4.20	31.06	0.59	1.55	18.26	32.37	78.8%	0.56	24.10	1.32
WL	4.25	30.75	0.54	1.50	16.71	32.01	77.9%	0.52	20.70	1.24
	4.30	30.12	0.50	1.45	15.19	31.37	76.3%	0.48	17.68	1.16
	4.35	28.90	0.47	1.40	13.72	30.09	73.2%	0.46	15.18	1.11
	4.40	27.79	0.44	1.35	12.30	28.93	70.4%	0.43	12.85	1.04
	4.45	26.69	0.41	1.30	10.94	27.78	67.6%	0.39	10.72	0.98
	4.50	25.71	0.37	1.25	9.63	26.75	65.1%	0.36	8.76	0.91
	4.55	24.74	0.34	1.20	8.36	25.72	62.6%	0.33	7.00	0.84
	4.60	22.22	0.32	1.15	7.19	23.17	56.4%	0.31	5.79	0.81
	4.65	18.59	0.33	1.10	6.17	19.49	47.4%	0.32	5.05	0.82
	4.70	16.96	0.31	1.05	5.28	17.79	43.3%	0.30	4.10	0.78
	4.75	14.02	0.32	1.00	4.51	14.79	36.0%	0.30	3.58	0.79
	4.80	12.59	0.31	0.95	3.84	13.29	32.3%	0.29	2.92	0.76
	4.85	11.16	0.29	0.90	3.25	11.79	28.7%	0.28	2.37	0.73
	4.90	9.67	0.28	0.85	2.73	10.23	24.9%	0.27	1.94	0.71
	4.95	8.17	0.28	0.80	2.28	8.67	21.1%	0.26	1.60	0.70
	5.00	7.11	0.27	0.75	1.90	7.52	18.3%	0.25	1.29	0.68
	5.05	4.88	0.32	0.70	1.57	5.22	12.7%	0.30	1.24	0.79
	5.10	4.27	0.32	0.65	1.35	4.58	11.1%	0.29	1.04	0.77
	5.15	3.66	0.31	0.60	1.15	3.93	9.6%	0.29	0.88	0.77
	5.20	3.04	0.32	0.55	0.98	3.28	8.0%	0.30	0.77	0.78
	5.25	2.82	0.30	0.50	0.83	3.03	7.4%	0.27	0.61	0.73
	5.30	2.60	0.27	0.45	0.70	2.79	6.8%	0.25	0.47	0.67
	5.35	2.38	0.24	0.40	0.57	2.55	6.2%	0.23	0.35	0.62
	5.40	2.18	0.21	0.35	0.46	2.32	5.6%	0.20	0.25	0.56
	5.45	1.98	0.18	0.30	0.35	2.09	5.1%	0.17	0.17	0.49
	5.50	1.78	0.15	0.25	0.26	1.87	4.5%	0.14	0.11	0.42
	5.55	1.58	0.11	0.20	0.18	1.64	4.0%	0.11	0.06	0.34
	5.60	1.38	0.08	0.15	0.10	1.42	3.4%	0.07	0.03	0.24
	5.65	0.92	0.05	0.10	0.05	0.94	2.3%	0.05	0.01	0.17
	5.70	0.46	0.03	0.05	0.01	0.47	1.1%	0.02	0.00	0.10
	5.75	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


CROSS SECTION DATA ANALYSIS
LS
G
W
W
G
RS
0.00
-1.00
-2.00
-3.00
-4.00
-5.00
-6.00
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Percent Wetted Perimeter vs. Discharge
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Percent Wetted Perimeter
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
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
50.00
100.00
150.00
200.00
250.00
300.00
350.00
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
150.00
200.00
250.00
300.00
350.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Stage - feet
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME:	Little Cimarron River
CROSS-SECTION NO.:	2
CROSS-SECTION LOCATION:	Approx. .7 mile upstream from confluence with Van Boxel Creek
DATE:	7-24-14
OBSERVERS:	R. Smith, A. Breibart
LEGAL DESCRIPTION ¼ SECTION:	NW
SECTION:	29
TOWNSHIP:	47 (N)/S
RANGE:	5 E/(W)
PM:	NM
COUNTY:	Gunnison
WATERSHED:	Gunnison
WATER DIVISION:	4
DOW WATER CODE:	39051
MAP(S): USGS:	GPS Zone 13 284317
USFS:	4241681

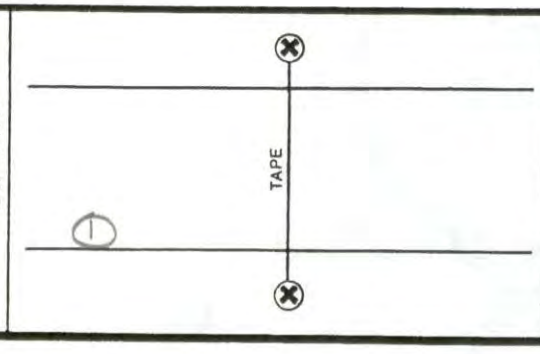
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES)/NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: _____ sec	TAPE WEIGHT: S _____ lbs/foot	TAPE TENSION: _____ lbs
CHANNEL BED MATERIAL SIZE RANGE: gravel - 3 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 3.10	5.05/5.10
② WS Upstream	28.0	4.50
③ WS Downstream	35.7	6.30
SLOPE	1.80/ 63.7 =	0.028

SKETCH



LEGEND:
Stake ⊗
Station ①
Photo ◇
Direction of Flow

AQUATIC SAMPLING SUMMARY

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

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

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

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

COMMENTS

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Little Cimarron River | CROSS-SECTION NO. 3 | DATE: 7-24-14 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ft | TIME:

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		3.0								
G	2.7		3.85								
W	3.1		5.05								
	4		5.25	0.20				0.10			
	5		5.45	0.40				0.48			
	6		5.80	0.75				1.25			
	7		5.60	0.55				1.31			
	8		5.85	0.80				1.40			
	9		5.75	0.70				0.36			
	10		5.35	0.30				1.95			
	11		5.80	0.75				1.53			
	12		5.25	0.20				1.84			
	13		5.85	0.80				2.61			
	14		5.85	0.80				1.98			
	15		5.80	0.75				1.63			
	16		5.85	0.80				1.48			
	17		5.70	0.65				2.08			
	18		5.50	0.45				2.23			
	19		5.60	0.55				2.60			
	20		5.15	0.10				0.0			
	21		5.60	0.50				0.0			
	22		5.65	0.55				0.05			
	23		5.85	0.75				0.0			
	24		5.80	0.70				2.63			
	25		5.50	0.40				2.90			
	26		5.60	0.50				1.10			
	27		5.65	0.55				2.95			
	28		5.45	0.35				2.47			
	29		5.45	0.35				1.69			
	30		5.45	0.35				1.34			
	31		5.30	0.20				0.26			
	32		5.10	0.0				0.0			
	33		5.15	0.05				Ø			
W	34.5		5.10								
	36.2		4.57								
G	38.5		3.85								
RS	43.0		3.75								
TOTALS:											

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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME:	Little Cimarron River
CROSS-SECTION NO.:	1
CROSS-SECTION LOCATION:	Approx. 1 mile upstream from confluence with Van Boxel Creek
DATE:	7-24-14
OBSERVERS:	R. Smith, A. Breibart
LEGAL DESCRIPTION	
¼ SECTION:	SW
SECTION:	29
TOWNSHIP:	47 (N)/S
RANGE:	5 E/(W)
PM:	NM
COUNTY:	Gunnison
WATERSHED:	Gunnison
WATER DIVISION:	4
DOW WATER CODE:	39051
MAP(S): USGS:	UTM Z13S
MAP(S): USFS:	284299E 4241400N

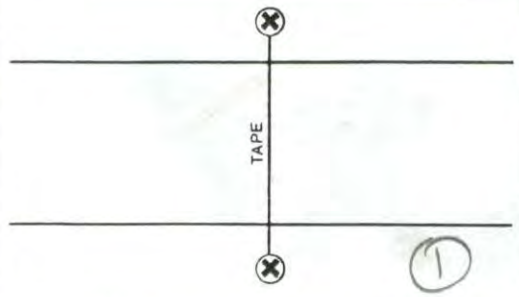
SUPPLEMENTAL DATA

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 3-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	4.23 / 4.25
(2) WS Upstream	32.5	3.00
(3) WS Downstream	20.2	6.04
SLOPE	3.04 / 52.5 = 0.058	

SKETCH



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

AQUATIC SAMPLING SUMMARY

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

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

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

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

COMMENTS

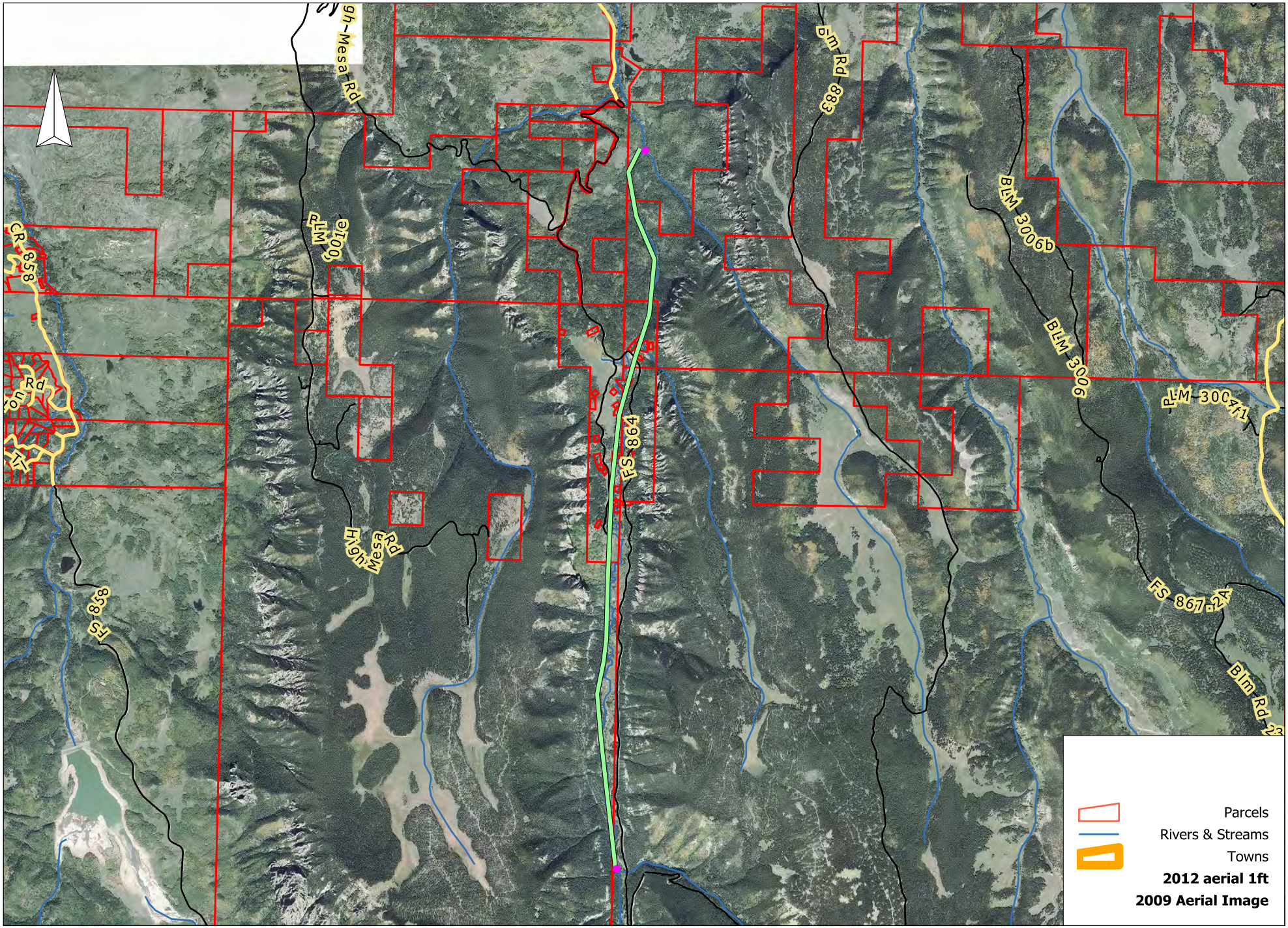
FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Little Cimarron River	CROSS-SECTION NO.: 1	DATE: 7-24-14	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME:

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		0.0								
	3.0		0.72								
G	3.2		2.25								
W	3.25		4.25	Φ							
	4		4.35	0.10				0.78			
	5		4.55	0.30				0.0			
	6		4.65	0.40				0.79			
	7		4.45	0.20				0.0			
	8		4.70	0.45				0.13			
	9		4.85	0.60				0.43			
	10		4.65	0.40				1.76			
	11		4.60	0.35				1.79			
	12		5.05	0.8				0.98			
	13		4.65	0.4				2.26			
	14		5.05	0.8				2.80			
	15		5.05	0.8				2.72			
	16		4.85	0.6				3.33			
	17		4.95	0.7				1.76			
	18		5.60	1.35				1.45			
	19		5.75	1.5				1.73			
	20		5.35	1.1				1.07			
	21		5.00	0.75				1.23			
	22		4.70	0.45				1.80			
	23		4.75	0.50				1.65			
	24		4.65	0.40				0.81			
	25		4.55	0.30				0.14			
	26		4.60	0.35				0.18			
	27		4.65	0.40				0.25			
	28		4.85	0.60				0.03			
	29		5.20	0.95				0.30			
	30		5.00	0.75				0.00			
	31		4.30	0.05				0.0			
	31.5		4.55	0.30				1.43			
	32		4.30	0.05				0			
	33		4.45	0.20				0			
W	34.0		4.25	Φ							
W	39.0		3.45								
G	40.9		2.40								
RLS	43.5		1.71								
TOTALS:											

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



Scale = 1:60000

Tuesday, July 21, 2015