DRAFT INSTREAM FLOW 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 Abrams Creek, located in Water Division 5. Colorado Parks and Wildlife and Trout Unlimited have also chosen to jointly make this recommendation with the BLM, and their recommendation letters will arrive under separate cover.

Location and Land Status. Abrams Creek originates on the northeastern flank of Hardscrabble Mountain approximately seven miles southwest of the City of Eagle. This recommendation covers a reach that starts at the headwaters and extends downstream to the confluence with Brush Creek. The confluence with Brush Creek is located within the Eagle city limits. This stream reach covers a distance of approximately 5.3 miles. The BLM and U.S. Forest Service manage the upper 3.5 miles of the creek, while the lower 1.8 miles are located on private lands and lands managed by the City of Eagle.

Existing Instream Flow Water Rights. In 1980, the Colorado Water Conservation Board appropriated an instream flow water right on Abrams Creek. The protected flow rate is 0.5 cfs from January 1 to December 31. The existing instream flow water right extends from the headwaters to a headgate diversion located in the SE ¼ SW ¼, Section 9, T5S R84W, Sixth P.M. The recommending entities believe that this location refers to the headgate of the Mrs. Paye Ditch.

Biological Summary. Abrams Creek is a cold-water, high gradient stream. It flows through a narrow valley with a valley floor of up to one-fourth mile in width. The stream is often confined by bedrock, and the horizontal extent of alluvium along the stream is typically less than 100 feet. The stream generally has large substrate, typically consisting of cobbles and small boulder mixed with gravels. The stream also exhibits a large amount of woody debris in the stream channel, which adds to stream stability and habitat complexity. While riffle habitat is sufficient, Abrams Creek generally lacks extensive pool habitat, which could be a limiting factor for the fish population.

Fisheries surveys have revealed a self-sustaining population of native cutthroat trout. The Abrams Creek population is considered a Core Conservation population of pure Green-Lineage Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*). This is the only known aboriginal cutthroat population in the Eagle River watershed and is important with respect to future reclamation planning within the watershed and overall conservation efforts for the species. The population is small and limited in part by reduced water flow – primarily during irrigation season 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 aspen in the higher elevation parts of the creek and is comprised of narrowleaf cottonwood and willow species in the lower elevation part of the creek. The riparian community is in very good condition, and provides adequate shading and cover for the fish habitat.

R2Cross Analysis. The BLM collected the following R2Cross data from Abrams 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)
7/1/13 #1	0.87 cfs	7.18 feet	0.65 cfs	1.71 cfs
7/1/13 #2	0.93 cfs	11.13 feet	0.80 cfs	Out of confidence interval for data set
7/1/13 #3	0.56 cfs	5.28 feet	0.56 cfs	Out of confidence interval for data set
7/1/13 #4	0.59 cfs	4.40 feet	0.59 cfs	1.22 cfs
6/26/14 #1	1.56 cfs	26.8 feet	Out of confidence interval for data set	Out of confidence interval for data set
6/26/14 #2	1.36 cfs	13.04 feet	0.84 cfs	Out of confidence interval for data set
6/26/14 #3	1.74 cfs	2.77 feet	Out of confidence interval for data set	0.83 cfs
		Averages:	0.69 cfs	1.25 cfs

Our analysis of this data indicates that the following flows are needed to protect the fishery and natural environment to a reasonable degree:

> 1.25 cubic feet per second is recommended from April 1 to July 15, corresponding with the snowmelt runoff period. This recommendation is driven by the average velocity criteria. According to the wetted perimeter criteria, this flow rate also makes a very high percentage of the physical habitat available for fish usage, such as spawning during the spring.
>
> 0.70 cubic feet per second is recommended from July 16 through March 31, corresponding to the base flow season. This recommendation is driven by the average depth criteria, which is to be expected in a high gradient stream. This flow rate also provides 58% to 80% wetted perimeter, depending on the riffle examined. This flow rate should be sufficient to maintain suitable stream temperatures during the late summer period, and also provide sufficient flow to prevent winter icing in pool habitat.

If the CWCB decides to accept this recommendation, implementing it will require an

increase of 0.2 cfs to the existing instream flow water right between July 16 and March 31, and an increase of 0.75 cfs to the existing instream flow right between April 1 and July 15. In addition, implementing this recommendation would require a new appropriation between the Mrs. Paye Ditch headgate and the confluence with Brush Creek, in the amounts and timing described in the two paragraphs above.

Water Availability. The recommending entities are aware of the following water rights on Abrams Creek:

J P O Ditch #2 – 1.0 cfs, 1908 Priority; 2.0 cfs, 1916 Priority
Mrs. Paye Ditch – 0.8 cfs, 1899 Priority; 2.2 cfs, 1923 Priority

The recommending agencies are not aware of any historic gage information on Abrams Creek. However, some historic diversion records are available for the Mrs. Paye Ditch, located in the lower part of the recommended reach, and for the JPO Ditch, located in the middle of the recommended reach. In addition, the most recent owners of the JPO Ditch have maintained measurement flumes on Abrams Creek and on the JPO Ditch. Those records can be made available for review by the CWCB staff.

Historically, diversions from the JPO Ditch severely limited the amount of water available below the headgate during the mid-July through October period. The JPO Ditch owners are actively exploring efficiency measures along the JPO Ditch that will result in a lower volume of diversions during the mid-July through October time period, making additional water available for instream flow protection.

Relationship to Fish Management Plans. Consistent with Colorado's Cutthroat Trout Conservation Strategy, the goal of this project is to protect and expand this precarious Core Conservation of Green-lineage cutthroat trout and increase the resiliency within the population. Specifically, protecting instream flows on Abrams Creek will:

- Increase physical/wetted habitat along approximately 3.5 miles of stream
- Improve in-stream habitat connectivity and quality
- Increase aquatic insect productivity, improving cutthroat food resources
- Develop increased pool depths
- Sustain/expand riparian canopy cover
- Maintain cooler water temperatures in lower Abrams Creek

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with our draft recommendation in January 2015. We thank the Colorado Water Conservation Board for its cooperation in this effort.

If you have any questions regarding our instream flow recommendation, please contact Roy Smith at 303-239-3940, Jay Skinner at 303-291-7260, or Mely Whiting at 720-470-4758.

Sincerely,

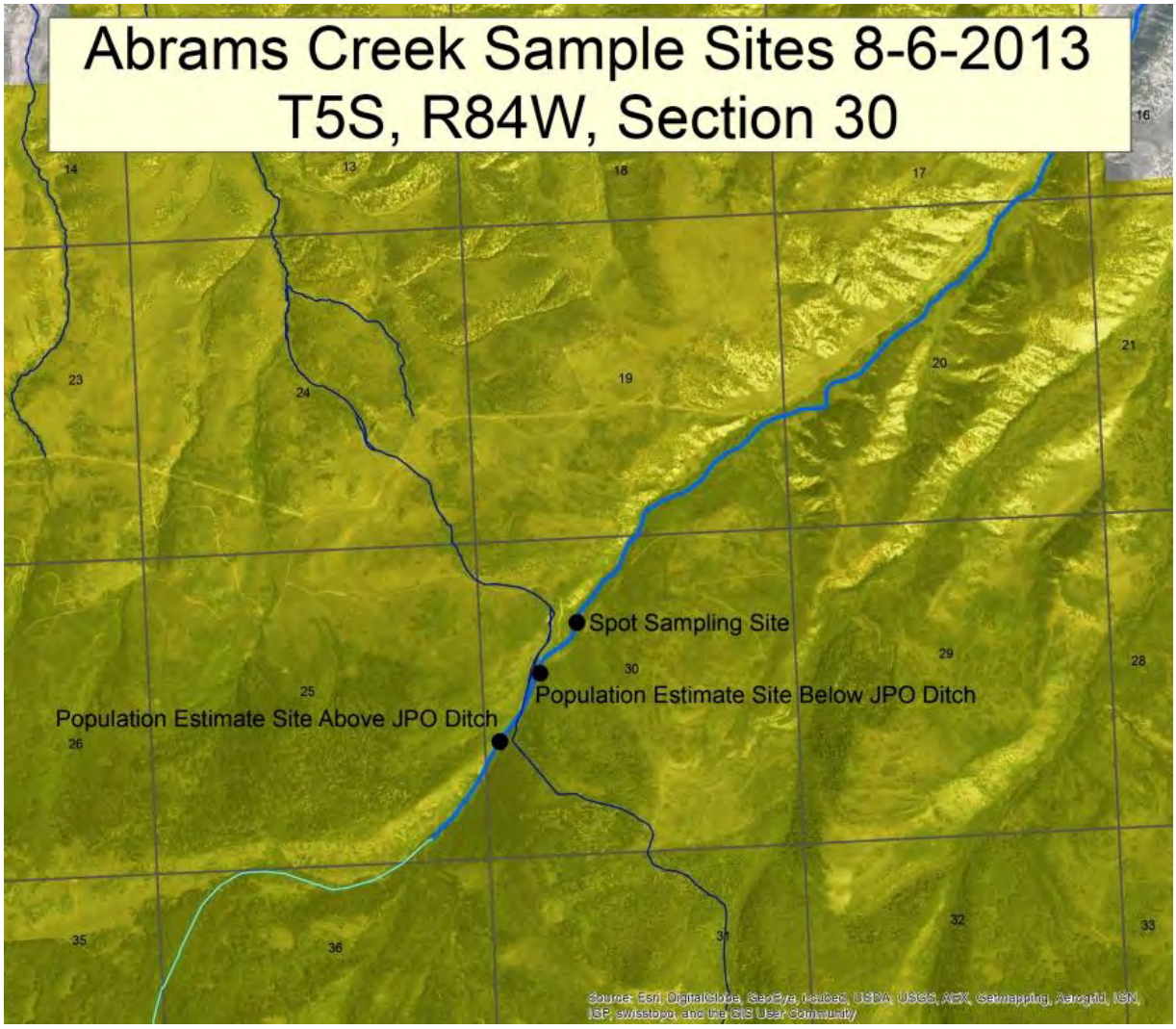
Brian St. George
Deputy State Director
Resources and Fire

Cc: Manager, Colorado River Valley FO
Pauline Adams, Colorado River Valley FO
Tom Fresques, Colorado River Valley FO

Colorado River Valley Field Office Stream Surveys
August 2013

Abrams Creek - Water Code #23414

Abrams Creek, located on lands managed by the Colorado River Valley Field Office, was sampled on August 6, 2013. Two population estimates were completed, one above the JPO Diversion Ditch, and one below the JPO Diversion Ditch. Each population estimate was completed using one backpack electroshocker. Data was obtained to compare population densities above and below this significant water diversion feature. Additional presence/absence spot sampling was done below BLM road 8380 for approximately 400 feet. Personnel present were Tom Fresques, Gregor Dekleva, and Matt Ringer, BLM, and Kendall Bakich and crew, Colorado Parks and Wildlife.




SIMMS

Discussion:

General

Abrams Creek contains a genetically pure population of Colorado River Cutthroat Trout - Green Lineage. In addition, this population has unique haplotypes that distinguish it amongst other green lineage populations which makes this population more unique. It is the only pure population of its kind in the entire Eagle River watershed and appears to be an aboriginal population that has likely been in existence since the last ice age. The population is small but stable and is currently restricted to approximately one 1-1.5 miles of habitat.

Site 1 (Above JPO Diversion Ditch)

CPW has the data associated with the sampling of this site.

Site 2 (Below JPO Diversion Ditch)

The stream at this site is small with an average width of 3 feet and an estimated flow of approximately 1.5 cfs. Habitat consists of small drop pools and areas of undercut banks with small riffle and run areas. The stream is a Rosgen B channel type. Riparian vegetation is lush, dense, and diverse consisting of rocky mountain maple, alder, willow, chokecherry, horsetail, aspen, wildrose, sedge, spruce, fir, and nettle. The stream contains excellent streamside cover and shading. Noxious weeds including Canada thistle and houndstongue are also common along portions of the creek.

The site is slightly impacted by cattle that concentrate at a couple stream crossings in this reach. Generally, flows below the JPO Ditch are 0.50 - 0.75 cfs less than those above the ditch. At the time of sampling, it did not appear that the full allocation of water was being diverted. Based on our sampling, this site is representitive of 156 adult cutthroat trout (>150 mm TL) + or – 6 fish, at the 95% confidence interval, per mile of stream.

Spot Sampling below the Road Crossing

Approximately 400 feet of stream was spot sampled below the road crossing to document presence of cutthroat trout and get some relative abundance information. Cutthroats were collected throughout the segment and nice sized adult fish as well as a few smaller fish were noted. Densities appear to be similar to slightly higher than the population estimate site above the road but below the JPO Diversion Ditch. All fish collected appeared healthy. Habitat was similar as the other sites with dense riparian vegetation and cover and excellent stream shading. Large, deep pools are lacking.

Recommendations:

- Resample the two population estimate sites again to get some more confidence as well as trend data
- Grazing permittees will complete the new allotment boundary fence to better manage cows and reduce trespass and stream crossing impacts
- Consider treating weeds including thistle and houndstongue

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

LOCATION INFORMATION

STREAM NAME:	Abrams Creek
XS LOCATION:	750' downstream from JPO Ditch headgate
XS NUMBER:	4
DATE:	1-Jul-13
OBSERVERS:	R. Smith, P. Adams
1/4 SEC:	NW
SECTION:	30
TWP:	5S
RANGE:	84W
PM:	Sixth
COUNTY:	Eagle
WATERSHED:	Eagle River
DIVISION:	5
DOW CODE:	23414
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

TAPE WT:	0.0106	*** NOTE *** Leave TAPE WT and TENSION at defaults for data collected with a survey level and rod
TENSION:	99999	

CHANNEL PROFILE DATA

SLOPE:	0.71

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

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

STREAM NAME: Abrams Creek
XS LOCATION: 750' downstream from JPO Ditch headgate
XS NUMBER: 4

DATA POINTS= 20

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	RS	0.00	5.34			0.00		0.00	0.00	0.0%
1	G	0.50	6.14			0.00		0.00	0.00	0.0%
		1.20	6.22			0.00		0.00	0.00	0.0%
	W	1.30	6.75	0.00	0.00	0.00		0.00	0.00	0.0%
		1.60	6.95	0.20	0.04	0.36	0.20	0.06	0.00	0.4%
		1.90	6.95	0.20	0.92	0.30	0.20	0.06	0.06	9.3%
		2.20	7.05	0.30	1.07	0.32	0.30	0.09	0.10	16.3%
		2.50	7.05	0.30	1.07	0.30	0.30	0.09	0.10	16.3%
		2.80	6.95	0.20	1.60	0.32	0.20	0.06	0.10	16.2%
		3.10	6.95	0.20	0.86	0.30	0.20	0.06	0.05	8.7%
		3.40	6.95	0.20	1.39	0.30	0.20	0.06	0.08	14.1%
		3.70	6.95	0.20	0.00	0.30	0.20	0.06	0.00	0.0%
		4.00	6.95	0.20	0.34	0.30	0.20	0.06	0.02	3.4%
		4.30	7.00	0.25	0.65	0.30	0.25	0.08	0.05	8.2%
		4.60	6.95	0.20	0.57	0.30	0.20	0.06	0.03	5.8%
		4.90	6.90	0.15	0.21	0.30	0.15	0.04	0.01	1.3%
	W	5.10	6.75	0.00	0.00	0.25		0.00	0.00	0.0%
		5.20	6.30			0.00		0.00	0.00	0.0%
1	G	5.60	6.22			0.00		0.00	0.00	0.0%
	LS	9.00	6.00			0.00		0.00	0.00	0.0%
	TOTALS ----------					3.96	0.3 (Max.)	0.77	0.59	100.0%

Manning's n = 0.5496
Hydraulic Radius= 0.19530139

STREAM NAME: Abrams Creek
XS LOCATION: 750' downstream from JPO Ditch headgate
XS NUMBER: 4

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.77	0.77	0.0%
6.50	0.77	1.74	124.6%
6.52	0.77	1.66	114.5%
6.54	0.77	1.58	104.5%
6.56	0.77	1.50	94.4%
6.58	0.77	1.42	84.4%
6.60	0.77	1.35	74.4%
6.62	0.77	1.27	64.4%
6.64	0.77	1.19	54.4%
6.66	0.77	1.12	44.5%
6.68	0.77	1.04	34.6%
6.70	0.77	0.96	24.7%
6.71	0.77	0.92	19.7%
6.72	0.77	0.89	14.8%
6.73	0.77	0.85	9.8%
6.74	0.77	0.81	4.9%
6.75	0.77	0.77	0.0%
6.76	0.77	0.73	-4.9%
6.77	0.77	0.70	-9.8%
6.78	0.77	0.66	-14.6%
6.79	0.77	0.62	-19.4%
6.80	0.77	0.59	-24.1%
6.82	0.77	0.51	-33.5%
6.84	0.77	0.44	-42.8%
6.86	0.77	0.37	-51.9%
6.88	0.77	0.30	-60.8%
6.90	0.77	0.23	-69.7%
6.92	0.77	0.17	-78.2%
6.94	0.77	0.11	-86.4%
6.96	0.77	0.06	-92.1%
6.98	0.77	0.04	-95.1%
7.00	0.77	0.02	-97.1%

WATERLINE AT ZERO
AREA ERROR = 6.750

STREAM NAME: Abrams Creek
XS LOCATION: 750' downstream from JPO Ditch headgate
XS NUMBER: 4 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	6.22	4.40	0.65	0.83	2.86	5.36	100.0%	0.53	4.28	1.50
	6.25	4.24	0.64	0.80	2.73	5.18	96.6%	0.53	4.06	1.49
	6.30	3.98	0.63	0.75	2.52	4.87	90.9%	0.52	3.71	1.47
	6.35	3.96	0.59	0.70	2.33	4.77	89.0%	0.49	3.28	1.41
	6.40	3.94	0.54	0.65	2.13	4.67	87.1%	0.46	2.87	1.35
	6.45	3.92	0.49	0.60	1.93	4.57	85.2%	0.42	2.48	1.28
	6.50	3.90	0.44	0.55	1.74	4.47	83.3%	0.39	2.11	1.21
	6.55	3.88	0.40	0.50	1.54	4.36	81.4%	0.35	1.75	1.14
	6.60	3.86	0.35	0.45	1.35	4.26	79.5%	0.32	1.42	1.06
	6.65	3.84	0.30	0.40	1.15	4.16	77.6%	0.28	1.12	0.97
	6.70	3.82	0.25	0.35	0.96	4.06	75.6%	0.24	0.84	0.87
WL	6.75	3.80	0.20	0.30	0.77	3.96	73.7%	0.20	0.59	0.77
	6.80	3.66	0.16	0.25	0.59	3.78	70.5%	0.15	0.39	0.66
	6.85	3.52	0.12	0.20	0.41	3.61	67.3%	0.11	0.22	0.53
	6.90	3.38	0.07	0.15	0.23	3.44	64.0%	0.07	0.09	0.38
	6.95	1.50	0.05	0.10	0.08	1.54	28.7%	0.05	0.02	0.30
	7.00	0.60	0.04	0.05	0.02	0.62	11.5%	0.04	0.01	0.25

STREAM NAME: Abrams Creek
XS LOCATION: 750' downstream from JPO Ditch headgate
XS NUMBER: 4

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.59	cfs
CALCULATED FLOW (Qc)=	0.59	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	6.75	ft
CALCULATED WATERLINE (WLc)=	6.75	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=	0.77	ft/sec
MANNING'S N=	0.550	
SLOPE=	0.71	ft/ft
.4 * Qm =	0.2	cfs
2.5 * Qm=	1.5	cfs

RECOMMENDED INSTREAM FLOW:
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FLOW (CFS)	PERIOD
===========	========
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

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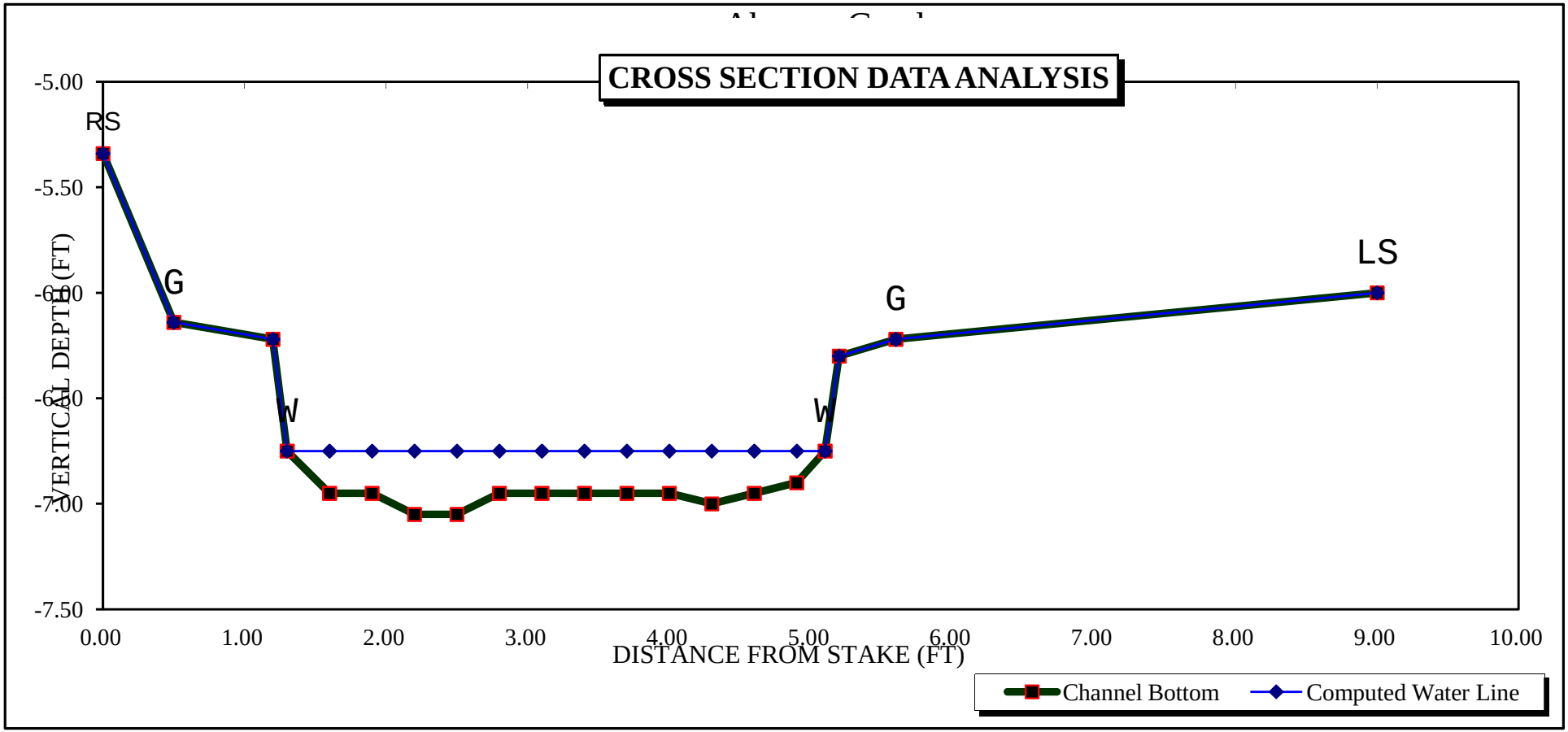
RECOMMENDATION BY: ………………...………..……............................... AGENCY..……………………......…….....…....……...... DATE:......…...…......……………

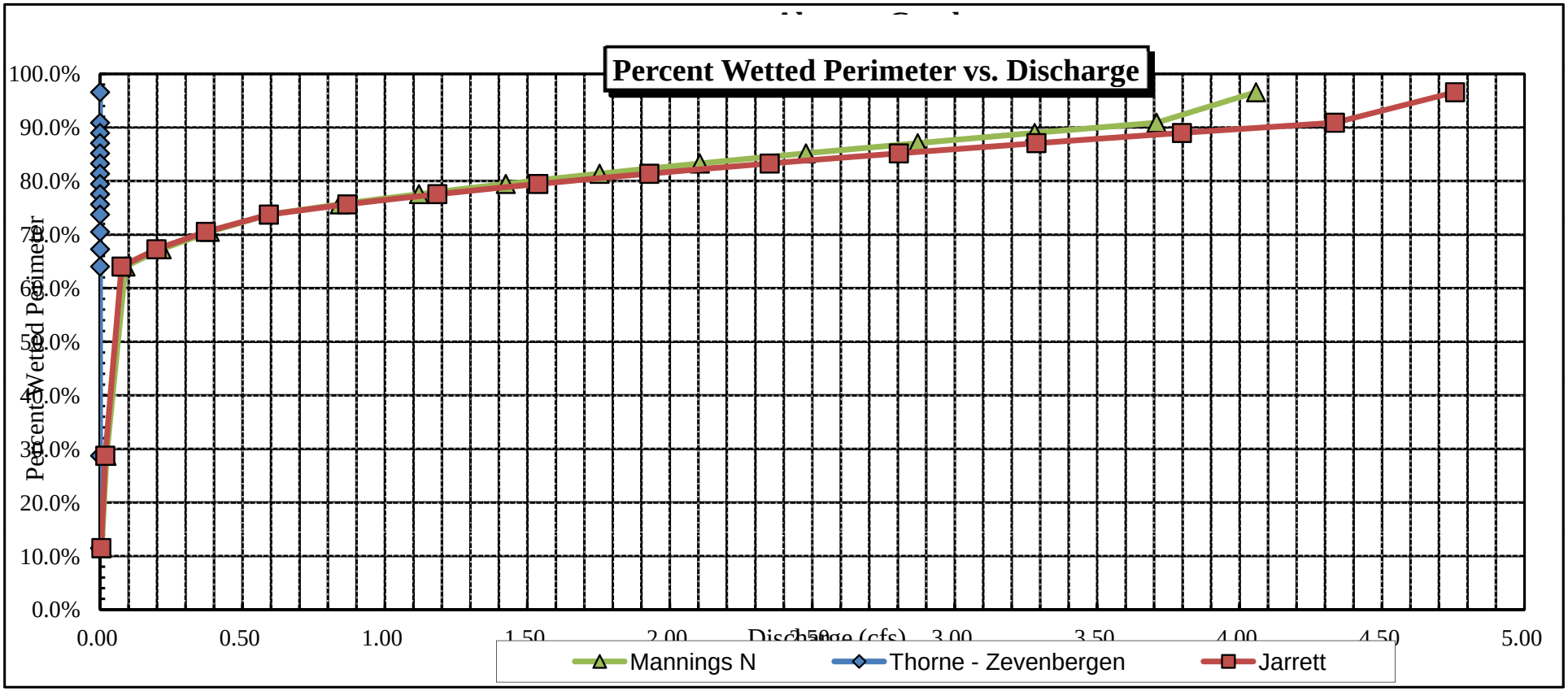
CWCB REVIEW BY: ..……………………….....…………………………………………….....................................…............. DATE:.................……………....…

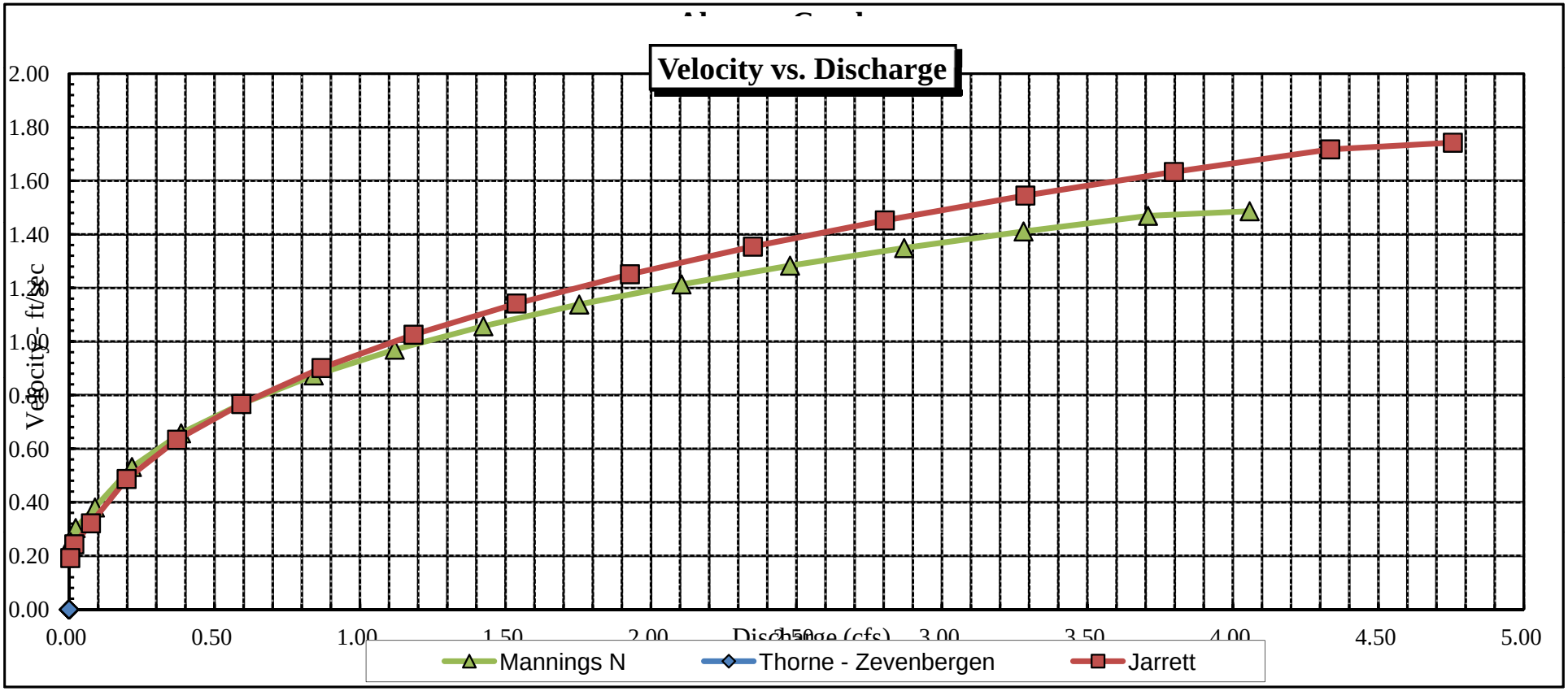
STREAM NAME: Abrams Creek
XS LOCATION: 750' downstream from JPO Ditch headgate
XS NUMBER: 4 Jarrett Variable Manning's n Correction Applied

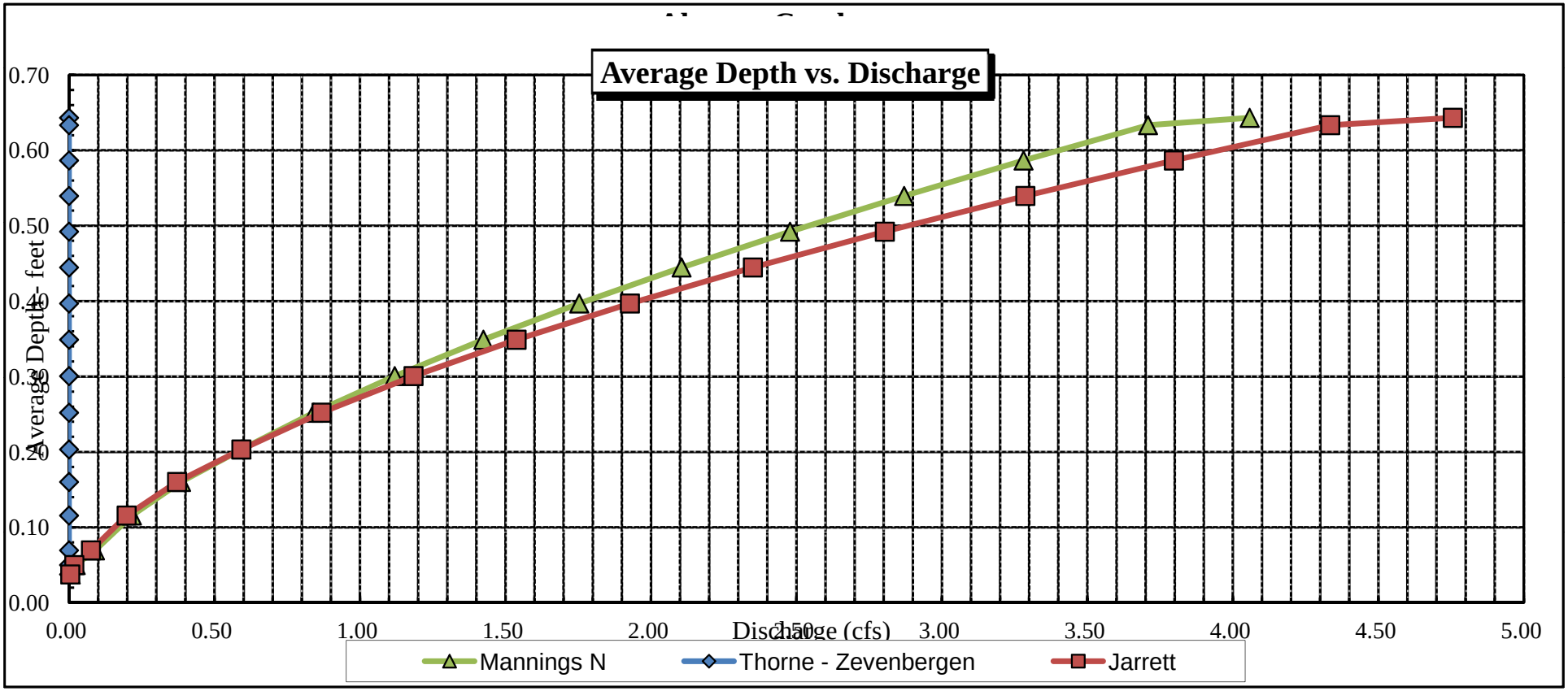
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

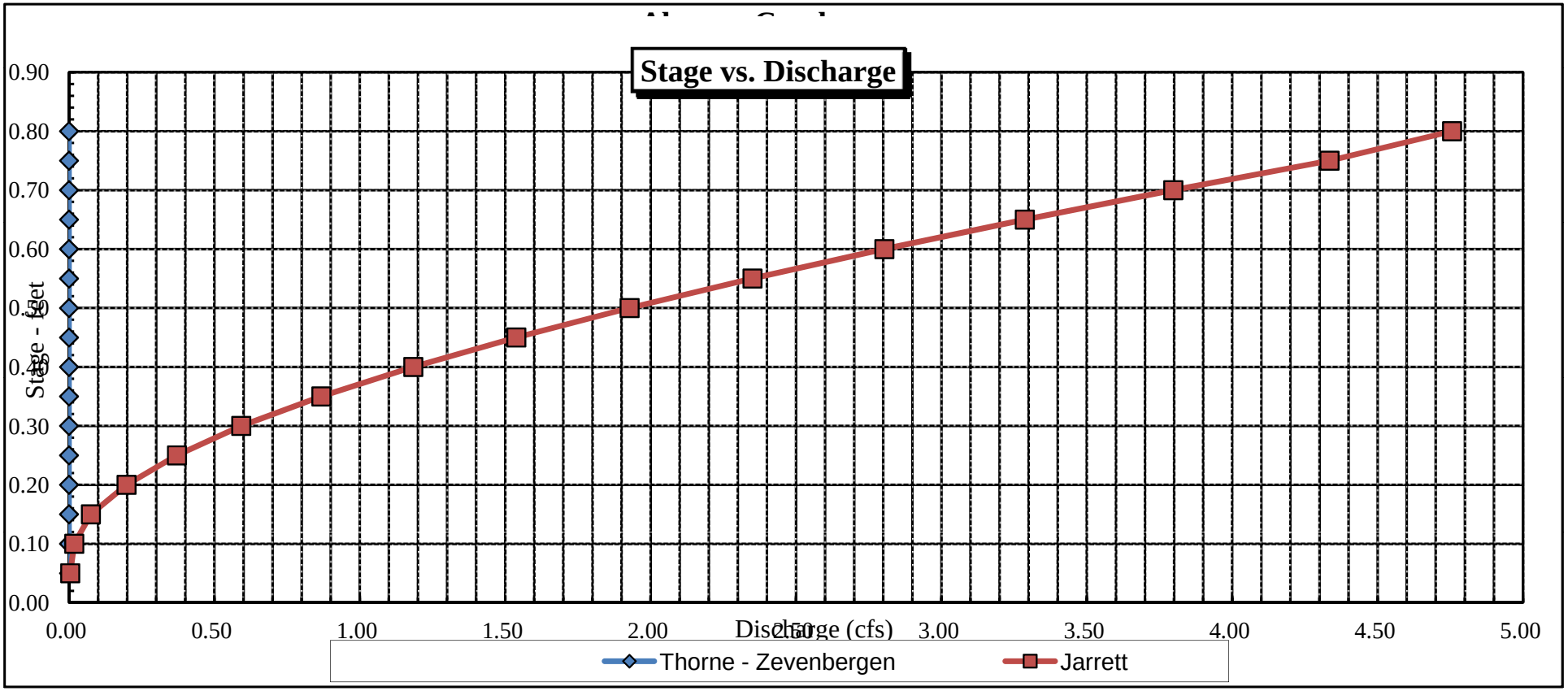
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	6.22	4.40	0.65	0.83	2.86	5.36	100.0%	0.53	5.03	1.76
	6.25	4.24	0.64	0.80	2.73	5.18	96.6%	0.53	4.76	1.74
	6.30	3.98	0.63	0.75	2.52	4.87	90.9%	0.52	4.33	1.72
	6.35	3.96	0.59	0.70	2.33	4.77	89.0%	0.49	3.80	1.63
	6.40	3.94	0.54	0.65	2.13	4.67	87.1%	0.46	3.29	1.54
	6.45	3.92	0.49	0.60	1.93	4.57	85.2%	0.42	2.80	1.45
	6.50	3.90	0.44	0.55	1.74	4.47	83.3%	0.39	2.35	1.35
	6.55	3.88	0.40	0.50	1.54	4.36	81.4%	0.35	1.93	1.25
	6.60	3.86	0.35	0.45	1.35	4.26	79.5%	0.32	1.54	1.14
	6.65	3.84	0.30	0.40	1.15	4.16	77.6%	0.28	1.18	1.03
	6.70	3.82	0.25	0.35	0.96	4.06	75.6%	0.24	0.87	0.90
WL	6.75	3.80	0.20	0.30	0.77	3.96	73.7%	0.20	0.59	0.77
	6.80	3.66	0.16	0.25	0.59	3.78	70.5%	0.15	0.37	0.63
	6.85	3.52	0.12	0.20	0.41	3.61	67.3%	0.11	0.20	0.49
	6.90	3.38	0.07	0.15	0.23	3.44	64.0%	0.07	0.08	0.32
	6.95	1.50	0.05	0.10	0.08	1.54	28.7%	0.05	0.02	0.24
	7.00	0.60	0.04	0.05	0.02	0.62	11.5%	0.04	0.00	0.19


CROSS SECTION DATA ANALYSIS
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
VERTICAL DEPTH (FT)
RS
G
W
W
G
LS
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
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
0.50
1.00
1.50
2.00
3.00
3.50
4.00
4.50
5.00
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Stage - feet
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
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:	Abrams Creek
XS LOCATION:	700 ft. downstream from JPO Ditch headgate
XS NUMBER:	3
DATE:	1-Jul-13
OBSERVERS:	R. Smith, P. Adams
1/4 SEC:	NW
SECTION:	30
TWP:	5S
RANGE:	84W
PM:	Sixth
COUNTY:	Eagle
WATERSHED:	Eagle River
DIVISION:	5
DOW CODE:	23414
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

TAPE WT:	0.0106	*** NOTE *** Leave TAPE WT and TENSION at defaults for data collected with a survey level and rod
TENSION:	99999	

CHANNEL PROFILE DATA

SLOPE:	0.071

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

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

STREAM NAME: Abrams Creek
XS LOCATION: 700 ft. downstream from JPO Ditch headgate
XS NUMBER: 3

DATA POINTS= 24

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
LS	0.00	3.40			0.00		0.00	0.00	0.0%
	1.50	4.45			0.00		0.00	0.00	0.0%
1 G	1.80	4.85			0.00		0.00	0.00	0.0%
W	1.90	5.30	0.00	0.00	0.00		0.00	0.00	0.0%
	2.20	5.50	0.20	0.00	0.36	0.20	0.06	0.00	0.0%
	2.50	5.50	0.20	0.00	0.30	0.20	0.06	0.00	0.0%
	2.80	5.45	0.15	0.00	0.30	0.15	0.05	0.00	0.0%
	3.10	5.45	0.15	0.16	0.30	0.15	0.05	0.01	1.3%
	3.40	5.45	0.15	0.67	0.30	0.15	0.05	0.03	5.4%
	3.70	5.50	0.20	1.20	0.30	0.20	0.06	0.07	12.9%
	4.00	5.40	0.10	0.73	0.32	0.10	0.03	0.02	3.9%
	4.30	5.50	0.20	0.49	0.32	0.20	0.06	0.03	5.2%
	4.60	5.50	0.20	0.09	0.30	0.20	0.06	0.01	1.0%
	4.90	5.55	0.25	1.54	0.30	0.25	0.08	0.12	20.6%
	5.20	5.55	0.25	1.40	0.30	0.25	0.08	0.11	18.7%
	5.50	5.60	0.30	0.91	0.30	0.30	0.09	0.08	14.6%
	5.80	5.60	0.30	0.44	0.30	0.30	0.09	0.04	7.1%
	6.10	5.60	0.30	0.46	0.30	0.30	0.09	0.04	7.4%
	6.40	5.60	0.30	0.12	0.30	0.30	0.09	0.01	1.9%
	6.70	5.50	0.20	0.00	0.32	0.20	0.06	0.00	0.0%
W	7.00	5.30	0.00	0.00	0.36		0.00	0.00	0.0%
1 G	7.10	4.70			0.00		0.00	0.00	0.0%
	10.00	4.64			0.00		0.00	0.00	0.0%
RS	15.60	3.60			0.00		0.00	0.00	0.0%
TOTALS ----------					5.29	0.3 (Max.)	1.04	0.56	100.0%

Manning's n = 0.2466
Hydraulic Radius= 0.19578741

STREAM NAME: Abrams Creek
XS LOCATION: 700 ft. downstream from JPO Ditch headgate
XS NUMBER: 3

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.04	1.04	0.0%
5.05	1.04	2.32	124.4%
5.07	1.04	2.22	114.3%
5.09	1.04	2.11	104.3%
5.11	1.04	2.01	94.3%
5.13	1.04	1.91	84.3%
5.15	1.04	1.80	74.3%
5.17	1.04	1.70	64.4%
5.19	1.04	1.60	54.4%
5.21	1.04	1.50	44.5%
5.23	1.04	1.39	34.6%
5.25	1.04	1.29	24.7%
5.26	1.04	1.24	19.7%
5.27	1.04	1.19	14.8%
5.28	1.04	1.14	9.9%
5.29	1.04	1.09	4.9%
5.30	1.04	1.04	0.0%
5.31	1.04	0.98	-4.9%
5.32	1.04	0.93	-9.8%
5.33	1.04	0.88	-14.7%
5.34	1.04	0.83	-19.5%
5.35	1.04	0.78	-24.3%
5.37	1.04	0.69	-33.8%
5.39	1.04	0.59	-43.2%
5.41	1.04	0.49	-52.4%
5.43	1.04	0.40	-61.3%
5.45	1.04	0.31	-69.9%
5.47	1.04	0.24	-76.8%
5.49	1.04	0.18	-82.8%
5.51	1.04	0.13	-87.5%
5.53	1.04	0.09	-91.2%
5.55	1.04	0.06	-94.6%

WATERLINE AT ZERO
AREA ERROR = 5.300

STREAM NAME: Abrams Creek
XS LOCATION: 700 ft. downstream from JPO Ditch headgate
XS NUMBER: 3 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	4.85	5.28	0.64	0.75	3.37	6.20	100.0%	0.54	3.60	1.07
	4.85	5.27	0.64	0.75	3.37	6.20	100.0%	0.54	3.60	1.07
	4.90	5.26	0.59	0.70	3.11	6.10	98.4%	0.51	3.18	1.02
	4.95	5.24	0.54	0.65	2.84	6.00	96.7%	0.47	2.78	0.98
	5.00	5.22	0.50	0.60	2.58	5.90	95.1%	0.44	2.39	0.93
	5.05	5.20	0.45	0.55	2.32	5.80	93.4%	0.40	2.03	0.87
	5.10	5.18	0.40	0.50	2.06	5.69	91.8%	0.36	1.68	0.82
	5.15	5.16	0.35	0.45	1.80	5.59	90.1%	0.32	1.36	0.76
	5.20	5.14	0.30	0.40	1.55	5.49	88.5%	0.28	1.07	0.69
	5.25	5.12	0.25	0.35	1.29	5.39	86.9%	0.24	0.80	0.62
WL	5.30	5.10	0.20	0.30	1.03	5.29	85.2%	0.20	0.56	0.54
	5.35	4.95	0.16	0.25	0.78	5.11	82.3%	0.15	0.36	0.46
	5.40	4.80	0.11	0.20	0.54	4.93	79.4%	0.11	0.20	0.37
	5.45	3.75	0.08	0.15	0.31	3.83	61.7%	0.08	0.09	0.30
	5.50	2.10	0.07	0.10	0.15	2.12	34.2%	0.07	0.04	0.27
	5.55	1.35	0.04	0.05	0.06	1.36	22.0%	0.04	0.01	0.19
	5.60	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Abrams Creek
XS LOCATION: 700 ft. downstream from JPO Ditch headgate
XS NUMBER: 3

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.56	cfs
CALCULATED FLOW (Qc)=	0.56	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	5.30	ft
CALCULATED WATERLINE (WLc)=	5.30	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=	0.247	
SLOPE=	0.071	ft/ft
.4 * Qm =	0.2	cfs
2.5 * Qm=	1.4	cfs

RECOMMENDED INSTREAM FLOW:
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FLOW (CFS)	PERIOD
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____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

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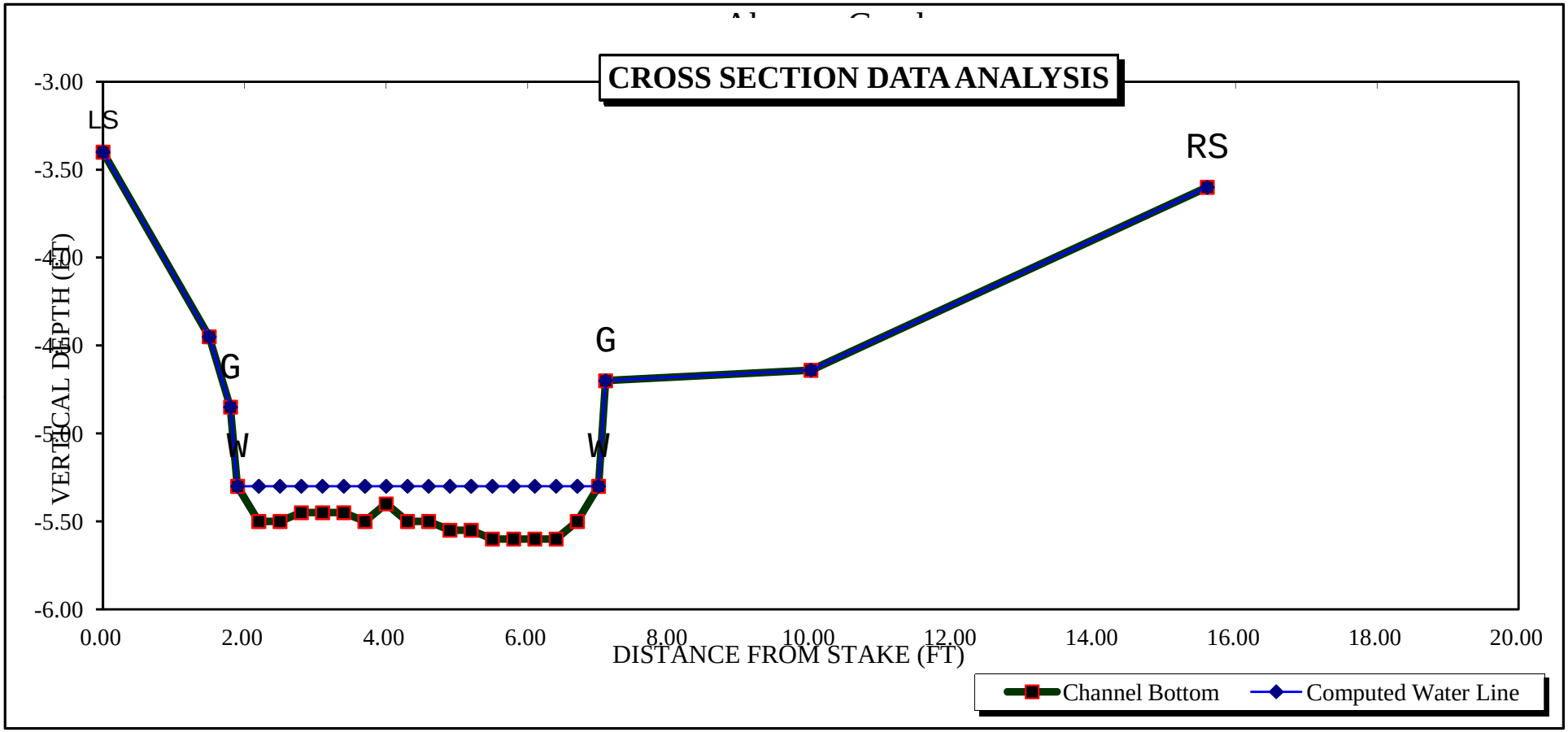
RECOMMENDATION BY: ……………………...………..…….............................. AGENCY...……………………….......……....…....……...... DATE:.......…...…......……………

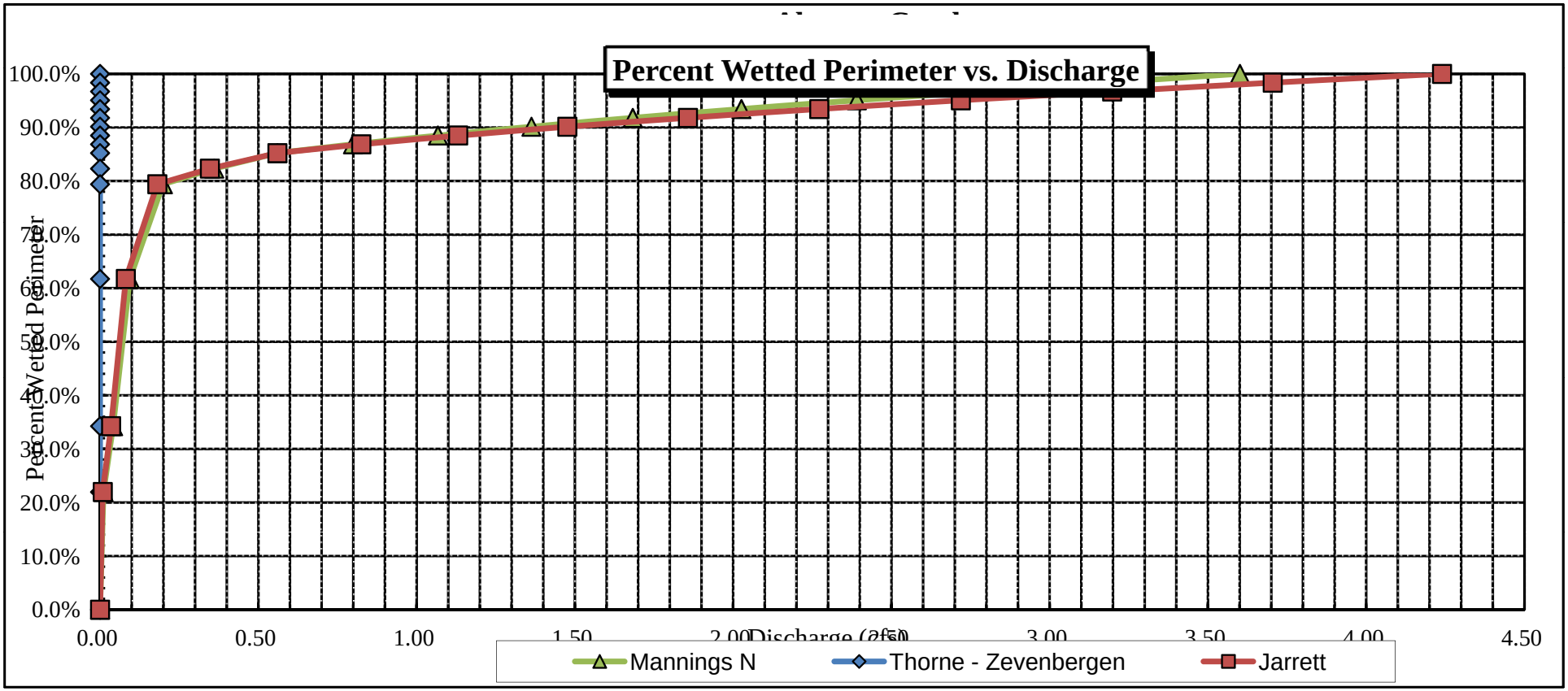
CWCB REVIEW BY: ..……………………………....…………………………………………………...…............. DATE:..................……………....…

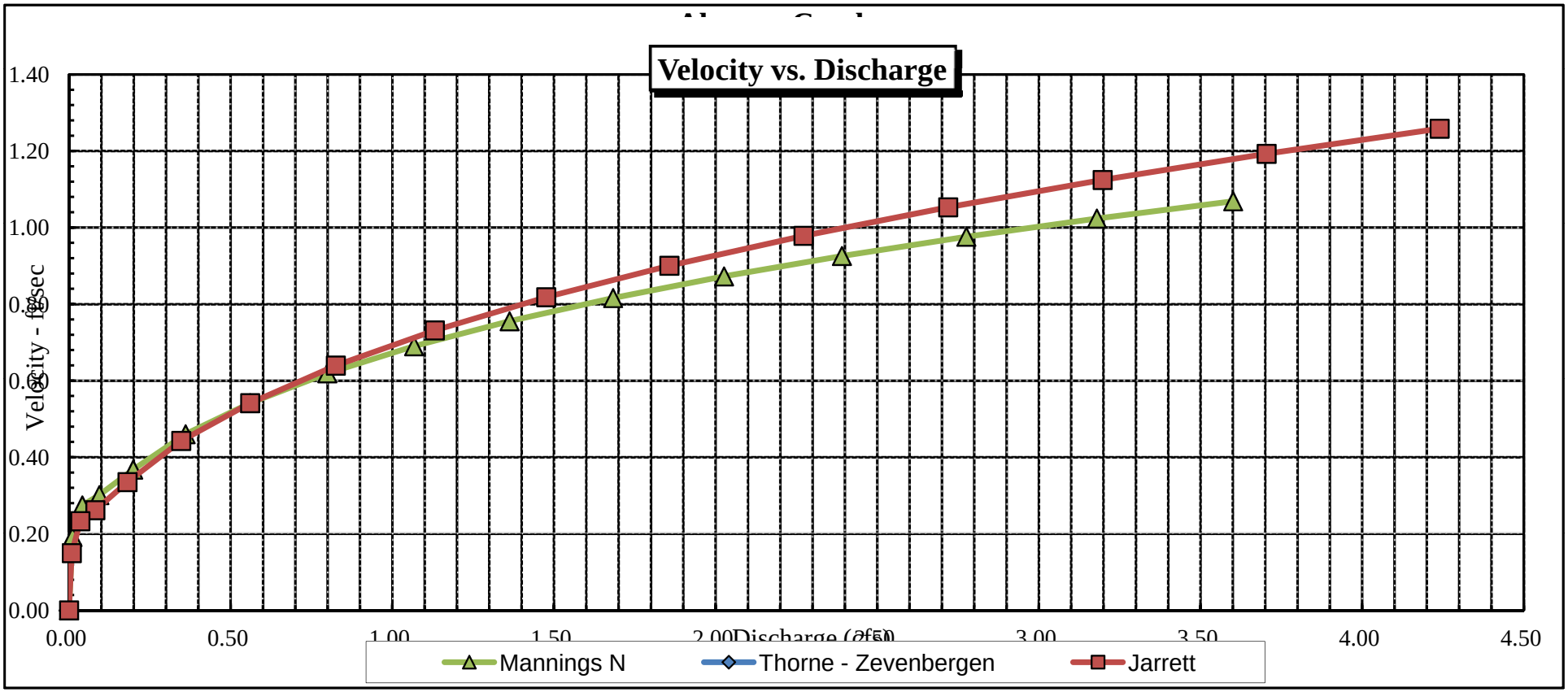
STREAM NAME: Abrams Creek
XS LOCATION: 700 ft. downstream from JPO Ditch headgate
XS NUMBER: 3 Jarrett Variable Manning's n Correction Applied

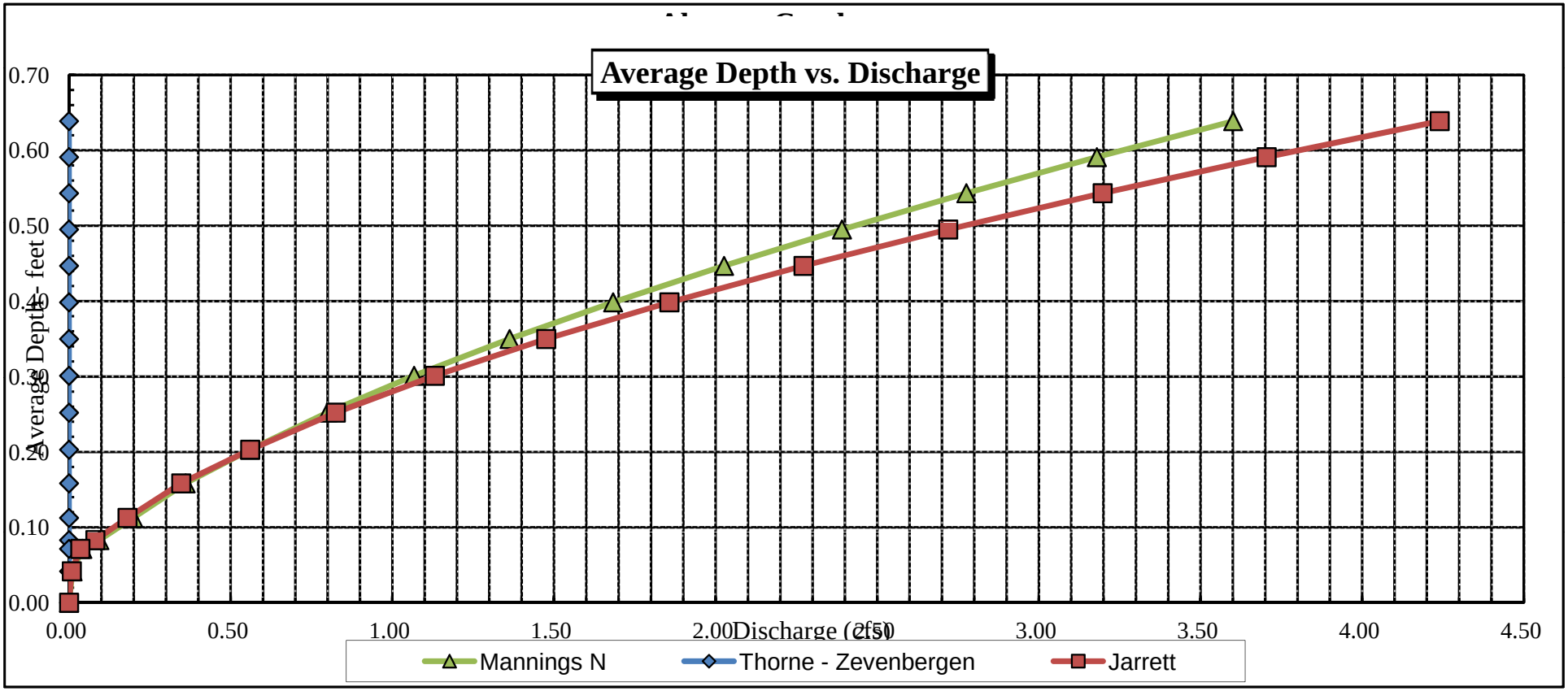
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

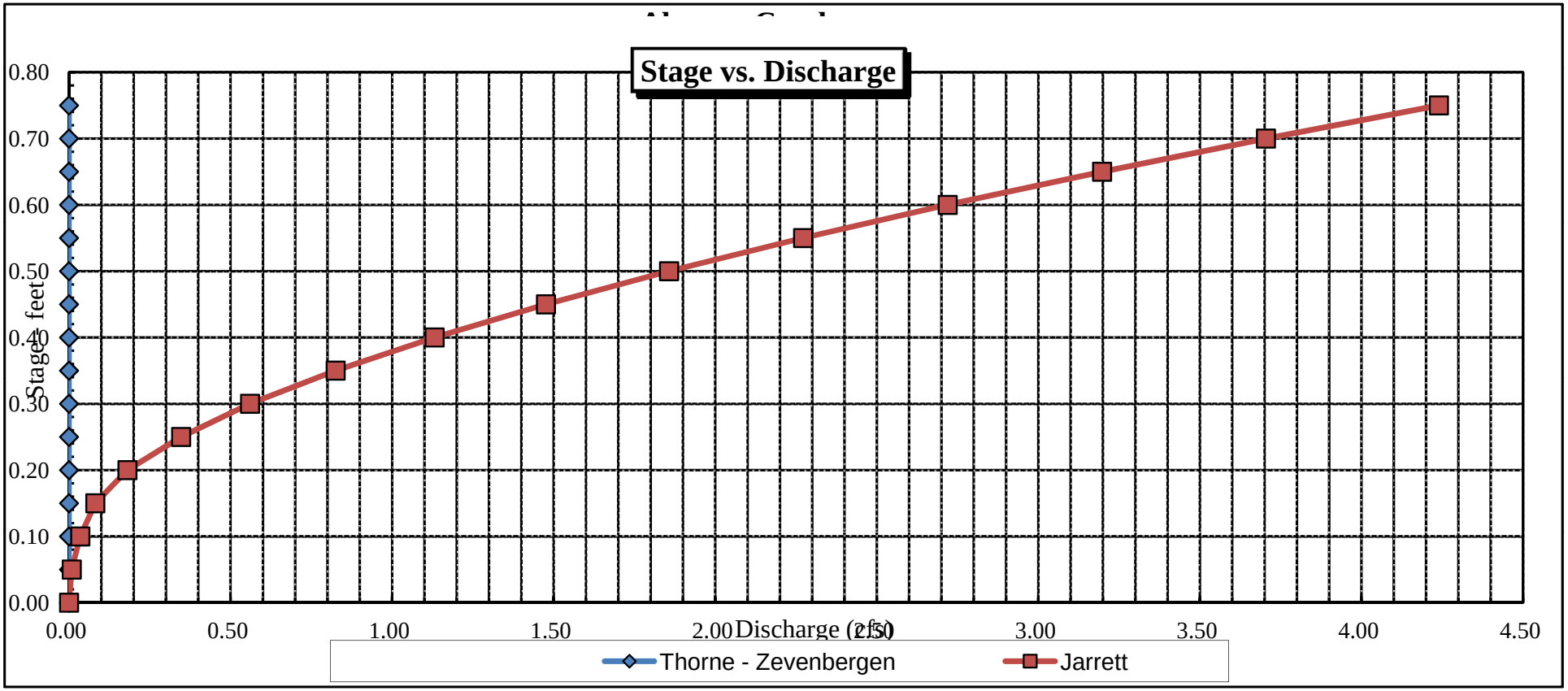
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.85	5.28	0.64	0.75	3.37	6.20	100.0%	0.54	4.24	1.26
	4.85	5.27	0.64	0.75	3.37	6.20	100.0%	0.54	4.24	1.26
	4.90	5.26	0.59	0.70	3.11	6.10	98.4%	0.51	3.70	1.19
	4.95	5.24	0.54	0.65	2.84	6.00	96.7%	0.47	3.20	1.12
	5.00	5.22	0.50	0.60	2.58	5.90	95.1%	0.44	2.72	1.05
	5.05	5.20	0.45	0.55	2.32	5.80	93.4%	0.40	2.27	0.98
	5.10	5.18	0.40	0.50	2.06	5.69	91.8%	0.36	1.86	0.90
	5.15	5.16	0.35	0.45	1.80	5.59	90.1%	0.32	1.48	0.82
	5.20	5.14	0.30	0.40	1.55	5.49	88.5%	0.28	1.13	0.73
	5.25	5.12	0.25	0.35	1.29	5.39	86.9%	0.24	0.83	0.64
WL	5.30	5.10	0.20	0.30	1.03	5.29	85.2%	0.20	0.56	0.54
	5.35	4.95	0.16	0.25	0.78	5.11	82.3%	0.15	0.35	0.44
	5.40	4.80	0.11	0.20	0.54	4.93	79.4%	0.11	0.18	0.34
	5.45	3.75	0.08	0.15	0.31	3.83	61.7%	0.08	0.08	0.26
	5.50	2.10	0.07	0.10	0.15	2.12	34.2%	0.07	0.03	0.23
	5.55	1.35	0.04	0.05	0.06	1.36	22.0%	0.04	0.01	0.15
	5.60	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
-3.00
-3.50
-4.00
-4.50
-5.00
-5.50
-6.00
VERTICAL DEPTH (FT)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
0.50
1.00
1.50
2.00
3.00
3.50
4.00
4.50
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
0.50
1.00
1.50
2.00
3.00
3.50
4.00
4.50
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
Stage - feet
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
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:	Abrams Creek
XS LOCATION:	200' upstream from JPO Ditch headgate
XS NUMBER:	2
DATE:	1-Jul-13
OBSERVERS:	R. Smith, P. Adams
1/4 SEC:	SW
SECTION:	30
TWP:	5S
RANGE:	84W
PM:	Sixth
COUNTY:	Eagle
WATERSHED:	Eagle River
DIVISION:	5
DOW CODE:	23414
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

		*** NOTE ***
		Leave TAPE WT and TENSION
		at defaults for data collected
TAPE WT:	0.0106	with a survey level and rod
TENSION:	99999	

CHANNEL PROFILE DATA

SLOPE:	0.066

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

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

STREAM NAME: Abrams Creek
XS LOCATION: 200' upstream from JPO Ditch headgate
XS NUMBER: 2

DATA POINTS= 31

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
LS	0.00	4.57			0.00		0.00	0.00	0.0%
	1.50	5.17			0.00		0.00	0.00	0.0%
1 G	2.70	5.84			0.00		0.00	0.00	0.0%
	4.00	6.15			0.00		0.00	0.00	0.0%
	5.50	6.12			0.00		0.00	0.00	0.0%
W	6.50	6.35	0.00	0.00	0.00		0.00	0.00	0.0%
	6.80	6.40	0.05	0.00	0.30	0.05	0.02	0.00	0.0%
	7.10	6.40	0.05	0.00	0.30	0.05	0.02	0.00	0.0%
	7.40	6.50	0.15	0.00	0.32	0.15	0.05	0.00	0.0%
	7.70	6.55	0.20	0.00	0.30	0.20	0.06	0.00	0.0%
	8.00	6.60	0.25	0.00	0.30	0.25	0.08	0.00	0.0%
	8.30	6.50	0.15	0.07	0.32	0.15	0.05	0.00	0.3%
	8.60	6.60	0.25	0.69	0.32	0.25	0.08	0.05	5.6%
	8.90	6.65	0.30	1.63	0.30	0.30	0.09	0.15	15.8%
	9.20	6.65	0.30	1.33	0.30	0.30	0.09	0.12	12.9%
	9.50	6.70	0.35	0.77	0.30	0.35	0.11	0.08	8.7%
	9.80	6.65	0.30	1.07	0.30	0.30	0.09	0.10	10.4%
	10.10	6.65	0.30	0.62	0.30	0.30	0.09	0.06	6.0%
	10.40	6.65	0.30	1.20	0.30	0.30	0.09	0.11	11.6%
	10.70	6.65	0.30	0.52	0.30	0.30	0.09	0.05	5.0%
	11.00	6.70	0.35	0.48	0.30	0.35	0.11	0.05	5.4%
	11.30	6.60	0.25	0.64	0.32	0.25	0.08	0.05	5.2%
	11.60	6.55	0.20	1.20	0.30	0.20	0.06	0.07	7.8%
	11.90	6.65	0.30	0.54	0.32	0.30	0.09	0.05	5.2%
	12.20	6.55	0.20	0.00	0.32	0.20	0.06	0.00	0.0%
	12.50	6.50	0.15	0.00	0.30	0.15	0.05	0.00	0.0%
	12.80	6.40	0.05	0.00	0.32	0.05	0.02	0.00	0.0%
W	13.20	6.35	0.00	0.00	0.40		0.00	0.00	0.0%
1 G	13.90	5.78			0.00		0.00	0.00	0.0%
	15.00	5.00			0.00		0.00	0.00	0.0%
RS	16.80	3.85			0.00		0.00	0.00	0.0%
TOTALS ----------					6.85	0.35 (Max.)	1.43	0.93	100.0%

Manning's n = 0.2063
Hydraulic Radius= 0.20827405

STREAM NAME: Abrams Creek
XS LOCATION: 200' upstream from JPO Ditch headgate
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.43	1.43	0.0%
6.10	1.43	3.33	133.5%
6.12	1.43	3.14	120.0%
6.14	1.43	2.96	107.4%
6.16	1.43	2.80	96.2%
6.18	1.43	2.65	85.4%
6.20	1.43	2.50	74.8%
6.22	1.43	2.35	64.3%
6.24	1.43	2.20	54.0%
6.26	1.43	2.05	43.8%
6.28	1.43	1.91	33.8%
6.30	1.43	1.77	24.0%
6.31	1.43	1.70	19.1%
6.32	1.43	1.63	14.3%
6.33	1.43	1.56	9.5%
6.34	1.43	1.49	4.7%
6.35	1.43	1.43	0.0%
6.36	1.43	1.36	-4.6%
6.37	1.43	1.30	-9.2%
6.38	1.43	1.23	-13.6%
6.39	1.43	1.17	-18.0%
6.40	1.43	1.11	-22.2%
6.42	1.43	1.00	-30.1%
6.44	1.43	0.89	-37.9%
6.46	1.43	0.78	-45.4%
6.48	1.43	0.67	-52.8%
6.50	1.43	0.57	-60.1%
6.52	1.43	0.47	-67.0%
6.54	1.43	0.38	-73.4%
6.56	1.43	0.30	-79.2%
6.58	1.43	0.22	-84.4%
6.60	1.43	0.16	-89.0%

WATERLINE AT ZERO
AREA ERROR = 6.350

STREAM NAME: Abrams Creek
XS LOCATION: 200' upstream from JPO Ditch headgate
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	5.84	11.13	0.54	0.86	6.04	11.52	100.0%	0.52	7.27	1.20
	5.85	11.07	0.54	0.85	5.93	11.47	99.5%	0.52	7.07	1.19
	5.90	10.80	0.50	0.80	5.39	11.17	96.9%	0.48	6.13	1.14
	5.95	10.53	0.46	0.75	4.85	10.88	94.4%	0.45	5.24	1.08
	6.00	10.26	0.42	0.70	4.33	10.58	91.8%	0.41	4.42	1.02
	6.05	9.99	0.38	0.65	3.83	10.29	89.3%	0.37	3.66	0.96
	6.10	9.72	0.34	0.60	3.33	9.99	86.7%	0.33	2.97	0.89
	6.15	7.82	0.37	0.55	2.88	8.06	70.0%	0.36	2.68	0.93
	6.20	7.54	0.33	0.50	2.50	7.76	67.3%	0.32	2.17	0.87
	6.25	7.26	0.29	0.45	2.13	7.46	64.7%	0.28	1.70	0.80
	6.30	6.98	0.25	0.40	1.77	7.16	62.1%	0.25	1.29	0.73
WL	6.35	6.70	0.21	0.35	1.43	6.85	59.5%	0.21	0.93	0.65
	6.40	5.70	0.19	0.30	1.11	5.85	50.7%	0.19	0.68	0.61
	6.45	5.40	0.15	0.25	0.83	5.53	48.0%	0.15	0.44	0.52
	6.50	5.10	0.11	0.20	0.57	5.21	45.2%	0.11	0.24	0.42
	6.55	4.20	0.08	0.15	0.34	4.29	37.2%	0.08	0.11	0.34
	6.60	3.00	0.05	0.10	0.16	3.05	26.5%	0.05	0.04	0.26
	6.65	1.05	0.03	0.05	0.03	1.07	9.3%	0.02	0.00	0.16
	6.70	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Abrams Creek
XS LOCATION: 200' upstream from JPO Ditch headgate
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.93	cfs
CALCULATED FLOW (Qc)=	0.93	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	6.35	ft
CALCULATED WATERLINE (WLc)=	6.35	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=	0.65	ft/sec
MANNING'S N=	0.206	
SLOPE=	0.066	ft/ft
.4 * Qm =	0.4	cfs
2.5 * Qm=	2.3	cfs

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

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

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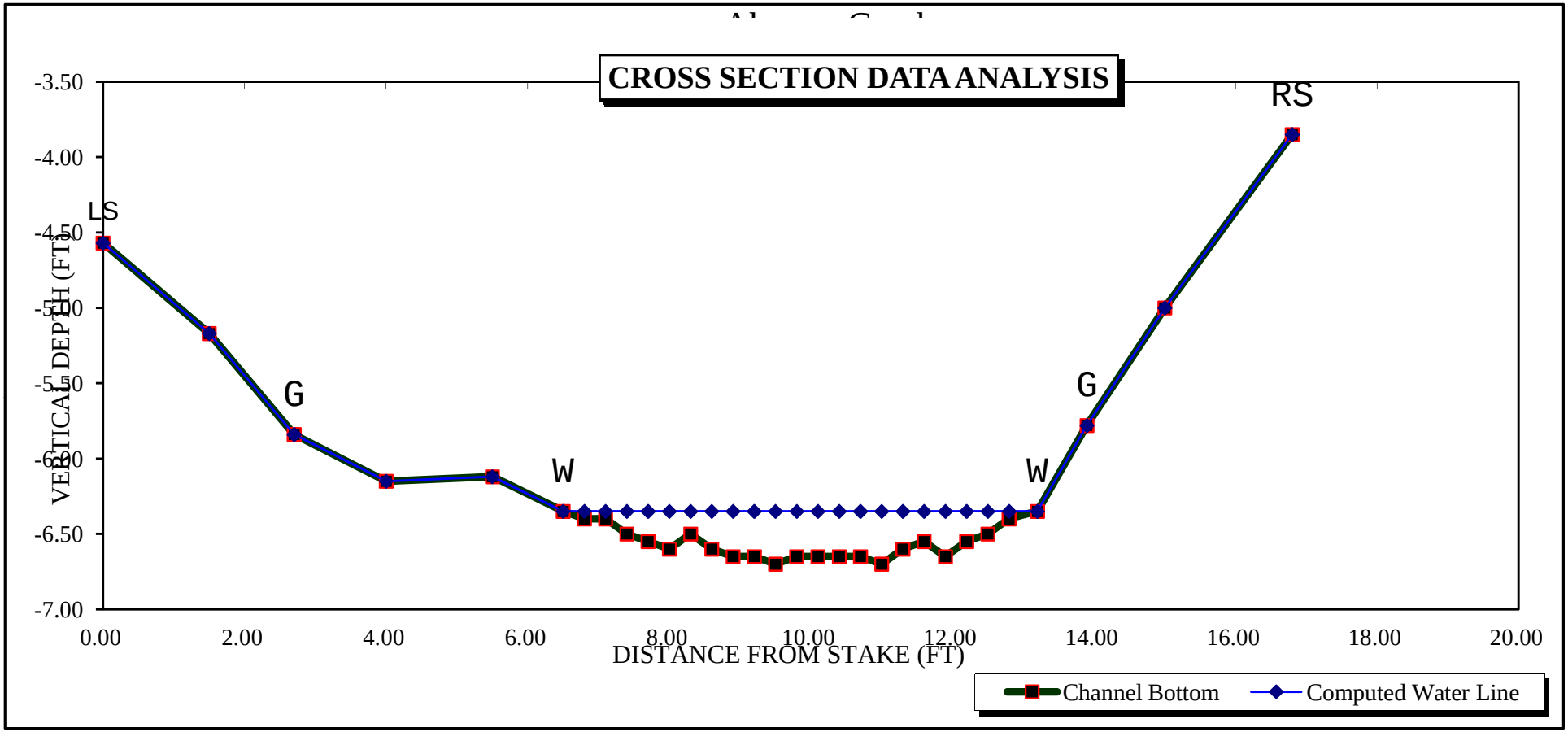
RECOMMENDATION BY: ……………………...………..……................................ AGENCY...………………………......…….....…....……....... DATE:.......…...….......……………

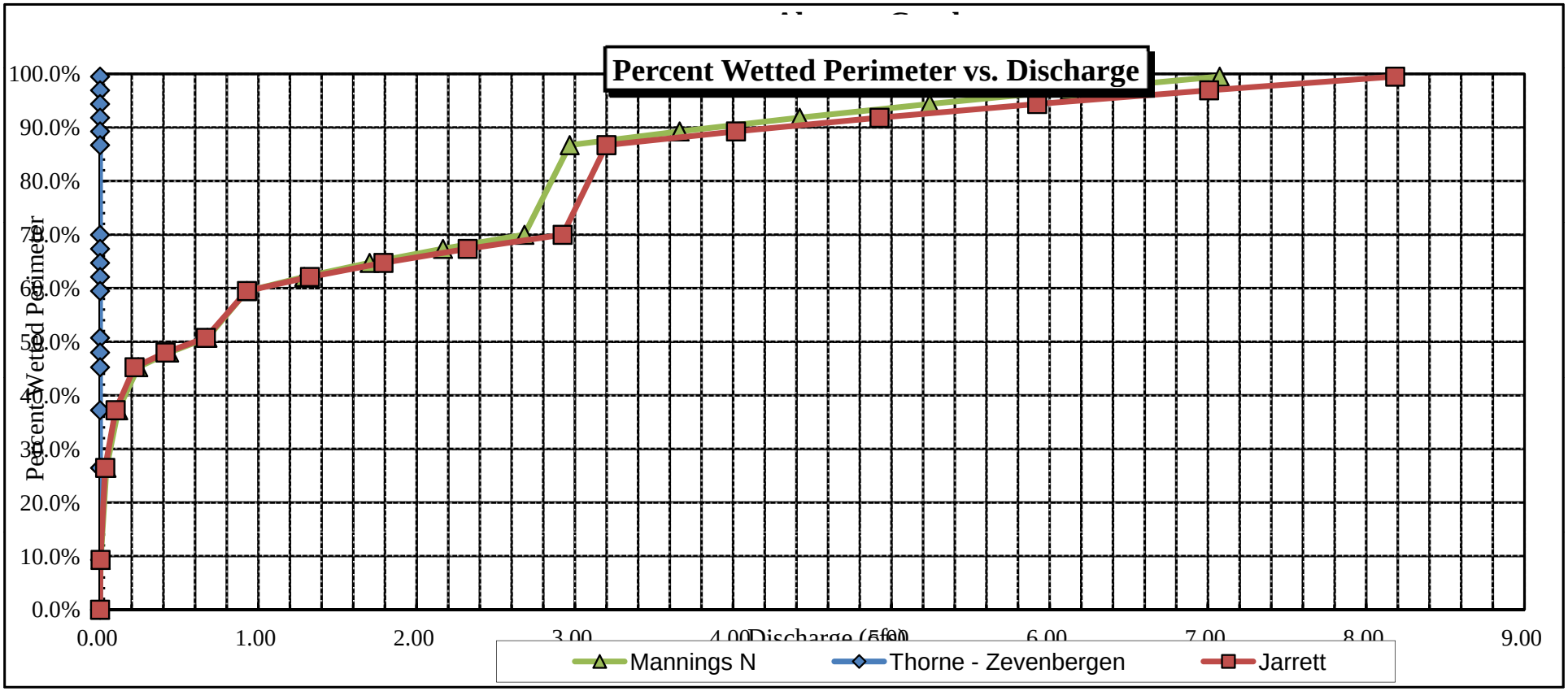
CWCB REVIEW BY: ..……………………………....……………………………………………………..…............. DATE:.................…………….....

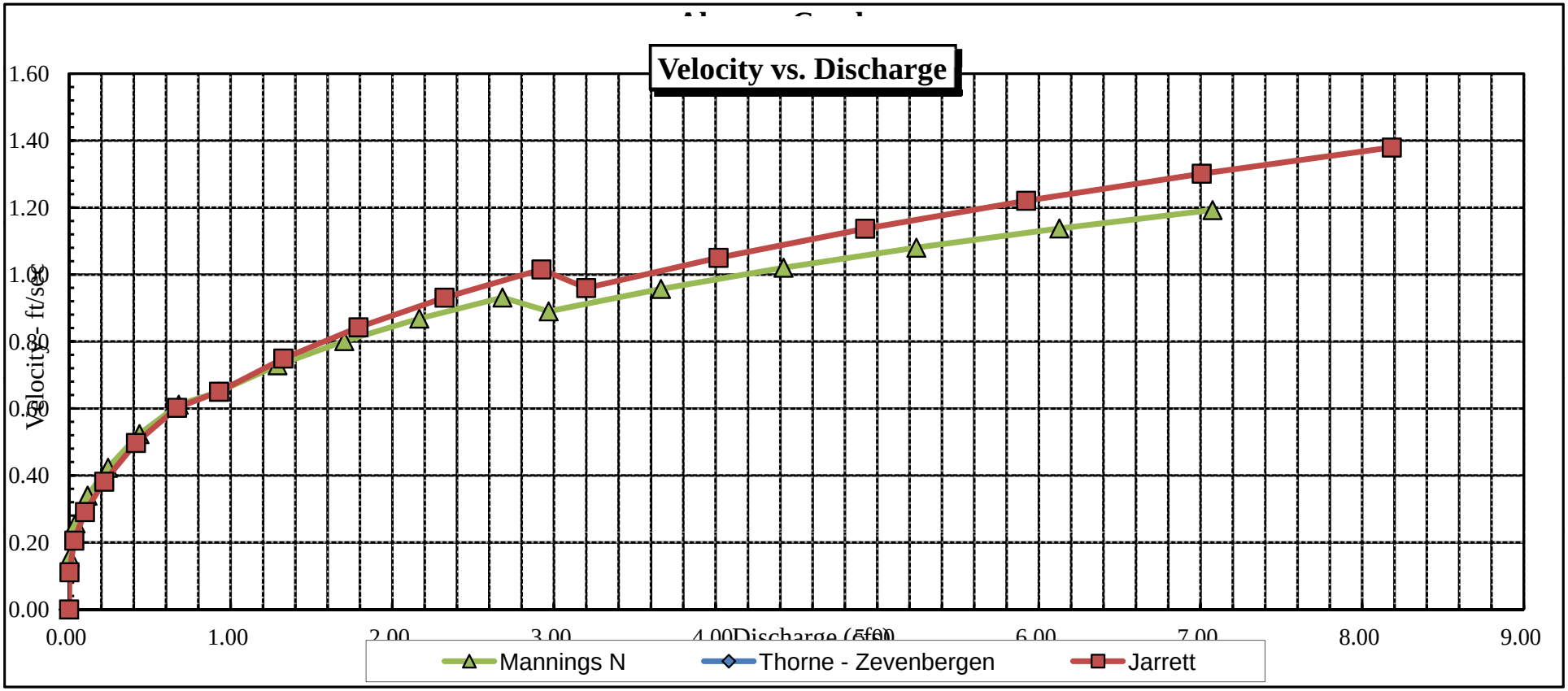
STREAM NAME: Abrams Creek
XS LOCATION: 200' upstream from JPO Ditch headgate
XS NUMBER: 2 Jarrett Variable Manning's n Correction Applied

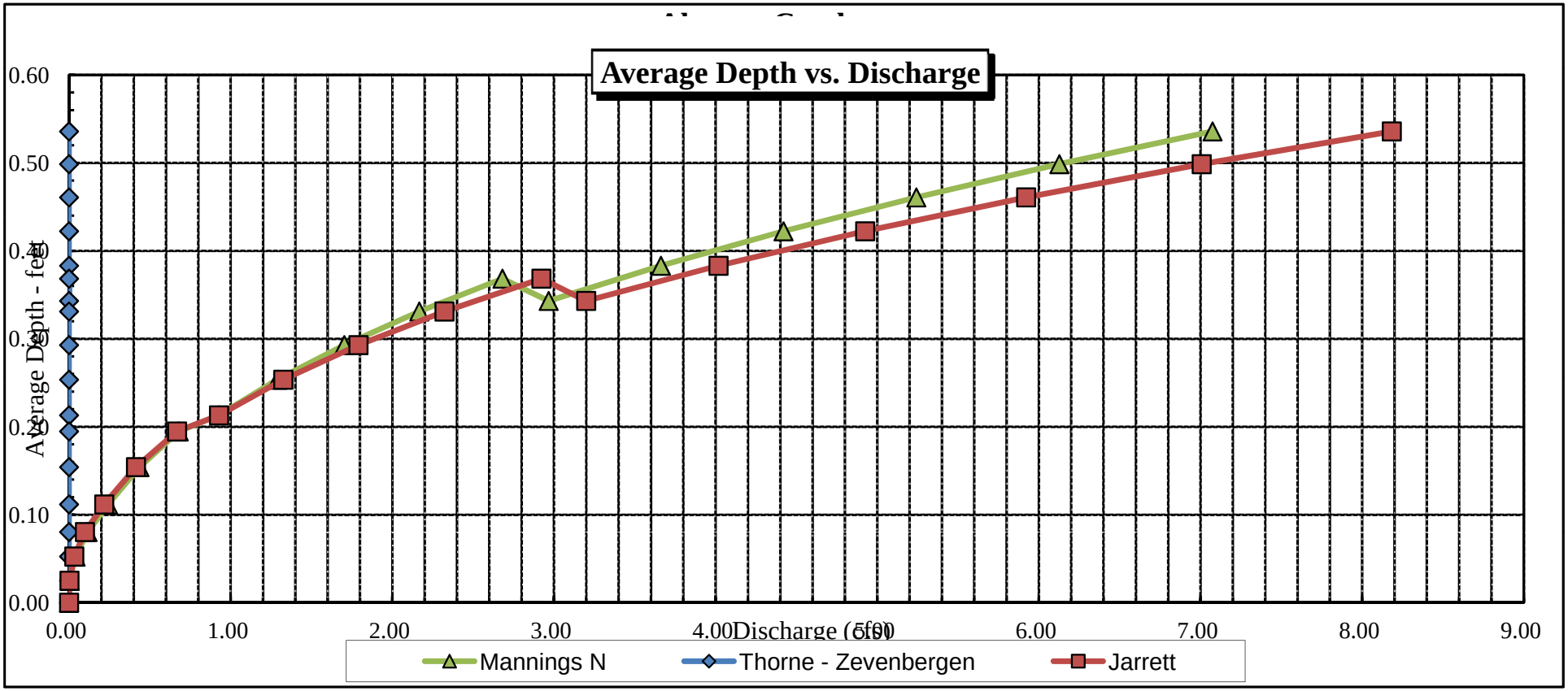
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

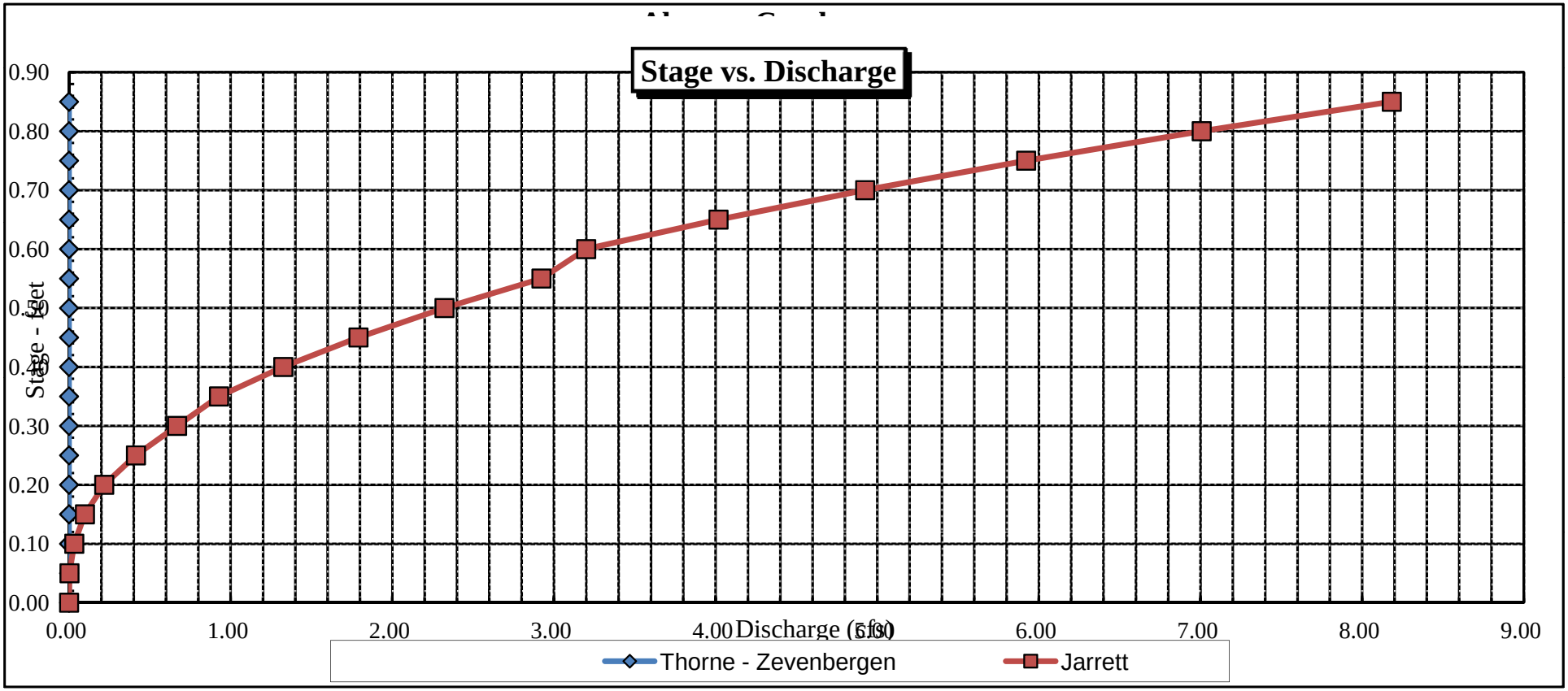
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.84	11.13	0.54	0.86	6.04	11.52	100.0%	0.52	8.43	1.39
	5.85	11.07	0.54	0.85	5.93	11.47	99.5%	0.52	8.18	1.38
	5.90	10.80	0.50	0.80	5.39	11.17	96.9%	0.48	7.01	1.30
	5.95	10.53	0.46	0.75	4.85	10.88	94.4%	0.45	5.92	1.22
	6.00	10.26	0.42	0.70	4.33	10.58	91.8%	0.41	4.92	1.14
	6.05	9.99	0.38	0.65	3.83	10.29	89.3%	0.37	4.02	1.05
	6.10	9.72	0.34	0.60	3.33	9.99	86.7%	0.33	3.20	0.96
	6.15	7.82	0.37	0.55	2.88	8.06	70.0%	0.36	2.92	1.02
	6.20	7.54	0.33	0.50	2.50	7.76	67.3%	0.32	2.32	0.93
	6.25	7.26	0.29	0.45	2.13	7.46	64.7%	0.28	1.79	0.84
	6.30	6.98	0.25	0.40	1.77	7.16	62.1%	0.25	1.33	0.75
WL	6.35	6.70	0.21	0.35	1.43	6.85	59.5%	0.21	0.93	0.65
	6.40	5.70	0.19	0.30	1.11	5.85	50.7%	0.19	0.67	0.60
	6.45	5.40	0.15	0.25	0.83	5.53	48.0%	0.15	0.41	0.50
	6.50	5.10	0.11	0.20	0.57	5.21	45.2%	0.11	0.22	0.38
	6.55	4.20	0.08	0.15	0.34	4.29	37.2%	0.08	0.10	0.29
	6.60	3.00	0.05	0.10	0.16	3.05	26.5%	0.05	0.03	0.21
	6.65	1.05	0.03	0.05	0.03	1.07	9.3%	0.02	0.00	0.11
	6.70	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


CROSS SECTION DATA ANALYSIS
-3.50
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
VERTICAL DEPTH (FT)
LS
G
W
W
G
RS
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
1.00
2.00
3.00
4.00
6.00
7.00
8.00
9.00
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
1.00
2.00
3.00
4.00
6.00
7.00
8.00
9.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
Stage - feet
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
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:	Abrams Creek
XS LOCATION:	300' upstream from JPO Ditch headgate
XS NUMBER:	1
DATE:	1-Jul-13
OBSERVERS:	R. Smith, P. Adams
1/4 SEC:	SW
SECTION:	30
TWP:	5S
RANGE:	84W
PM:	Sixth
COUNTY:	Eagle
WATERSHED:	Eagle River
DIVISION:	5
DOW CODE:	0
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

TAPE WT:	0.0106	*** NOTE *** Leave TAPE WT and TENSION at defaults for data collected with a survey level and rod
TENSION:	99999	

CHANNEL PROFILE DATA

SLOPE:	0.089

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

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

STREAM NAME: Abrams Creek
XS LOCATION: 300' upstream from JPO Ditch headgate
XS NUMBER: 1

DATA POINTS= 25

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	2.98			0.00		0.00	0.00	0.0%
	1.00	3.32			0.00		0.00	0.00	0.0%
1 G	3.00	4.16			0.00		0.00	0.00	0.0%
	4.00	4.47			0.00		0.00	0.00	0.0%
W	4.80	4.70	0.00	0.00	0.00		0.00	0.00	0.0%
	5.10	4.95	0.25	0.22	0.39	0.25	0.08	0.02	1.9%
	5.40	4.90	0.20	0.44	0.30	0.20	0.06	0.03	3.0%
	5.70	4.95	0.25	0.54	0.30	0.25	0.08	0.04	4.7%
	6.00	4.90	0.20	0.53	0.30	0.20	0.06	0.03	3.7%
	6.30	4.90	0.20	0.83	0.30	0.20	0.06	0.05	5.7%
	6.60	4.95	0.25	1.40	0.30	0.25	0.08	0.11	12.1%
	6.90	4.95	0.25	1.47	0.30	0.25	0.08	0.11	12.7%
	7.20	5.10	0.40	1.16	0.34	0.40	0.12	0.14	16.0%
	7.50	4.95	0.25	1.07	0.34	0.25	0.08	0.08	9.2%
	7.80	4.85	0.15	0.77	0.32	0.15	0.05	0.03	4.0%
	8.10	5.05	0.35	0.42	0.36	0.35	0.11	0.04	5.1%
	8.40	5.00	0.30	0.25	0.30	0.30	0.09	0.02	2.6%
	8.70	5.05	0.35	1.24	0.30	0.35	0.11	0.13	15.0%
	9.00	4.90	0.20	0.62	0.34	0.20	0.06	0.04	4.3%
	9.30	4.70	0.00	0.00	0.36		0.00	0.00	0.0%
	9.60	4.75	0.05	0.00	0.30	0.05	0.02	0.00	0.0%
W	10.00	4.70	0.00	0.00	0.40		0.00	0.00	0.0%
1 G	10.20	4.10			0.00		0.00	0.00	0.0%
	11.60	3.75			0.00		0.00	0.00	0.0%
RS	12.10	2.59			0.00		0.00	0.00	0.0%
TOTALS ----------					5.57	0.4 (Max.)	1.10	0.87	100.0%

Manning's n = 0.1898
Hydraulic Radius= 0.1971736

STREAM NAME: Abrams Creek
XS LOCATION: 300' upstream from JPO Ditch headgate
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.10	1.10	0.0%
4.45	1.10	2.52	129.3%
4.47	1.10	2.39	118.2%
4.49	1.10	2.27	107.2%
4.51	1.10	2.15	96.3%
4.53	1.10	2.04	85.6%
4.55	1.10	1.92	75.0%
4.57	1.10	1.81	64.5%
4.59	1.10	1.69	54.2%
4.61	1.10	1.58	44.0%
4.63	1.10	1.47	34.0%
4.65	1.10	1.36	24.1%
4.66	1.10	1.31	19.2%
4.67	1.10	1.26	14.4%
4.68	1.10	1.20	9.5%
4.69	1.10	1.15	4.8%
4.70	1.10	1.10	0.0%
4.71	1.10	1.05	-4.7%
4.72	1.10	1.00	-9.2%
4.73	1.10	0.95	-13.5%
4.74	1.10	0.90	-17.7%
4.75	1.10	0.86	-21.8%
4.77	1.10	0.77	-29.7%
4.79	1.10	0.69	-37.5%
4.81	1.10	0.60	-45.2%
4.83	1.10	0.52	-52.8%
4.85	1.10	0.44	-60.3%
4.87	1.10	0.35	-67.7%
4.89	1.10	0.28	-74.7%
4.91	1.10	0.21	-81.2%
4.93	1.10	0.15	-86.3%
4.95	1.10	0.11	-90.2%

WATERLINE AT ZERO
AREA ERROR = 4.700

STREAM NAME: Abrams Creek
XS LOCATION: 300' upstream from JPO Ditch headgate
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	4.16	7.18	0.62	0.94	4.45	8.01	100.0%	0.56	7.02	1.58
	4.20	7.04	0.59	0.90	4.16	7.84	97.8%	0.53	6.38	1.53
	4.25	6.86	0.56	0.85	3.82	7.62	95.0%	0.50	5.63	1.47
	4.30	6.68	0.52	0.80	3.48	7.39	92.3%	0.47	4.91	1.41
	4.35	6.50	0.48	0.75	3.15	7.17	89.5%	0.44	4.25	1.35
	4.40	6.33	0.45	0.70	2.83	6.95	86.7%	0.41	3.63	1.28
	4.45	6.15	0.41	0.65	2.52	6.73	84.0%	0.37	3.05	1.21
	4.50	5.96	0.37	0.60	2.21	6.50	81.1%	0.34	2.52	1.14
	4.55	5.77	0.33	0.55	1.92	6.27	78.2%	0.31	2.04	1.06
	4.60	5.58	0.29	0.50	1.64	6.03	75.3%	0.27	1.60	0.98
	4.65	5.39	0.25	0.45	1.36	5.80	72.4%	0.23	1.21	0.89
WL	4.70	5.20	0.21	0.40	1.10	5.57	69.4%	0.20	0.87	0.79
	4.75	4.36	0.20	0.35	0.86	4.69	58.5%	0.18	0.65	0.75
	4.80	4.23	0.15	0.30	0.64	4.52	56.4%	0.14	0.41	0.64
	4.85	4.10	0.11	0.25	0.44	4.35	54.3%	0.10	0.22	0.50
	4.90	3.44	0.07	0.20	0.24	3.64	45.4%	0.07	0.09	0.38
	4.95	1.55	0.07	0.15	0.11	1.68	21.0%	0.06	0.04	0.37
	5.00	1.17	0.03	0.10	0.04	1.26	15.7%	0.03	0.01	0.23
	5.05	0.20	0.03	0.05	0.01	0.22	2.8%	0.02	0.00	0.19
	5.10	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Abrams Creek
XS LOCATION: 300' upstream from JPO Ditch headgate
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.87	cfs
CALCULATED FLOW (Qc)=	0.87	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	4.70	ft
CALCULATED WATERLINE (WLc)=	4.70	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.40	ft
MAX CALCULATED DEPTH (Dc)=	0.40	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	0.79	ft/sec
MANNING'S N=	0.190	
SLOPE=	0.089	ft/ft
.4 * Qm =	0.3	cfs
2.5 * Qm=	2.2	cfs

RECOMMENDED INSTREAM FLOW:
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FLOW (CFS)	PERIOD
===========	========
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

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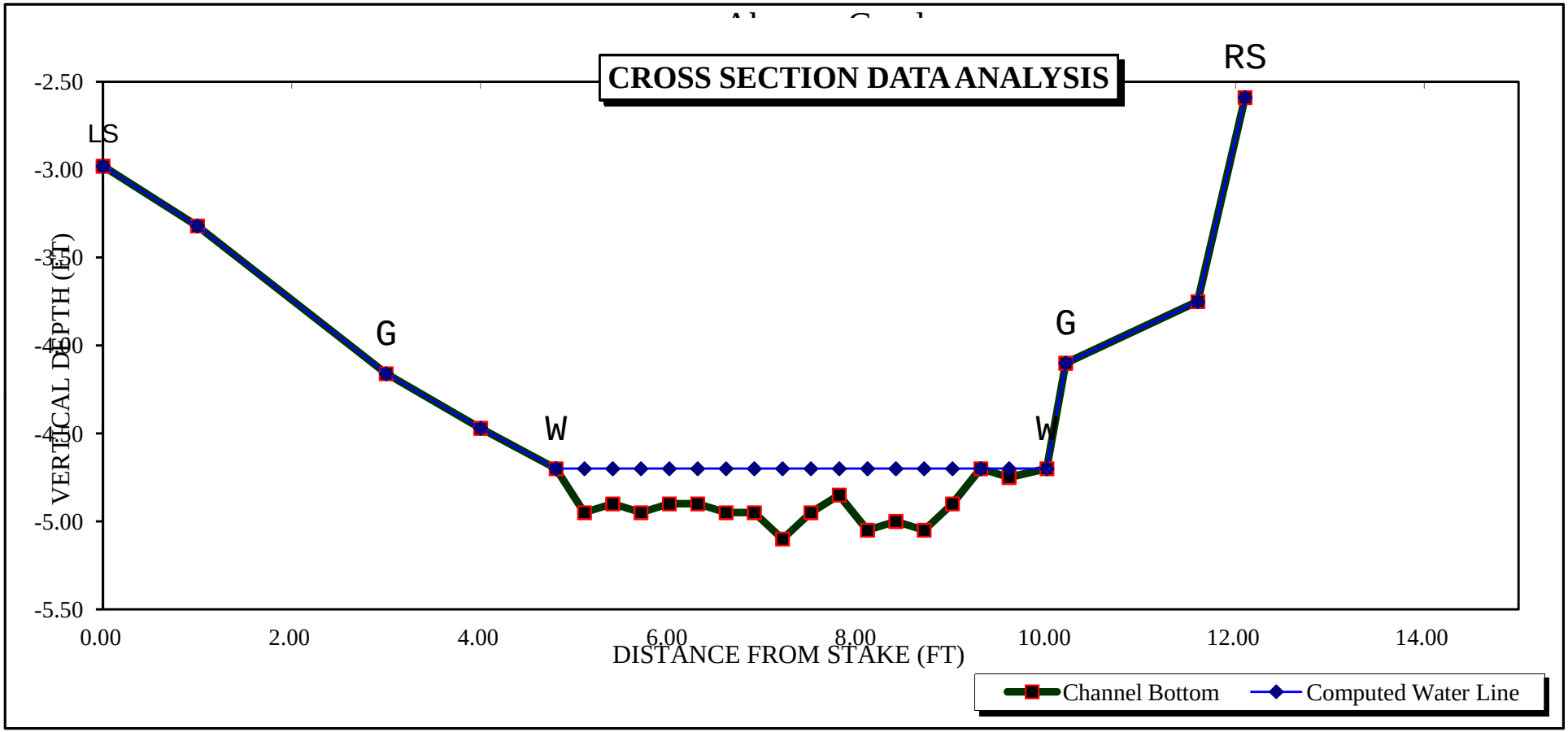
RECOMMENDATION BY: ………………...………..……............................. AGENCY...……………………......……...…...……...... DATE:......…...…......……………

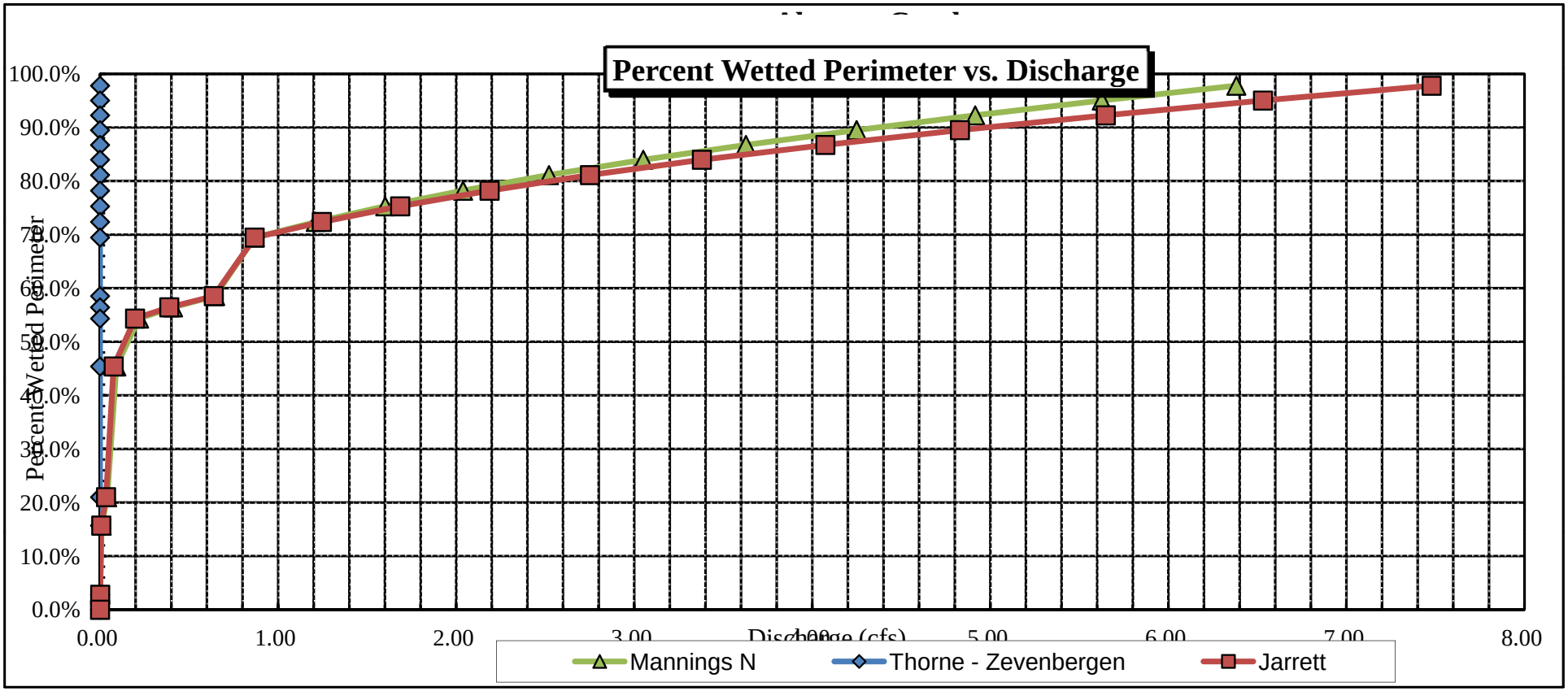
CWCB REVIEW BY: ..…………………………....………………………………………………...…............. DATE:.................………………...…

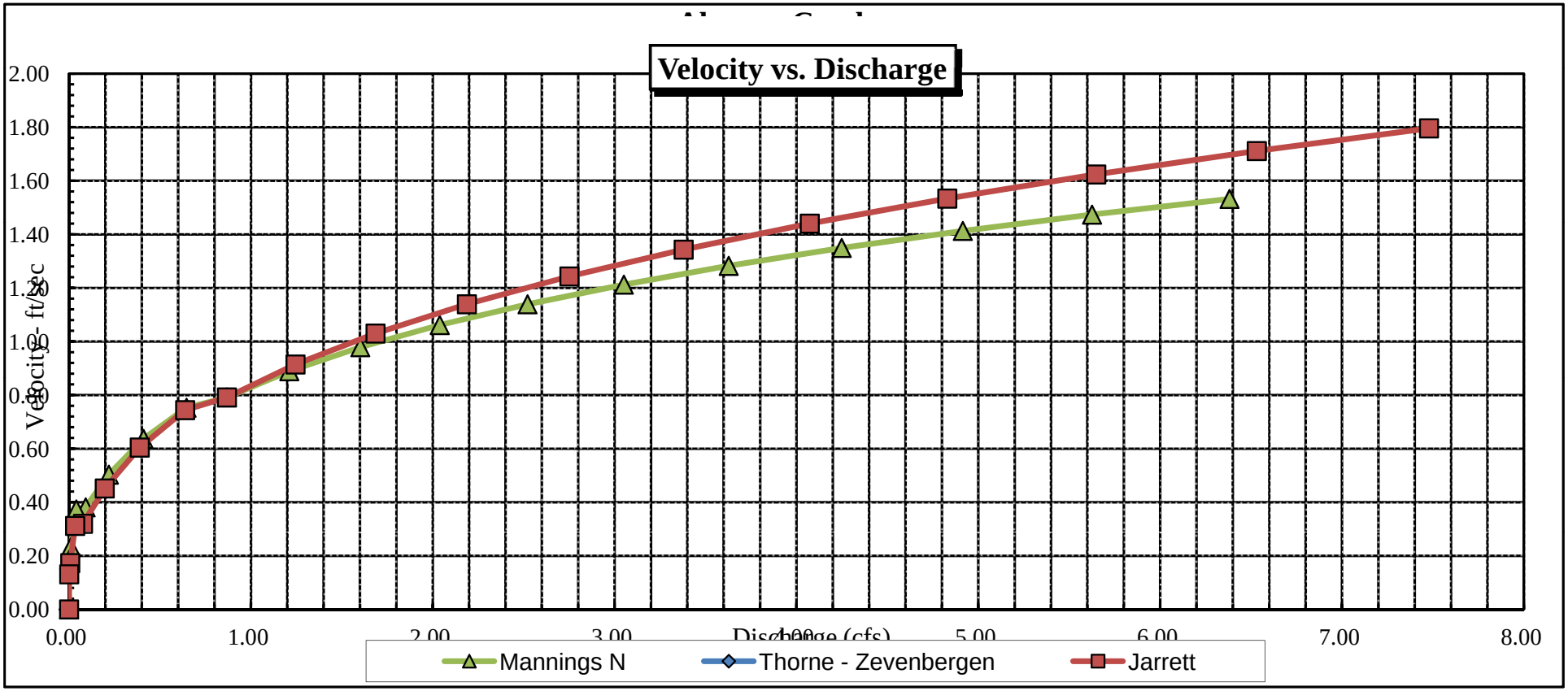
STREAM NAME: Abrams Creek
XS LOCATION: 300' upstream from JPO Ditch headgate
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

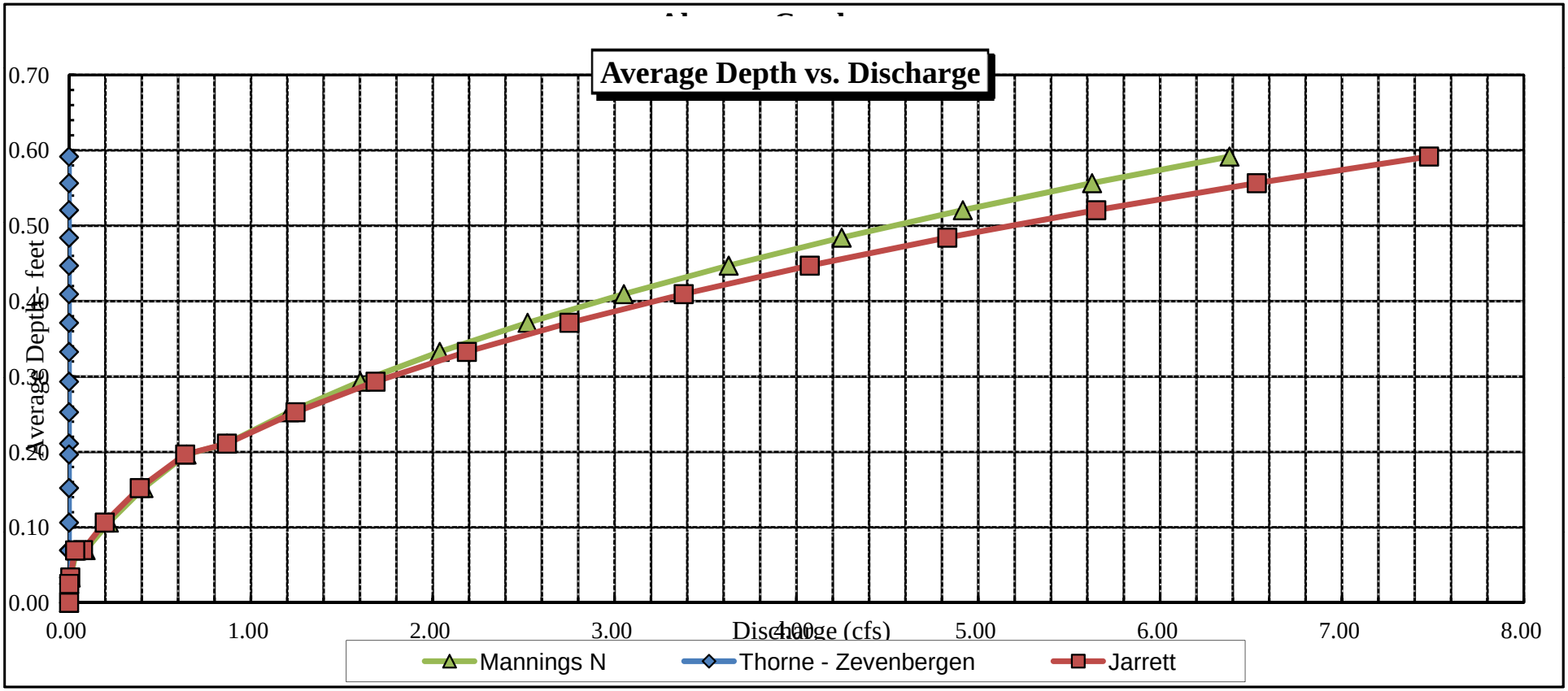
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

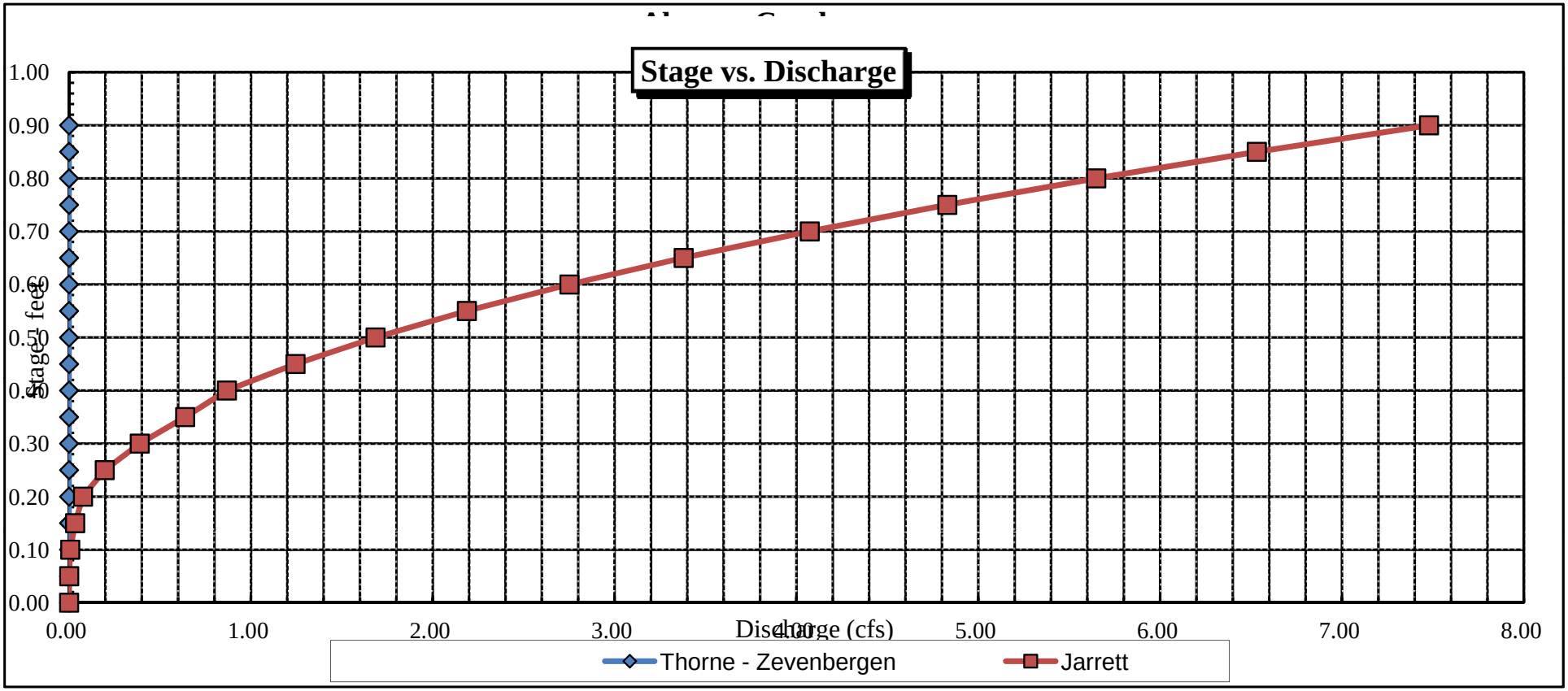
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.16	7.18	0.62	0.94	4.45	8.01	100.0%	0.56	8.28	1.86
	4.20	7.04	0.59	0.90	4.16	7.84	97.8%	0.53	7.48	1.80
	4.25	6.86	0.56	0.85	3.82	7.62	95.0%	0.50	6.53	1.71
	4.30	6.68	0.52	0.80	3.48	7.39	92.3%	0.47	5.65	1.62
	4.35	6.50	0.48	0.75	3.15	7.17	89.5%	0.44	4.83	1.53
	4.40	6.33	0.45	0.70	2.83	6.95	86.7%	0.41	4.07	1.44
	4.45	6.15	0.41	0.65	2.52	6.73	84.0%	0.37	3.38	1.34
	4.50	5.96	0.37	0.60	2.21	6.50	81.1%	0.34	2.75	1.24
	4.55	5.77	0.33	0.55	1.92	6.27	78.2%	0.31	2.19	1.14
	4.60	5.58	0.29	0.50	1.64	6.03	75.3%	0.27	1.69	1.03
	4.65	5.39	0.25	0.45	1.36	5.80	72.4%	0.23	1.25	0.91
WL	4.70	5.20	0.21	0.40	1.10	5.57	69.4%	0.20	0.87	0.79
	4.75	4.36	0.20	0.35	0.86	4.69	58.5%	0.18	0.64	0.74
	4.80	4.23	0.15	0.30	0.64	4.52	56.4%	0.14	0.39	0.60
	4.85	4.10	0.11	0.25	0.44	4.35	54.3%	0.10	0.20	0.45
	4.90	3.44	0.07	0.20	0.24	3.64	45.4%	0.07	0.08	0.32
	4.95	1.55	0.07	0.15	0.11	1.68	21.0%	0.06	0.03	0.31
	5.00	1.17	0.03	0.10	0.04	1.26	15.7%	0.03	0.01	0.17
	5.05	0.20	0.03	0.05	0.01	0.22	2.8%	0.02	0.00	0.13
	5.10	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
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00
-5.50
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
1.00
2.00
3.00
5.00
6.00
7.00
8.00
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Average Depth - feet
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Stage - feet
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
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:	Abrams Creek
XS LOCATION:	0.6 miles downstream fr X-Sec #2
XS NUMBER:	3
DATE:	26-Jun-14
OBSERVERS:	J. Skinner, D. Graf
1/4 SEC:	NE
SECTION:	20
TWP:	5S
RANGE:	84W
PM:	Sixth
COUNTY:	Eagle
WATERSHED:	Eagle
DIVISION:	5
DOW CODE:	23414
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

TAPE WT:	0.0106	*** NOTE *** Leave TAPE WT and TENSION at defaults for data collected with a survey level and rod
TENSION:	99999	

CHANNEL PROFILE DATA

SLOPE:	0.029

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

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

STREAM NAME: Abrams Creek
XS LOCATION: 0.6 miles downstream fr X-Sec #2
XS NUMBER: 3

DATA POINTS= 20

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	S	5.50	5.65			0.00		0.00	0.00	0.0%
		6.80	5.85			0.00		0.00	0.00	0.0%
		7.10	6.45			0.00		0.00	0.00	0.0%
1	G	7.80	6.80			0.00		0.00	0.00	0.0%
	W	8.00	7.89	0.00	0.00	0.00		0.00	0.00	0.0%
		8.10	8.20	0.30	0.00	0.33	0.30	0.05	0.00	0.0%
		8.30	8.25	0.30	1.59	0.21	0.30	0.08	0.12	6.9%
		8.60	8.20	0.35	1.35	0.30	0.35	0.11	0.14	8.2%
		8.90	8.15	0.40	2.26	0.30	0.40	0.12	0.27	15.6%
		9.20	8.20	0.35	2.45	0.30	0.35	0.11	0.26	14.8%
		9.50	8.20	0.30	2.78	0.30	0.30	0.09	0.25	14.4%
		9.80	8.20	0.35	2.99	0.30	0.35	0.11	0.31	18.1%
		10.10	8.20	0.30	2.89	0.30	0.30	0.09	0.26	15.0%
		10.40	8.10	0.25	2.43	0.32	0.25	0.05	0.12	7.0%
	W	10.50	7.89	0.00	0.00	0.23		0.00	0.00	0.0%
		10.60	6.65			0.00		0.00	0.00	0.0%
		11.00	6.40			0.00		0.00	0.00	0.0%
1	G	11.70	6.85			0.00		0.00	0.00	0.0%
		12.20	5.80			0.00		0.00	0.00	0.0%
	S	13.00	5.45			0.00		0.00	0.00	0.0%
	TOTALS ----------					2.89	0.4 (Max.)	0.79	1.74	100.0%

Manning's n = 0.0480
Hydraulic Radius= 0.27133323

STREAM NAME: Abrams Creek
XS LOCATION: 0.6 miles downstream fr X-Sec #2
XS NUMBER: 3

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.79	0.72	-8.1%
7.64	0.79	1.35	72.6%
7.66	0.79	1.30	66.0%
7.68	0.79	1.25	59.5%
7.70	0.79	1.20	53.0%
7.72	0.79	1.15	46.5%
7.74	0.79	1.10	40.1%
7.76	0.79	1.05	33.6%
7.78	0.79	1.00	27.1%
7.80	0.79	0.95	20.7%
7.82	0.79	0.90	14.3%
7.84	0.79	0.85	7.9%
7.85	0.79	0.82	4.7%
7.86	0.79	0.80	1.5%
7.87	0.79	0.77	-1.7%
7.88	0.79	0.75	-4.9%
7.89	0.79	0.72	-8.1%
7.90	0.79	0.70	-11.3%
7.91	0.79	0.67	-14.4%
7.92	0.79	0.65	-17.6%
7.93	0.79	0.62	-20.7%
7.94	0.79	0.60	-23.9%
7.96	0.79	0.55	-30.1%
7.98	0.79	0.50	-36.3%
8.00	0.79	0.45	-42.5%
8.02	0.79	0.40	-48.6%
8.04	0.79	0.36	-54.7%
8.06	0.79	0.31	-60.8%
8.08	0.79	0.26	-66.8%
8.10	0.79	0.21	-72.7%
8.12	0.79	0.17	-78.6%
8.14	0.79	0.12	-84.3%

WATERLINE AT ZERO
AREA ERROR = 7.865

STREAM NAME: Abrams Creek
XS LOCATION: 0.6 miles downstream fr X-Sec #2
XS NUMBER: 3 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	6.85	2.77	1.25	1.40	3.46	4.99	100.0%	0.69	14.32	4.13
	6.86	2.77	1.24	1.39	3.42	4.96	99.4%	0.69	14.10	4.12
	6.91	2.76	1.19	1.34	3.29	4.86	97.4%	0.68	13.34	4.06
	6.96	2.74	1.15	1.29	3.15	4.76	95.4%	0.66	12.60	4.00
	7.01	2.73	1.10	1.24	3.01	4.66	93.3%	0.65	11.87	3.94
	7.06	2.72	1.06	1.19	2.87	4.56	91.3%	0.63	11.15	3.88
	7.11	2.70	1.01	1.14	2.74	4.46	89.3%	0.61	10.44	3.81
	7.16	2.69	0.97	1.09	2.60	4.36	87.3%	0.60	9.75	3.74
	7.21	2.68	0.92	1.04	2.47	4.26	85.3%	0.58	9.06	3.67
	7.26	2.67	0.88	0.99	2.34	4.16	83.2%	0.56	8.39	3.59
	7.31	2.65	0.83	0.94	2.20	4.06	81.2%	0.54	7.74	3.51
	7.36	2.64	0.78	0.89	2.07	3.95	79.2%	0.52	7.10	3.43
	7.41	2.63	0.74	0.84	1.94	3.85	77.2%	0.50	6.47	3.34
	7.46	2.61	0.69	0.79	1.81	3.75	75.1%	0.48	5.87	3.24
	7.51	2.60	0.65	0.74	1.68	3.65	73.1%	0.46	5.27	3.14
	7.56	2.59	0.60	0.69	1.55	3.55	71.1%	0.44	4.70	3.03
	7.61	2.57	0.55	0.64	1.42	3.45	69.1%	0.41	4.14	2.92
	7.66	2.56	0.50	0.59	1.29	3.35	67.0%	0.39	3.61	2.79
	7.71	2.55	0.46	0.54	1.16	3.25	65.0%	0.36	3.10	2.66
	7.76	2.53	0.41	0.49	1.04	3.15	63.0%	0.33	2.61	2.52
	7.81	2.52	0.36	0.44	0.91	3.05	61.0%	0.30	2.15	2.36
WL	7.86	2.51	0.31	0.39	0.78	2.94	59.0%	0.27	1.71	2.18
	7.91	2.48	0.27	0.34	0.66	2.84	56.9%	0.23	1.32	1.99
	7.96	2.44	0.22	0.29	0.54	2.73	54.7%	0.20	0.96	1.78
	8.01	2.40	0.17	0.24	0.42	2.62	52.5%	0.16	0.64	1.55
	8.06	2.36	0.13	0.19	0.30	2.52	50.4%	0.12	0.38	1.27
	8.11	2.28	0.08	0.14	0.18	2.38	47.6%	0.08	0.17	0.94
	8.16	1.94	0.04	0.09	0.07	1.99	39.8%	0.04	0.04	0.57
	8.21	0.35	0.02	0.04	0.01	0.36	7.2%	0.02	0.00	0.35

STREAM NAME: Abrams Creek
XS LOCATION: 0.6 miles downstream fr X-Sec #2
XS NUMBER: 3

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.74	cfs
CALCULATED FLOW (Qc)=	1.71	cfs
(Qm-Qc)/Qm * 100 =	1.2	%
MEASURED WATERLINE (WLm)=	7.89	ft
CALCULATED WATERLINE (WLc)=	7.86	ft
(WLm-WLc)/WLm * 100 =	0.3	%
MAX MEASURED DEPTH (Dm)=	0.40	ft
MAX CALCULATED DEPTH (Dc)=	0.39	ft
(Dm-Dc)/Dm * 100	3.7	%
MEAN VELOCITY=	2.18	ft/sec
MANNING'S N=	0.048	
SLOPE=	0.029	ft/ft
.4 * Qm =	0.7	cfs
2.5 * Qm=	4.3	cfs

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

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

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

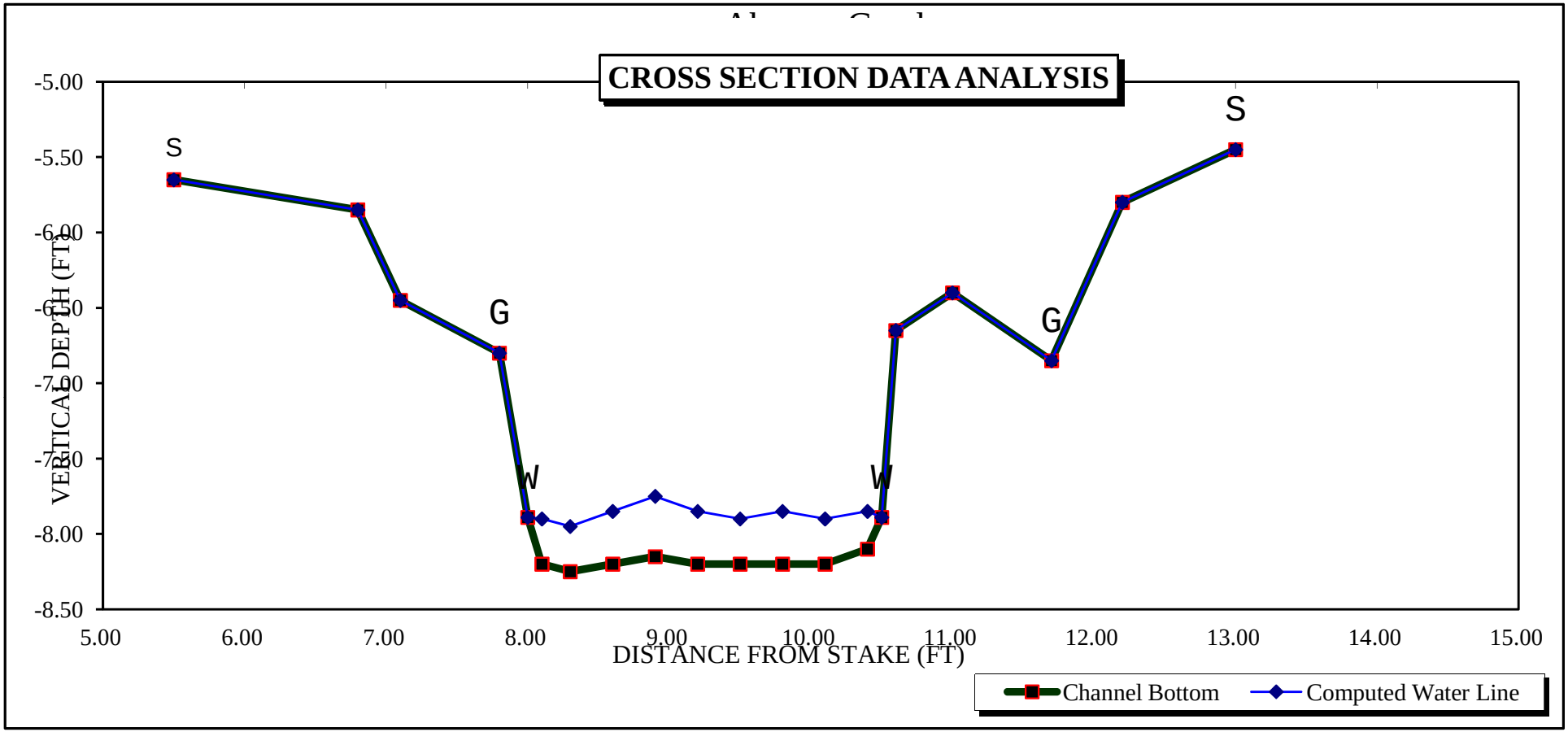
RECOMMENDATION BY: ………………...………..……............................... AGENCY..……………………......…....…...…….…...... DATE:.......…...…......……………

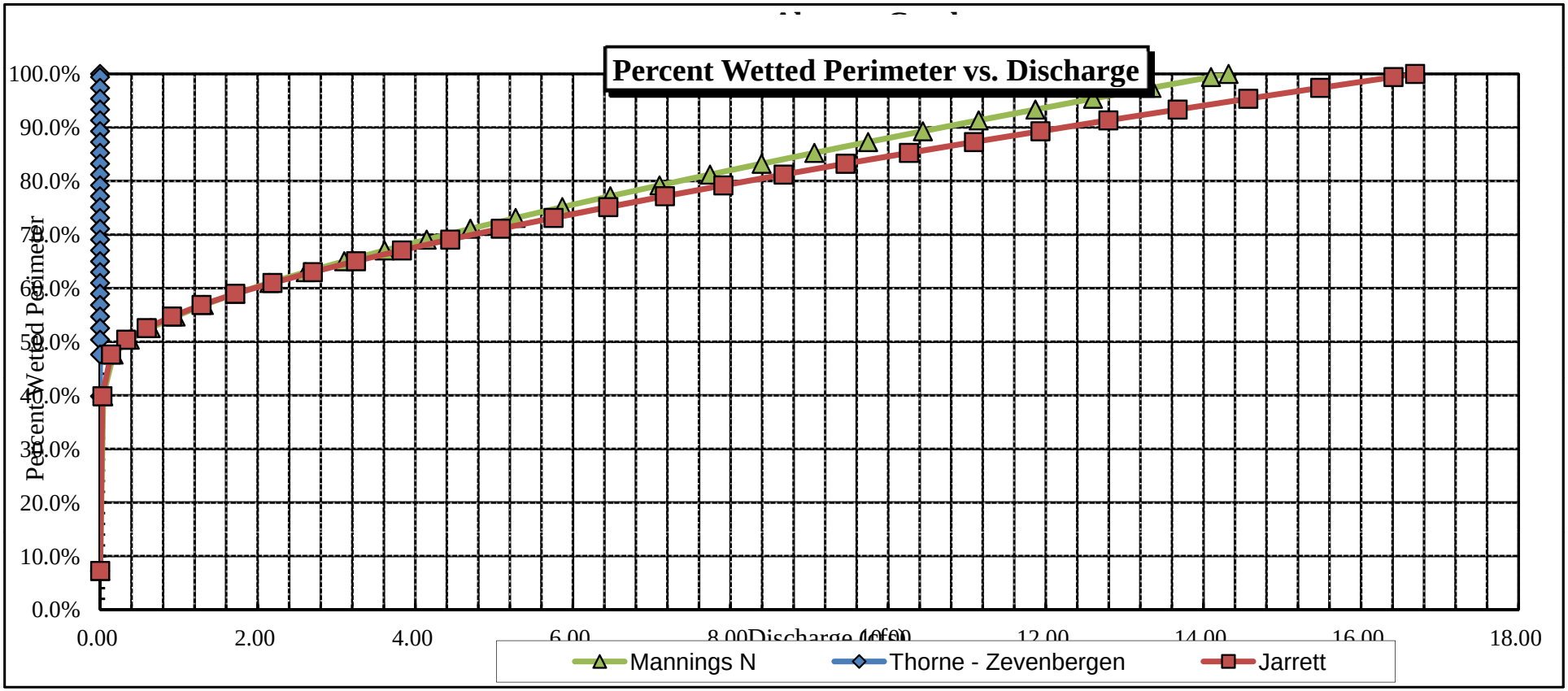
CWCB REVIEW BY: ..……………………….....……………………………………………...…............. DATE:..................…………….…

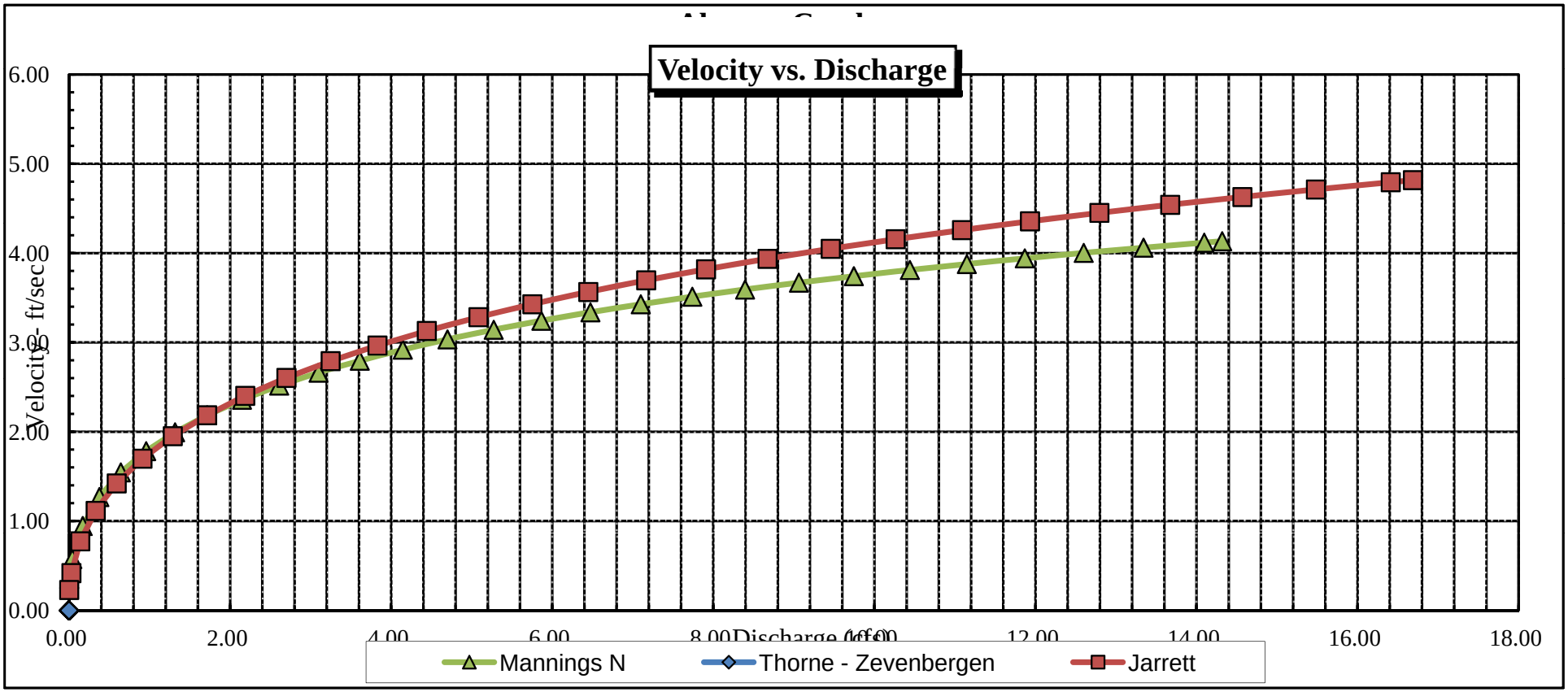
STREAM NAME: Abrams Creek
XS LOCATION: 0.6 miles downstream fr X-Sec #2
XS NUMBER: 3 Jarrett Variable Manning's n Correction Applied

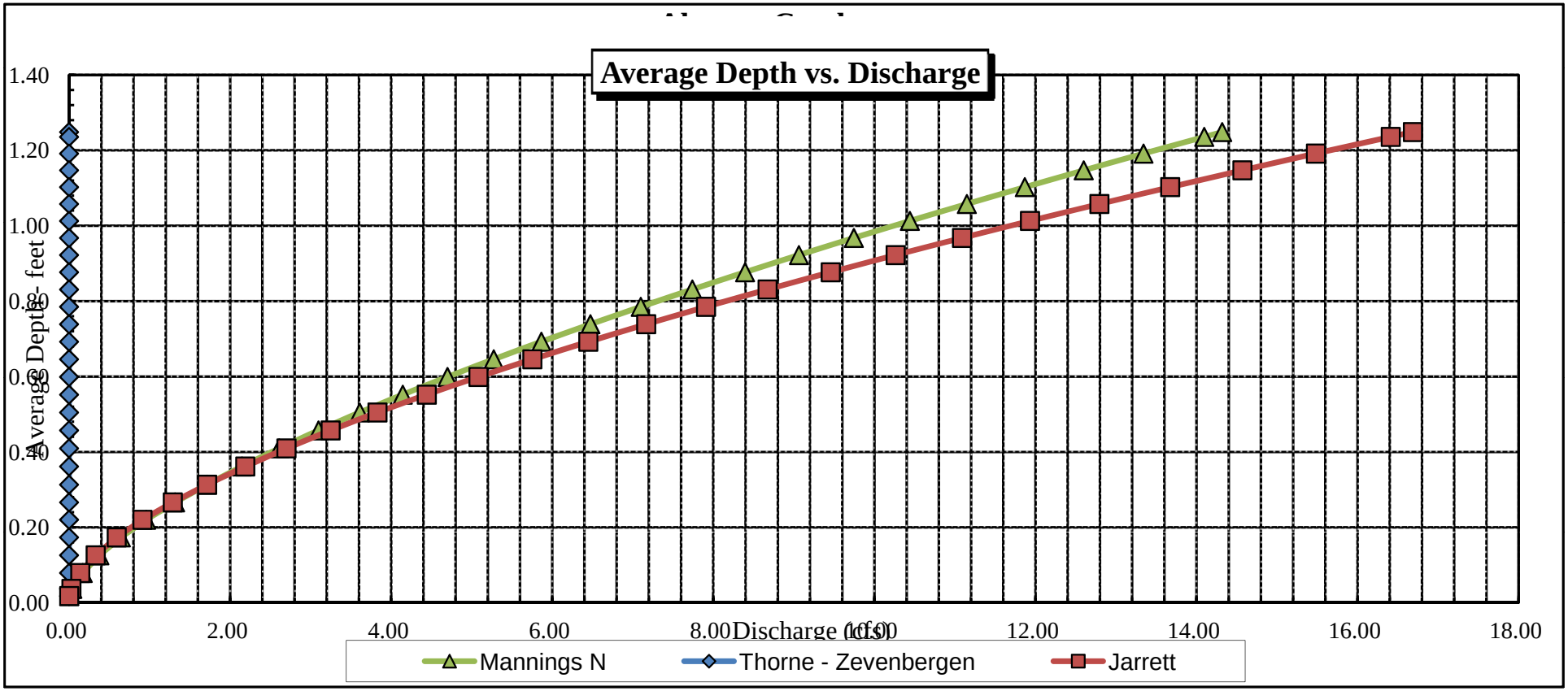
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

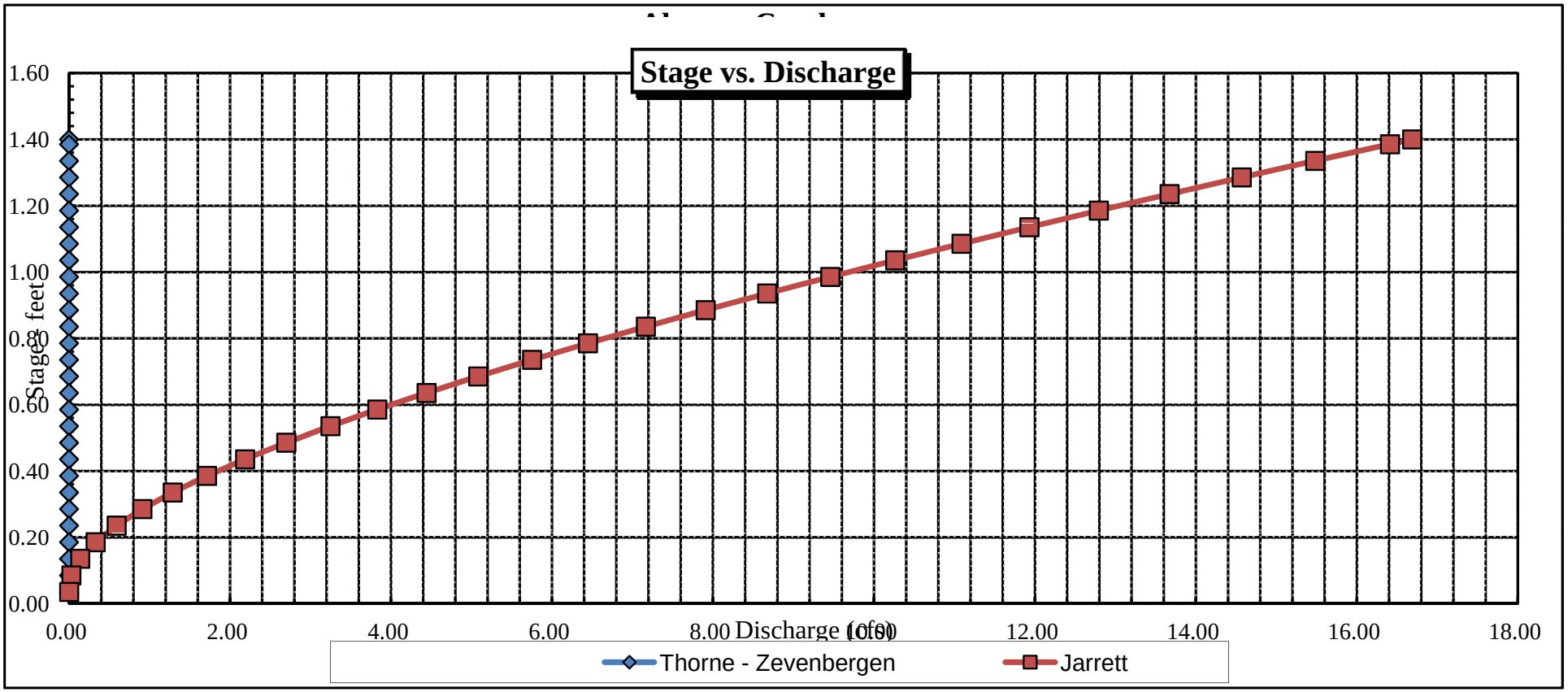
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	6.85	2.77	1.25	1.40	3.46	4.99	100.0%	0.69	16.69	4.82
	6.86	2.77	1.24	1.39	3.42	4.96	99.4%	0.69	16.41	4.79
	6.91	2.76	1.19	1.34	3.29	4.86	97.4%	0.68	15.48	4.71
	6.96	2.74	1.15	1.29	3.15	4.76	95.4%	0.66	14.57	4.63
	7.01	2.73	1.10	1.24	3.01	4.66	93.3%	0.65	13.67	4.54
	7.06	2.72	1.06	1.19	2.87	4.56	91.3%	0.63	12.79	4.45
	7.11	2.70	1.01	1.14	2.74	4.46	89.3%	0.61	11.93	4.36
	7.16	2.69	0.97	1.09	2.60	4.36	87.3%	0.60	11.09	4.26
	7.21	2.68	0.92	1.04	2.47	4.26	85.3%	0.58	10.26	4.16
	7.26	2.67	0.88	0.99	2.34	4.16	83.2%	0.56	9.46	4.05
	7.31	2.65	0.83	0.94	2.20	4.06	81.2%	0.54	8.67	3.94
	7.36	2.64	0.78	0.89	2.07	3.95	79.2%	0.52	7.91	3.82
	7.41	2.63	0.74	0.84	1.94	3.85	77.2%	0.50	7.17	3.69
	7.46	2.61	0.69	0.79	1.81	3.75	75.1%	0.48	6.45	3.56
	7.51	2.60	0.65	0.74	1.68	3.65	73.1%	0.46	5.75	3.43
	7.56	2.59	0.60	0.69	1.55	3.55	71.1%	0.44	5.08	3.28
	7.61	2.57	0.55	0.64	1.42	3.45	69.1%	0.41	4.44	3.13
	7.66	2.56	0.50	0.59	1.29	3.35	67.0%	0.39	3.83	2.96
	7.71	2.55	0.46	0.54	1.16	3.25	65.0%	0.36	3.25	2.79
	7.76	2.53	0.41	0.49	1.04	3.15	63.0%	0.33	2.70	2.60
	7.81	2.52	0.36	0.44	0.91	3.05	61.0%	0.30	2.19	2.40
WL	7.86	2.51	0.31	0.39	0.78	2.94	59.0%	0.27	1.71	2.18
	7.91	2.48	0.27	0.34	0.66	2.84	56.9%	0.23	1.29	1.95
	7.96	2.44	0.22	0.29	0.54	2.73	54.7%	0.20	0.91	1.70
	8.01	2.40	0.17	0.24	0.42	2.62	52.5%	0.16	0.59	1.42
	8.06	2.36	0.13	0.19	0.30	2.52	50.4%	0.12	0.33	1.11
	8.11	2.28	0.08	0.14	0.18	2.38	47.6%	0.08	0.14	0.77
	8.16	1.94	0.04	0.09	0.07	1.99	39.8%	0.04	0.03	0.42
	8.21	0.35	0.02	0.04	0.01	0.36	7.2%	0.02	0.00	0.23


CROSS SECTION DATA ANALYSIS
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
-8.00
-8.50
VERTICAL DEPTH (FT)
S
G
W
W
G
S
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
13.00
14.00
15.00
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
2.00
4.00
6.00
8.00
12.00
14.00
16.00
18.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Velocity - ft/sec
0.00
2.00
4.00
6.00
8.00
12.00
14.00
16.00
18.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
2.00
4.00
6.00
8.00
12.00
14.00
16.00
18.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
Stage - feet
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
2.00
4.00
6.00
8.00
12.00
14.00
16.00
18.00
Thorne - Zevenbergen
Jarrett

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

LOCATION INFORMATION

STREAM NAME:	Abrams Creek
XS LOCATION:	2000' downstream from road crossing
XS NUMBER:	2
DATE:	26-Jun-14
OBSERVERS:	J. Skinner, D. Graf
1/4 SEC:	SW
SECTION:	20
TWP:	5S
RANGE:	84W
PM:	Sixth
COUNTY:	Eagle
WATERSHED:	Eagle
DIVISION:	5
DOW CODE:	23414
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

TAPE WT:	0.0106
TENSION:	99999

*** NOTE ***
Leave TAPE WT and TENSION at defaults for data collected with a survey level and rod

CHANNEL PROFILE DATA

SLOPE:	0.063

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

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

STREAM NAME: Abrams Creek
XS LOCATION: 2000' downstream from road crossing
XS NUMBER: 2

DATA POINTS= 27

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	S	0.00	5.45			0.00		0.00	0.00	0.0%
		3.30	6.15			0.00		0.00	0.00	0.0%
		5.80	6.00			0.00		0.00	0.00	0.0%
1	G	8.80	6.00			0.00		0.00	0.00	0.0%
		10.70	6.10			0.00		0.00	0.00	0.0%
		11.70	6.60			0.00		0.00	0.00	0.0%
	W	12.00	6.86	0.00	0.00	0.00		0.00	0.00	0.0%
		12.30	6.95	0.15	2.91	0.31	0.15	0.05	0.13	9.6%
		12.60	7.00	0.20	2.73	0.30	0.20	0.06	0.16	12.0%
		12.90	7.35	0.50	1.27	0.46	0.50	0.15	0.19	14.0%
		13.20	7.30	0.50	1.23	0.30	0.50	0.15	0.18	13.5%
		13.50	7.25	0.40	1.58	0.30	0.40	0.12	0.19	13.9%
		13.80	7.20	0.40	0.68	0.30	0.40	0.12	0.08	6.0%
		14.10	7.20	0.35	0.56	0.30	0.35	0.11	0.06	4.3%
		14.40	7.15	0.20	0.44	0.30	0.20	0.06	0.03	1.9%
		14.70	7.15	0.30	0.85	0.30	0.30	0.09	0.08	5.6%
		15.00	7.15	0.30	0.88	0.30	0.30	0.09	0.08	5.8%
		15.30	7.05	0.25	0.90	0.32	0.25	0.08	0.07	4.9%
		15.60	6.95	0.10	1.57	0.32	0.10	0.03	0.05	3.5%
		15.90	7.05	0.10	0.20	0.32	0.10	0.03	0.01	0.4%
		16.20	7.00	0.15	1.36	0.30	0.15	0.05	0.06	4.5%
	W	16.50	6.86	0.00	0.00	0.33		0.00	0.00	0.0%
		16.70	6.60			0.00		0.00	0.00	0.0%
		18.50	6.25			0.00		0.00	0.00	0.0%
		18.80	5.70			0.00		0.00	0.00	0.0%
1	G	21.30	5.45			0.00		0.00	0.00	0.0%
	S	23.30	5.15			0.00		0.00	0.00	0.0%
	TOTALS ----------					4.78	0.5	1.17	1.36	100.0%
							(Max.)			

Manning's n = 0.1252
Hydraulic Radius= 0.24483352

STREAM NAME: Abrams Creek
XS LOCATION: 2000' downstream from road crossing
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.17	1.11	-4.9%
6.61	1.17	2.30	96.4%
6.63	1.17	2.20	87.9%
6.65	1.17	2.10	79.5%
6.67	1.17	2.00	71.2%
6.69	1.17	1.91	62.9%
6.71	1.17	1.81	54.7%
6.73	1.17	1.71	46.5%
6.75	1.17	1.62	38.4%
6.77	1.17	1.53	30.4%
6.79	1.17	1.43	22.5%
6.81	1.17	1.34	14.6%
6.82	1.17	1.29	10.6%
6.83	1.17	1.25	6.7%
6.84	1.17	1.20	2.9%
6.85	1.17	1.16	-1.0%
6.86	1.17	1.11	-4.9%
6.87	1.17	1.07	-8.7%
6.88	1.17	1.02	-12.5%
6.89	1.17	0.98	-16.2%
6.90	1.17	0.94	-19.9%
6.91	1.17	0.89	-23.5%
6.93	1.17	0.81	-30.6%
6.95	1.17	0.73	-37.6%
6.97	1.17	0.65	-44.2%
6.99	1.17	0.58	-50.3%
7.01	1.17	0.52	-56.0%
7.03	1.17	0.45	-61.2%
7.05	1.17	0.40	-65.9%
7.07	1.17	0.35	-70.4%
7.09	1.17	0.30	-74.8%
7.11	1.17	0.25	-79.0%

WATERLINE AT ZERO
AREA ERROR = 6.847

STREAM NAME: Abrams Creek
XS LOCATION: 2000' downstream from road crossing
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	6.00	13.04	0.52	1.35	6.82	13.87	100.0%	0.49	12.64	1.85
	6.05	11.10	0.56	1.30	6.24	11.90	85.8%	0.52	12.10	1.94
	6.10	9.06	0.63	1.25	5.74	9.81	70.7%	0.58	11.96	2.08
	6.15	7.82	0.68	1.20	5.32	8.52	61.4%	0.62	11.57	2.17
	6.20	7.63	0.65	1.15	4.93	8.30	59.8%	0.59	10.39	2.11
	6.25	7.51	0.61	1.10	4.56	8.13	58.6%	0.56	9.22	2.02
	6.30	7.16	0.58	1.05	4.19	7.77	56.0%	0.54	8.26	1.97
	6.35	6.80	0.56	1.00	3.84	7.39	53.3%	0.52	7.39	1.92
	6.40	6.45	0.54	0.95	3.51	7.02	50.6%	0.50	6.58	1.88
	6.45	6.09	0.52	0.90	3.19	6.64	47.9%	0.48	5.84	1.83
	6.50	5.73	0.51	0.85	2.90	6.27	45.2%	0.46	5.16	1.78
	6.55	5.38	0.49	0.80	2.62	5.90	42.5%	0.44	4.55	1.73
	6.60	5.02	0.47	0.75	2.36	5.52	39.8%	0.43	3.99	1.69
	6.65	4.91	0.43	0.70	2.11	5.37	38.7%	0.39	3.38	1.60
	6.70	4.81	0.39	0.65	1.87	5.23	37.7%	0.36	2.81	1.50
	6.75	4.72	0.35	0.60	1.63	5.09	36.7%	0.32	2.28	1.39
	6.80	4.62	0.30	0.55	1.40	4.95	35.7%	0.28	1.79	1.28
WL	6.85	4.52	0.26	0.50	1.17	4.81	34.7%	0.24	1.36	1.16
	6.90	4.30	0.22	0.45	0.95	4.56	32.9%	0.21	0.99	1.05
	6.95	4.02	0.18	0.40	0.74	4.27	30.8%	0.17	0.69	0.93
	7.00	3.34	0.17	0.35	0.56	3.55	25.6%	0.16	0.48	0.87
	7.05	2.69	0.15	0.30	0.41	2.86	20.6%	0.14	0.33	0.81
	7.10	2.47	0.11	0.25	0.28	2.62	18.9%	0.11	0.18	0.67
	7.15	2.28	0.07	0.20	0.16	2.39	17.2%	0.07	0.08	0.49
	7.20	1.35	0.06	0.15	0.08	1.43	10.3%	0.06	0.04	0.44
	7.25	0.70	0.05	0.10	0.04	0.76	5.5%	0.05	0.01	0.39
	7.30	0.36	0.03	0.05	0.01	0.39	2.8%	0.02	0.00	0.25
	7.35	0.02	0.00	0.00	0.00	0.02	0.1%	0.00	0.00	0.03

STREAM NAME: Abrams Creek
XS LOCATION: 2000' downstream from road crossing
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.36	cfs
CALCULATED FLOW (Qc)=	1.36	cfs
(Qm-Qc)/Qm * 100 =	0.5	%
MEASURED WATERLINE (WLm)=	6.86	ft
CALCULATED WATERLINE (WLc)=	6.85	ft
(WLm-WLc)/WLm * 100 =	0.2	%
MAX MEASURED DEPTH (Dm)=	0.50	ft
MAX CALCULATED DEPTH (Dc)=	0.50	ft
(Dm-Dc)/Dm * 100	-0.5	%
MEAN VELOCITY=	1.16	ft/sec
MANNING'S N=	0.125	
SLOPE=	0.063	ft/ft
.4 * Qm =	0.5	cfs
2.5 * Qm=	3.4	cfs

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

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

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

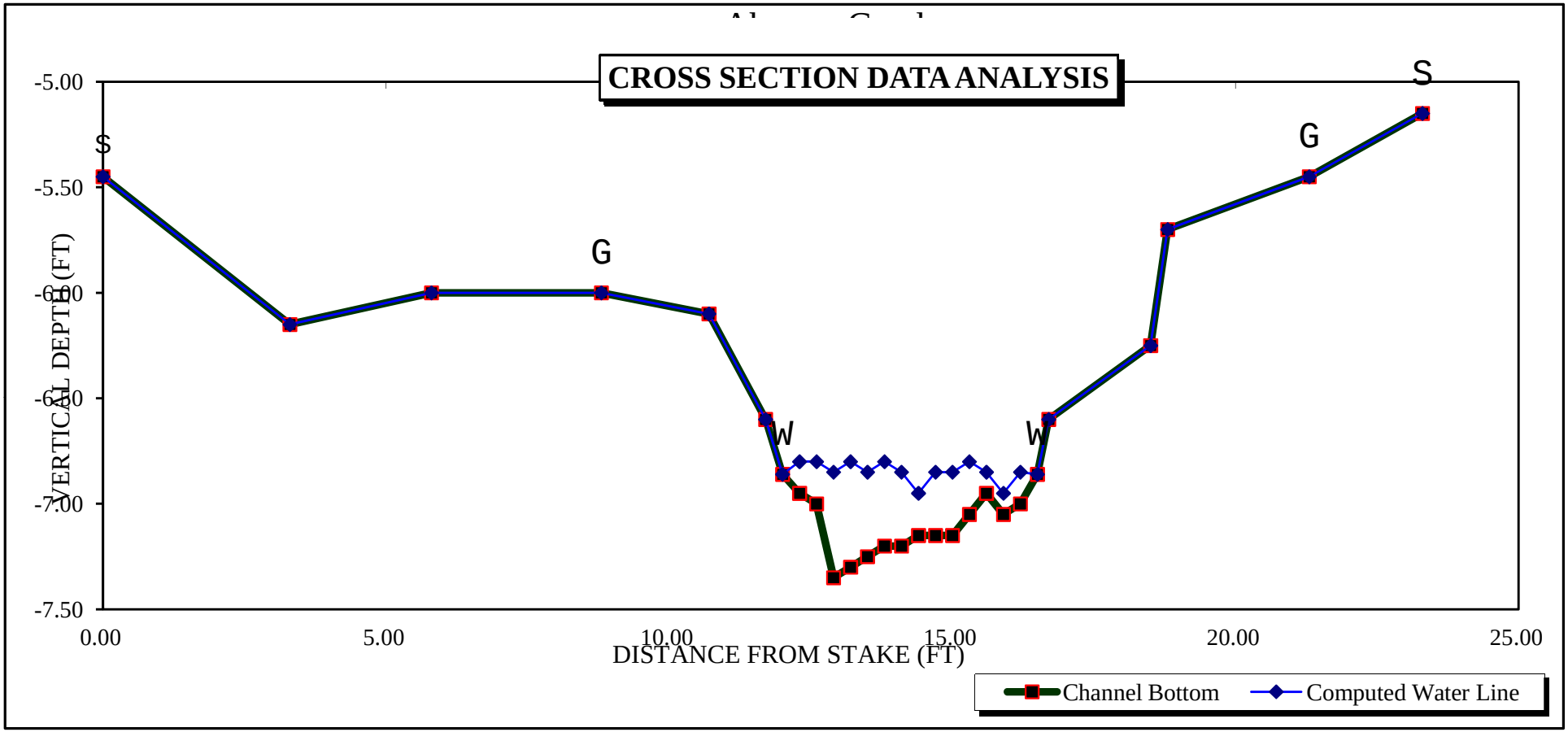
RECOMMENDATION BY: ………………………………………………… AGENCY………………………………………… DATE:………………………

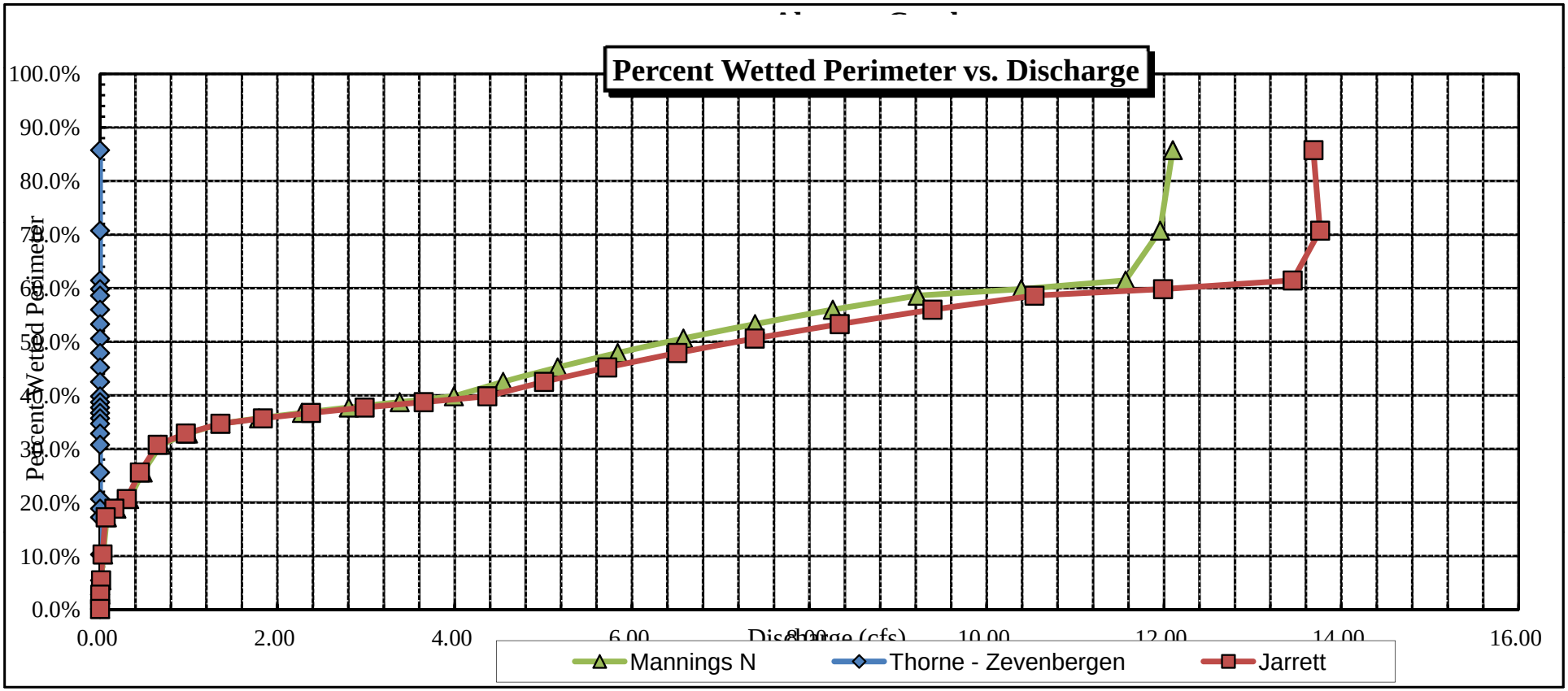
CWCB REVIEW BY: …………………………………………………………………………………………………… DATE:………………………

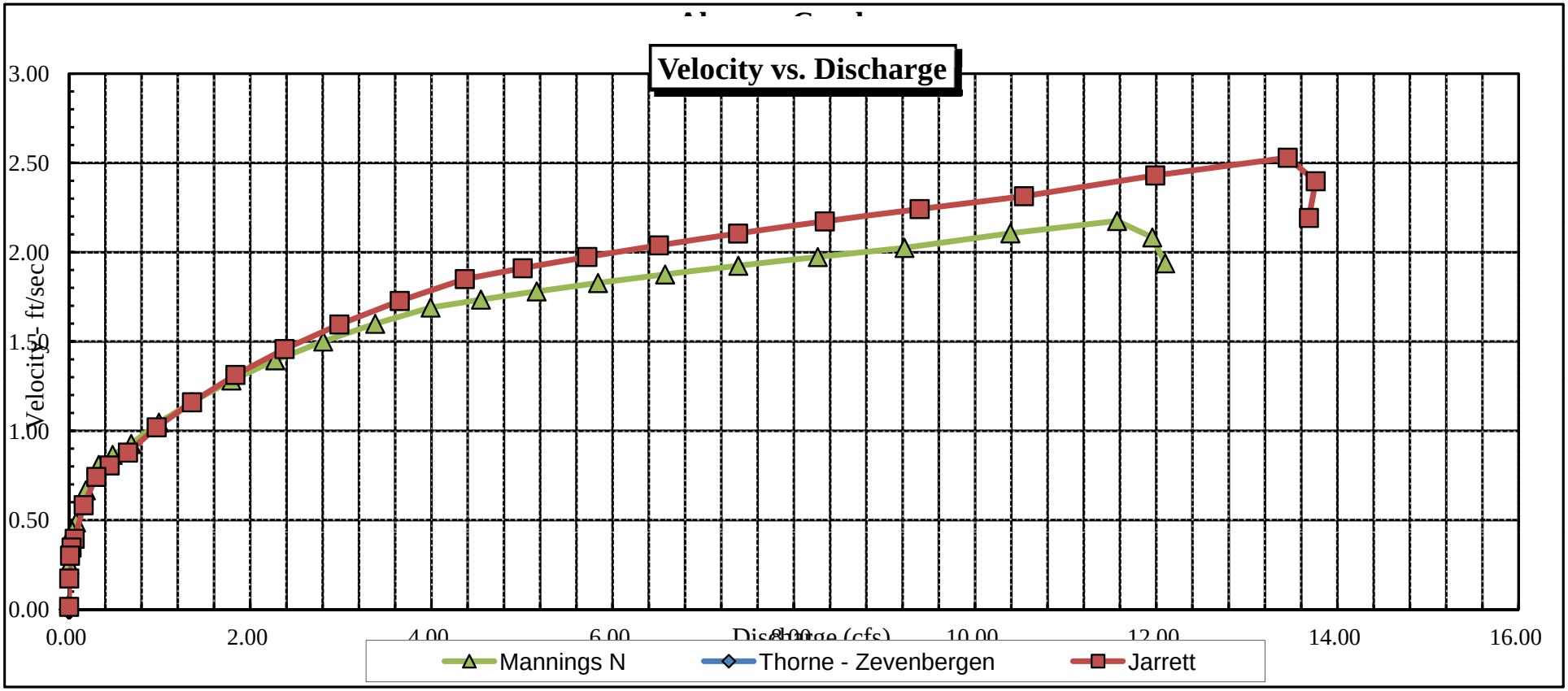
STREAM NAME: Abrams Creek
XS LOCATION: 2000' downstream from road crossing
XS NUMBER: 2 Jarrett Variable Manning's n Correction Applied

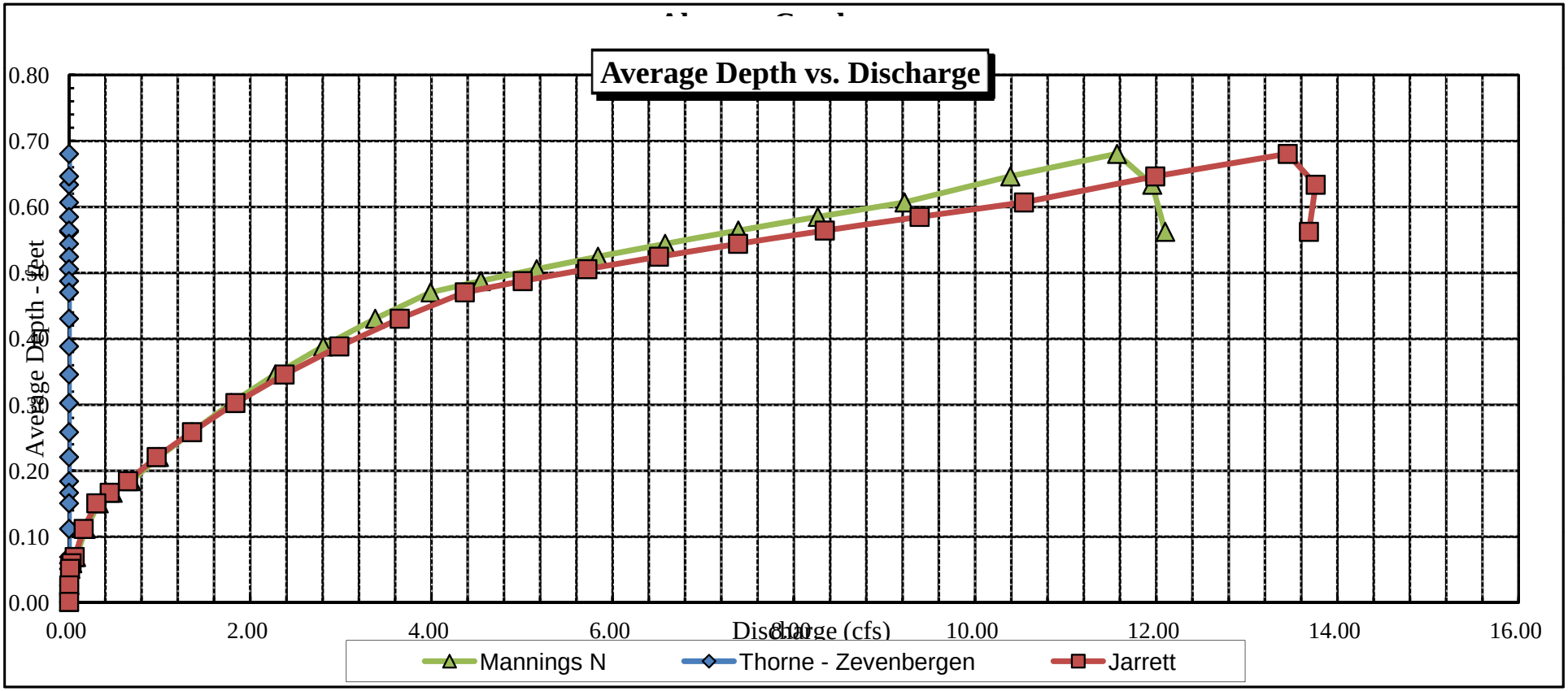
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

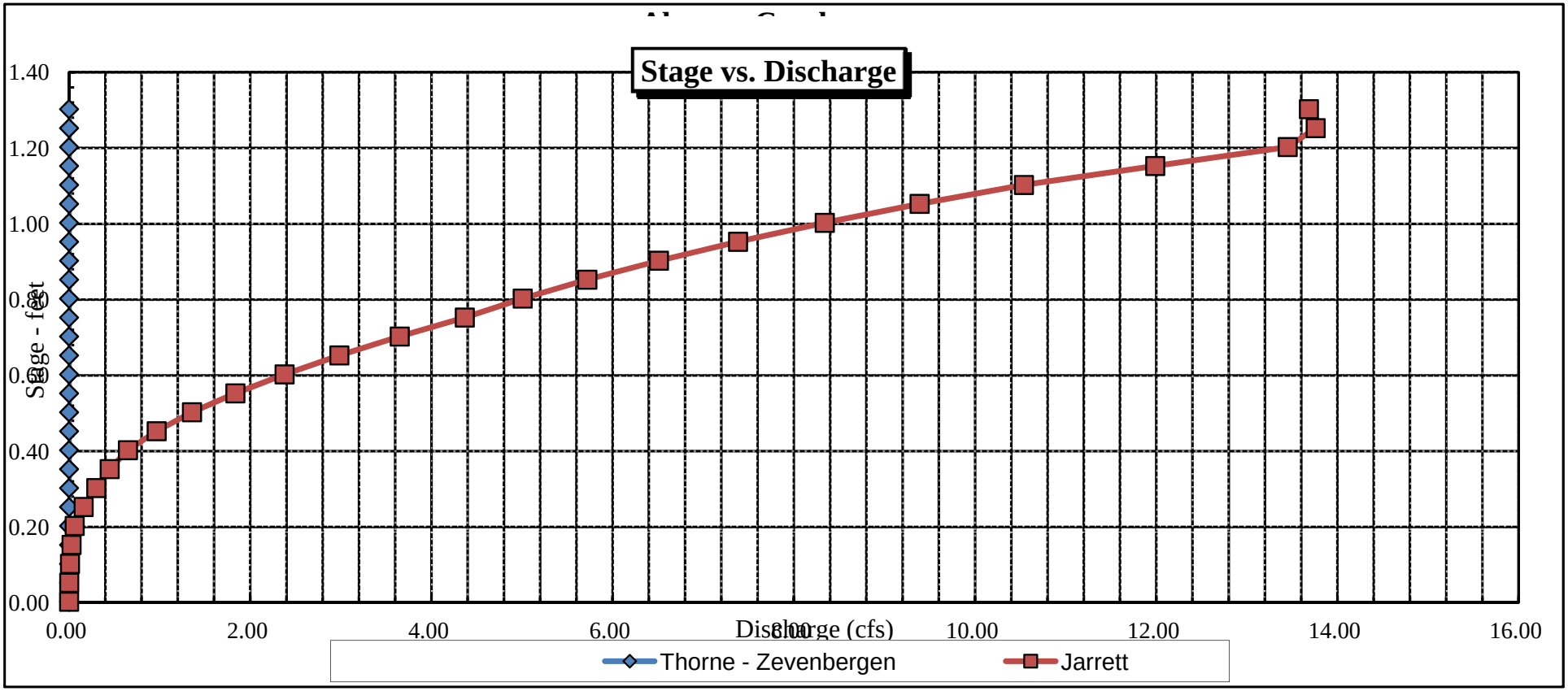
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	6.00	13.04	0.52	1.35	6.82	13.87	100.0%	0.49	14.15	2.08
	6.05	11.10	0.56	1.30	6.24	11.90	85.8%	0.52	13.68	2.19
	6.10	9.06	0.63	1.25	5.74	9.81	70.7%	0.58	13.76	2.40
	6.15	7.82	0.68	1.20	5.32	8.52	61.4%	0.62	13.45	2.53
	6.20	7.63	0.65	1.15	4.93	8.30	59.8%	0.59	11.99	2.43
	6.25	7.51	0.61	1.10	4.56	8.13	58.6%	0.56	10.54	2.31
	6.30	7.16	0.58	1.05	4.19	7.77	56.0%	0.54	9.39	2.24
	6.35	6.80	0.56	1.00	3.84	7.39	53.3%	0.52	8.34	2.17
	6.40	6.45	0.54	0.95	3.51	7.02	50.6%	0.50	7.38	2.10
	6.45	6.09	0.52	0.90	3.19	6.64	47.9%	0.48	6.51	2.04
	6.50	5.73	0.51	0.85	2.90	6.27	45.2%	0.46	5.72	1.97
	6.55	5.38	0.49	0.80	2.62	5.90	42.5%	0.44	5.01	1.91
	6.60	5.02	0.47	0.75	2.36	5.52	39.8%	0.43	4.37	1.85
	6.65	4.91	0.43	0.70	2.11	5.37	38.7%	0.39	3.65	1.73
	6.70	4.81	0.39	0.65	1.87	5.23	37.7%	0.36	2.98	1.60
	6.75	4.72	0.35	0.60	1.63	5.09	36.7%	0.32	2.38	1.46
	6.80	4.62	0.30	0.55	1.40	4.95	35.7%	0.28	1.84	1.31
WL	6.85	4.52	0.26	0.50	1.17	4.81	34.7%	0.24	1.36	1.16
	6.90	4.30	0.22	0.45	0.95	4.56	32.9%	0.21	0.97	1.02
	6.95	4.02	0.18	0.40	0.74	4.27	30.8%	0.17	0.65	0.88
	7.00	3.34	0.17	0.35	0.56	3.55	25.6%	0.16	0.45	0.81
	7.05	2.69	0.15	0.30	0.41	2.86	20.6%	0.14	0.30	0.74
	7.10	2.47	0.11	0.25	0.28	2.62	18.9%	0.11	0.16	0.58
	7.15	2.28	0.07	0.20	0.16	2.39	17.2%	0.07	0.06	0.40
	7.20	1.35	0.06	0.15	0.08	1.43	10.3%	0.06	0.03	0.35
	7.25	0.70	0.05	0.10	0.04	0.76	5.5%	0.05	0.01	0.30
	7.30	0.36	0.03	0.05	0.01	0.39	2.8%	0.02	0.00	0.17
	7.35	0.02	0.00	0.00	0.00	0.02	0.1%	0.00	0.00	0.01


CROSS SECTION DATA ANALYSIS
S
G
W
W
G
S
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


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


Velocity vs. Discharge
Velocity - ft/sec
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
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
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
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:	Abrams Creek
XS LOCATION:	60' downstream from road crossing
XS NUMBER:	1
DATE:	26-Jun-14
OBSERVERS:	J. Skinner, D. Graf
1/4 SEC:	NW
SECTION:	30
TWP:	5S
RANGE:	84W
PM:	Sixth
COUNTY:	Eagle
WATERSHED:	Eagle
DIVISION:	5
DOW CODE:	23414
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

TAPE WT:	0.0106
TENSION:	99999

*** NOTE ***
Leave TAPE WT and TENSION at defaults for data collected with a survey level and rod

CHANNEL PROFILE DATA

SLOPE:	0.077

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

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

STREAM NAME: Abrams Creek
XS LOCATION: 60' downstream from road crossing
XS NUMBER: 1

DATA POINTS= 26

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
1	S & G	0.00	3.80			0.00		0.00	0.00	0.0%
		4.60	5.60			0.00		0.00	0.00	0.0%
		6.80	6.60			0.00		0.00	0.00	0.0%
		11.60	6.30			0.00		0.00	0.00	0.0%
	W	11.70	6.57	0.00	0.00	0.00		0.00	0.00	0.0%
		12.00	6.80	0.15	0.88	0.38	0.15	0.05	0.04	2.5%
		12.30	6.80	0.15	0.78	0.30	0.15	0.05	0.04	2.3%
		12.60	6.70	0.10	0.39	0.32	0.10	0.03	0.01	0.8%
		12.90	6.75	0.15	0.88	0.30	0.15	0.05	0.04	2.5%
		13.20	6.75	0.15	0.03	0.30	0.15	0.05	0.00	0.1%
		13.50	6.95	0.25	1.48	0.36	0.25	0.08	0.11	7.1%
		13.80	6.95	0.20	2.52	0.30	0.20	0.06	0.15	9.7%
		14.10	6.95	0.20	1.82	0.30	0.20	0.06	0.11	7.0%
		14.40	6.90	0.40	2.35	0.30	0.40	0.12	0.28	18.1%
		14.70	7.05	0.30	2.68	0.34	0.30	0.09	0.24	15.5%
		15.00	6.85	0.30	2.36	0.36	0.30	0.09	0.21	13.7%
		15.30	6.95	0.30	1.93	0.32	0.30	0.09	0.17	11.2%
		15.60	6.80	0.25	1.06	0.34	0.25	0.08	0.08	5.1%
		15.90	6.70	0.10	0.00	0.32	0.10	0.03	0.00	0.0%
		16.20	6.70	0.10	2.26	0.30	0.10	0.03	0.07	4.4%
	W	16.50	6.57	0.00	0.00	0.33		0.00	0.00	0.0%
		17.20	6.10			0.00		0.00	0.00	0.0%
		18.50	5.45			0.00		0.00	0.00	0.0%
		20.90	4.90			0.00		0.00	0.00	0.0%
		23.00	4.60			0.00		0.00	0.00	0.0%
1	S & GL	27.50	3.65			0.00		0.00	0.00	0.0%
	TOTALS ----------					5.15	0.4 (Max.)	0.93	1.56	100.0%

Manning's n = 0.0787
Hydraulic Radius= 0.18044703

STREAM NAME: Abrams Creek
XS LOCATION: 60' downstream from road crossing
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.93	1.22	31.5%
6.32	0.93	3.19	242.6%
6.34	0.93	2.98	220.8%
6.36	0.93	2.79	199.8%
6.38	0.93	2.60	179.7%
6.40	0.93	2.42	160.4%
6.42	0.93	2.25	142.0%
6.44	0.93	2.09	124.5%
6.46	0.93	1.93	107.8%
6.48	0.93	1.79	92.0%
6.50	0.93	1.65	77.0%
6.52	0.93	1.52	63.0%
6.53	0.93	1.45	56.2%
6.54	0.93	1.39	49.7%
6.55	0.93	1.33	43.5%
6.56	0.93	1.28	37.4%
6.57	0.93	1.22	31.5%
6.58	0.93	1.17	25.9%
6.59	0.93	1.12	20.5%
6.60	0.93	1.07	15.3%
6.61	0.93	1.03	10.3%
6.62	0.93	0.98	5.3%
6.64	0.93	0.89	-4.5%
6.66	0.93	0.80	-14.2%
6.68	0.93	0.71	-23.8%
6.70	0.93	0.62	-33.2%
6.72	0.93	0.54	-41.6%
6.74	0.93	0.47	-49.4%
6.76	0.93	0.41	-56.3%
6.78	0.93	0.35	-62.5%
6.80	0.93	0.29	-68.3%
6.82	0.93	0.25	-73.3%

WATERLINE AT ZERO
AREA ERROR = 6.631

STREAM NAME: Abrams Creek
XS LOCATION: 60' downstream from road crossing
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	3.80	26.79	1.79	3.25	47.85	28.36	100.0%	1.69	355.17	7.42
	5.63	13.47	0.85	1.42	11.48	14.49	51.1%	0.79	51.51	4.49
	5.68	13.26	0.82	1.37	10.81	14.25	50.3%	0.76	47.11	4.36
	5.73	13.05	0.78	1.32	10.16	14.02	49.4%	0.72	42.90	4.22
	5.78	12.84	0.74	1.27	9.51	13.79	48.6%	0.69	38.88	4.09
	5.83	12.63	0.70	1.22	8.87	13.56	47.8%	0.65	35.03	3.95
	5.88	12.42	0.66	1.17	8.25	13.32	47.0%	0.62	31.37	3.80
	5.93	12.21	0.62	1.12	7.63	13.09	46.2%	0.58	27.88	3.65
	5.98	12.00	0.59	1.07	7.02	12.86	45.3%	0.55	24.59	3.50
	6.03	11.79	0.55	1.02	6.43	12.62	44.5%	0.51	21.48	3.34
	6.08	11.58	0.50	0.97	5.85	12.39	43.7%	0.47	18.55	3.17
	6.13	11.39	0.46	0.92	5.27	12.17	42.9%	0.43	15.80	3.00
	6.18	11.20	0.42	0.87	4.71	11.96	42.2%	0.39	13.24	2.81
	6.23	11.02	0.38	0.82	4.15	11.75	41.4%	0.35	10.86	2.62
	6.28	10.83	0.33	0.77	3.61	11.54	40.7%	0.31	8.69	2.41
	6.33	10.14	0.30	0.72	3.08	10.80	38.1%	0.28	6.97	2.27
	6.38	9.14	0.28	0.67	2.59	9.74	34.3%	0.27	5.62	2.17
	6.43	8.14	0.27	0.62	2.16	8.67	30.6%	0.25	4.48	2.07
	6.48	7.14	0.25	0.57	1.78	7.61	26.8%	0.23	3.54	1.99
	6.53	6.13	0.24	0.52	1.45	6.54	23.1%	0.22	2.78	1.92
	6.58	5.11	0.23	0.47	1.17	5.46	19.3%	0.21	2.18	1.87
WL	6.63	4.58	0.20	0.42	0.93	4.90	17.3%	0.19	1.61	1.73
	6.68	4.40	0.16	0.37	0.71	4.69	16.5%	0.15	1.04	1.48
	6.73	3.62	0.14	0.32	0.50	3.88	13.7%	0.13	0.68	1.34
	6.78	2.79	0.12	0.27	0.35	3.01	10.6%	0.12	0.43	1.24
	6.83	2.22	0.10	0.22	0.22	2.40	8.5%	0.09	0.24	1.08
	6.88	1.90	0.06	0.17	0.12	2.04	7.2%	0.06	0.10	0.79
	6.93	1.26	0.03	0.12	0.04	1.34	4.7%	0.03	0.02	0.49
	6.98	0.24	0.03	0.07	0.01	0.28	1.0%	0.03	0.00	0.51
	7.03	0.07	0.01	0.02	0.00	0.08	0.3%	0.01	0.00	0.21

STREAM NAME: Abrams Creek
XS LOCATION: 60' downstream from road crossing
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.56	cfs
CALCULATED FLOW (Qc)=	1.61	cfs
(Qm-Qc)/Qm * 100 =	-3.4	%
MEASURED WATERLINE (WLm)=	6.57	ft
CALCULATED WATERLINE (WLc)=	6.63	ft
(WLm-WLc)/WLm * 100 =	-0.9	%
MAX MEASURED DEPTH (Dm)=	0.40	ft
MAX CALCULATED DEPTH (Dc)=	0.42	ft
(Dm-Dc)/Dm * 100	-4.8	%
MEAN VELOCITY=	1.73	ft/sec
MANNING'S N=	0.079	
SLOPE=	0.077	ft/ft
.4 * Qm =	0.6	cfs
2.5 * Qm=	3.9	cfs

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

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

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

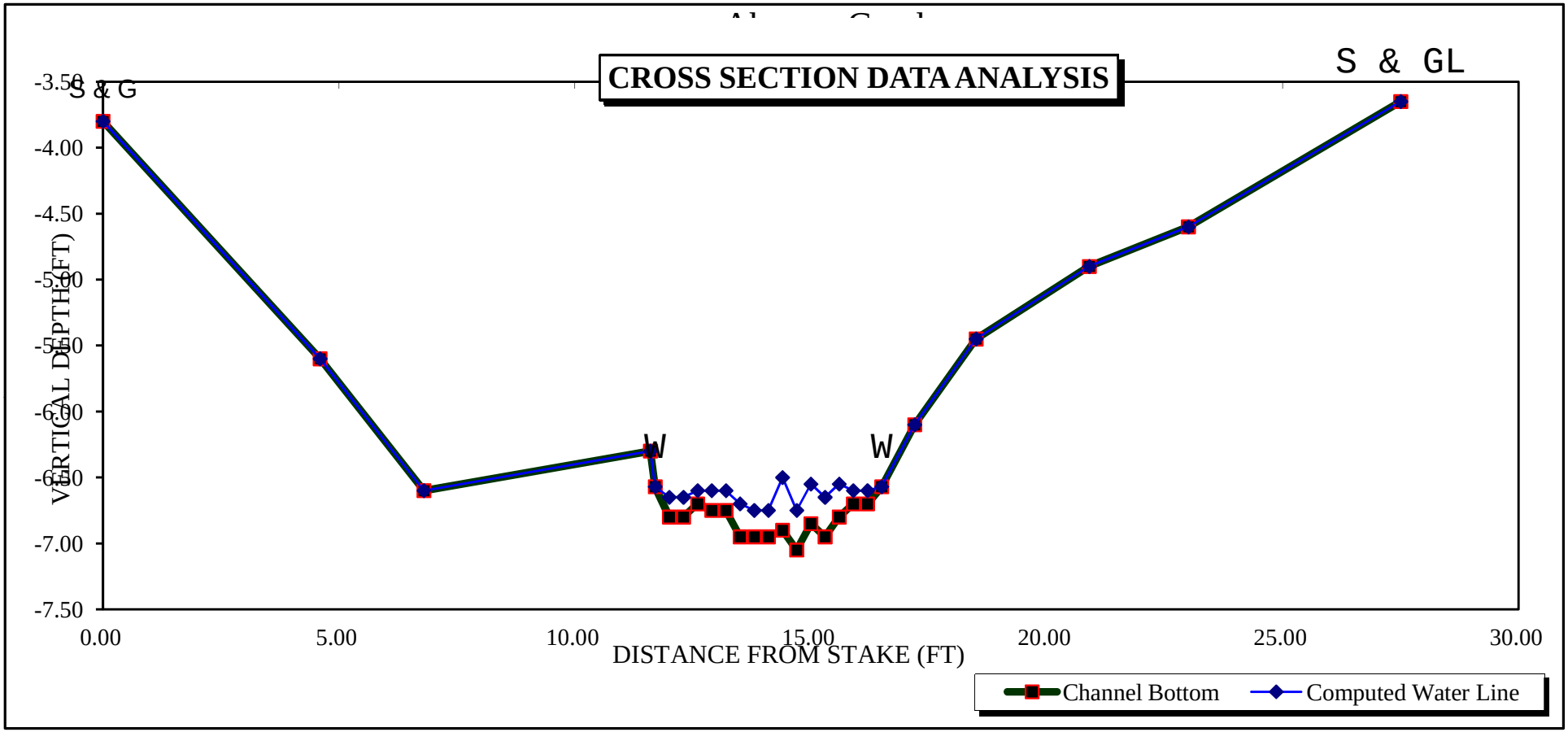
RECOMMENDATION BY: ………………...………..……............................. AGENCY..…………………….....……...…...……...... DATE:......…...…......……………

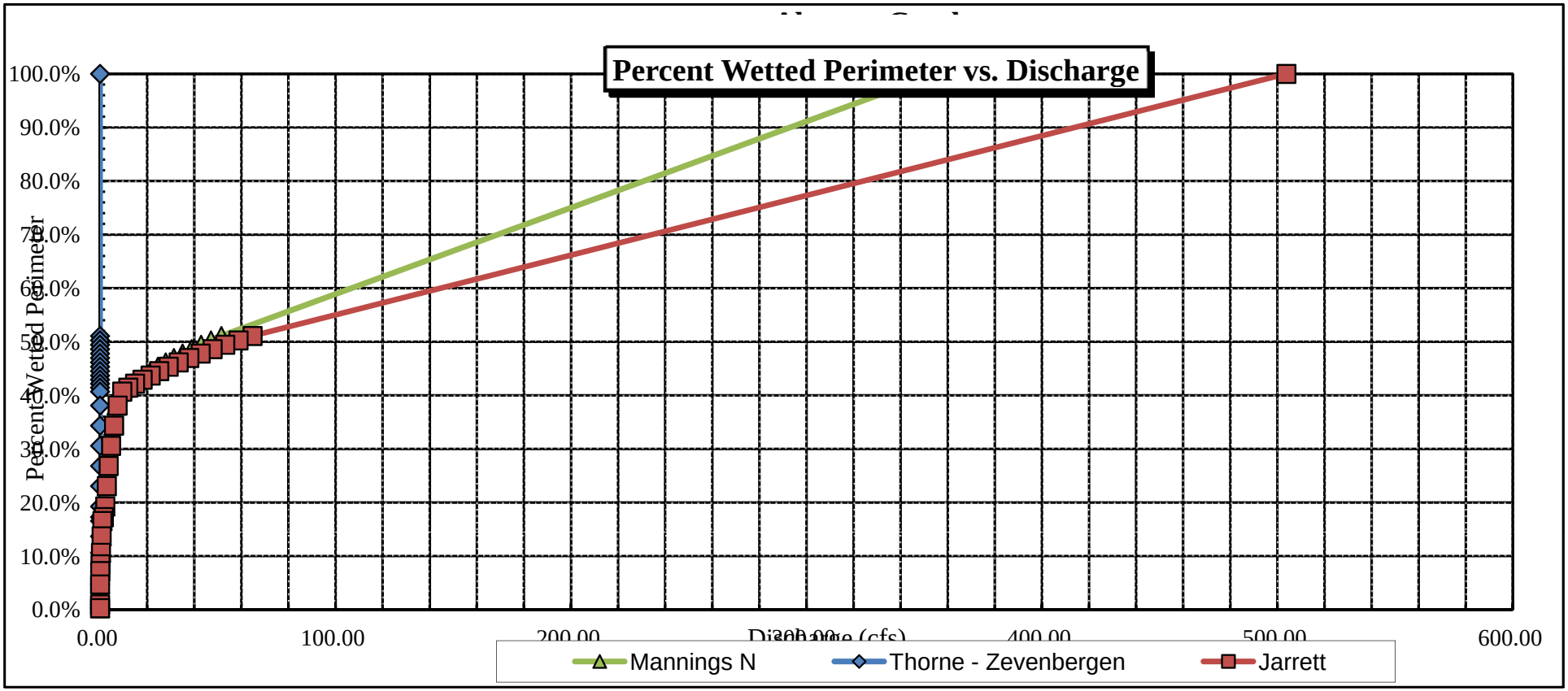
CWCB REVIEW BY: ..……………………….....……………………………………………...…............. DATE:.................…………….…

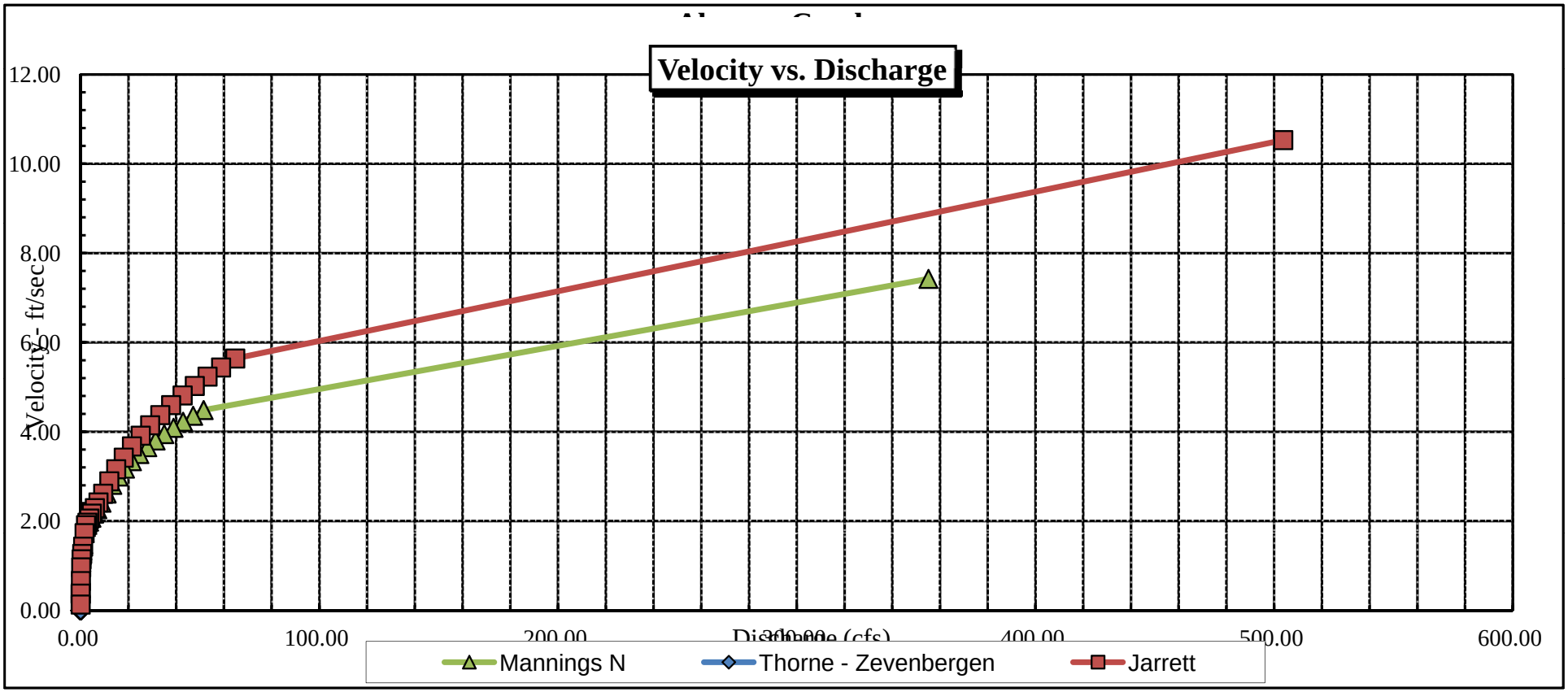
STREAM NAME: Abrams Creek
XS LOCATION: 60' downstream from road crossing
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

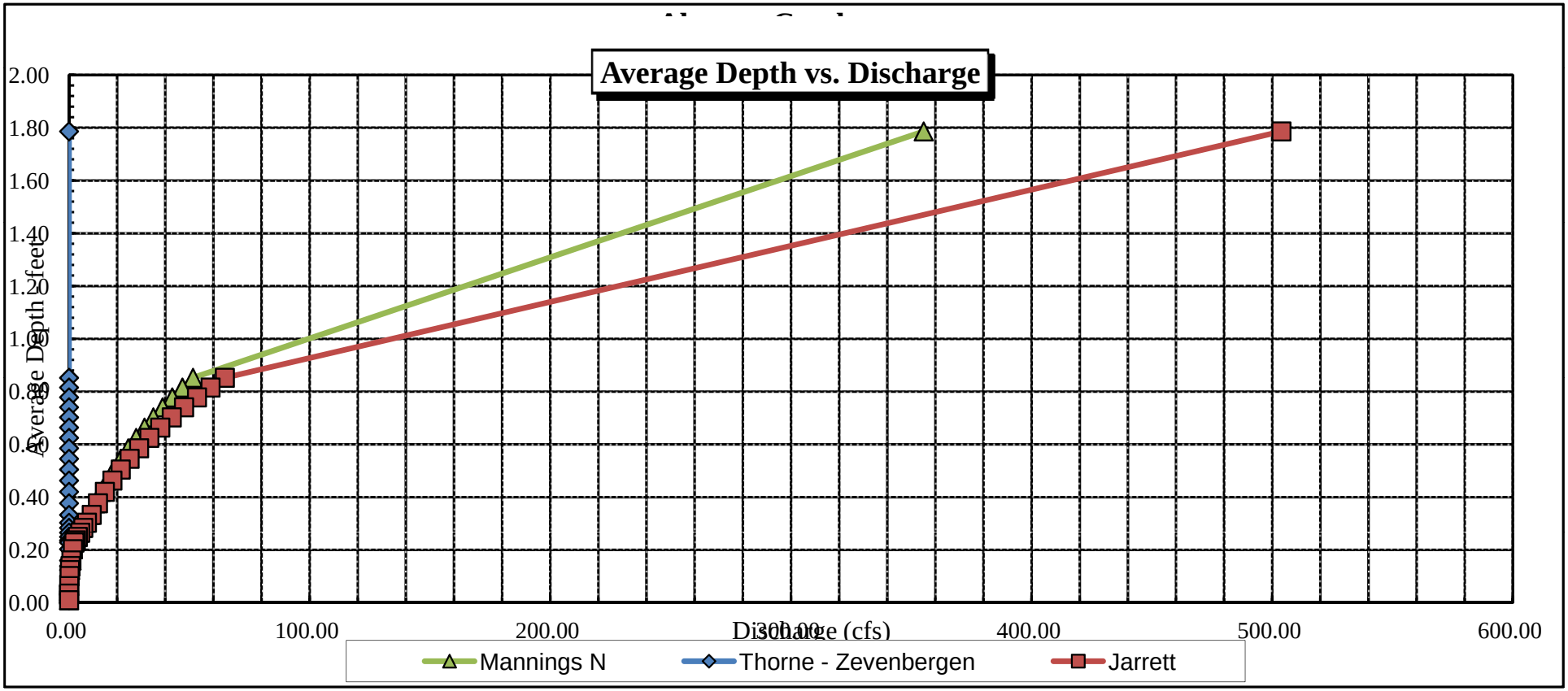
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

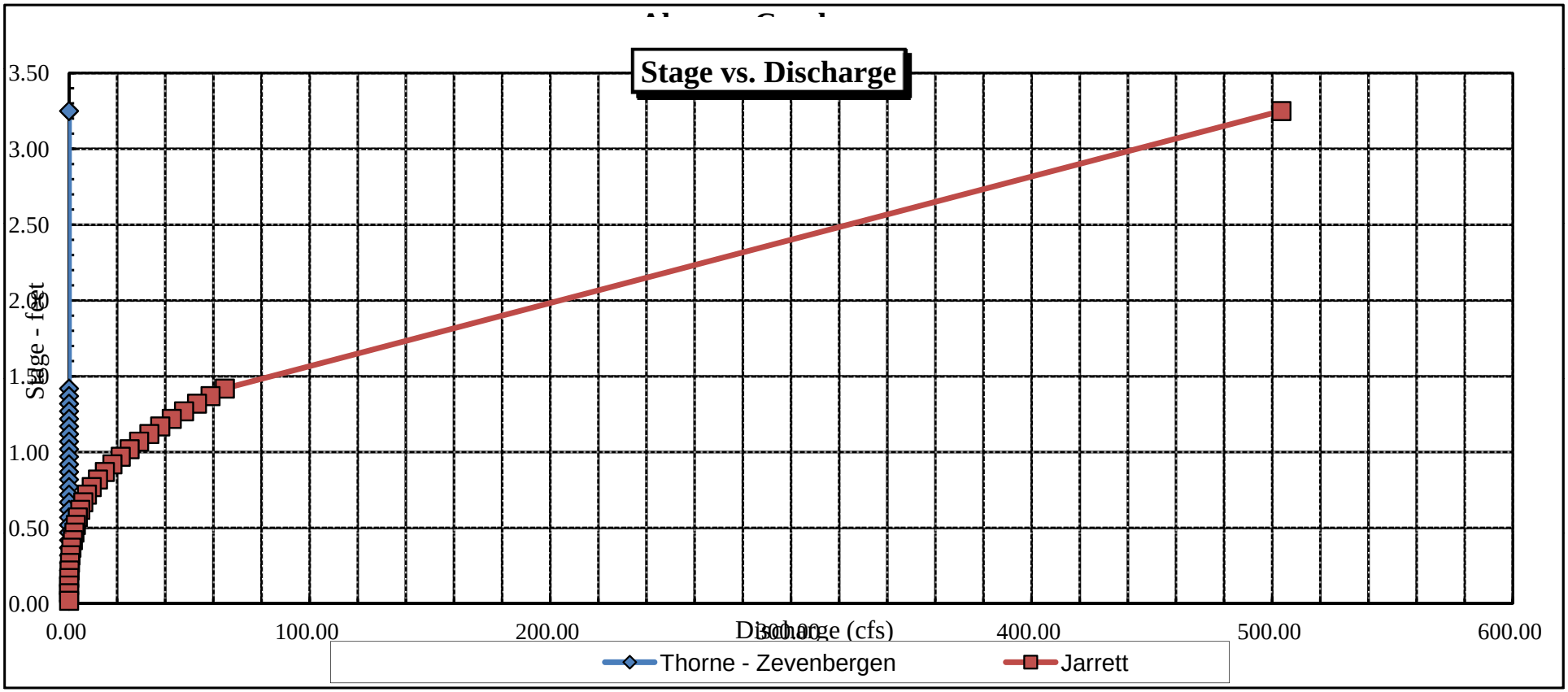
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	3.80	26.79	1.79	3.25	47.85	28.36	100.0%	1.69	503.82	10.53
	5.63	13.47	0.85	1.42	11.48	14.49	51.1%	0.79	64.75	5.64
	5.68	13.26	0.82	1.37	10.81	14.25	50.3%	0.76	58.81	5.44
	5.73	13.05	0.78	1.32	10.16	14.02	49.4%	0.72	53.16	5.23
	5.78	12.84	0.74	1.27	9.51	13.79	48.6%	0.69	47.79	5.03
	5.83	12.63	0.70	1.22	8.87	13.56	47.8%	0.65	42.70	4.81
	5.88	12.42	0.66	1.17	8.25	13.32	47.0%	0.62	37.90	4.60
	5.93	12.21	0.62	1.12	7.63	13.09	46.2%	0.58	33.37	4.37
	5.98	12.00	0.59	1.07	7.02	12.86	45.3%	0.55	29.12	4.15
	6.03	11.79	0.55	1.02	6.43	12.62	44.5%	0.51	25.15	3.91
	6.08	11.58	0.50	0.97	5.85	12.39	43.7%	0.47	21.46	3.67
	6.13	11.39	0.46	0.92	5.27	12.17	42.9%	0.43	18.03	3.42
	6.18	11.20	0.42	0.87	4.71	11.96	42.2%	0.39	14.88	3.16
	6.23	11.02	0.38	0.82	4.15	11.75	41.4%	0.35	12.00	2.89
	6.28	10.83	0.33	0.77	3.61	11.54	40.7%	0.31	9.41	2.61
	6.33	10.14	0.30	0.72	3.08	10.80	38.1%	0.28	7.44	2.42
	6.38	9.14	0.28	0.67	2.59	9.74	34.3%	0.27	5.94	2.29
	6.43	8.14	0.27	0.62	2.16	8.67	30.6%	0.25	4.68	2.17
	6.48	7.14	0.25	0.57	1.78	7.61	26.8%	0.23	3.66	2.06
	6.53	6.13	0.24	0.52	1.45	6.54	23.1%	0.22	2.84	1.96
	6.58	5.11	0.23	0.47	1.17	5.46	19.3%	0.21	2.22	1.91
WL	6.63	4.58	0.20	0.42	0.93	4.90	17.3%	0.19	1.61	1.73
	6.68	4.40	0.16	0.37	0.71	4.69	16.5%	0.15	1.01	1.43
	6.73	3.62	0.14	0.32	0.50	3.88	13.7%	0.13	0.64	1.26
	6.78	2.79	0.12	0.27	0.35	3.01	10.6%	0.12	0.40	1.14
	6.83	2.22	0.10	0.22	0.22	2.40	8.5%	0.09	0.22	0.96
	6.88	1.90	0.06	0.17	0.12	2.04	7.2%	0.06	0.08	0.66
	6.93	1.26	0.03	0.12	0.04	1.34	4.7%	0.03	0.01	0.37
	6.98	0.24	0.03	0.07	0.01	0.28	1.0%	0.03	0.00	0.38
	7.03	0.07	0.01	0.02	0.00	0.08	0.3%	0.01	0.00	0.13


CROSS SECTION DATA ANALYSIS
S & G
S & GL
W
W
-3.50
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
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
100.00
200.00
400.00
500.00
600.00
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Velocity - ft/sec
0.00
100.00
200.00
300.00
400.00
500.00
600.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth (feet)
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
100.00
200.00
300.00
400.00
500.00
600.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Stage - feet
0.00
100.00
200.00
300.00
400.00
500.00
600.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Abrams Creek					CROSS-SECTION NO.: 4	
CROSS-SECTION LOCATION: 750 ft. downstream from JPO Ditch Diversion						
DATE: 7-1-13	OBSERVERS: R. Smith, P. Adams					
LEGAL DESCRIPTION	¼ SECTION: NW	SECTION: 30	TOWNSHIP: 5 (N/S)	RANGE: 84 (E/W)	PM: Sixth	
COUNTY: Eagle	WATERSHED: Eagle River	WATER DIVISION: 5	DOW WATER CODE: 23414			
MAP(S): USGS:						
USFS:						

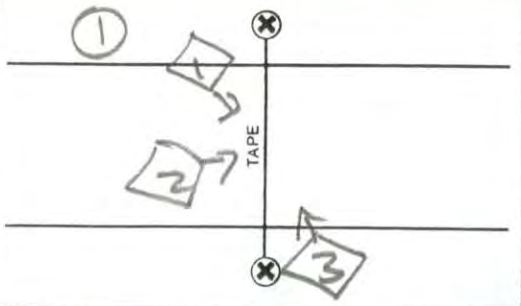
SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(X) Tape @ Stake LB	0.0	surveyed
(X) Tape @ Stake RB	0.0	surveyed
(1) WS @ Tape LB/RB 5.1 / 1.3	0.0	6.75 / 6.75
(2) WS Upstream	45.0	3.92
(3) WS Downstream	19.0	8.46
SLOPE	4.54 / 64.0 = .071	

SKETCH



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

AQUATIC SAMPLING SUMMARY

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

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

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

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

COMMENTS

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Abrams Creek	CROSS-SECTION NO.: 4	DATE: 7-1-13	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 3:11 pm

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	0.0		5.34								
G	0.5		6.14								
	1.2		6.22								
W	1.3		6.75								
	1.6		6.95	.2				.04			
	1.9		6.95	.2				.92			
	2.2		7.05	.3				1.07			
	2.5		7.05	.3				1.07			
	2.8		6.95	.2				1.60			
	3.1		6.95	.2				.86			
	3.4		6.95	.2				1.39			
	3.7		6.95	.2				Ø			
	4.0		6.95	.2				.34			
	4.3		7.00	.25				.65			
	4.6		6.95	.20				.57			
	4.9		6.90	.15				.21			
W	5.1		6.75								
	5.2		6.30								
G	5.6		6.22								
LS	9.0		6.00								
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: Abrams Creek						CROSS-SECTION NO.: 3	
CROSS-SECTION LOCATION: 700 ft. downstream from JPO Ditch Diversion							
DATE: 7-1-13	OBSERVERS: R. Smith, P. Adams						
LEGAL DESCRIPTION	¼ SECTION: NW	SECTION: 30	TOWNSHIP: 5 N/S	RANGE: 84 E/W	PM: Sixth		
COUNTY: Eagle	WATERSHED: Eagle River	WATER DIVISION: 5	DOW WATER CODE: 23414				
MAP(S): USGS:	GPS Zone 13 340407						
USFS:	4383857						

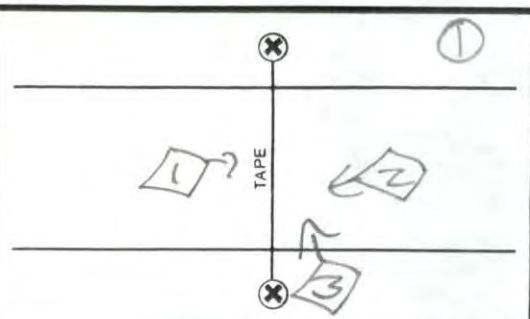
SUPPLEMENTAL DATA

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 19.70	0.0	5.30 / 5.30
② WS Upstream	25.0	3.92
③ WS Downstream	39.0	5.46
SLOPE	4.54 / 64.0 = .071	

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:
caddisfly, mayfly

COMMENTS

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Abrams Creek	CROSS-SECTION NO.:	DATE: 7-1-13	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 2:40 pm

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		3.40								
	1.5		4.45								
G	1.8		4.85								
W	1.9		5.30								
	2.2		5.50	.2				Ø			
	2.5		5.50	.2				Ø			
	2.8		5.45	.15				Ø			
	3.1		5.45	.15				.16			
	3.4		5.45	.15				.67			
	3.7		5.50	.20				1.20			
	4.0		5.40	.10				.73			
	4.3		5.50	.20				.49			
	4.6		5.50	.20				.09			
	4.9		5.55	.25				1.54			
	5.2		5.55	.25				1.40			
	5.5		5.60	.30				.91			
	5.8		5.60	.30				.44			
	6.1		5.60	.30				.46			
	6.4		5.60	.30				.12			
	6.7		5.50	.20				Ø			
W	7.0		5.30								
G	7.1		4.70								
	10.0		4.64								
RS	15.6		3.60								
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: Abrams Creek						CROSS-SECTION NO.: 2	
CROSS-SECTION LOCATION: 200' upstream from IPO Ditch Diversion							
DATE: 7-1-13	OBSERVERS: R. Smith, P. Adams						
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 30	TOWNSHIP: 5 (N/S)	RANGE: 84 (E/W)	PM: 6th		
COUNTY: Eagle	WATERSHED: Eagle River	WATER DIVISION: 5	DOW WATER CODE: 23414				
MAP(S): USGS:	GPS Zone 13 340193						
USFS:	4383458						

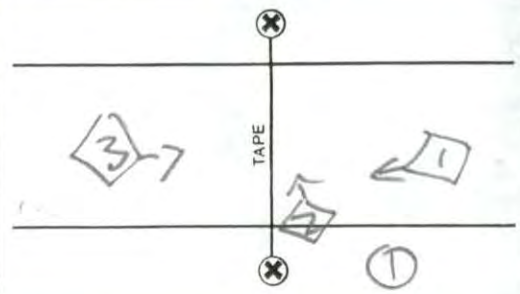
SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB 6/3/14	0.0	6.35 / 6.35
② WS Upstream	16.5	5.08
③ WS Downstream	35.5	8.50
SLOPE	3.42 / 52.0 = .066	

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

Riparian = Maple, Willow, Doug fir. - but mostly forbs & grasses

FORM #ICE FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Abrams Creek	CROSS-SECTION NO.: 2	DATE: 7-1-13	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 1:50 pm

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		4.57								
	1.5		5.17								
G	2.7		5.84								
	4.0		6.15								
	5.5		6.12								
W	6.5		6.35								
	6.8		6.40	.05				ϕ			
	7.1		6.40	.05				ϕ			
	7.4		6.50	.15				ϕ			
	7.7		6.55	.20				ϕ			
	8.0		6.60	.25				ϕ			
	8.3		6.50	.15				.07			
	8.6		6.60	.25				.69			
	8.9		6.65	.30				1.63			
	9.2		6.65	.30				1.33			
	9.5		6.70	.35				.77			
	9.8		6.65	.30				1.07			
	10.1		6.65	.30				.62			
	10.4		6.65	.30				1.20			
	10.7		6.65	.30				.52			
	11.0		6.70	.35				.48			
	11.3		6.60	.25				.64			
	11.6		6.55	.20				1.20			
	11.9		6.65	.30				.54			
	12.2		6.55	.20				ϕ			
	12.5		6.50	.15				ϕ			
	12.8		6.40	.05				ϕ			
W	13.2		6.35								
G	13.9		5.78								
	15.0		5.00								
RS	16.8		3.85								
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: Abrams Creek | CROSS-SECTION NO.: 1

CROSS-SECTION LOCATION: 300' upstream from IPO Ditch headgate.

DATE: 7-1-13 | OBSERVERS: R. Smith, P. Adams

LEGAL DESCRIPTION | ¼ SECTION: SW | SECTION: 30 | TOWNSHIP: 5 N/S | RANGE: 84 E/W | PM: 6th

COUNTY: Eagle | WATERSHED: Eagle R. | WATER DIVISION: 5 | DOW WATER CODE: 23414

MAP(S): USGS: GPS Zone 13S 340163 | USFS: 4383411

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO | METER TYPE: M-M

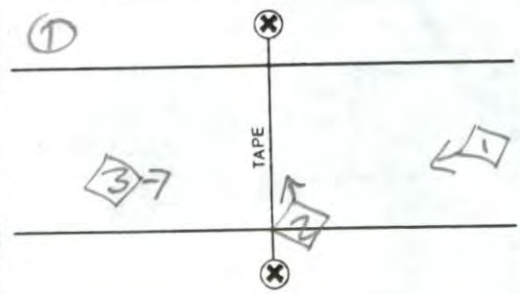
METER NUMBER: | DATE RATED: | CALIB/SPIN: ____ sec | TAPE WEIGHT: surveyed ____ lbs/foot | TAPE TENSION: surveyed ____ lbs

CHANNEL BED MATERIAL SIZE RANGE: gravel to 1-foot boulders | PHOTOGRAPHS TAKEN: (YES)/NO | NUMBER OF PHOTOGRAPHS: 3

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	4.70 / 4.70
② WS Upstream	22.0	1.54
③ WS Downstream	34.5	6.68
SLOPE	5.14/57.5 = .089	

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

pH =
Salinity = 182 µs
Temp = 11.1° C
Salinity = 0.1 ppt

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Abrams Creek	CROSS-SECTION NO: 1	DATE: 7-1-13	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME 1 pm

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		2.98								
	1.0		3.32								
G	3.0		4.16								
	4.0		4.47								
W	4.8		4.70								
	5.1		4.95	.25				.22			
	5.4		4.90	.20				.44			
	5.7		4.95	.25				.54			
	6.0		4.90	.20				.53			
	6.3		4.90	.20				.83			
	6.6		4.95	.25				1.40			
	6.9		4.95	.25				1.47			
	7.2		5.10	.40				1.16			
	7.5		4.95	.25				1.07			
	7.8		4.85	.15				.77			
	8.1		5.05	.35				.42			
	8.4		5.00	.30				.25			
	8.7		5.05	.35				1.24			
	9.0		4.90	.20				.62			
	9.3		4.70	∅				∅			
	9.6		4.75	.05				∅			
W	10.0		4.70								
G	10.2		4.10								
	11.6		3.75								
RS	12.1		2.59								
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: ABRAMS						CROSS-SECTION NO.: 3	
CROSS-SECTION LOCATION: 0.4 MI DIS OF X-S #2							
DATE: 6-26-14	OBSERVERS: J. Skinner, D. Graf						
LEGAL DESCRIPTION	¼ SECTION: NE	SECTION: 20	TOWNSHIP: 5 N/S	RANGE: 84 E/W	PM: 6th		
COUNTY: Eagle	WATERSHED: Eagle	WATER DIVISION: 5	DOW WATER CODE:				
MAP(S): USGS:				N 4385642			
USFS:				E 342638			

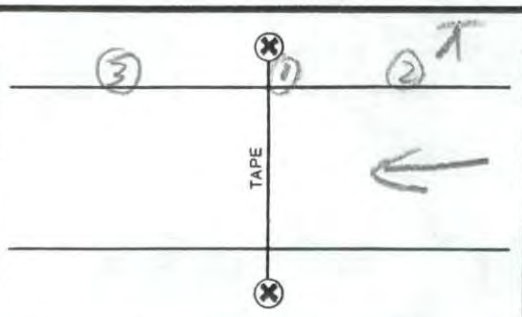
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO	METER TYPE:			
METER NUMBER:	DATE RATED:	CALIB/SPIN: _____ sec	TAPE WEIGHT: _____ lbs/foot	TAPE TENSION: _____ lbs
CHANNEL BED MATERIAL SIZE RANGE:	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	
⊗ Tape @ Stake RB	0.0	
① WS @ Tape LB/RB	0.0	7.89
② WS Upstream	7.1	7.69
③ WS Downstream	7.4	8.08
SLOPE	0.39 / 14.5 = 0.029	

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 #105-ED-1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME:	CROSS-SECTION NO.:	DATE: /	SHEET ___ OF ___

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: ____ ft	TIME: 1400

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 (ft²)	Discharge (cfs)
5.5	S		5.65								
6.8			5.85								
7.1			6.45								
7.8	BF		6.80								
8	WL		7.89	0							
8.1			8.20	.3				0			
8.3			8.25	.3				1.59			
.6			8.20	.35				1.35			
.9			8.15	.4				2.26			
9.2			8.20	.35				2.45			
.5			8.20	.3				2.78			
.8			8.20	.35				2.99			
10.1			8.20	.3				2.89			
10.4			8.10	.25				2.43			
10.5	W		7.89	0							
10.6			6.65								
11			6.40								
11.7	BF		6.85								
12.2			5.80								
13			5.45								
TOTALS:											

3 Photos on Grif's Camera

End of Measurement	Time: 1415	Gage Reading: ____ ft	CALCULATIONS PERFORMED BY:	CALCULATIONS CHECKED BY:

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO WATER CONSERVATION BOARD

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: ABRAMS 11						CROSS-SECTION NO.: 2	
CROSS-SECTION LOCATION: 2000' D/S ROAD XING							
DATE: 6-26-14	OBSERVERS: J. Skinner, D. Graf						
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 20	TOWNSHIP: 5 N/(S)	RANGE: 84 E/(W)	PM: 6th		
COUNTY: Eagle	WATERSHED: Eagle		WATER DIVISION: 5		DOW WATER CODE:		
MAP(S):	USGS:				N 4385042.		
	USFS:				E 341740.		

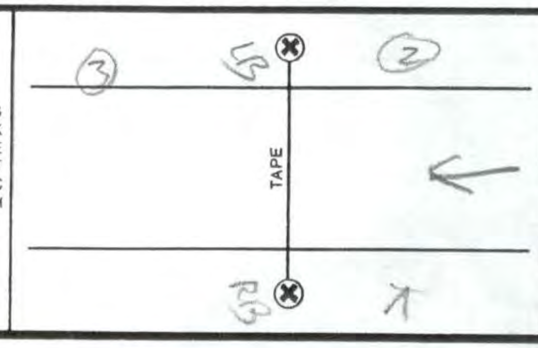
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO	METER TYPE:			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: ____ lbs/foot	TAPE TENSION: ____ lbs
CHANNEL BED MATERIAL SIZE RANGE:		PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS:	

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(X) Tape @ Stake LB	0.0	—
(X) Tape @ Stake RB	0.0	—
(1) WS @ Tape LB/RB	0.0	6.88 / 6.83
(2) WS Upstream	6.9	6.43
(3) WS Downstream	6.5	7.30
SLOPE	0.87 / 13.9 = 0.063	

SKETCH



LEGEND:
Stake (X)
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

DISCHARGE/CROSS SECTION NOTES

STREAM NAME:	CROSS-SECTION NO.:	DATE:	SHEET ___ OF ___

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: ____ ft	TIME: 1305

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 (ft²)	Discharge (cfs)
S	0		5.45								
	3.3		6.15								
	5.8		6.00								
GL	8.8		6.00								
	10.7		6.10								
	11.7		6.60								
WL	12		6.86	0							
	12.3		6.95	.15				2.91			
	.6		7.00	.2				2.73			
	.9		7.35	.5				1.27			
	13.2		7.30	.5				1.23			
	.5		7.25	.4				1.58			
	.8		7.20	.4				.68			
	14.1		7.20	.35				.56			
	.4		7.15	.2				.44			
	.7		7.15	.3				.85			
	15		7.15	.3				.88			
	.3		7.05	.25				.90			
	.6		6.95	.10				1.57			
	.9		7.05	.10				.2			
	16.2		7.00	.15				1.36			
WL	16.5		6.86	0							
	16.7		6.60								
	17.5		6.25								
	18.8		5.70								
GL	21.3		5.45								
S	23.3		5.15								
TOTALS:											

3 Photos on Grab Camera

End of Measurement	Time: 1325	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: ABRAMS							CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: 60' D/S ROAD XING							
DATE: 26 JUL 14	OBSERVERS: ROBINSON SKINNER GRAF (JV)						
LEGAL DESCRIPTION	¼ SECTION: NW	SECTION: 30	TOWNSHIP: 5 N/S	RANGE: 84 E/W	PM: 6th		
COUNTY: Eagle	WATERSHED: Eagle	WATER DIVISION: 5	DOW WATER CODE:				
MAP(S):	USGS: 0	UTM: N 438392.65					
	USFS:	E 340515.06					

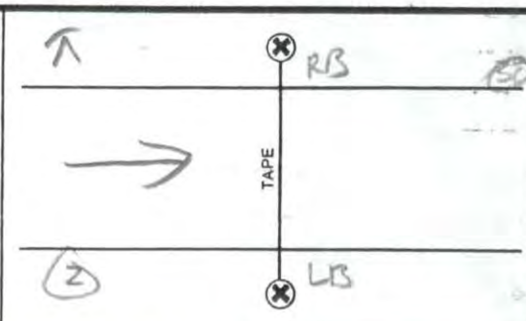
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES/NO	METER TYPE: Mc/sh McB			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: ____ lbs/foot	TAPE TENSION: ____ lbs
CHANNEL BED MATERIAL SIZE RANGE:	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS:		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	
⊗ Tape @ Stake RB	0.0	
(1) WS @ Tape LB/RB	0.0	6.46 / 6.68
(2) WS Upstream	11.6	5.61
(3) WS Downstream	6.7	7.02
SLOPE	1.41 / 18.3 = 0.077	

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

DISCHARGE/CROSS SECTION NOTES

STREAM NAME:	CROSS-SECTION NO.:	DATE:	SHEET ___ OF ___

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: ______ ft	TIME: 1120

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 (ft²)	Discharge (cfs)
S GL	0		3.8								
	4.6		5.6								
	6.8		6.6								
	11.6		6.3								
WL	11.7		6.57	0							
	12		6.8	.15				.88			
	.3		6.8	.15				.78			
	.6		6.7	.1				.39			
	.9		6.75	.15				.88			
	13.2		6.75	.15				.03			
	.5		6.95	.25				1.48			
	.8		6.95	.2				2.52			
	14.1		6.95	.2				1.82			
	.4		6.9	.15				2.35			
	.7		7.05	.4				2.68			
	15		6.85	.3				2.36			
	.3		6.95	.3				1.93			
	.6		6.80	.25				1.06			
	.9		6.70	.1				0			
	16.2		6.70	.1				2.26			
WL	16.5		6.57	0							
	17.2		6.1								
	18.5		5.45								
	20.9		4.90								
	23		4.60								
S GL	27.5		3.65								
TOTALS:											

3 Photos on D Gr[illegible] camera

End of Measurement	Time: 1205	Gage Reading: ______ ft	CALCULATIONS PERFORMED BY:	CALCULATIONS CHECKED BY: