DRAFT INSTREAM FLOW RECOMMENDATION March 13, 2004 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 Alkali Creek, located in Water Division 4.

Location and Land Status. Alkali Creek originates at the southern end of Grand Mesa near Point Peninsula, approximately eleven miles northwest of Delta. This recommendation covers the stream reach that begins at the headwaters and extends downstream to the headgate of the Lone Starr Ditch. This stream reach covers a distance of approximately 4.5 miles. The BLM and U.S. Forest Service manage the entire reach.

Biological Summary. Alkali Creek is a cold-water, high gradient stream in a narrow canyon. The stream is confined by bedrock in many locations. The stream generally has small to moderate sized substrate, consisting of sands, gravels, and cobbles. Pool habitat is abundant because of the step-pool nature of the stream morphology, but riffle habitat is limited.

Fisheries surveys have revealed a self-sustaining population of native cutthroat trout, possibly of high genetic quality. The BLM has taken fin samples from the fish population and is awaiting genetic analysis results. Intensive macro-invertebrate surveys have not been conducted, but spot samples have revealed various species of mayfly, caddisfly, and stonefly.

The riparian community along Alkali Creek at higher elevations is comprised of red osier dogwood, equisetum, currant, and sedges/rushes. At lower elevations, the riparian community is comprised of willow, alder, and narrowleaf cottonwood. The riparian community along the creek is narrow in width because of the steep gradient and canyon walls, and limited alluvial soils. Some portions of the lower riparian area are recovering from historic grazing practices. The robust riparian community creates good cover and shading for fish habitat purposes.

R2Cross Analysis. BLM collected the following R2Cross data from Alkali Creek:

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (meets 3 of 3 hydraulic criteria)
05/16/2013 #1	3.22 cfs	5.0 feet	Out of range	1.30 cfs
05/16/2013 #2	3.68 cfs	9.3 feet	Out of range	2.55 cfs
08/15/2013 #1	0.95 cfs	8.3 feet	0.51 cfs	Out of range
08/15/2013 #2	0.83 cfs	7.0 feet	0.82 cfs	2.00 cfs

Averages:	0.67 cfs	1.95 cfs

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

> 1.9 cubic feet per second is recommended for the snowmelt runoff and early summer period from May 1 through August 15. This recommendation is driven by the average velocity criteria. This creek experiences consistently low flows during late summer and fall, so it is important to protect as much physical habitat as possible during the limited time when snowmelt runoff and growing season flows are available. This flow rate is capable of maintaining pool habitat in the creek and preventing excessively water high temperatures.
>
> 0.65 cubic feet per second is recommended for the late summer, fall, and winter period from August 16 to April 30. This recommendation is driven the average depth and wetted perimeter criteria. This flow rate should provide sufficient flow to prevent pools from freezing and protect overwintering fish.

Water Availability. The BLM is not aware of any historic gage data on Alkali Creek, but there are other sources of potentially useful data.

The BLM notes that there is approximately 10 years of historic gage data available from a gage on Dirty George Creek, located approximately eight miles to the northeast. Dirty George Creek has similar elevation, aspect, and weather patterns to Alkali Creek. It is important to note, however, that the gage data is likely influenced by historical reservoir releases from Granby Reservoirs. With this in mind, data during the late irrigation season, from July through October, may not be usable.

The Lone Star Ditch typically diverts the entire flow of the creek at its headgate. However, no diversion records exist for this ditch because it is the only water right on the creek, and it is not subject to being called out by other rights because Alkali Creek does not form a connection with the Gunnison River. However, the water commissioner may be able to confirm that the ditch consistently diverts throughout thegrowing season. It is also important to note that the creek provides sufficiently reliable flows that enable the ditch to be used to fill a reservoir during the non-irrigation season.

In developing this recommendation, the BLM also consulted StreamStats package developed jointly between the U.S. Geological Survey and the CWCB. While the package is useful for developing flow estimates, it is not capable of considering unique hydrologic and geological features associated with individual streams. The BLM notes that a very high percentage of the flow in Alkali Creek is from a large spring located in Alkali Basin. For this reason, the BLM believes that the flow estimates provided by Streamstats are too low during the baseflow season from mid-August through April.

The only decreed water right is this reach is the Lone Starr Ditch, which BLM is recommending as the downstream terminus for the instream flow water right. The water right is decreed for 6.5 cfs with a 1908 priority date.

Relationship to Land Management Plans. BLM land use plans for this area call for actions to maintain and enhance riparian and fisheries habitat. In general, any proposed new land use, such as right-of-way corridors or mineral development, must be implemented with no surface occupancy to avoid impacts to the creek. Any proposed land uses along this creek are also carefully reviewed and mitigated to prevent impacts to native cutthroat trout, which appear on BLM's sensitive species list. Establishing an instream flow water right would assist in meeting these objectives.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2014. We thank both Colorado Parks and Wildlife and the Colorado Water Conservation Board for their cooperation in this effort.

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

Sincerely,

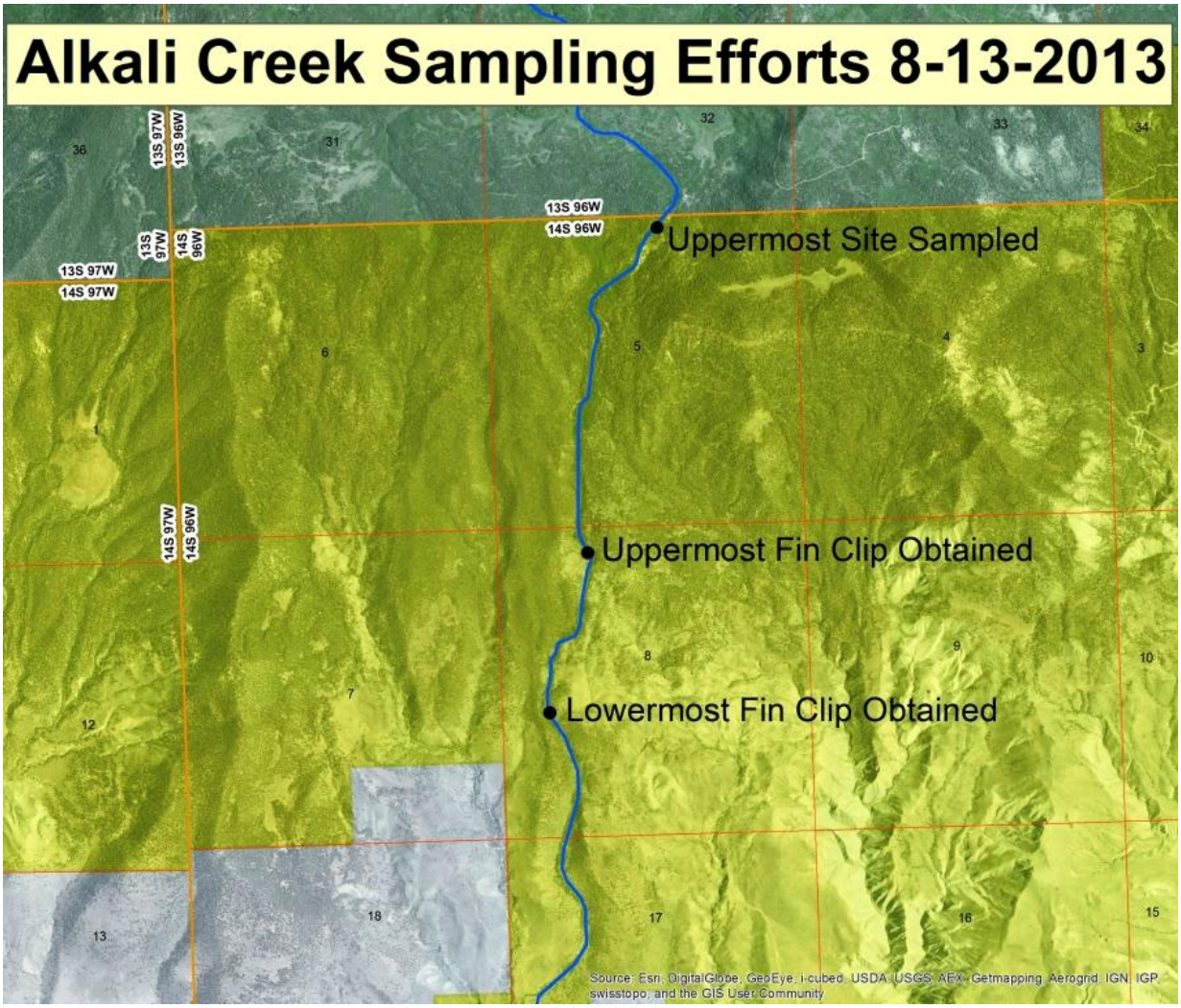
Leigh Espy
Deputy State Director
Resources and Fire

Cc: Barb Sharrow, Uncompahgre FO
Jedd Sondergard, Uncompahgre FO
Lori Armstrong, Southwest District Office

Uncompahgre Field Office Stream Surveys
August 2013

Alkali Creek - Water Code # 37968

Alkali Creek, located northeast of Delta, Colorado on BLM lands managed by the Uncompahgre Field Office, was sampled on August 13, 2013. Alkali Creek is tributary to the Gunnison River. The stream was sampled to collect fin clips from resident cutthroat trout for genetic analysis and lineage identification, as well as determine upper and lower fish distribution limits. Sampling was conducted via threw crews, each with one backpack electro-shocker. Personnel present were Tom Fresques, Gregor Dekleva, and Ken Holsinger, BLM, Eric Gardunio and crew, CPW, and Mike Carrillo, USFS.



Alkali Creek

Representative pool habitat

Small waterfall possible fish movement barrier at some flows – upper distribution limit?

Cutthroat trout

Cutthroat trout

FISH SAMPLING DATA SUMMARY 2013

WATER Alkali Creek DATE 8/13/2013 GEAR Backpack Shocker - 1

EFFORT spot sampling ~ 1.500 ft. CREW Fresques, Dekleva – BLM, Eric Gardunio and crew CPW, Mike Carillo, USFS

Species	Length (mm)		Species	Length (mm)
CRN	140		CRN	135
CRN	147		CRN	154
CRN	164		CRN	148
CRN	139		CRN	151
CRN	156		CRN	160
CRN	145		CRN	143
CRN	156		CRN	141
CRN	128		CRN	159
CRN	250			

CRN = Cutthroat Trout

Notes: Stream Width Average 17 ft. Sample Reach Length 401 ft.

GPS Coordinates at start of sample reach: Zone 12S X: 746911 Y: 4303827

Discussion:
A total of 17 fin clips were collected from adult fish during this effort. Fish densities are low but well distributed throughout the sample reach. A population estimate was not completed at this time. The lower distribution limit of fish was not determined and it is possible that the fishery extends up to 1 mile further downstream to where the majority of flow is diverted at the Lone Starr Ditch. No fish were collected or seen at the upper sample site noted on the map.

The riparian area is narrow, but vegetation along the stream is lush and dense, and is comprised of horsetail, red osier dogwood, wolf current, sedges/rushes, water leaf, hemlock, and wood rose. The stream substrate is a mix of gravels, cobbles, and small boulders. Substrates are slightly embedded. The stream is a steep Rosgen A/B channel type with step pools, and a mix of riffles and swift runs. Large, deep pools are limited. Fish were concentrated primarily in the pools sampled. Mayflies, stoneflies, and caddisflies were among the aquatic insects observed. Water quality data was previously collected by UFO staff.

Recommendations:

- Await genetics results and discuss future management/sampling needs with CPW
- Complete a population estimate at a representative site or two
- Although planned, lower distribution was not entirely determined. Determine lower distribution limits of the cutthroat population
- Assess fish entrainment potential at the Lone Starr Ditch to determine if fish are entering/using the ditch system

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

LOCATION INFORMATION

STREAM NAME:	Alkali Creek
XS LOCATION:	1000' u/s from Lone Star Ditch headgate
XS NUMBER:	1
DATE:	15-Aug-13
OBSERVERS:	R. Smith, J. Sondergard
1/4 SEC:	NW NW
SECTION:	17
TWP:	14S
RANGE:	96W
PM:	Sixth
COUNTY:	Delta
WATERSHED:	Gunnison River
DIVISION:	4
DOW CODE:	37968
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:	0.042

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

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

STREAM NAME: Alkali Creek
XS LOCATION: 1000' u/s from Lone Star Ditch headgate
XS NUMBER: 1

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	4.56			0.00		0.00	0.00	0.0%
1	G	4.00	5.50			0.00		0.00	0.00	0.0%
		4.80	5.62			0.00		0.00	0.00	0.0%
	W	5.20	5.90	0.00	0.00	0.00		0.00	0.00	0.0%
		5.50	6.00	0.10	0.00	0.32	0.10	0.03	0.00	0.0%
		5.80	6.10	0.20	0.00	0.32	0.20	0.06	0.00	0.0%
		6.10	6.15	0.25	0.08	0.30	0.25	0.08	0.01	0.6%
		6.40	6.25	0.35	0.63	0.32	0.35	0.11	0.07	7.0%
		6.70	6.30	0.40	0.97	0.30	0.40	0.12	0.12	12.2%
		7.00	6.30	0.40	1.50	0.30	0.40	0.12	0.18	18.9%
		7.30	6.05	0.15	1.44	0.39	0.15	0.05	0.08	7.9%
		7.70	6.15	0.25	1.50	0.41	0.25	0.09	0.13	13.8%
		8.00	6.25	0.35	1.35	0.32	0.35	0.11	0.14	14.9%
		8.30	6.20	0.30	0.87	0.30	0.30	0.09	0.08	8.2%
		8.60	6.30	0.40	0.62	0.32	0.40	0.12	0.07	7.8%
		8.90	6.25	0.35	0.33	0.30	0.35	0.11	0.03	3.6%
		9.20	6.15	0.25	0.20	0.32	0.25	0.08	0.02	1.6%
		9.50	6.10	0.20	0.35	0.30	0.20	0.06	0.02	2.2%
		9.80	6.00	0.10	0.24	0.32	0.10	0.03	0.01	0.8%
		10.10	6.00	0.10	0.00	0.30	0.10	0.04	0.00	0.0%
		10.60	6.05	0.15	0.04	0.50	0.15	0.08	0.00	0.3%
	W	11.20	5.90	0.00	0.00	0.62		0.00	0.00	0.0%
1	G	13.00	5.60			0.00		0.00	0.00	0.0%
	RS	17.20	2.92			0.00		0.00	0.00	0.0%
	TOTALS ----------					6.26	0.4 (Max.)	1.36	0.95	100.0%

Manning's n = 0.1569
Hydraulic Radius= 0.21691999

STREAM NAME: Alkali Creek
XS LOCATION: 1000' u/s from Lone Star Ditch headgate
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.36	1.36	0.0%
5.65	1.36	3.09	127.6%
5.67	1.36	2.93	116.1%
5.69	1.36	2.78	104.9%
5.71	1.36	2.63	93.9%
5.73	1.36	2.48	83.0%
5.75	1.36	2.34	72.5%
5.77	1.36	2.20	62.1%
5.79	1.36	2.06	51.9%
5.81	1.36	1.93	42.0%
5.83	1.36	1.80	32.3%
5.85	1.36	1.67	22.8%
5.86	1.36	1.60	18.1%
5.87	1.36	1.54	13.5%
5.88	1.36	1.48	8.9%
5.89	1.36	1.42	4.4%
5.90	1.36	1.36	0.0%
5.91	1.36	1.30	-4.4%
5.92	1.36	1.24	-8.7%
5.93	1.36	1.18	-13.0%
5.94	1.36	1.12	-17.3%
5.95	1.36	1.07	-21.5%
5.97	1.36	0.95	-29.7%
5.99	1.36	0.85	-37.7%
6.01	1.36	0.74	-45.2%
6.03	1.36	0.65	-52.0%
6.05	1.36	0.57	-58.2%
6.07	1.36	0.49	-63.9%
6.09	1.36	0.42	-69.3%
6.11	1.36	0.35	-74.4%
6.13	1.36	0.29	-78.9%
6.15	1.36	0.23	-83.0%

WATERLINE AT ZERO
AREA ERROR = 5.900

STREAM NAME: Alkali Creek
XS LOCATION: 1000' u/s from Lone Star 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	5.60	8.33	0.42	0.70	3.49	8.71	100.0%	0.40	3.69	1.06
	5.60	8.33	0.42	0.70	3.49	8.71	100.0%	0.40	3.69	1.06
	5.65	7.86	0.39	0.65	3.09	8.21	94.4%	0.38	3.12	1.01
	5.70	7.49	0.36	0.60	2.71	7.82	89.9%	0.35	2.59	0.96
	5.75	7.11	0.33	0.55	2.34	7.43	85.4%	0.31	2.10	0.90
	5.80	6.74	0.30	0.50	1.99	7.04	80.9%	0.28	1.67	0.84
	5.85	6.37	0.26	0.45	1.67	6.65	76.4%	0.25	1.29	0.77
WL	5.90	6.00	0.23	0.40	1.36	6.26	71.9%	0.22	0.95	0.70
	5.95	5.65	0.19	0.35	1.07	5.89	67.7%	0.18	0.66	0.62
	6.00	5.00	0.16	0.30	0.79	5.23	60.1%	0.15	0.44	0.55
	6.05	4.00	0.14	0.25	0.57	4.20	48.3%	0.13	0.29	0.51
	6.10	3.44	0.11	0.20	0.38	3.60	41.4%	0.11	0.17	0.43
	6.15	2.58	0.09	0.15	0.23	2.71	31.1%	0.09	0.09	0.38
	6.20	2.07	0.06	0.10	0.11	2.16	24.8%	0.05	0.03	0.27
	6.25	1.11	0.03	0.05	0.04	1.14	13.1%	0.03	0.01	0.19
	6.30	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Alkali Creek
XS LOCATION: 1000' u/s from Lone Star Ditch headgate
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.95	cfs
CALCULATED FLOW (Qc)=	0.95	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	5.90	ft
CALCULATED WATERLINE (WLc)=	5.90	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=	0.70	ft/sec
MANNING'S N=	0.157	
SLOPE=	0.042	ft/ft
.4 * Qm =	0.4	cfs
2.5 * Qm=	2.4	cfs

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

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

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

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

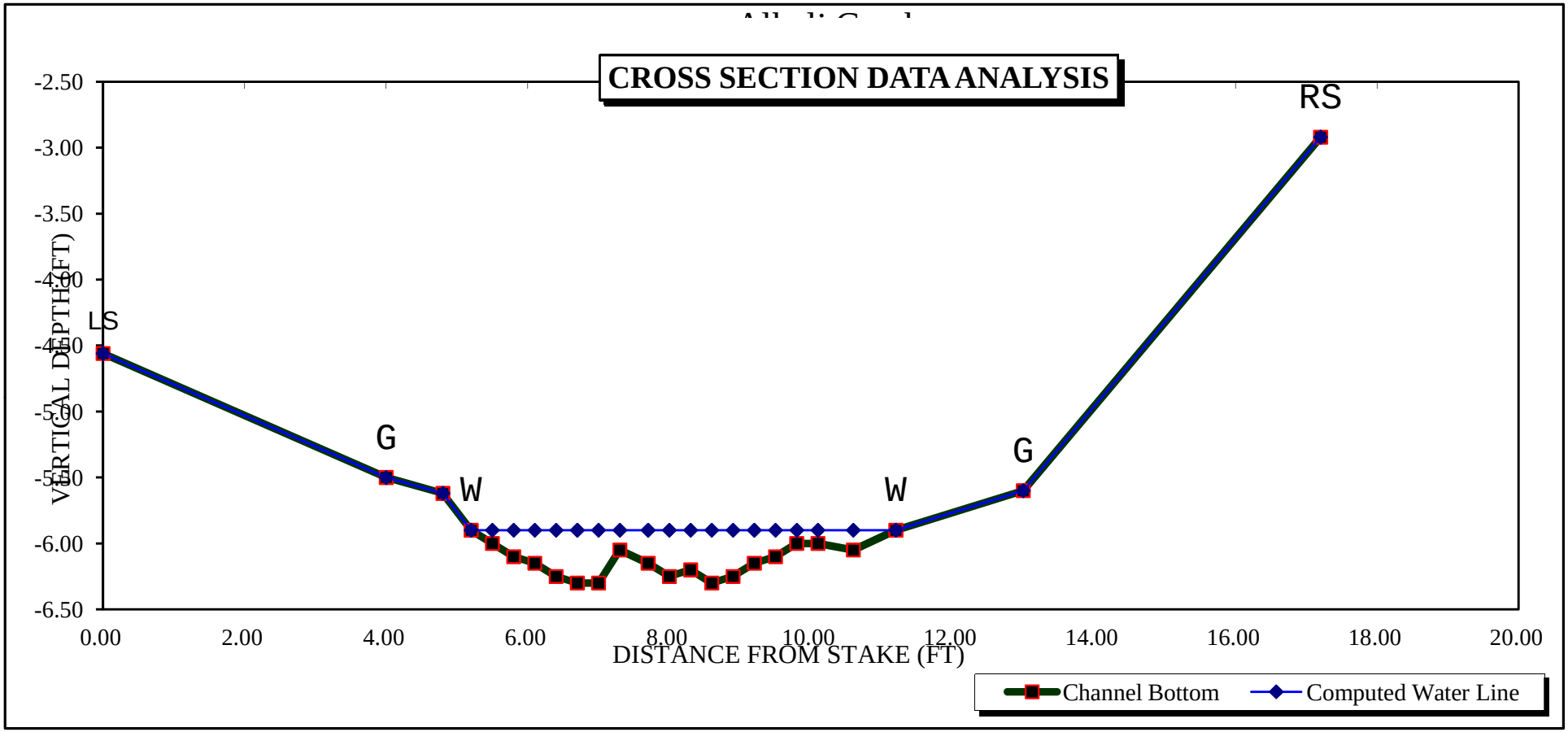
RECOMMENDATION BY: ..... AGENCY..... DATE:.....

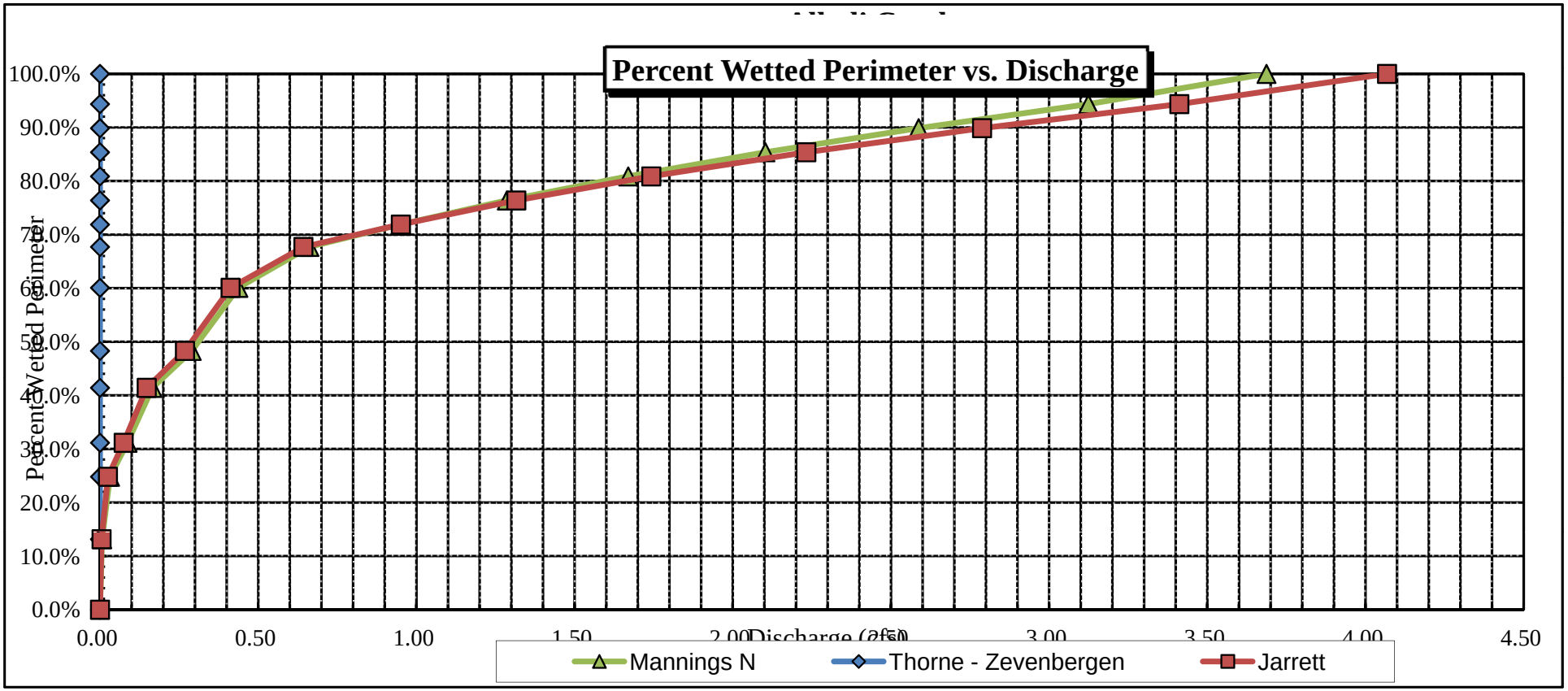
CWCB REVIEW BY: ..... DATE:.....

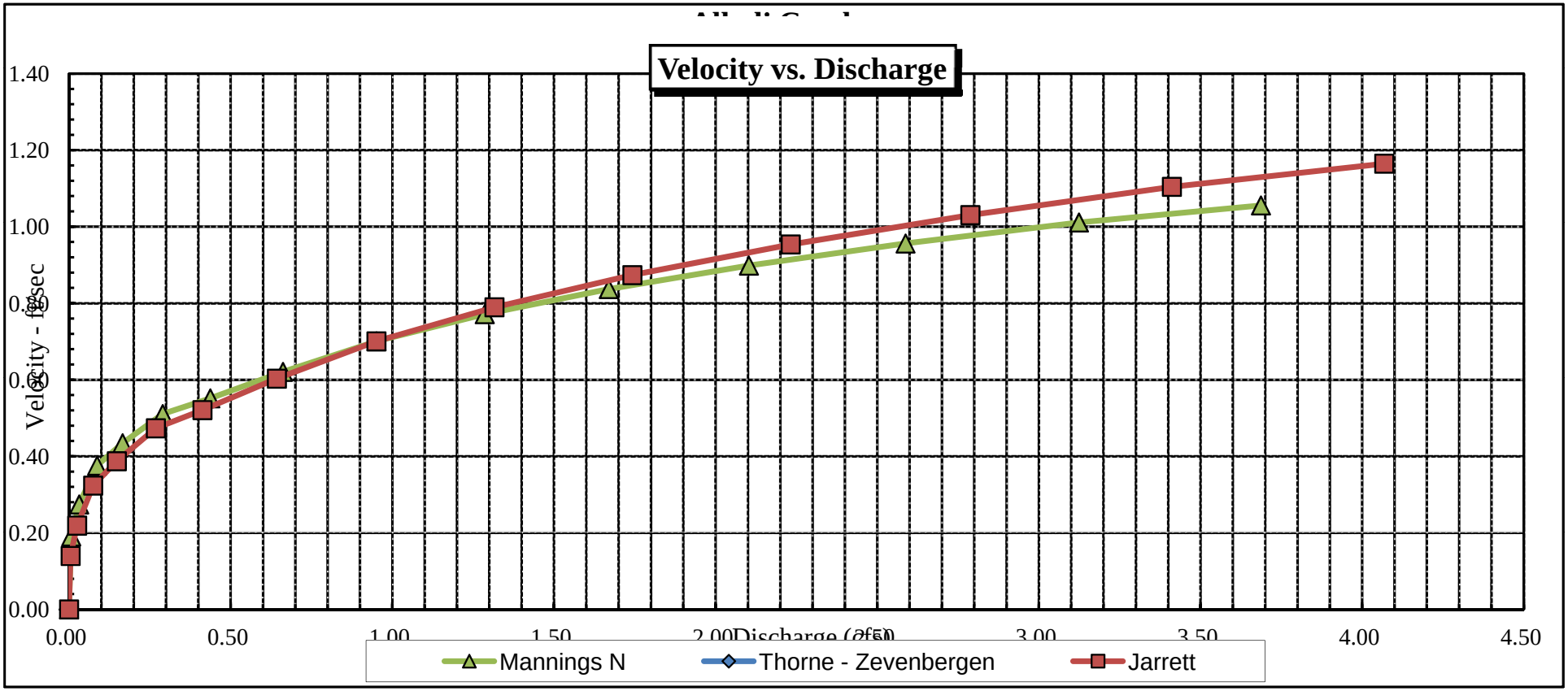
STREAM NAME: Alkali Creek
XS LOCATION: 1000' u/s from Lone Star Ditch headgate
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

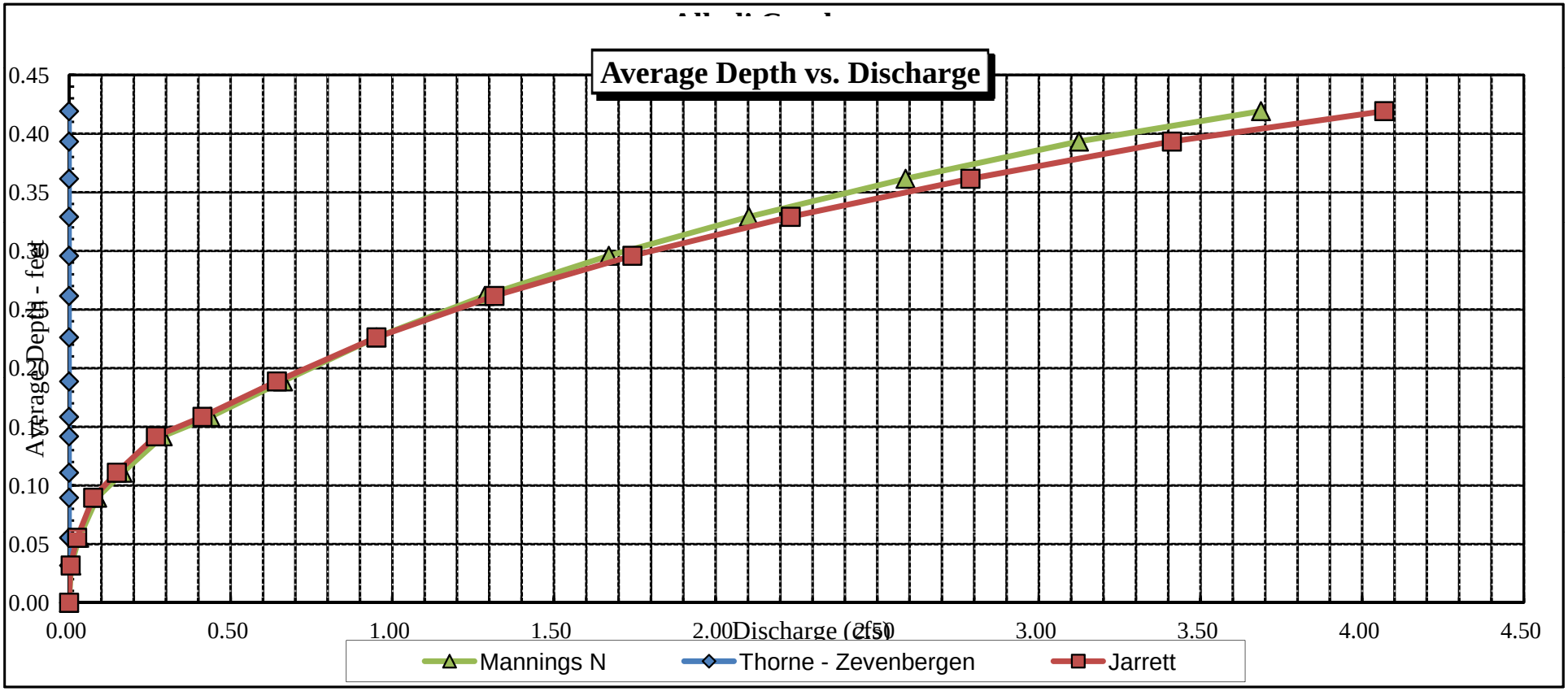
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

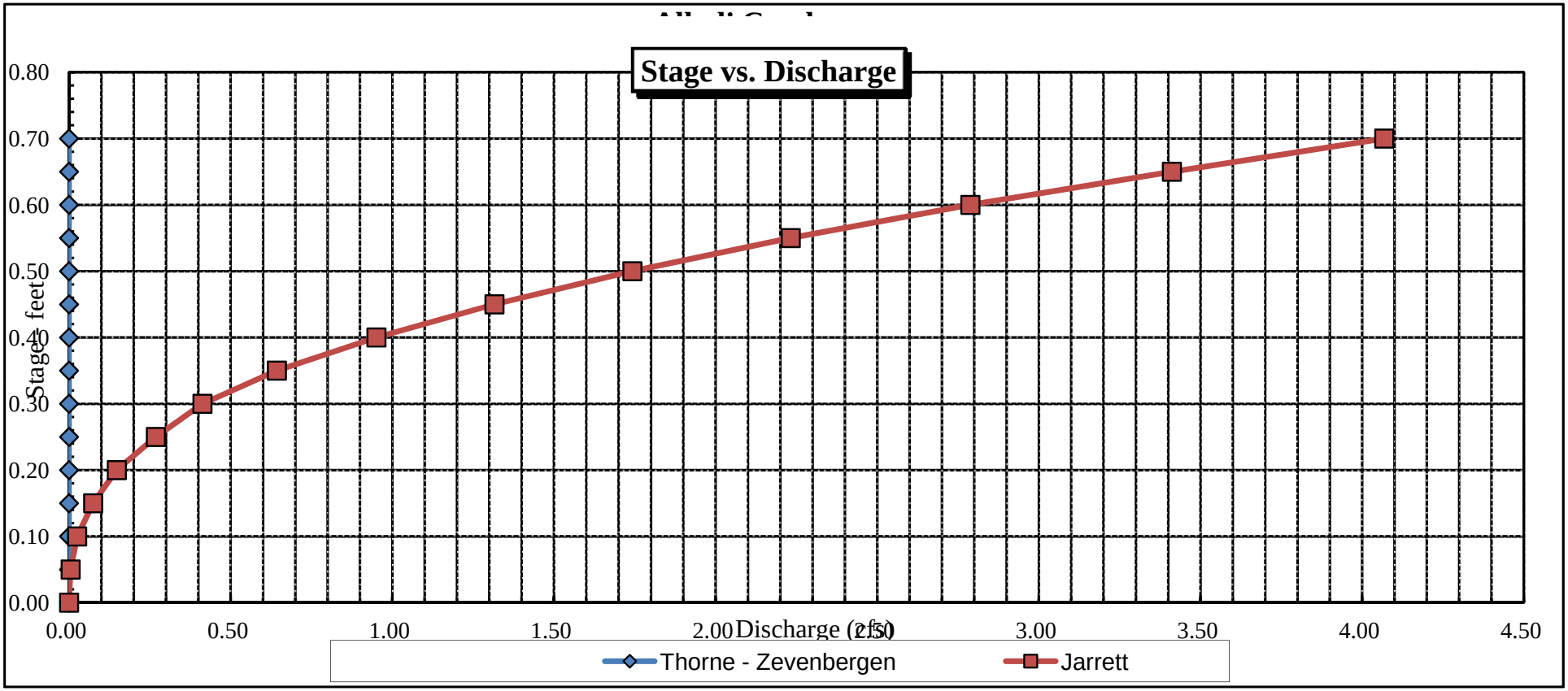
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.60	8.33	0.42	0.70	3.49	8.71	100.0%	0.40	4.07	1.16
	5.60	8.33	0.42	0.70	3.49	8.71	100.0%	0.40	4.07	1.16
	5.65	7.86	0.39	0.65	3.09	8.21	94.4%	0.38	3.41	1.10
	5.70	7.49	0.36	0.60	2.71	7.82	89.9%	0.35	2.79	1.03
	5.75	7.11	0.33	0.55	2.34	7.43	85.4%	0.31	2.23	0.95
	5.80	6.74	0.30	0.50	1.99	7.04	80.9%	0.28	1.74	0.87
	5.85	6.37	0.26	0.45	1.67	6.65	76.4%	0.25	1.32	0.79
WL	5.90	6.00	0.23	0.40	1.36	6.26	71.9%	0.22	0.95	0.70
	5.95	5.65	0.19	0.35	1.07	5.89	67.7%	0.18	0.64	0.60
	6.00	5.00	0.16	0.30	0.79	5.23	60.1%	0.15	0.41	0.52
	6.05	4.00	0.14	0.25	0.57	4.20	48.3%	0.13	0.27	0.47
	6.10	3.44	0.11	0.20	0.38	3.60	41.4%	0.11	0.15	0.39
	6.15	2.58	0.09	0.15	0.23	2.71	31.1%	0.09	0.07	0.32
	6.20	2.07	0.06	0.10	0.11	2.16	24.8%	0.05	0.03	0.22
	6.25	1.11	0.03	0.05	0.04	1.14	13.1%	0.03	0.00	0.14
	6.30	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


CROSS SECTION DATA ANALYSIS
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
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
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
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
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

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

LOCATION INFORMATION

STREAM NAME: Alkali Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: Approx. 1000' upstream from headgate of Lone Star Ditch						
DATE: 8-15-13	OBSERVERS: R. Smith, J. Sondergard					
LEGAL DESCRIPTION	¼ SECTION: NW NW	SECTION: 17	TOWNSHIP: 14 N/S	RANGE: 96 E/W	PM: Sixth	
COUNTY: Delta	WATERSHED: Gunnison	WATER DIVISION: 4	DOW WATER CODE: 37968			
MAP(S): USGS: GPS: 747112						
USFS: 4302749						

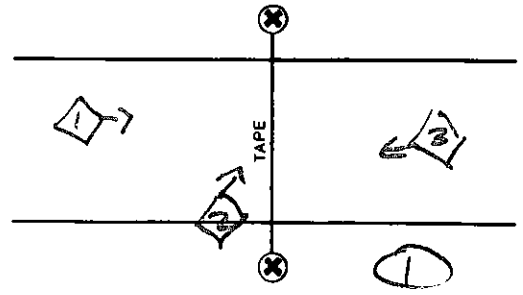
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: gravel to 4" cobble - recent huge storm event	PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	5.90 / 5.90
② WS Upstream	17.3'	5.06
③ WS Downstream	20.0	6.65
SLOPE	1.59 / 37.3' = .042	

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

Storm event in July delivered 2" rain & reworked much of channel

FORM #ISF ED 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Alkali Creek	CROSS-SECTION NO.: 1	DATE: 8-15-13	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 12:15 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)		Area (ft^2)	Discharge (cfs)
								At Point	Mean in Vertical		
LS	0.0		4.56								
G	4.0		5.50								
	4.8		5.67								
W	5.2		5.90								
	5.5		6.00	.1				0			
	5.8		6.10	.2				0			
	6.1		6.15	.25				.08			
	6.4		6.25	.35				.63			
	6.7		6.30	.40				.97			
	7.0		6.30	.40				1.50			
	7.3		6.05	.15				1.44			
	7.7		6.15	.25				1.50			
	8.0		6.25	.35				1.35			
	8.3		6.20	.30				0.87			
	8.6		6.30	.40				0.62			
	8.9		6.25	.35				0.33			
	9.2		6.15	.25				0.20			
	9.5		6.10	.20				0.35			
	9.8		6.00	.10				0.24			
	10.1		6.00	.10				0			
	10.6		6.05	.15				0.04			
W	11.2		5.90								
G	13.0		5.60								
RS	17.2		2.92								
TOTALS:											

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

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

LOCATION INFORMATION

STREAM NAME:	Alkali Creek
XS LOCATION:	800' u/s fron Lone Star Ditch headgate
XS NUMBER:	2
DATE:	15-Aug-13
OBSERVERS:	R. Smith, J. Sondergard
1/4 SEC:	NW NW
SECTION:	17
TWP:	14S
RANGE:	96W
PM:	Sixth
COUNTY:	Delta
WATERSHED:	Gunnison River
DIVISION:	4
DOW CODE:	37968
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:	0.017

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

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

STREAM NAME: Alkali Creek
XS LOCATION: 800' u/s fron Lone Star Ditch headgate
XS NUMBER: 2

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
	LS	0.00	4.82			0.00		0.00	0.00	0.0%
1	G	3.80	5.03			0.00		0.00	0.00	0.0%
	W	5.10	6.25	0.00	0.00	0.00		0.00	0.00	0.0%
		5.20	6.45	0.20	0.00	0.22	0.20	0.03	0.00	0.0%
		5.40	6.45	0.20	0.02	0.20	0.20	0.05	0.00	0.1%
		5.70	6.55	0.30	0.19	0.32	0.30	0.09	0.02	2.1%
		6.00	6.55	0.30	0.13	0.30	0.30	0.09	0.01	1.4%
		6.30	6.50	0.25	0.20	0.30	0.25	0.08	0.02	1.8%
		6.60	6.55	0.30	0.58	0.30	0.30	0.09	0.05	6.3%
		6.90	6.65	0.40	0.94	0.32	0.40	0.12	0.11	13.6%
		7.20	6.55	0.30	2.02	0.32	0.30	0.09	0.18	21.8%
		7.50	6.55	0.30	1.27	0.30	0.30	0.09	0.11	13.7%
		7.80	6.55	0.30	1.16	0.30	0.30	0.09	0.10	12.5%
		8.10	6.65	0.40	1.45	0.32	0.40	0.12	0.17	20.9%
		8.40	6.65	0.40	0.20	0.30	0.40	0.12	0.02	2.9%
		8.70	6.50	0.25	0.38	0.34	0.25	0.06	0.02	2.9%
	W	8.90	6.25	0.00	0.00	0.32		0.00	0.00	0.0%
		9.40	5.49			0.00		0.00	0.00	0.0%
1	G	11.00	4.95			0.00		0.00	0.00	0.0%
	RS	13.30	4.36			0.00		0.00	0.00	0.0%
	TOTALS ----------					4.15	0.4 (Max.)	1.12	0.83	100.0%

Manning's n = 0.1085
Hydraulic Radius= 0.26912403

STREAM NAME: Alkali Creek
XS LOCATION: 800' u/s fron Lone Star Ditch headgate
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.12	1.12	0.0%
6.00	1.12	2.12	89.8%
6.02	1.12	2.04	82.3%
6.04	1.12	1.95	74.8%
6.06	1.12	1.87	67.4%
6.08	1.12	1.79	60.0%
6.10	1.12	1.71	52.7%
6.12	1.12	1.63	45.5%
6.14	1.12	1.55	38.3%
6.16	1.12	1.47	31.2%
6.18	1.12	1.39	24.2%
6.20	1.12	1.31	17.2%
6.21	1.12	1.27	13.7%
6.22	1.12	1.23	10.3%
6.23	1.12	1.19	6.8%
6.24	1.12	1.16	3.4%
6.25	1.12	1.12	0.0%
6.26	1.12	1.08	-3.4%
6.27	1.12	1.04	-6.8%
6.28	1.12	1.00	-10.1%
6.29	1.12	0.97	-13.5%
6.30	1.12	0.93	-16.9%
6.32	1.12	0.85	-23.5%
6.34	1.12	0.78	-30.1%
6.36	1.12	0.71	-36.7%
6.38	1.12	0.63	-43.2%
6.40	1.12	0.56	-49.7%
6.42	1.12	0.49	-56.1%
6.44	1.12	0.42	-62.5%
6.46	1.12	0.35	-68.7%
6.48	1.12	0.29	-74.5%
6.50	1.12	0.22	-80.2%

WATERLINE AT ZERO
AREA ERROR = 6.250

STREAM NAME: Alkali Creek
XS LOCATION: 800' u/s fron Lone Star Ditch headgate
XS NUMBER: 2 Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.03	6.96	1.05	1.62	7.28	8.28	100.0%	0.88	11.93	1.64
	5.25	6.08	0.96	1.40	5.85	7.27	87.8%	0.80	9.03	1.54
	5.30	5.88	0.94	1.35	5.55	7.04	85.0%	0.79	8.45	1.52
	5.35	5.67	0.93	1.30	5.26	6.82	82.3%	0.77	7.90	1.50
	5.40	5.47	0.91	1.25	4.98	6.59	79.5%	0.76	7.38	1.48
	5.45	5.27	0.89	1.20	4.71	6.36	76.7%	0.74	6.89	1.46
	5.50	5.09	0.87	1.15	4.45	6.15	74.2%	0.72	6.41	1.44
	5.55	5.01	0.84	1.10	4.20	6.01	72.6%	0.70	5.91	1.41
	5.60	4.92	0.80	1.05	3.95	5.88	71.0%	0.67	5.42	1.37
	5.65	4.83	0.77	1.00	3.71	5.75	69.4%	0.65	4.94	1.33
	5.70	4.75	0.73	0.95	3.47	5.61	67.8%	0.62	4.49	1.30
	5.75	4.66	0.69	0.90	3.23	5.48	66.2%	0.59	4.06	1.26
	5.80	4.58	0.66	0.85	3.00	5.35	64.6%	0.56	3.65	1.22
	5.85	4.49	0.62	0.80	2.78	5.22	63.0%	0.53	3.26	1.17
	5.90	4.40	0.58	0.75	2.55	5.08	61.4%	0.50	2.88	1.13
	5.95	4.32	0.54	0.70	2.34	4.95	59.8%	0.47	2.53	1.08
	6.00	4.23	0.50	0.65	2.12	4.82	58.2%	0.44	2.19	1.03
	6.05	4.14	0.46	0.60	1.91	4.68	56.5%	0.41	1.88	0.98
	6.10	4.06	0.42	0.55	1.71	4.55	54.9%	0.38	1.59	0.93
	6.15	3.97	0.38	0.50	1.51	4.42	53.3%	0.34	1.31	0.87
	6.20	3.89	0.34	0.45	1.31	4.29	51.7%	0.31	1.06	0.81
WL	6.25	3.80	0.29	0.40	1.12	4.15	50.1%	0.27	0.83	0.74
	6.30	3.73	0.25	0.35	0.93	4.03	48.7%	0.23	0.62	0.67
	6.35	3.67	0.20	0.30	0.74	3.91	47.2%	0.19	0.44	0.59
	6.40	3.60	0.16	0.25	0.56	3.79	45.8%	0.15	0.28	0.50
	6.45	3.34	0.11	0.20	0.38	3.47	41.9%	0.11	0.16	0.41
	6.50	3.15	0.07	0.15	0.22	3.25	39.2%	0.07	0.07	0.30
	6.55	1.40	0.06	0.10	0.09	1.47	17.8%	0.06	0.02	0.27
	6.60	0.85	0.03	0.05	0.03	0.89	10.7%	0.03	0.01	0.18
	6.65	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Alkali Creek
XS LOCATION: 800' u/s fron Lone Star Ditch headgate
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.83	cfs
CALCULATED FLOW (Qc)=	0.83	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	6.25	ft
CALCULATED WATERLINE (WLc)=	6.25	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=	0.74	ft/sec
MANNING'S N=	0.108	
SLOPE=	0.017	ft/ft
.4 * Qm =	0.3	cfs
2.5 * Qm=	2.1	cfs

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

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

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

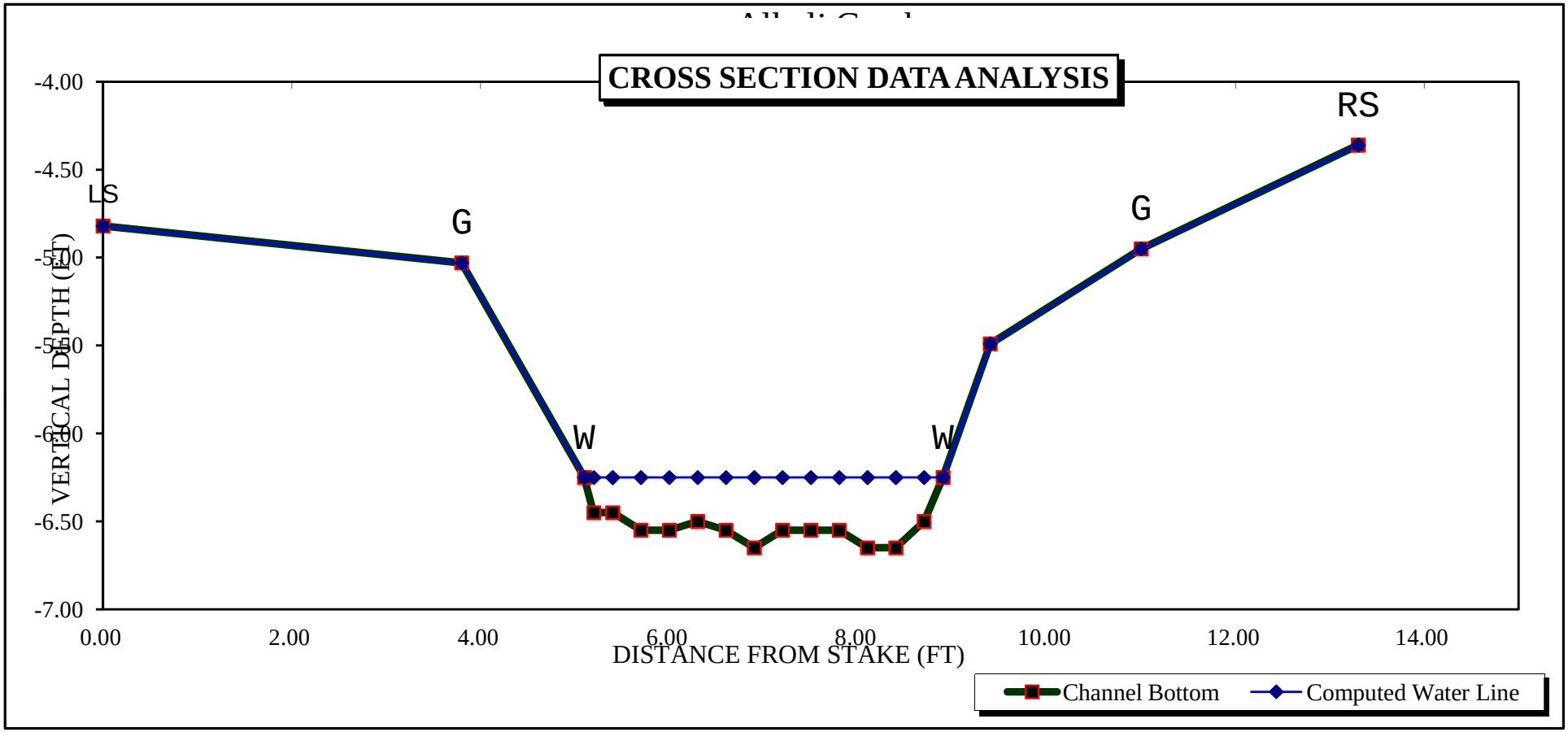
RECOMMENDATION BY: ………………….. AGENCY.. DATE:..................................

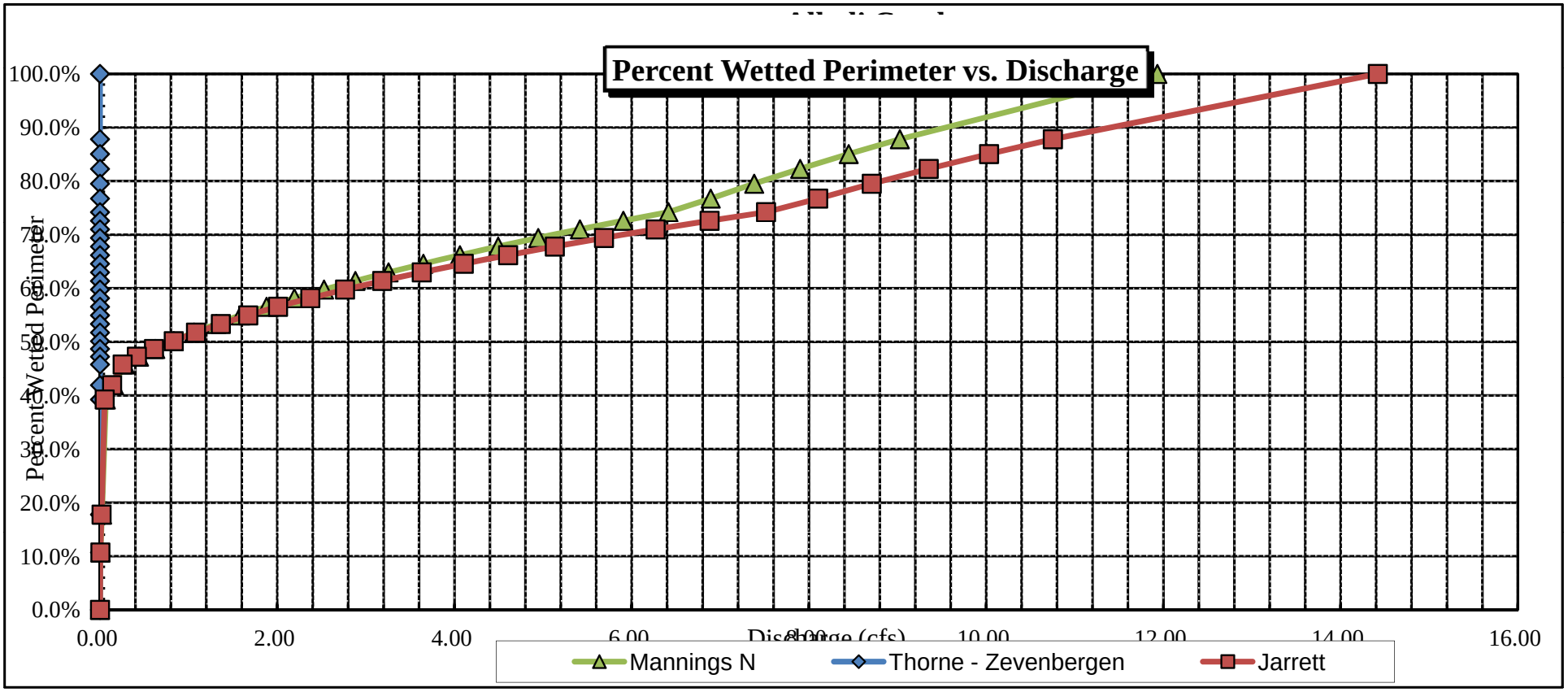
CWCB REVIEW BY: .... DATE:..................................

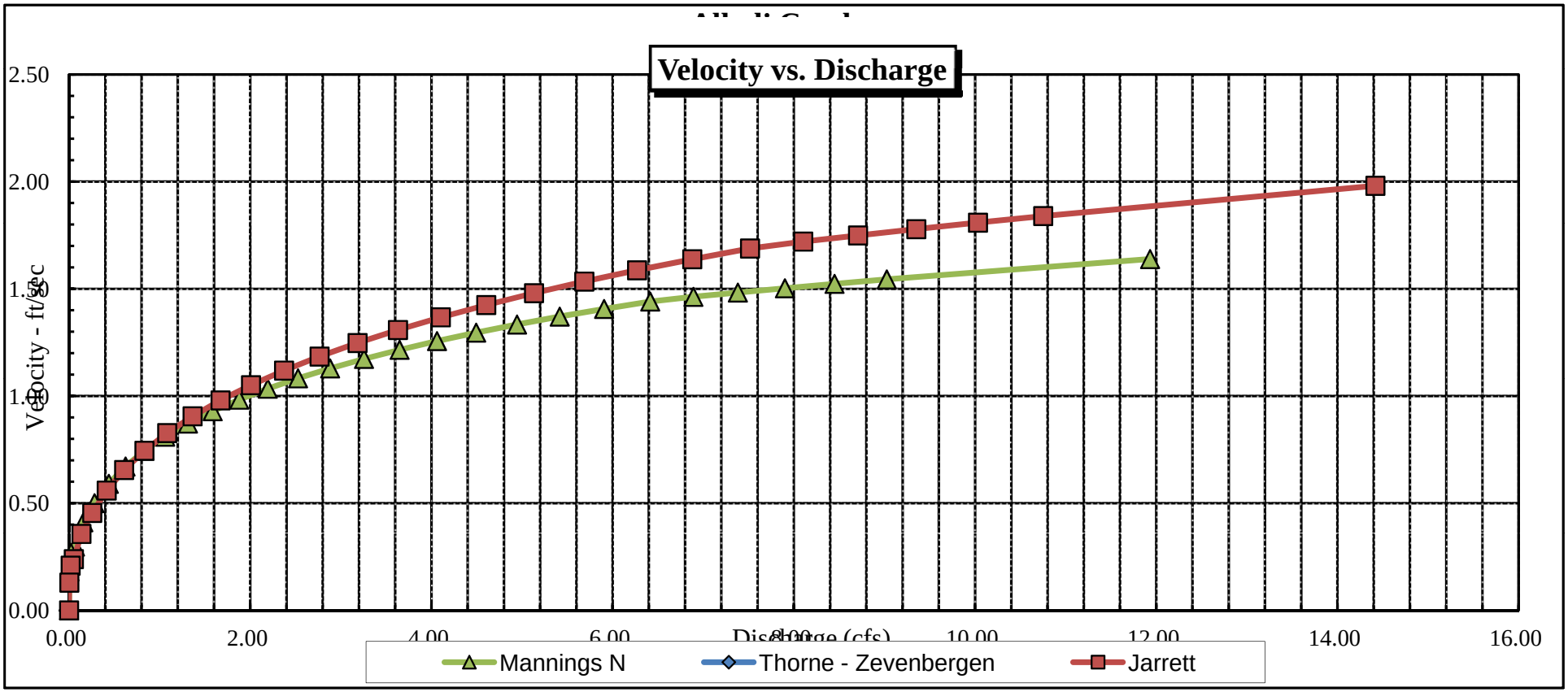
STREAM NAME: Alkali Creek
XS LOCATION: 800' u/s fron Lone Star Ditch headgate
XS NUMBER: 2 Jarrett Variable Manning's n Correction Applied

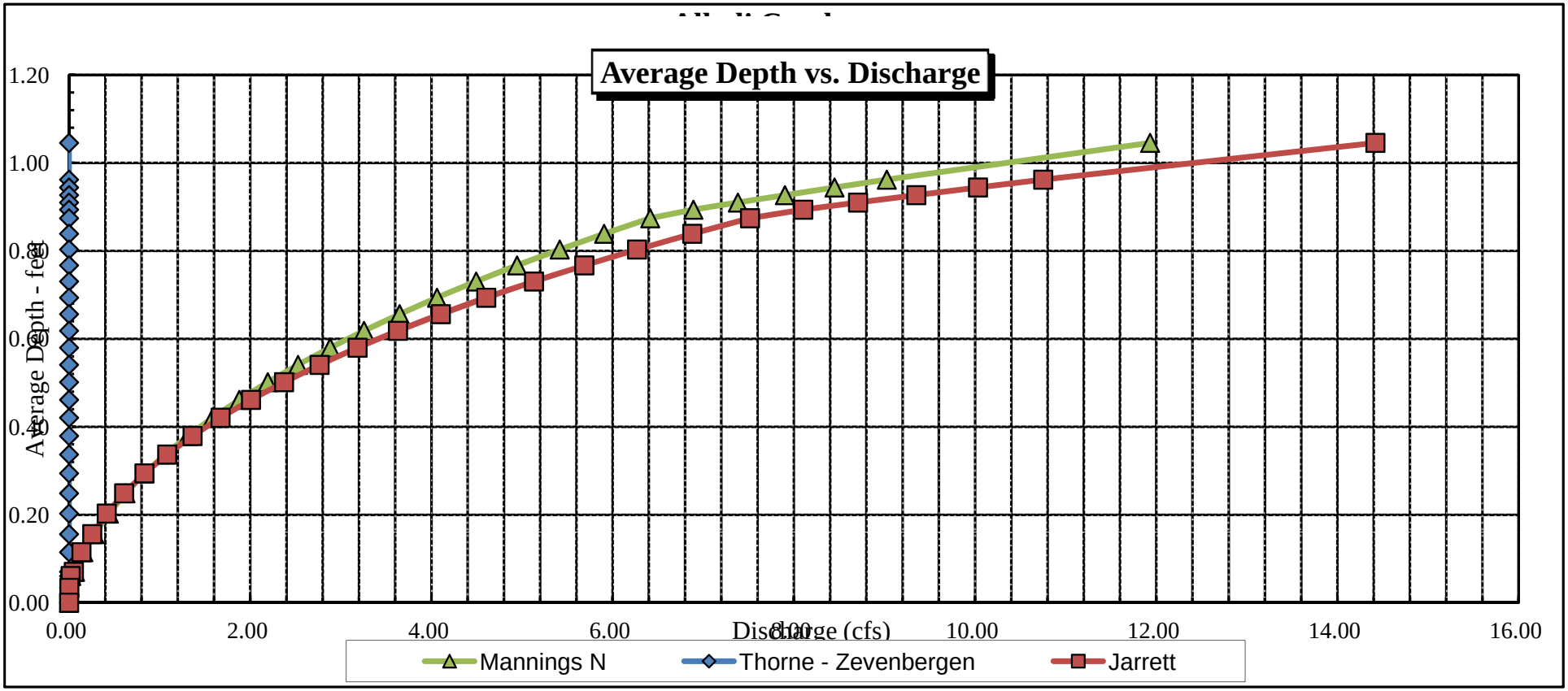
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

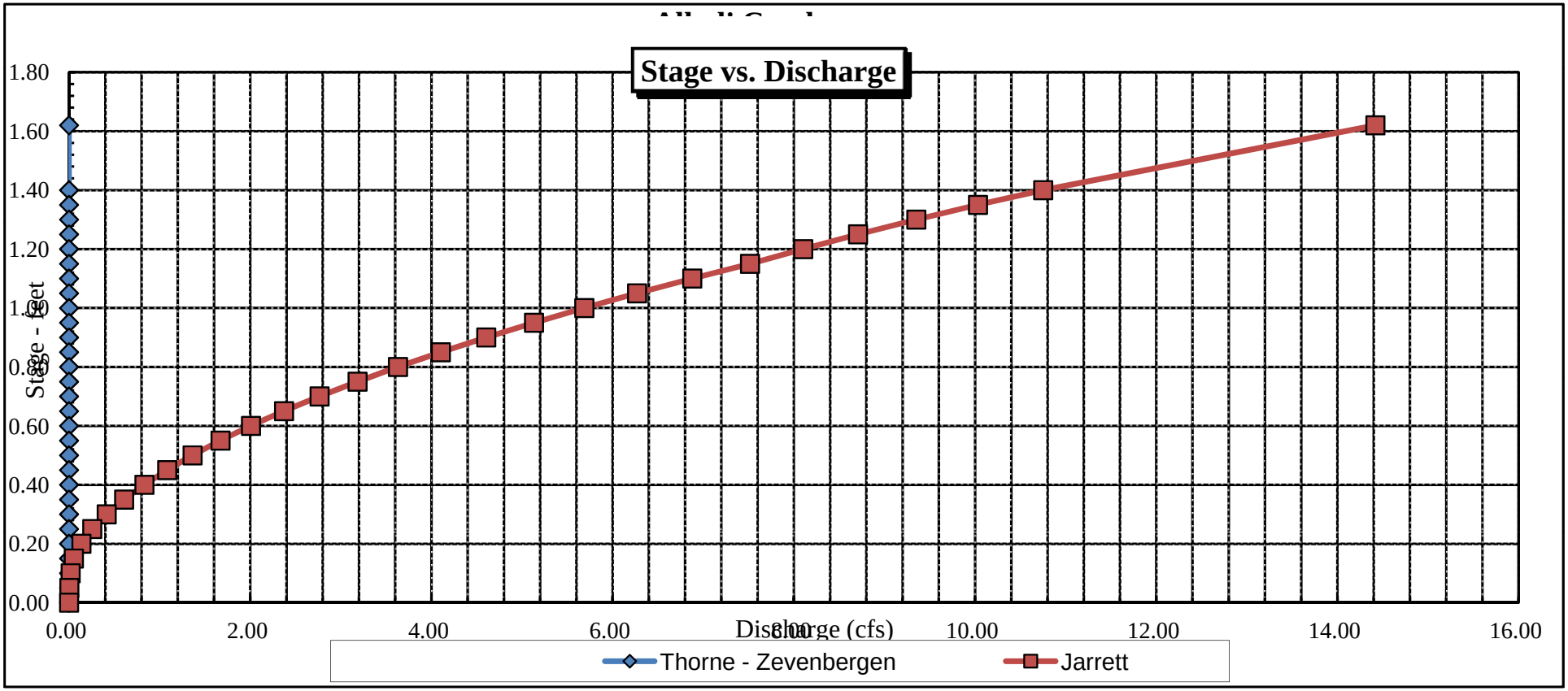
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.03	6.96	1.05	1.62	7.28	8.28	100.0%	0.88	14.42	1.98
	5.25	6.08	0.96	1.40	5.85	7.27	87.8%	0.80	10.75	1.84
	5.30	5.88	0.94	1.35	5.55	7.04	85.0%	0.79	10.03	1.81
	5.35	5.67	0.93	1.30	5.26	6.82	82.3%	0.77	9.35	1.78
	5.40	5.47	0.91	1.25	4.98	6.59	79.5%	0.76	8.71	1.75
	5.45	5.27	0.89	1.20	4.71	6.36	76.7%	0.74	8.10	1.72
	5.50	5.09	0.87	1.15	4.45	6.15	74.2%	0.72	7.52	1.69
	5.55	5.01	0.84	1.10	4.20	6.01	72.6%	0.70	6.88	1.64
	5.60	4.92	0.80	1.05	3.95	5.88	71.0%	0.67	6.27	1.59
	5.65	4.83	0.77	1.00	3.71	5.75	69.4%	0.65	5.69	1.53
	5.70	4.75	0.73	0.95	3.47	5.61	67.8%	0.62	5.13	1.48
	5.75	4.66	0.69	0.90	3.23	5.48	66.2%	0.59	4.60	1.42
	5.80	4.58	0.66	0.85	3.00	5.35	64.6%	0.56	4.10	1.37
	5.85	4.49	0.62	0.80	2.78	5.22	63.0%	0.53	3.63	1.31
	5.90	4.40	0.58	0.75	2.55	5.08	61.4%	0.50	3.18	1.25
	5.95	4.32	0.54	0.70	2.34	4.95	59.8%	0.47	2.77	1.18
	6.00	4.23	0.50	0.65	2.12	4.82	58.2%	0.44	2.37	1.12
	6.05	4.14	0.46	0.60	1.91	4.68	56.5%	0.41	2.01	1.05
	6.10	4.06	0.42	0.55	1.71	4.55	54.9%	0.38	1.67	0.98
	6.15	3.97	0.38	0.50	1.51	4.42	53.3%	0.34	1.36	0.91
	6.20	3.89	0.34	0.45	1.31	4.29	51.7%	0.31	1.08	0.83
WL	6.25	3.80	0.29	0.40	1.12	4.15	50.1%	0.27	0.83	0.74
	6.30	3.73	0.25	0.35	0.93	4.03	48.7%	0.23	0.61	0.65
	6.35	3.67	0.20	0.30	0.74	3.91	47.2%	0.19	0.42	0.56
	6.40	3.60	0.16	0.25	0.56	3.79	45.8%	0.15	0.26	0.45
	6.45	3.34	0.11	0.20	0.38	3.47	41.9%	0.11	0.14	0.36
	6.50	3.15	0.07	0.15	0.22	3.25	39.2%	0.07	0.05	0.24
	6.55	1.40	0.06	0.10	0.09	1.47	17.8%	0.06	0.02	0.21
	6.60	0.85	0.03	0.05	0.03	0.89	10.7%	0.03	0.00	0.13
	6.65	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


CROSS SECTION DATA ANALYSIS
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
-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
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
2.50
2.00
1.50
1.00
0.50
0.00
Velocity - ft/sec
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
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)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Stage - feet
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

LOCATION INFORMATION

STREAM NAME: Alkali Creek						CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: Approx. 800' upstream from headgate of Lone Star Ditch						
DATE: 8-15-13	OBSERVERS: R. Smith, J. Sondergard					
LEGAL DESCRIPTION	¼ SECTION: NW NW	SECTION: 17	TOWNSHIP: 14 N/S	RANGE: 96 E/W	PM: Sixth	
COUNTY: Delta	WATERSHED: Gunnison	WATER DIVISION: 4	DOW WATER CODE: 37968			
MAP(S): USGS:	GPS 747106 Zone 12					
USFS:	4302701					

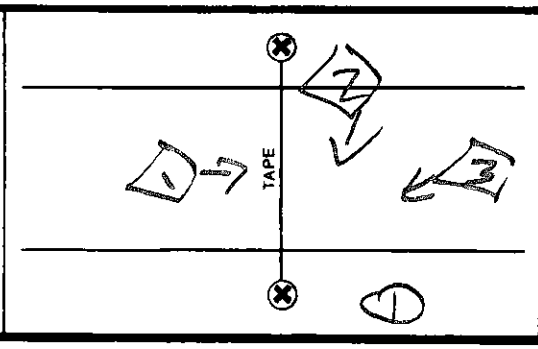
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES/NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: gravel to 6" cobbles	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
Tape @ Stake LB	0.0	surveyed
Tape @ Stake RB	0.0	surveyed
WS @ Tape LB/RB 5.1 8.9	0.0	6.25 / 6.25
WS Upstream	21.2'	5.84
WS Downstream	6.0'	6.30
SLOPE	0.46 / 27.2' = .017	

SKETCH



AQUATIC SAMPLING SUMMARY

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

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

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

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

caddisfly, stonefly

COMMENTS

FORM #ISF ED 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Alkali Creek | CROSS-SECTION NO.: 2 | DATE: 8-15-13 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 1:35 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		4.82								
G	3.8		5.03								
W	5.1		6.25								
	5.2		6.45		.2			0			
	5.4		6.45		.2			.02			
	5.7		6.55		.3			.19			
	6.0		6.55		.3			.13			
	6.3		6.50		.25			.20			
	6.6		6.55		.30			.58			
	6.9		6.65		.40			.94			
	7.2		6.55		.30			2.02			
	7.5		6.55		.30			1.27			
	7.8		6.55		.30			1.16			
	8.1		6.65		.40			1.45			
	8.4		6.65		.40			.20			
	8.7		6.50		.25			.38			
W	9.9		6.25								
	9.4		5.49								
G	11.0		4.95								
RS	13.3		4.36								
TOTALS:											

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

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

LOCATION INFORMATION

STREAM NAME:	Alkali Creek
XS LOCATION:	1000' u/s fr hdg of Lone Star Ditch
XS NUMBER:	1
DATE:	16-May-13
OBSERVERS:	R. Smith, J. Sondergard
1/4 SEC:	NW NW
SECTION:	17
TWP:	14S
RANGE:	96W
PM:	Sixth
COUNTY:	Delta
WATERSHED:	Gunnison
DIVISION:	4
DOW CODE:	37968
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:	0.033

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

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

STREAM NAME: Alkali Creek
XS LOCATION: 1000' u/s fr hdg of Lone Star Ditch
XS NUMBER: 1

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
	LS	0.00	4.85			0.00		0.00	0.00	0.0%
1	G	2.00	5.10			0.00		0.00	0.00	0.0%
	W	2.25	5.65	0.00	0.00	0.00		0.00	0.00	0.0%
		2.30	6.40	0.75	1.08	0.75	0.75	0.13	0.14	4.4%
		2.60	6.10	0.45	2.03	0.42	0.45	0.14	0.27	8.5%
		2.90	6.20	0.55	2.57	0.32	0.55	0.17	0.42	13.2%
		3.20	6.15	0.50	2.49	0.30	0.50	0.15	0.37	11.6%
		3.50	6.30	0.65	2.10	0.34	0.65	0.20	0.41	12.7%
		3.80	6.15	0.50	1.85	0.34	0.50	0.15	0.28	8.6%
		4.10	6.20	0.55	1.49	0.30	0.55	0.17	0.25	7.6%
		4.40	6.20	0.55	1.63	0.30	0.55	0.17	0.27	8.3%
		4.70	6.30	0.65	1.30	0.32	0.65	0.20	0.25	7.9%
		5.00	6.35	0.70	1.25	0.30	0.70	0.21	0.26	8.1%
		5.30	6.45	0.80	0.62	0.32	0.80	0.24	0.15	4.6%
		5.60	6.30	0.65	0.59	0.34	0.65	0.20	0.12	3.6%
		5.90	6.30	0.65	0.14	0.30	0.65	0.20	0.03	0.8%
		6.20	5.85	0.20	0.00	0.54	0.20	0.06	0.00	0.0%
	W	6.50	5.65	0.00	0.00	0.36		0.00	0.00	0.0%
1	G	7.00	5.10			0.00		0.00	0.00	0.0%
	RS	10.00	4.55			0.00		0.00	0.00	0.0%
	TOTALS ----------					5.54	0.8 (Max.)	2.35	3.22	100.0%

Manning's n = 0.1112
Hydraulic Radius= 0.42405781

STREAM NAME: Alkali Creek
XS LOCATION: 1000' u/s fr hdg of Lone Star Ditch
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	2.35	2.35	0.0%
5.40	2.35	3.46	47.0%
5.42	2.35	3.36	43.1%
5.44	2.35	3.27	39.2%
5.46	2.35	3.18	35.4%
5.48	2.35	3.09	31.6%
5.50	2.35	3.00	27.8%
5.52	2.35	2.92	24.0%
5.54	2.35	2.83	20.2%
5.56	2.35	2.74	16.5%
5.58	2.35	2.65	12.8%
5.60	2.35	2.57	9.1%
5.61	2.35	2.52	7.3%
5.62	2.35	2.48	5.4%
5.63	2.35	2.44	3.6%
5.64	2.35	2.39	1.8%
5.65	2.35	2.35	0.0%
5.66	2.35	2.31	-1.8%
5.67	2.35	2.27	-3.6%
5.68	2.35	2.22	-5.4%
5.69	2.35	2.18	-7.2%
5.70	2.35	2.14	-9.0%
5.72	2.35	2.06	-12.5%
5.74	2.35	1.98	-16.0%
5.76	2.35	1.89	-19.5%
5.78	2.35	1.81	-22.9%
5.80	2.35	1.73	-26.4%
5.82	2.35	1.65	-29.8%
5.84	2.35	1.57	-33.1%
5.86	2.35	1.49	-36.5%
5.88	2.35	1.41	-39.8%
5.90	2.35	1.34	-43.2%

WATERLINE AT ZERO
AREA ERROR = 5.650

STREAM NAME: Alkali Creek
XS LOCATION: 1000' u/s fr hdg of Lone Star Ditch
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	5.10	5.00	0.98	1.35	4.90	6.89	100.0%	0.71	9.46	1.93
	5.10	5.00	0.98	1.35	4.89	6.89	100.0%	0.71	9.46	1.93
	5.15	4.93	0.94	1.30	4.65	6.77	98.2%	0.69	8.78	1.89
	5.20	4.86	0.91	1.25	4.40	6.65	96.4%	0.66	8.12	1.84
	5.25	4.80	0.87	1.20	4.16	6.52	94.7%	0.64	7.48	1.80
	5.30	4.73	0.83	1.15	3.92	6.40	92.9%	0.61	6.87	1.75
	5.35	4.66	0.79	1.10	3.69	6.28	91.1%	0.59	6.28	1.70
	5.40	4.59	0.75	1.05	3.46	6.16	89.3%	0.56	5.71	1.65
	5.45	4.52	0.71	1.00	3.23	6.03	87.6%	0.53	5.17	1.60
	5.50	4.45	0.67	0.95	3.00	5.91	85.8%	0.51	4.64	1.55
	5.55	4.39	0.63	0.90	2.78	5.79	84.0%	0.48	4.15	1.49
	5.60	4.32	0.59	0.85	2.57	5.67	82.2%	0.45	3.67	1.43
WL	5.65	4.25	0.55	0.80	2.35	5.54	80.4%	0.42	3.22	1.37
	5.70	4.17	0.51	0.75	2.14	5.40	78.4%	0.40	2.80	1.31
	5.75	4.09	0.47	0.70	1.93	5.26	76.4%	0.37	2.41	1.25
	5.80	4.02	0.43	0.65	1.73	5.12	74.3%	0.34	2.04	1.18
	5.85	3.94	0.39	0.60	1.53	4.98	72.3%	0.31	1.70	1.11
	5.90	3.90	0.34	0.55	1.34	4.87	70.7%	0.27	1.37	1.02
	5.95	3.86	0.30	0.50	1.14	4.76	69.1%	0.24	1.07	0.94
	6.00	3.83	0.25	0.45	0.95	4.65	67.5%	0.20	0.80	0.84
	6.05	3.79	0.20	0.40	0.76	4.54	65.9%	0.17	0.56	0.74
	6.10	3.75	0.15	0.35	0.57	4.43	64.3%	0.13	0.35	0.62
	6.15	3.52	0.11	0.30	0.39	4.09	59.4%	0.10	0.20	0.51
	6.20	2.18	0.11	0.25	0.24	2.62	38.1%	0.09	0.12	0.49
	6.25	1.74	0.08	0.20	0.14	2.06	29.9%	0.07	0.06	0.41
	6.30	1.01	0.06	0.15	0.07	1.20	17.4%	0.05	0.02	0.35
	6.35	0.55	0.05	0.10	0.03	0.66	9.6%	0.04	0.01	0.28
	6.40	0.25	0.03	0.05	0.01	0.27	3.9%	0.02	0.00	0.20
	6.45	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Alkali Creek
XS LOCATION: 1000' u/s fr hdg of Lone Star Ditch
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	3.22	cfs
CALCULATED FLOW (Qc)=	3.22	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	5.65	ft
CALCULATED WATERLINE (WLc)=	5.65	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.80	ft
MAX CALCULATED DEPTH (Dc)=	0.80	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.37	ft/sec
MANNING'S N=	0.111	
SLOPE=	0.033	ft/ft
.4 * Qm =	1.3	cfs
2.5 * Qm=	8.1	cfs

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

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

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

_____
_____
_____
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_____

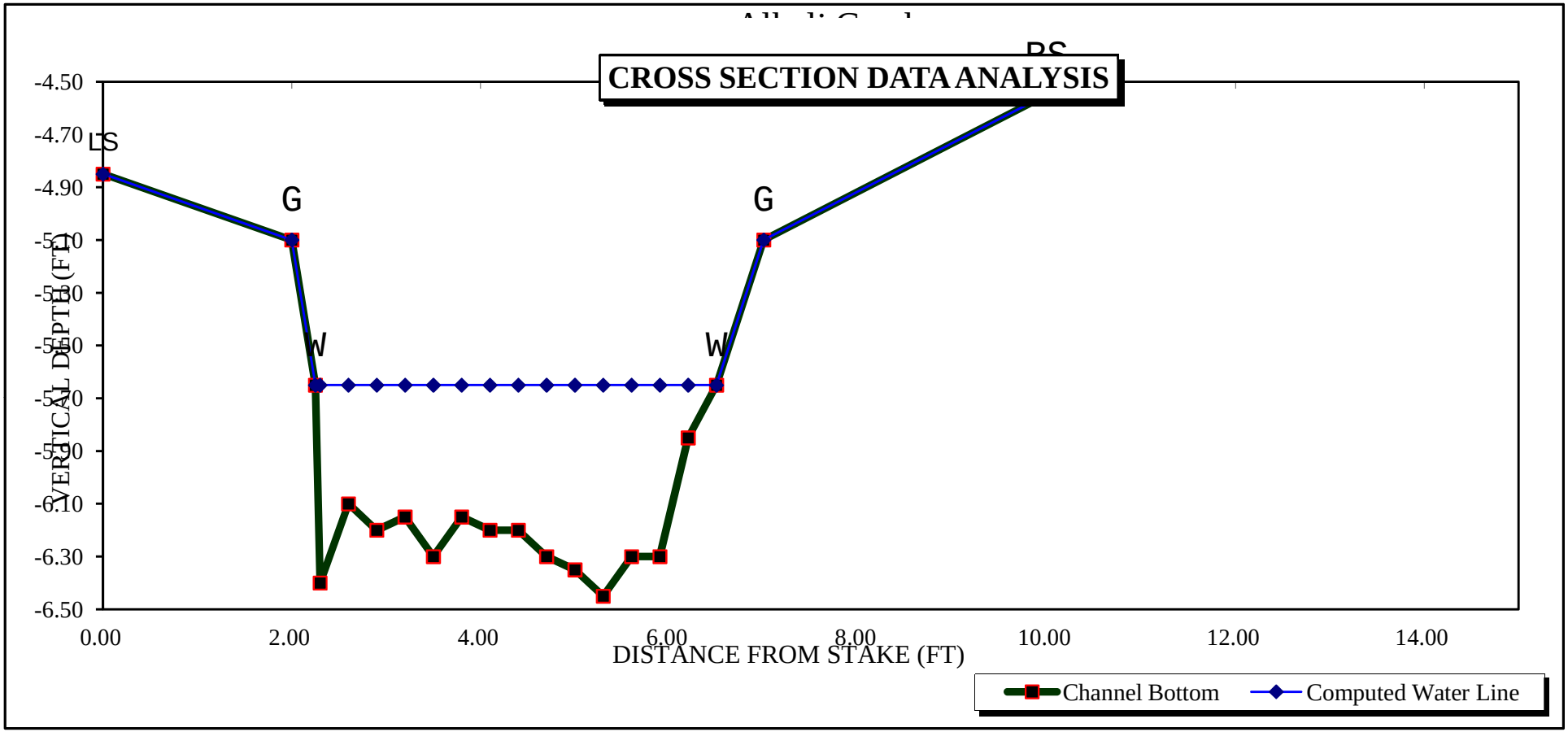
RECOMMENDATION BY: ..... AGENCY..... DATE:.....

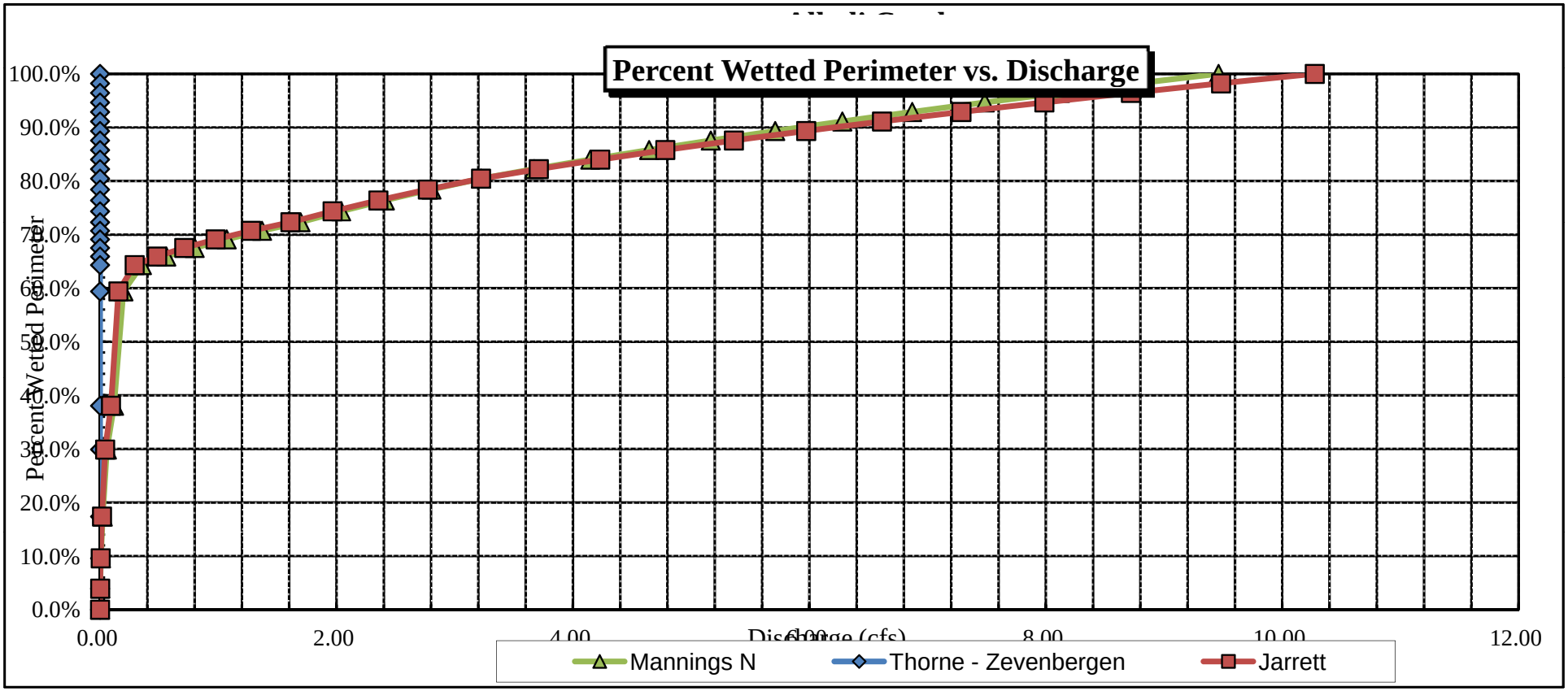
CWCB REVIEW BY: ..... DATE:.....

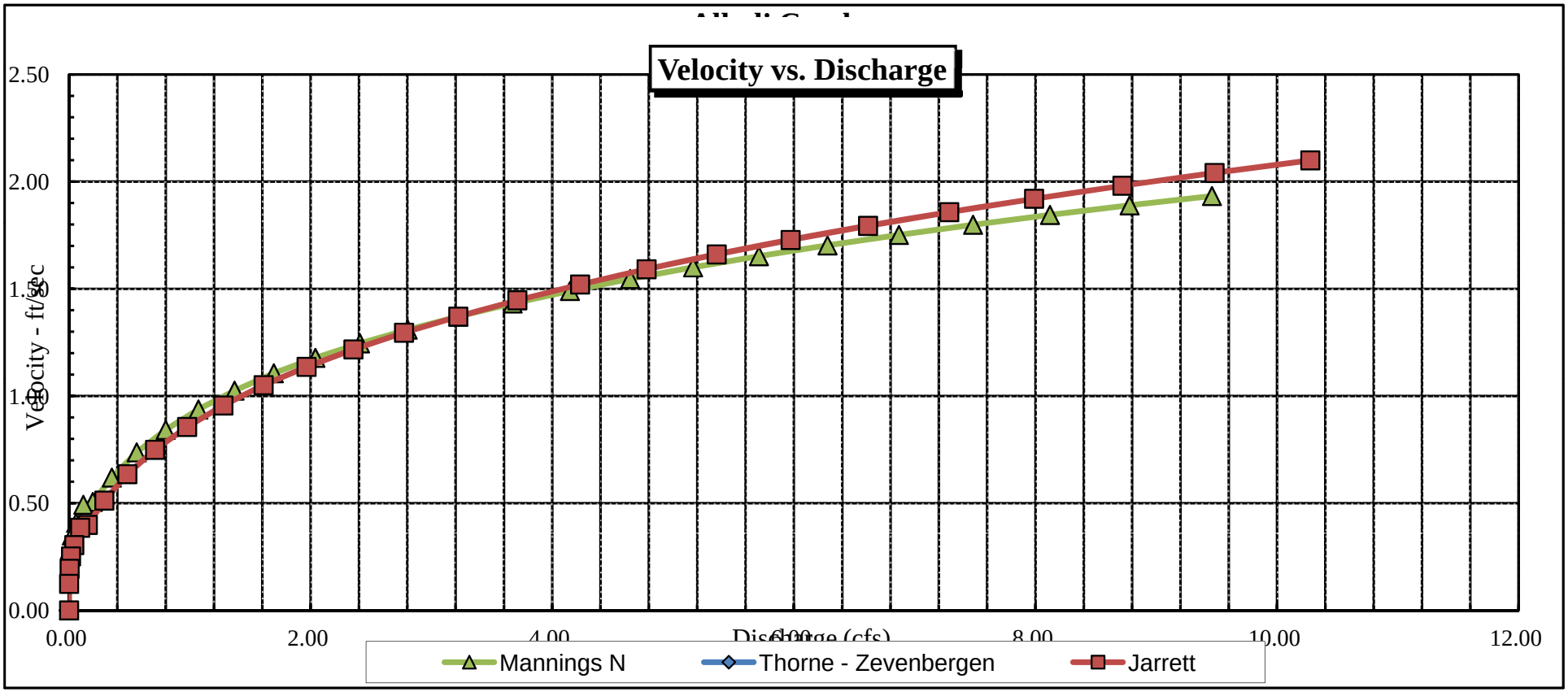
STREAM NAME: Alkali Creek
XS LOCATION: 1000' u/s fr hdg of Lone Star Ditch
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

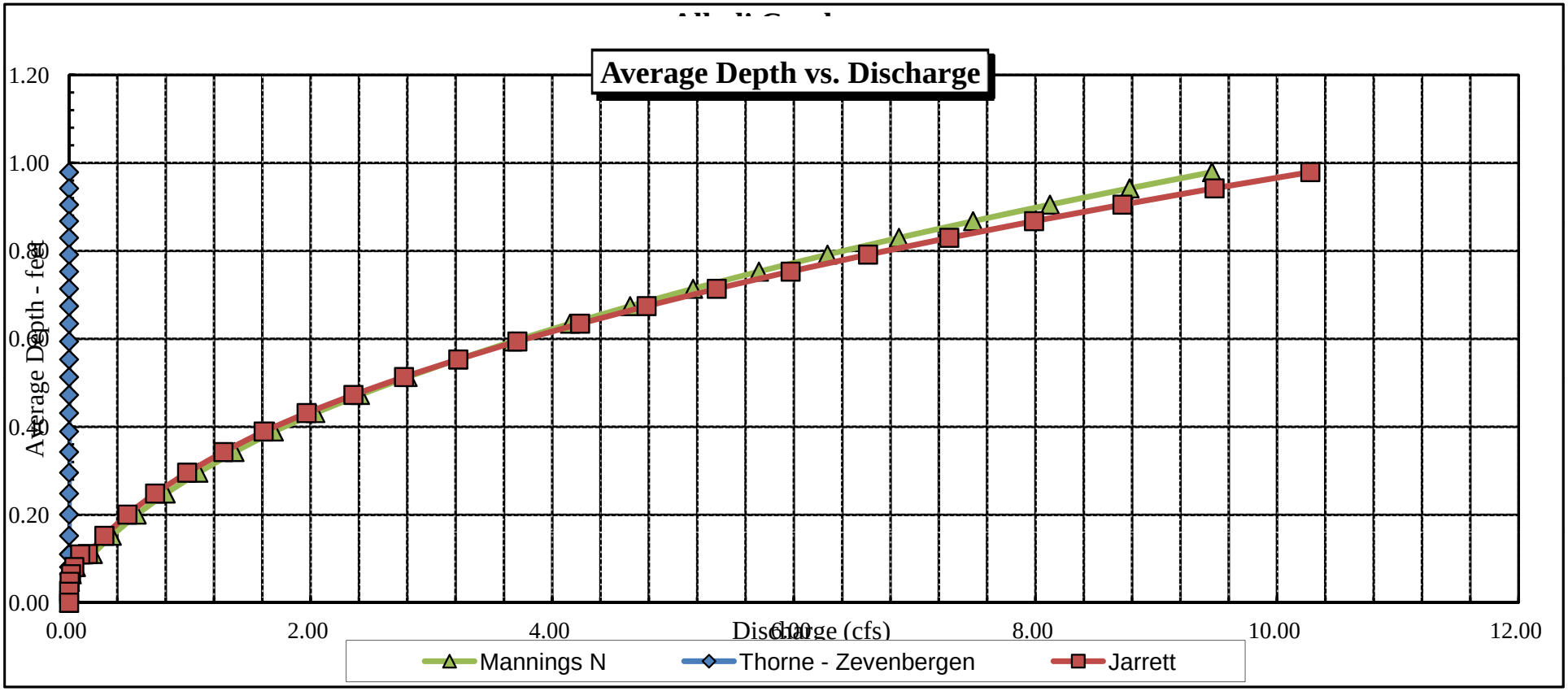
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

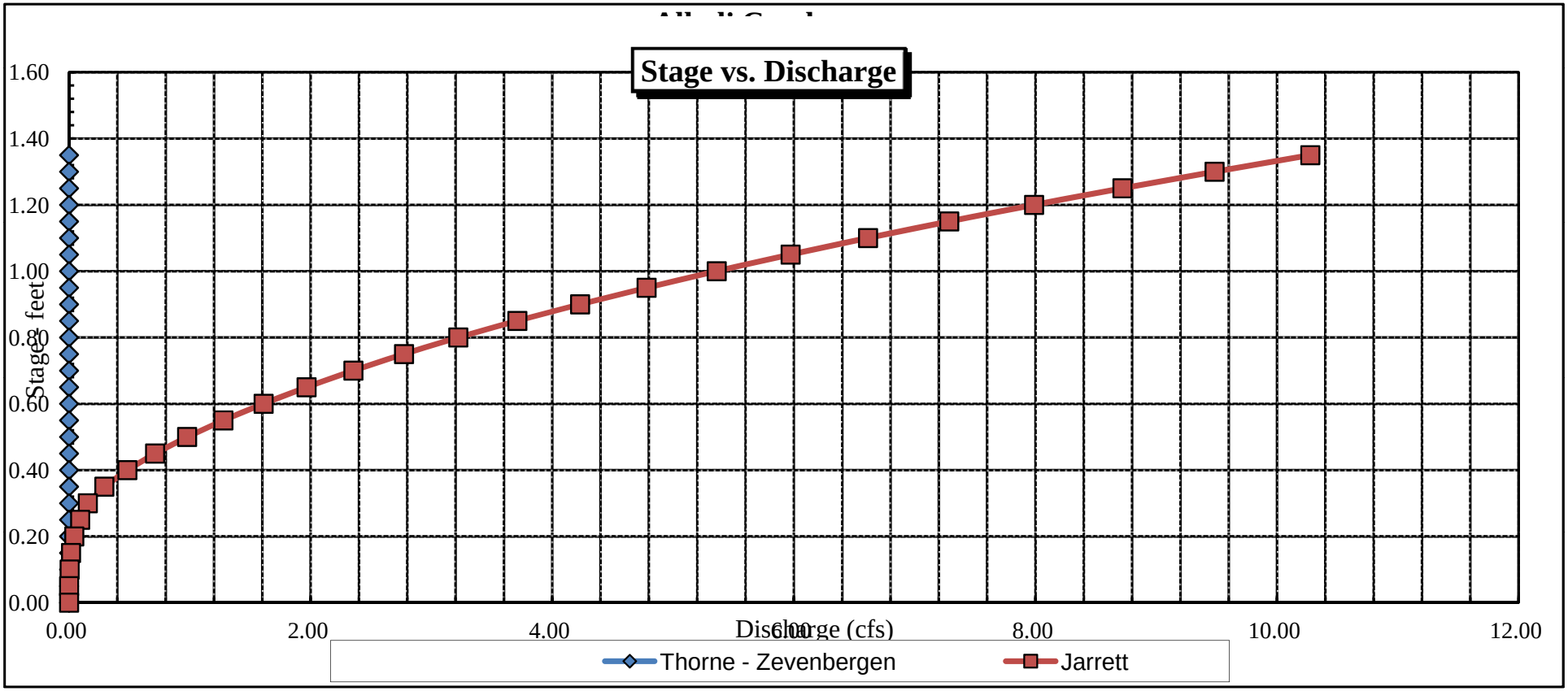
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.10	5.00	0.98	1.35	4.90	6.89	100.0%	0.71	10.27	2.10
	5.10	5.00	0.98	1.35	4.89	6.89	100.0%	0.71	10.27	2.10
	5.15	4.93	0.94	1.30	4.65	6.77	98.2%	0.69	9.48	2.04
	5.20	4.86	0.91	1.25	4.40	6.65	96.4%	0.66	8.72	1.98
	5.25	4.80	0.87	1.20	4.16	6.52	94.7%	0.64	7.99	1.92
	5.30	4.73	0.83	1.15	3.92	6.40	92.9%	0.61	7.29	1.86
	5.35	4.66	0.79	1.10	3.69	6.28	91.1%	0.59	6.61	1.79
	5.40	4.59	0.75	1.05	3.46	6.16	89.3%	0.56	5.97	1.73
	5.45	4.52	0.71	1.00	3.23	6.03	87.6%	0.53	5.36	1.66
	5.50	4.45	0.67	0.95	3.00	5.91	85.8%	0.51	4.78	1.59
	5.55	4.39	0.63	0.90	2.78	5.79	84.0%	0.48	4.23	1.52
	5.60	4.32	0.59	0.85	2.57	5.67	82.2%	0.45	3.71	1.45
WL	5.65	4.25	0.55	0.80	2.35	5.54	80.4%	0.42	3.22	1.37
	5.70	4.17	0.51	0.75	2.14	5.40	78.4%	0.40	2.77	1.30
	5.75	4.09	0.47	0.70	1.93	5.26	76.4%	0.37	2.35	1.22
	5.80	4.02	0.43	0.65	1.73	5.12	74.3%	0.34	1.97	1.14
	5.85	3.94	0.39	0.60	1.53	4.98	72.3%	0.31	1.61	1.05
	5.90	3.90	0.34	0.55	1.34	4.87	70.7%	0.27	1.28	0.96
	5.95	3.86	0.30	0.50	1.14	4.76	69.1%	0.24	0.98	0.86
	6.00	3.83	0.25	0.45	0.95	4.65	67.5%	0.20	0.71	0.75
	6.05	3.79	0.20	0.40	0.76	4.54	65.9%	0.17	0.48	0.64
	6.10	3.75	0.15	0.35	0.57	4.43	64.3%	0.13	0.29	0.51
	6.15	3.52	0.11	0.30	0.39	4.09	59.4%	0.10	0.16	0.40
	6.20	2.18	0.11	0.25	0.24	2.62	38.1%	0.09	0.09	0.39
	6.25	1.74	0.08	0.20	0.14	2.06	29.9%	0.07	0.04	0.30
	6.30	1.01	0.06	0.15	0.07	1.20	17.4%	0.05	0.02	0.25
	6.35	0.55	0.05	0.10	0.03	0.66	9.6%	0.04	0.01	0.19
	6.40	0.25	0.03	0.05	0.01	0.27	3.9%	0.02	0.00	0.12
	6.45	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


CROSS SECTION DATA ANALYSIS
LS
G
W
W
G
RS
-4.50
-4.70
-4.90
-6.10
-6.30
-6.50
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
VERTICAL DEPTHS (FT)
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
8.00
10.00
12.00
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
2.50
2.00
1.50
1.00
0.50
0.00
Velocity - ft/sec
0.00
2.00
4.00
8.00
10.00
12.00
Mannings N
Thorne - Zevenbergen
Jarrett


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


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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Alkali Creek						CROSS-SECTION NO. 1
CROSS-SECTION LOCATION: 1000' upstream from headgate of Lone Star Ditch						
DATE: 5-16-13	OBSERVERS: R. Smith, J. Sondergard					
LEGAL DESCRIPTION	¼ SECTION: NW NW	SECTION: 17	TOWNSHIP: 14 N/S	RANGE: 96 E/W	PM: Sixth	
COUNTY: Delta	WATERSHED: Gunnison	WATER DIVISION: 4	DOW WATER CODE: 37968			
MAP(S): USGS.	GPS = 747112					
USFS:	4302749					

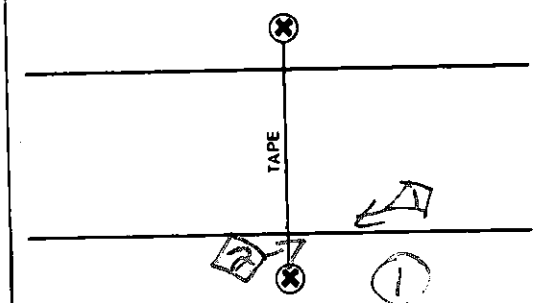
SUPPLEMENTAL DATA

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: gravels to 4" cobbles	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	5.65 / 5.65
② WS Upstream	21.0	4.30
③ WS Downstream	21.0	5.70
SLOPE	1.4 / 42.0 = .033	

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

Temp: 7.4° C
Cond: 101
Salinity = 0
Ph: 7.42

POD for ditch Zone 12 747063 4302497

Riparian = Alder - Narrowleaf

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Alkali Creek	CROSS-SECTION NO 1	DATE 5-16-13	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME 10:00 am

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		4.85								
G	2.0		5.10								
W	2.25		5.65								
	2.30		6.40	0.75				1.03			
	2.60		6.10	0.45				2.03			
	2.9		6.20	0.55				2.57			
	3.2		6.15	0.50				2.49			
	3.5		6.30	0.65				2.10			
	3.8		6.15	0.50				1.85			
	4.1		6.20	0.55				1.49			
	4.4		6.20	0.55				1.63			
	4.7		6.30	0.65				1.30			
	5.0		6.35	0.70				1.25			
	5.3		6.45	0.80				0.62			
	5.6		6.30	0.65				0.59			
	5.9		6.30	0.65				0.14			
	6.2		5.95	0.20				0			
W	6.5		5.65								
G	7.0		5.10								
RS	10.0		4.55								
TOTALS											

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

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

LOCATION INFORMATION

STREAM NAME:	Alkali Creek
XS LOCATION:	950' u/s fr hdg of Lone Star Ditch
XS NUMBER:	2
DATE:	16-May-13
OBSERVERS:	R. Smith, J. Sondergard
1/4 SEC:	NW NW
SECTION:	17
TWP:	14S
RANGE:	96W
PM:	Sixth
COUNTY:	Delta
WATERSHED:	Gunnison
DIVISION:	4
DOW CODE:	37968
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:	0.033

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

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

STREAM NAME: Alkali Creek
XS LOCATION: 950' u/s fr hdg of Lone Star Ditch
XS NUMBER: 2

DATA POINTS= 30

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	4.65			0.00		0.00	0.00	0.0%
1	G	2.60	5.45			0.00		0.00	0.00	0.0%
	W	3.80	5.70	0.00	0.00	0.00		0.00	0.00	0.0%
		4.10	5.75	0.05	0.00	0.30	0.05	0.02	0.00	0.0%
		4.40	5.75	0.05	0.00	0.30	0.05	0.02	0.00	0.0%
		4.70	5.75	0.05	0.00	0.30	0.05	0.02	0.00	0.0%
		5.00	5.80	0.10	0.00	0.30	0.10	0.03	0.00	0.0%
		5.30	5.80	0.10	0.00	0.30	0.10	0.03	0.00	0.0%
		5.60	6.10	0.40	0.15	0.42	0.40	0.12	0.02	0.5%
		5.90	6.10	0.40	0.54	0.30	0.40	0.12	0.06	1.8%
		6.20	6.40	0.70	0.80	0.42	0.70	0.21	0.17	4.6%
		6.50	6.35	0.65	1.05	0.30	0.65	0.20	0.20	5.6%
		6.80	6.45	0.75	1.27	0.32	0.75	0.23	0.29	7.8%
		7.10	6.45	0.75	1.48	0.30	0.75	0.23	0.33	9.0%
		7.40	6.30	0.60	1.53	0.34	0.60	0.18	0.28	7.5%
		7.70	6.40	0.70	1.51	0.32	0.70	0.21	0.32	8.6%
		8.00	6.45	0.75	1.51	0.30	0.75	0.23	0.34	9.2%
		8.30	6.40	0.70	1.35	0.30	0.70	0.21	0.28	7.7%
		8.60	6.40	0.70	1.42	0.30	0.70	0.21	0.30	8.1%
		8.90	6.40	0.70	1.27	0.30	0.70	0.21	0.27	7.2%
		9.20	6.40	0.70	1.04	0.30	0.70	0.21	0.22	5.9%
		9.50	6.40	0.70	0.98	0.30	0.70	0.21	0.21	5.6%
		9.80	6.35	0.65	1.01	0.30	0.65	0.23	0.23	6.2%
		10.20	6.35	0.65	0.64	0.40	0.65	0.20	0.12	3.4%
		10.40	6.30	0.60	0.28	0.21	0.60	0.15	0.04	1.1%
		10.70	5.95	0.25	0.07	0.46	0.25	0.08	0.01	0.1%
		11.00	5.80	0.10	0.00	0.34	0.10	0.03	0.00	0.0%
	W	11.20	5.70	0.00	0.00	0.22		0.00	0.00	0.0%
1	G	12.20	5.35			0.00		0.00	0.00	0.0%
	RS	14.60	4.25			0.00		0.00	0.00	0.0%
	TOTALS ----------					7.97	0.75 (Max.)	3.54	3.68	100.0%

Manning's n = 0.1510
Hydraulic Radius= 0.44399834

STREAM NAME: Alkali Creek
XS LOCATION: 950' u/s fr hdg of Lone Star Ditch
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.54	3.54	0.0%
5.45	3.54	5.63	59.1%
5.47	3.54	5.44	53.8%
5.49	3.54	5.26	48.7%
5.51	3.54	5.08	43.7%
5.53	3.54	4.91	38.7%
5.55	3.54	4.73	33.8%
5.57	3.54	4.56	29.0%
5.59	3.54	4.40	24.3%
5.61	3.54	4.23	19.7%
5.63	3.54	4.07	15.2%
5.65	3.54	3.92	10.7%
5.66	3.54	3.84	8.5%
5.67	3.54	3.76	6.4%
5.68	3.54	3.69	4.2%
5.69	3.54	3.61	2.1%
5.70	3.54	3.54	0.0%
5.71	3.54	3.46	-2.1%
5.72	3.54	3.39	-4.1%
5.73	3.54	3.32	-6.2%
5.74	3.54	3.25	-8.2%
5.75	3.54	3.18	-10.2%
5.77	3.54	3.05	-13.7%
5.79	3.54	2.93	-17.2%
5.81	3.54	2.81	-20.5%
5.83	3.54	2.70	-23.7%
5.85	3.54	2.59	-26.9%
5.87	3.54	2.48	-30.0%
5.89	3.54	2.37	-33.1%
5.91	3.54	2.26	-36.2%
5.93	3.54	2.15	-39.2%
5.95	3.54	2.05	-42.2%

WATERLINE AT ZERO
AREA ERROR = 5.700

STREAM NAME: Alkali Creek
XS LOCATION: 950' u/s fr hdg of Lone Star Ditch
XS NUMBER: 2

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.45	9.31	0.60	1.00	5.63	9.95	100.0%	0.57	6.88	1.22
	5.45	9.31	0.60	1.00	5.63	9.95	100.0%	0.57	6.88	1.22
	5.50	8.93	0.58	0.95	5.17	9.55	96.0%	0.54	6.14	1.19
	5.55	8.55	0.55	0.90	4.73	9.16	92.0%	0.52	5.45	1.15
	5.60	8.17	0.53	0.85	4.32	8.76	88.0%	0.49	4.81	1.12
	5.65	7.78	0.50	0.80	3.92	8.36	84.1%	0.47	4.22	1.08
WL	5.70	7.40	0.48	0.75	3.54	7.97	80.1%	0.44	3.68	1.04
	5.75	6.40	0.50	0.70	3.18	6.95	69.9%	0.46	3.37	1.06
	5.80	5.70	0.50	0.65	2.87	6.24	62.7%	0.46	3.05	1.07
	5.85	5.55	0.47	0.60	2.59	6.05	60.8%	0.43	2.62	1.01
	5.90	5.40	0.43	0.55	2.31	5.87	59.0%	0.39	2.22	0.96
	5.95	5.25	0.39	0.50	2.05	5.69	57.2%	0.36	1.85	0.90
	6.00	5.16	0.35	0.45	1.79	5.55	55.8%	0.32	1.50	0.84
	6.05	5.06	0.30	0.40	1.53	5.41	54.4%	0.28	1.18	0.77
	6.10	4.67	0.27	0.35	1.28	4.98	50.0%	0.26	0.92	0.72
	6.15	4.58	0.23	0.30	1.05	4.84	48.7%	0.22	0.68	0.64
	6.20	4.49	0.18	0.25	0.82	4.71	47.3%	0.17	0.46	0.56
	6.25	4.39	0.14	0.20	0.60	4.57	45.9%	0.13	0.28	0.46
	6.30	4.30	0.09	0.15	0.38	4.43	44.5%	0.09	0.13	0.35
	6.35	3.40	0.05	0.10	0.18	3.49	35.0%	0.05	0.04	0.25
	6.40	1.15	0.03	0.05	0.04	1.18	11.8%	0.03	0.01	0.18
	6.45	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Alkali Creek
XS LOCATION: 950' u/s fr hdg of Lone Star Ditch
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	3.68	cfs
CALCULATED FLOW (Qc)=	3.68	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	5.70	ft
CALCULATED WATERLINE (WLc)=	5.70	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.75	ft
MAX CALCULATED DEPTH (Dc)=	0.75	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.04	ft/sec
MANNING'S N=	0.151	
SLOPE=	0.033	ft/ft
.4 * Qm =	1.5	cfs
2.5 * Qm=	9.2	cfs

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

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

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

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

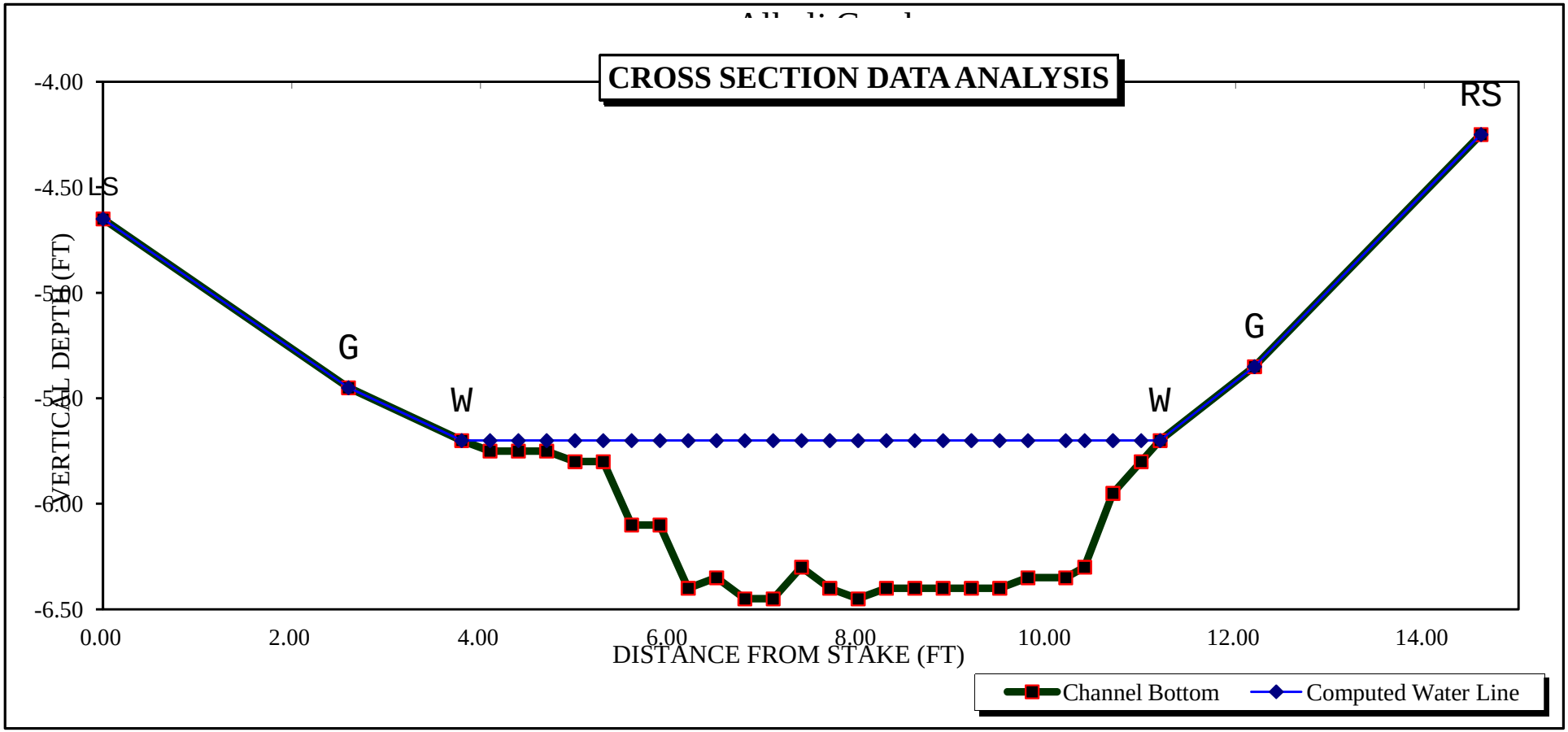
CWCB REVIEW BY: ..……………………………....…………………………………………………...…............ DATE:.................…………….…

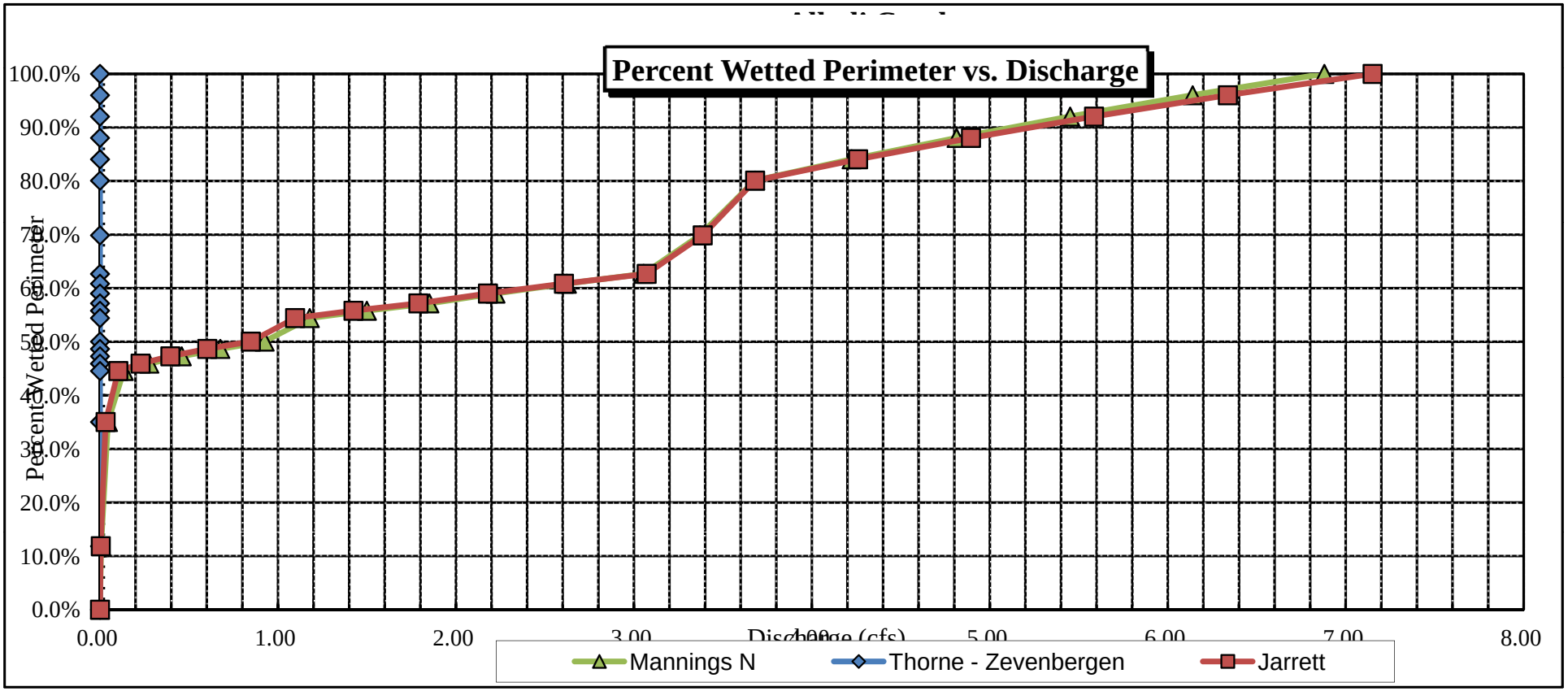
STREAM NAME: Alkali Creek
XS LOCATION: 950' u/s fr hdg of Lone Star Ditch
XS NUMBER: 2

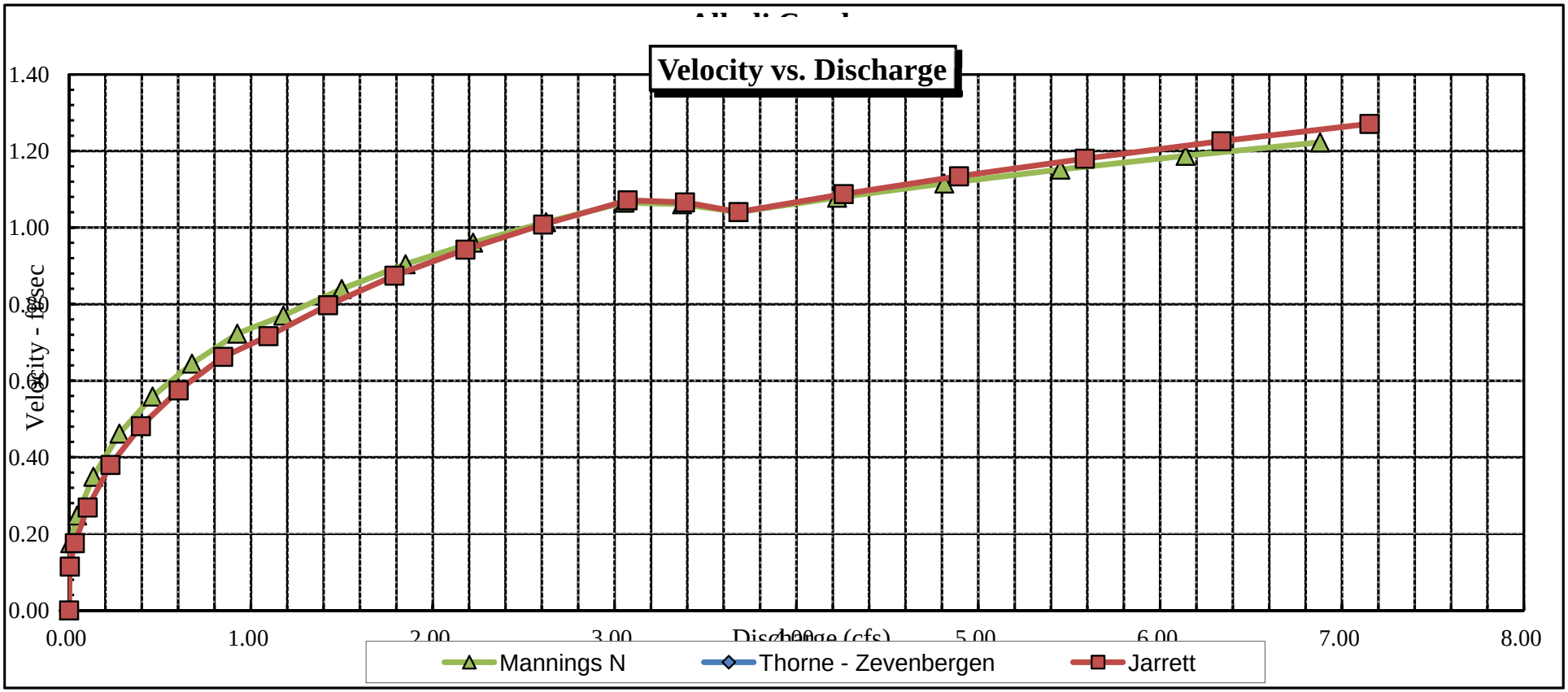
Jarrett Variable Manning's n Correction Applied

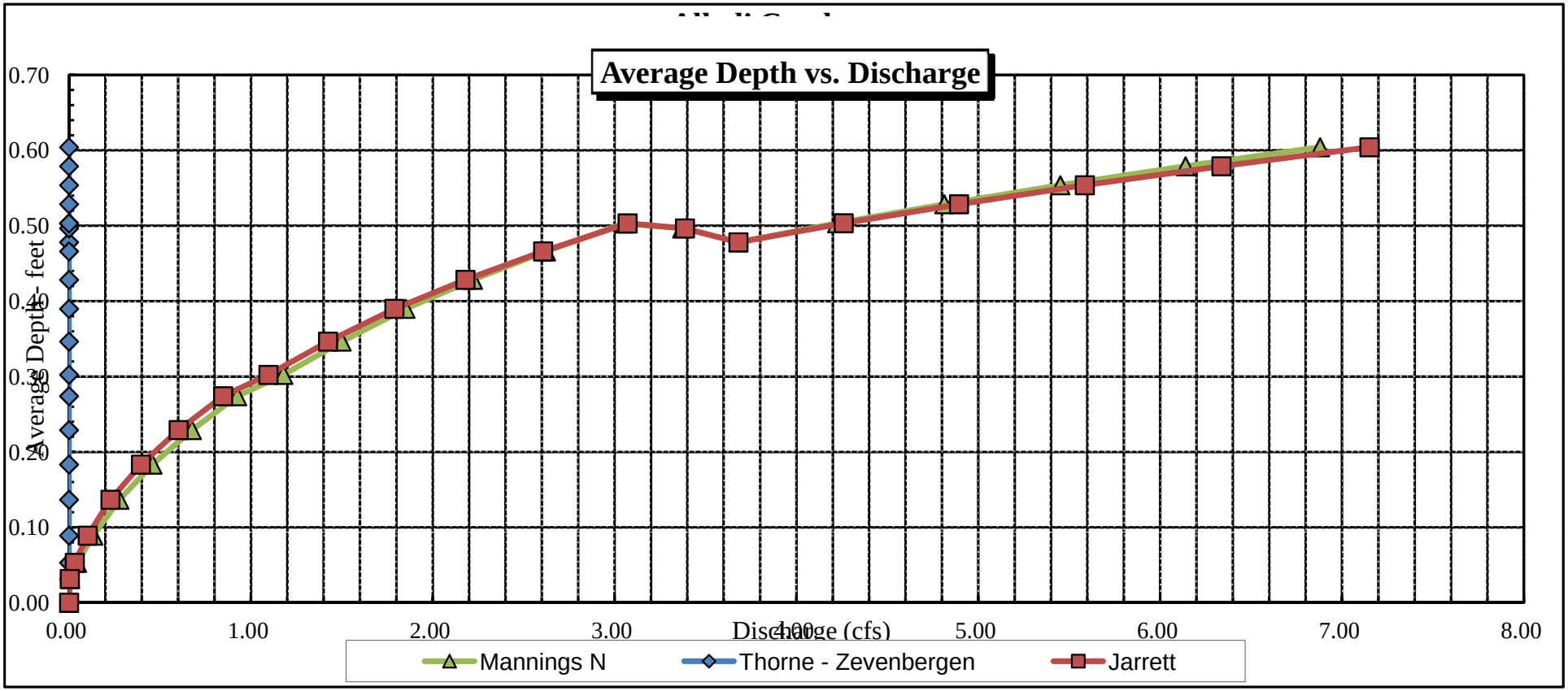
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

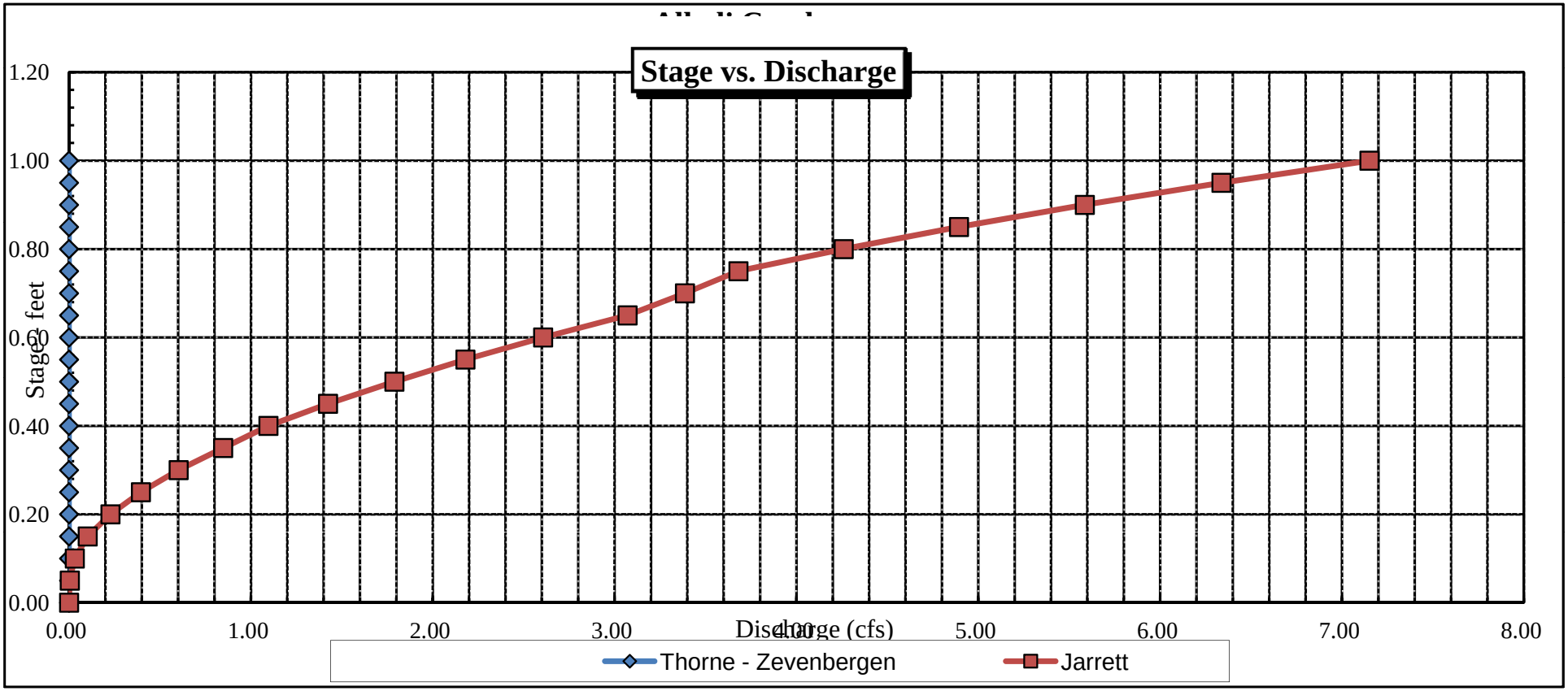
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.45	9.31	0.60	1.00	5.63	9.95	100.0%	0.57	7.15	1.27
	5.45	9.31	0.60	1.00	5.63	9.95	100.0%	0.57	7.15	1.27
	5.50	8.93	0.58	0.95	5.17	9.55	96.0%	0.54	6.34	1.23
	5.55	8.55	0.55	0.90	4.73	9.16	92.0%	0.52	5.59	1.18
	5.60	8.17	0.53	0.85	4.32	8.76	88.0%	0.49	4.89	1.13
	5.65	7.78	0.50	0.80	3.92	8.36	84.1%	0.47	4.26	1.09
WL	5.70	7.40	0.48	0.75	3.54	7.97	80.1%	0.44	3.68	1.04
	5.75	6.40	0.50	0.70	3.18	6.95	69.9%	0.46	3.39	1.07
	5.80	5.70	0.50	0.65	2.87	6.24	62.7%	0.46	3.07	1.07
	5.85	5.55	0.47	0.60	2.59	6.05	60.8%	0.43	2.61	1.01
	5.90	5.40	0.43	0.55	2.31	5.87	59.0%	0.39	2.18	0.94
	5.95	5.25	0.39	0.50	2.05	5.69	57.2%	0.36	1.79	0.87
	6.00	5.16	0.35	0.45	1.79	5.55	55.8%	0.32	1.42	0.80
	6.05	5.06	0.30	0.40	1.53	5.41	54.4%	0.28	1.10	0.72
	6.10	4.67	0.27	0.35	1.28	4.98	50.0%	0.26	0.85	0.66
	6.15	4.58	0.23	0.30	1.05	4.84	48.7%	0.22	0.60	0.57
	6.20	4.49	0.18	0.25	0.82	4.71	47.3%	0.17	0.40	0.48
	6.25	4.39	0.14	0.20	0.60	4.57	45.9%	0.13	0.23	0.38
	6.30	4.30	0.09	0.15	0.38	4.43	44.5%	0.09	0.10	0.27
	6.35	3.40	0.05	0.10	0.18	3.49	35.0%	0.05	0.03	0.18
	6.40	1.15	0.03	0.05	0.04	1.18	11.8%	0.03	0.00	0.11
	6.45	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


CROSS SECTION DATA ANALYSIS
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
VERTICAL DEPTH (FT)
LS
G
W
W
G
RS
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
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Velocity - ft/sec
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
1.20
1.00
0.80
0.60
0.40
0.20
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

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Alkali Creek						CROSS-SECTION NO. 2	
CROSS-SECTION LOCATION: 950' upstream from headgate of Lone Star Ditch							
DATE: 5-16-13	OBSERVERS: R. Smith, J. Soundergard						
LEGAL DESCRIPTION	¼ SECTION: NW NW	SECTION: 17	TOWNSHIP: 14 N (S)	RANGE: 96 E (W)	PM: Sixth		
COUNTY: Delta	WATERSHED: Gunnison	WATER DIVISION: 4	DOW WATER CODE: 37968				
MAP(S): USGS:							
USFS:							

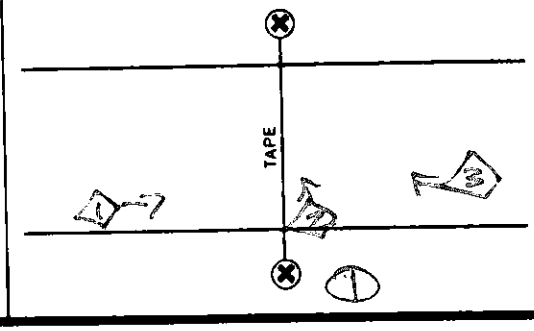
SUPPLEMENTAL DATA

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: gravels	PHOTOGRAPHS TAKEN (YES)/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	5.70 / 5.70
② WS Upstream	21.0	4.30
③ WS Downstream	21.0	5.70
SLOPE	1.4 / 42.0 = .033	

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

Temp: 7.4°C
Cond: 101
Salinity: 0
Ph: 7.42

0.8 ' 11.2

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Alkali Creek	CROSS-SECTION NO 2	DATE 5-16-13	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: ____ ft	TIME 10:30 am

Features (Stake (S), Grassline (G), Waterline (W), Rock (R))	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		4.65								
G	2.6		5.45								
W	3.8		5.70								
	4.1		5.75	0.05				0			
	4.4		5.75	0.05				0			
	4.7		5.75	0.05				0			
	5.0		5.80	0.10				0			
	5.3		5.80	0.10				0			
	5.6		6.10	0.40				0.15			
	5.9		6.10	0.40				0.54			
	6.2		6.40	0.70				0.80			
	6.5		6.35	0.65				1.05			
	6.8		6.45	0.75				1.27			
	7.1		6.45	0.75				1.48			
	7.4		6.30	0.60				1.53			
	7.7		6.40	0.70				1.51			
	8.0		6.45	0.75				1.51			
	8.3		6.40	0.70				1.35			
	8.6		6.40	0.70				1.42			
	8.9		6.40	0.70				1.27			
	9.2		6.40	0.70				1.04			
	9.5		6.40	0.70				0.98			
	9.8		6.35	0.65				1.01			
	10.2		6.35	0.65				0.64			
	10.4		6.30	0.60				0.28			
	10.7		5.95	0.25				0.07			
	11.0		5.80	0.10				0			
W	11.2		5.70								
G	12.2		5.25								
LS	14.6		4.25								
TOTALS											

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