



United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Colorado State Office
2850 Youngfield Street
Lakewood, Colorado 80215-7210

www.blm.gov/colorado



DRAFT RECOMMENDATION – SUBJECT TO CHANGE

In Reply Refer To:
7250 (CO-932)

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 Iowa Gulch, located in Water Division 2.

Location and Land Status. Iowa Gulch originates on the west flank of Mount Sherman approximately six miles southeast of Leadville, and it flows into the Arkansas River four miles southwest of Leadville. This recommendation addresses only the portion of Iowa Gulch that starts at the headwaters and extends downstream to the headgate of the Iowa Gulch Intake in Section 33, T9S R79W. The BLM manages 2.53 miles of this reach, and approximately 0.6 miles are in private ownership.

Biological Summary. Iowa Gulch is a cold water, very high gradient stream. The reach that is the subject of this recommendation flows through a valley approximately one half mile in width at the base of Mount Sherman. This portion of Iowa Gulch has large substrate, with boulders up to one foot in diameter. The large substrate and steep gradient provide fish habitat consisting primarily of pools separated by large drops, with limited riffles. Water quality is good for supporting salmonid fish species.

Fish surveys indicate that Iowa Gulch supports a self-sustaining population of brook trout below the recommended stream reach. The recommended reach does not presently support a fish population, and BLM fish biologists believe that this is the case because of short-term, historic heavy metal discharges from abandoned mines within the watershed. The BLM believes that the water quality is sufficient to support a fish population and has requested that Colorado Parks and Wildlife consider reintroduction of fish after all historic mine tailings are stabilized.

Spot surveys indicated populations of mayflies that would be sufficient to support a fish population. The creek also supports a vigorous riparian community comprised of willows and

sedges. The riparian community provides some cover and shading for the creek, and contributes to substantial to bank stability. Extensive beaver activity is also evident.

R2Cross Analysis. The BLM collected the following R2Cross data:

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)
09/18/2018 #1		18.03 feet	1.54 cfs	3.43 cfs
09/18/2018 #2		12.60 feet	Out of range	3.48 cfs
		Averages:	1.54 cfs	3.46 cfs

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

3.5 cubic feet per second is recommended during the snowmelt runoff period from May 1 to June 30. This recommendation is driven by the average velocity criteria. Given the small amount of riffle habitat in this reach, it is important to provide velocities that are suitable for spawning trout.

1.5 cubic feet per second is recommended during summer, from July 1 to September 15. This recommendation is driven by the wetted perimeter criteria. This flow rate will maintain sufficient physical habitat in the creek for the fish population to complete important parts of their life cycle before cold temperatures reduce fish activity for the winter.

0.6 cubic feet per second is recommended from September 16 to April 30. This recommendation is driven by limited water availability. This flow rate should prevent complete icing of the numerous pools in this reach, allowing the fish population to overwinter.

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

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

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

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2019. We thank both Colorado

Parks and Wildlife and the Colorado Water Conservation Board for their cooperation in this effort.

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

Sincerely,

Brian St. George
Deputy State Director
Resources and Fire

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

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: _____			
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		
RS	0.0		5.18								
	0.7		6.05								
G	1.2		6.42								
	2.3		6.79								
	3.3		7.66								
RW	5.5		7.90								
	5.8		7.95	0.05				0.08			
	6.0		8.0	0.10				0.39			
	6.2		8.1	0.20				1.20			
	6.4		8.15	0.25				0.92			
	6.6		8.15	0.25				1.03			
	6.8		8.20	0.30				1.37			
	7.0		8.20	0.30				1.33			
	7.2		8.20	0.30				1.69			
	7.4		8.25	0.35				1.54			
	7.6		8.3	0.40				1.30			
	7.8		8.3	0.40				1.67			
	8.0		8.2	0.30				1.13			
	8.2		8.25	0.35				1.53			
	8.4		8.2	0.30				1.55			
	8.6		8.2	0.30				1.42			
	8.8		8.1	0.20				1.55			
	9.0		8.15	0.25				1.59			
	9.2		8.15	0.25				1.04			
	9.4		8.15	0.25				1.43			
	9.6		8.15	0.25				1.37			
	9.8		8.10	0.20				0.77			
	10.0		8.05	0.15				1.15			
	10.2		8.05	0.15				1.21			
	10.4		8.0	0.10				1.04			
	10.6		8.0	0.10				0.32			
	10.8		8.0	0.10				0.15			
	11.0		7.95	0.05				0.11			
LW	11.7		7.90								
	12.4		7.40								
G	12.8		6.49								
	13.6		6.09								
LS	14.7		5.49								
TOTALS:											
End of Measurement	Time:	Gage Reading: _____ ft	CALCULATIONS PERFORMED BY:					CALCULATIONS CHECKED BY:			

End of Measurement

Time:

Gage Reading: _____ ft

CALCULATIONS PERFORMED BY:

CALCULATIONS CHECKED BY:

Data Input & Proofing

STREAM NAME: Iowa Gulch
 XS LOCATION: 150 ft dwnstr fr conf w Dyer Gulch
 XS NUMBER: 1
 DATE: 9/18/2018
 OBSERVERS: R. Smith, J. Thompson, J. Abeles

1/4 SEC: NW
 SECTION: 35
 TWP: 9N
 RANGE: 79W
 PM: Sixth

COUNTY: Lake
 WATERSHED: Arkansas River
 DIVISION: 2
 DOW CODE: 33198
 USGS MAP:
 USFS MAP:

TAPE WT: 0.0106 lbs / ft
 TENSION: 99999 lbs

SLOPE: 0.016 ft / ft

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

ASSIGNED TO:DATE.....

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
Total Data Points = 38								
1	RS	0.00	5.18			0.00	0.00	0.00
		0.70	6.05			0.00	0.00	0.00
	G	1.20	6.42			0.00	0.00	0.00
		2.20	6.79			0.00	0.00	0.00
		3.30	7.66			0.00	0.00	0.00
	RW	5.50	7.90	0.00	0.00	0.00	0.00	0.00
		5.80	7.95	0.05	0.08	0.01	0.00	7.90
		6.00	8.00	0.10	0.39	0.02	0.01	7.90
		6.20	8.10	0.20	1.20	0.04	0.05	7.90
		6.40	8.15	0.25	0.92	0.05	0.05	7.90
		6.60	8.15	0.25	1.03	0.05	0.05	7.90
		6.80	8.20	0.30	1.37	0.06	0.08	7.90
		7.00	8.20	0.30	1.33	0.06	0.08	7.90
		7.20	8.20	0.30	1.69	0.06	0.10	7.90
		7.40	8.25	0.35	1.54	0.07	0.11	7.90
		7.60	8.30	0.40	1.30	0.08	0.10	7.90
		7.80	8.30	0.40	1.67	0.08	0.13	7.90
		8.00	8.20	0.30	1.13	0.06	0.07	7.90
		8.20	8.25	0.35	1.53	0.07	0.11	7.90
		8.40	8.20	0.30	1.55	0.06	0.09	7.90
1		8.60	8.20	0.30	1.42	0.06	0.09	7.90
		8.80	8.10	0.20	1.55	0.04	0.06	7.90
		9.00	8.15	0.25	1.59	0.05	0.08	7.90
		9.20	8.15	0.25	1.04	0.05	0.05	7.90
		9.40	8.15	0.25	1.43	0.05	0.07	7.90
		9.60	8.15	0.25	1.37	0.05	0.07	7.90
		9.80	8.10	0.20	0.77	0.04	0.03	7.90
		10.00	8.05	0.15	1.15	0.03	0.03	7.90
		10.20	8.05	0.15	1.21	0.03	0.04	7.90
		10.40	8.00	0.10	1.04	0.02	0.02	7.90
1		10.60	8.00	0.10	0.32	0.02	0.01	7.90
		10.80	8.00	0.10	0.15	0.02	0.00	7.90
		11.00	7.95	0.05	0.11	0.02	0.00	7.90
	LW	11.70	7.90	0.00	0.00	0.00	0.00	0.00
		12.40	7.40			0.00	0.00	0.00
	G	12.80	6.49			0.00	0.00	0.00
1		13.60	6.09			0.00	0.00	0.00
	LS	14.70	5.49			0.00	0.00	0.00

Totals	1.26	1.58
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COLORADO WATER CONSERVATION BOARD
INSTREAM FLOW / NATURAL LAKE LEVEL PROGRAM
STREAM CROSS-SECTION AND FLOW ANALYSIS

LOCATION INFORMATION

STREAM NAME: Iowa Gulch
XS LOCATION: 150 ft dwnstr fr conf w Dyer Gulch
XS NUMBER: 1

DATE: 18-Sep-18
OBSERVERS: R. Smith, J. Thompson, J. Abeles

1/4 SEC: NW
SECTION: 35
TWP: 9N
RANGE: 79W
PM: Sixth

COUNTY: Lake
WATERSHED: Arkansas River
DIVISION: 2
DOW CODE: 33198

USGS MAP: 0
USFS MAP: 0

SUPPLEMENTAL DATA

*** NOTE ***

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

TAPE WT: 0.0106
TENSION: 99999

CHANNEL PROFILE DATA

SLOPE: 0.016

INPUT DATA CHECKED BY:DATE.....

ASSIGNED TO:DATE.....

STREAM NAME: Iowa Gulch
 XS LOCATION: 150 ft dwnstr fr conf w Dyer Gulch
 XS NUMBER: 1

DATA POINTS= 38

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL
RS	0.00	5.18		
	0.70	6.05		
1 G	1.20	6.42		
	2.20	6.79		
	3.30	7.66		
RW	5.50	7.90	0.00	0.00
	5.80	7.95	0.05	0.08
	6.00	8.00	0.10	0.39
	6.20	8.10	0.20	1.20
	6.40	8.15	0.25	0.92
	6.60	8.15	0.25	1.03
	6.80	8.20	0.30	1.37
	7.00	8.20	0.30	1.33
	7.20	8.20	0.30	1.69
	7.40	8.25	0.35	1.54
	7.60	8.30	0.40	1.30
	7.80	8.30	0.40	1.67
	8.00	8.20	0.30	1.13
	8.20	8.25	0.35	1.53
	8.40	8.20	0.30	1.55
	8.60	8.20	0.30	1.42
	8.80	8.10	0.20	1.55
	9.00	8.15	0.25	1.59
	9.20	8.15	0.25	1.04
	9.40	8.15	0.25	1.43
	9.60	8.15	0.25	1.37
	9.80	8.10	0.20	0.77
	10.00	8.05	0.15	1.15
	10.20	8.05	0.15	1.21
	10.40	8.00	0.10	1.04
	10.60	8.00	0.10	0.32
	10.80	8.00	0.10	0.15
	11.00	7.95	0.05	0.11
LW	11.70	7.90	0.00	0.00
	12.40	7.40		
1 G	12.80	6.49		
	13.60	6.09		
LS	14.70	5.49		

WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.30	0.05	0.01	0.00	0.1%
0.21	0.10	0.02	0.01	0.5%
0.22	0.20	0.04	0.05	3.0%
0.21	0.25	0.05	0.05	2.9%
0.20	0.25	0.05	0.05	3.3%
0.21	0.30	0.06	0.08	5.2%
0.20	0.30	0.06	0.08	5.0%
0.20	0.30	0.06	0.10	6.4%
0.21	0.35	0.07	0.11	6.8%
0.21	0.40	0.08	0.10	6.6%
0.20	0.40	0.08	0.13	8.4%
0.22	0.30	0.06	0.07	4.3%
0.21	0.35	0.07	0.11	6.8%
0.21	0.30	0.06	0.09	5.9%
0.20	0.30	0.06	0.09	5.4%
0.22	0.20	0.04	0.06	3.9%
0.21	0.25	0.05	0.08	5.0%
0.20	0.25	0.05	0.05	3.3%
0.20	0.25	0.05	0.07	4.5%
0.20	0.25	0.05	0.07	4.3%
0.21	0.20	0.04	0.03	1.9%
0.21	0.15	0.03	0.03	2.2%
0.20	0.15	0.03	0.04	2.3%
0.21	0.10	0.02	0.02	1.3%
0.20	0.10	0.02	0.01	0.4%
0.20	0.10	0.02	0.00	0.2%
0.21	0.05	0.02	0.00	0.2%
0.70		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%

TOTALS -----

6.35 0.4 1.26 1.58 100.0%
 (Max.)

Manning's n = 0.0505
 Hydraulic Radius= 0.19761896

STREAM NAME: Iowa Gulch
 XS LOCATION: 150 ft dwnstr fr conf w Dyer Gulch
 XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.26	1.26	0.0%
7.65	1.26	3.13	149.8%
7.67	1.26	2.96	135.9%
7.69	1.26	2.79	122.3%
7.71	1.26	2.62	109.1%
7.73	1.26	2.46	96.2%
7.75	1.26	2.30	83.6%
7.77	1.26	2.15	71.3%
7.79	1.26	2.00	59.4%
7.81	1.26	1.86	47.9%
7.83	1.26	1.71	36.6%
7.85	1.26	1.58	25.8%
7.86	1.26	1.51	20.4%
7.87	1.26	1.45	15.2%
7.88	1.26	1.38	10.0%
7.89	1.26	1.32	5.0%
7.90	1.26	1.26	0.0%
7.91	1.26	1.19	-4.9%
7.92	1.26	1.14	-9.6%
7.93	1.26	1.08	-14.1%
7.94	1.26	1.02	-18.5%
7.95	1.26	0.97	-22.7%
7.97	1.26	0.87	-30.9%
7.99	1.26	0.77	-38.8%
8.01	1.26	0.68	-46.1%
8.03	1.26	0.59	-52.9%
8.05	1.26	0.51	-59.6%
8.07	1.26	0.43	-65.7%
8.09	1.26	0.36	-71.6%
8.11	1.26	0.28	-77.3%
8.13	1.26	0.22	-82.6%
8.15	1.26	0.16	-87.5%

WATERLINE AT ZERO

AREA ERROR = 7.900

STREAM NAME: Iowa Gulch
 XS LOCATION: 150 ft dwnstr fr conf w Dyer Gulch
 XS NUMBER: 1

Constant Manning's n

GL = lowest Grassline elevation corrected for sag

STAGING TABLE

WL = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	6.49	11.41	1.29	1.81	14.76	12.68	100.0%	1.16	60.74	4.12
	6.90	10.28	1.01	1.40	10.34	11.20	88.3%	0.92	36.46	3.53
	6.95	10.20	0.96	1.35	9.82	11.06	87.2%	0.89	33.77	3.44
	7.00	10.11	0.92	1.30	9.32	10.92	86.1%	0.85	31.17	3.35
	7.05	10.03	0.88	1.25	8.81	10.79	85.1%	0.82	28.65	3.25
	7.10	9.94	0.84	1.20	8.31	10.65	84.0%	0.78	26.22	3.15
	7.15	9.85	0.79	1.15	7.82	10.52	82.9%	0.74	23.87	3.05
	7.20	9.77	0.75	1.10	7.33	10.38	81.9%	0.71	21.61	2.95
	7.25	9.68	0.71	1.05	6.84	10.25	80.8%	0.67	19.44	2.84
	7.30	9.60	0.66	1.00	6.36	10.11	79.7%	0.63	17.37	2.73
	7.35	9.51	0.62	0.95	5.88	9.98	78.7%	0.59	15.39	2.62
	7.40	9.43	0.57	0.90	5.41	9.84	77.6%	0.55	13.50	2.50
	7.45	9.30	0.53	0.85	4.94	9.68	76.3%	0.51	11.74	2.38
	7.50	9.16	0.49	0.80	4.48	9.51	75.0%	0.47	10.09	2.25
	7.55	9.03	0.45	0.75	4.02	9.34	73.7%	0.43	8.54	2.12
	7.60	8.90	0.40	0.70	3.58	9.18	72.3%	0.39	7.10	1.98
	7.65	8.76	0.36	0.65	3.13	9.01	71.0%	0.35	5.77	1.84
	7.70	8.31	0.33	0.60	2.71	8.54	67.3%	0.32	4.68	1.73
	7.75	7.78	0.30	0.55	2.30	7.99	63.0%	0.29	3.74	1.62
	7.80	7.26	0.27	0.50	1.93	7.44	58.7%	0.26	2.91	1.51
	7.85	6.73	0.23	0.45	1.58	6.90	54.4%	0.23	2.20	1.39
WL	7.90	6.20	0.20	0.40	1.25	6.35	50.1%	0.20	1.58	1.26
	7.95	5.20	0.19	0.35	0.97	5.34	42.1%	0.18	1.16	1.19
	8.00	4.40	0.16	0.30	0.72	4.53	35.7%	0.16	0.79	1.09
	8.05	3.90	0.13	0.25	0.51	4.01	31.6%	0.13	0.48	0.94
	8.10	3.60	0.09	0.20	0.32	3.70	29.1%	0.09	0.23	0.73
	8.15	2.10	0.08	0.15	0.16	2.17	17.1%	0.07	0.10	0.65
	8.20	1.20	0.05	0.10	0.06	1.25	9.8%	0.05	0.03	0.49
	8.25	0.50	0.04	0.05	0.02	0.52	4.1%	0.03	0.01	0.39
	8.30	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Iowa Gulch
XS LOCATION: 150 ft dwnstr fr conf w Dyer Gulch
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)= 1.58 cfs
CALCULATED FLOW (Qc)= 1.58 cfs
(Qm-Qc)/Qm * 100 = 0.0 %

MEASURED WATERLINE (WLm)= 7.90 ft
CALCULATED WATERLINE (WLc)= 7.90 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= 1.26 ft/sec
MANNING'S N= 0.051
SLOPE= 0.016 ft/ft

.4 * Qm = 0.6 cfs
2.5 * Qm= 4.0 cfs

RECOMMENDED INSTREAM FLOW:
=====

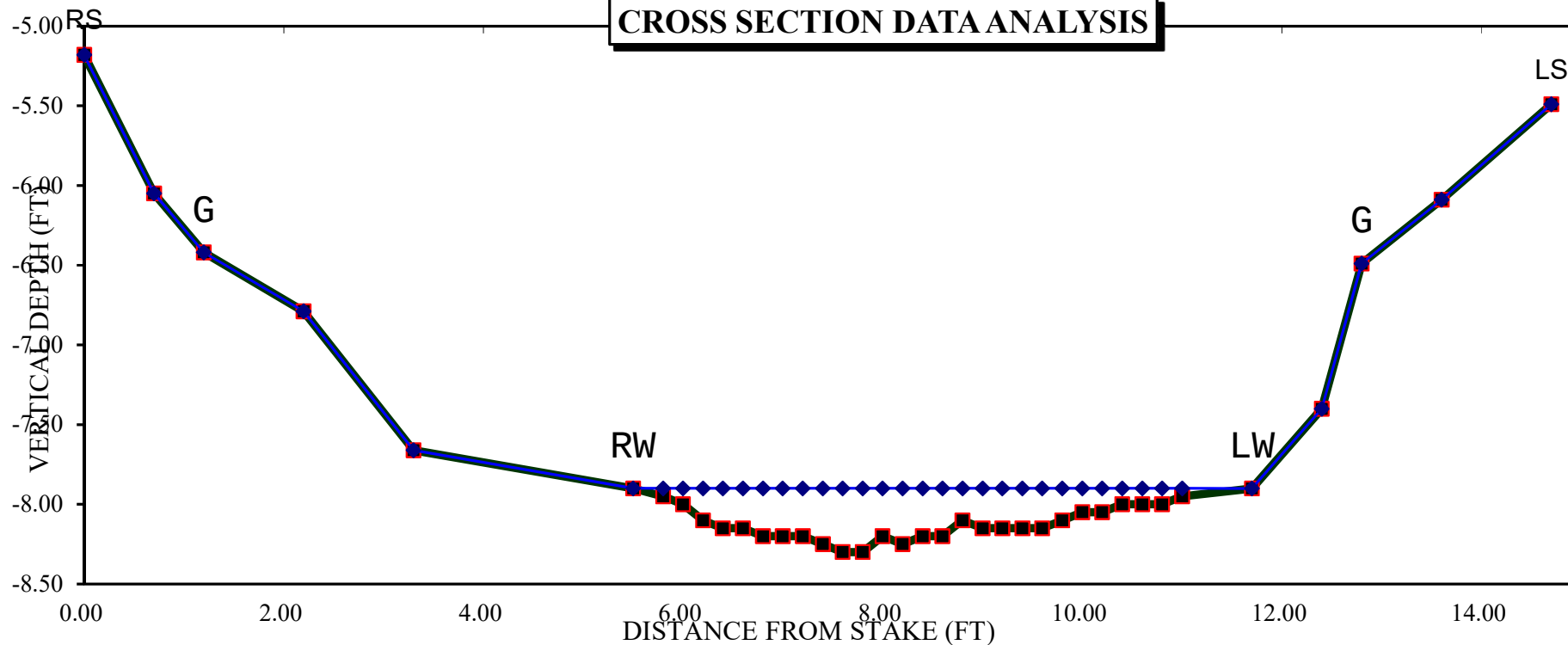
FLOW (CFS)	PERIOD
=====	=====
_____	_____
_____	_____
_____	_____
_____	_____

RATIONALE FOR RECOMMENDATION:
=====

RECOMMENDATION BY: AGENCY..... DATE:.....
CWCB REVIEW BY: DATE:.....

Iowa Gulch

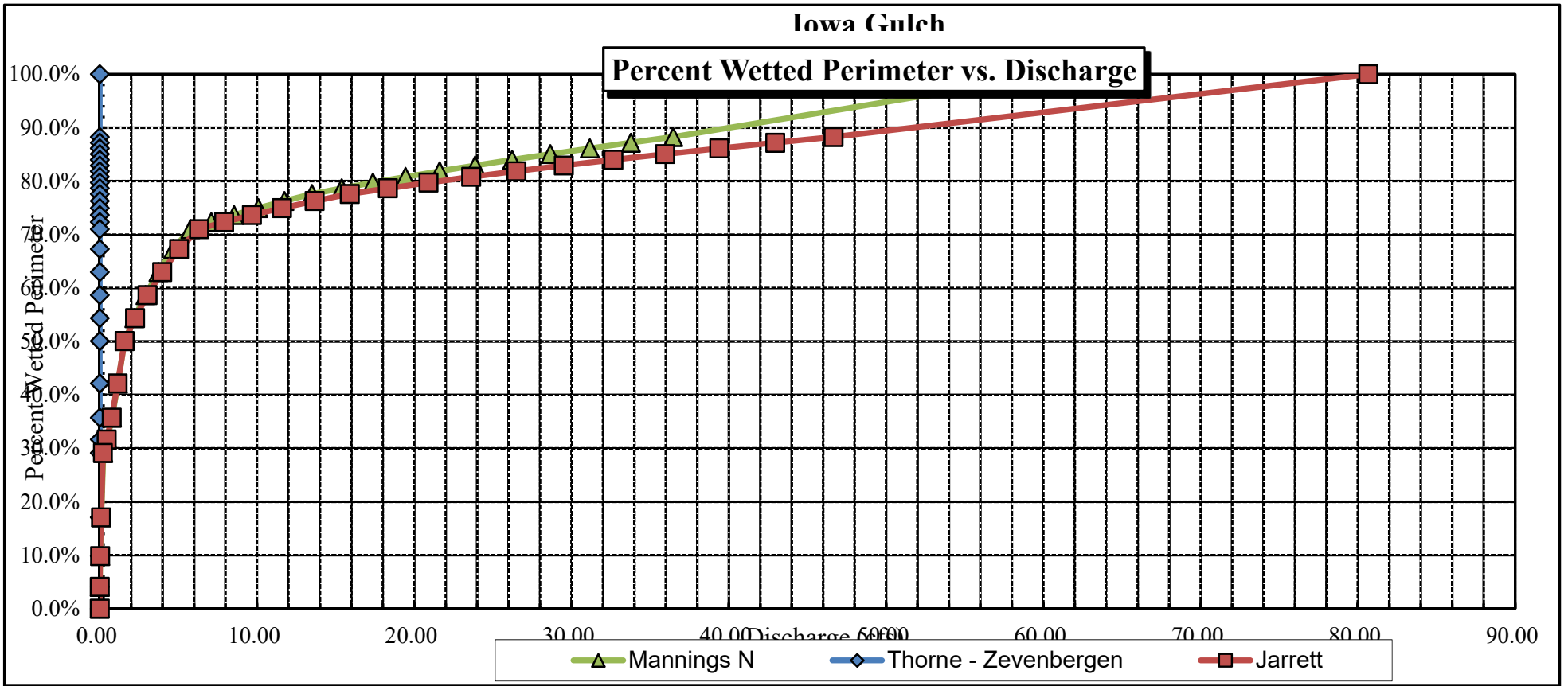
CROSS SECTION DATA ANALYSIS

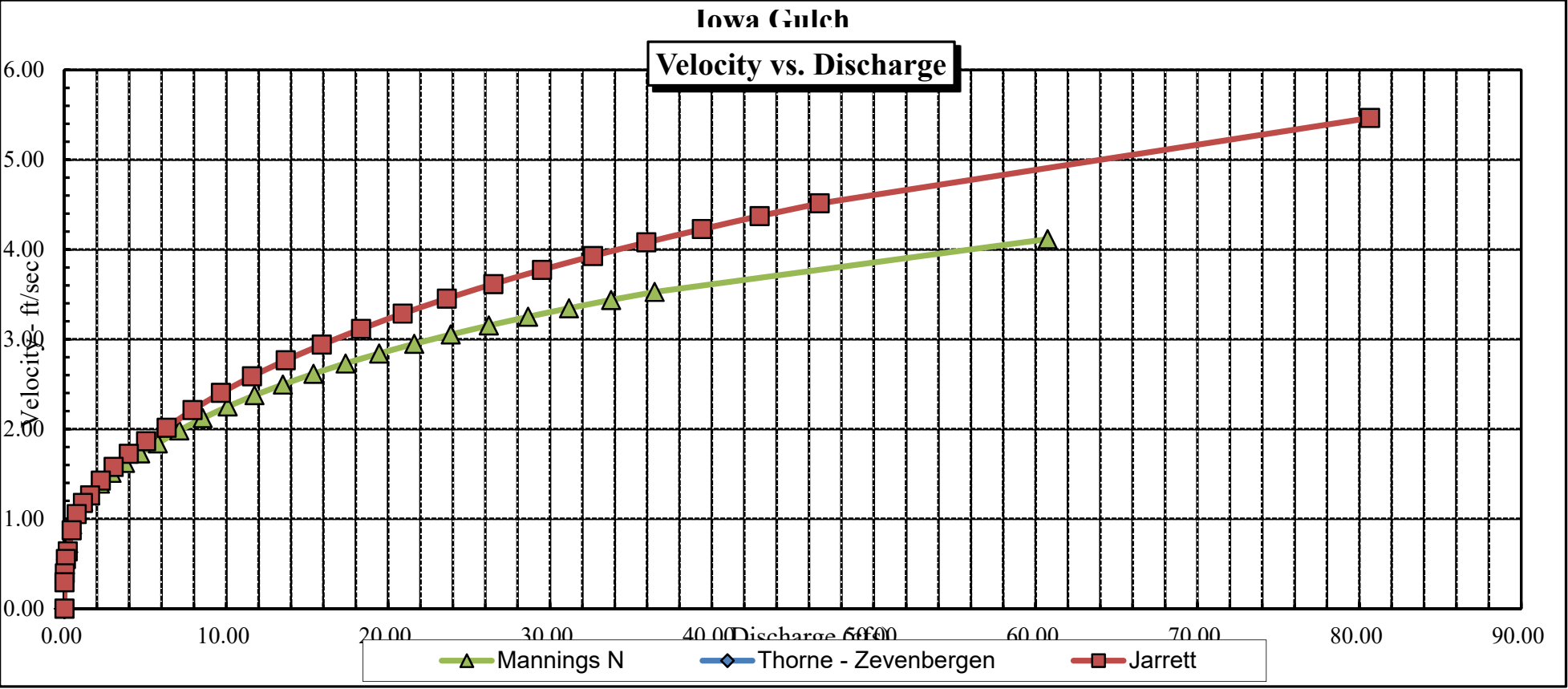


Channel Bottom Computed Water Line

Iowa Gulch

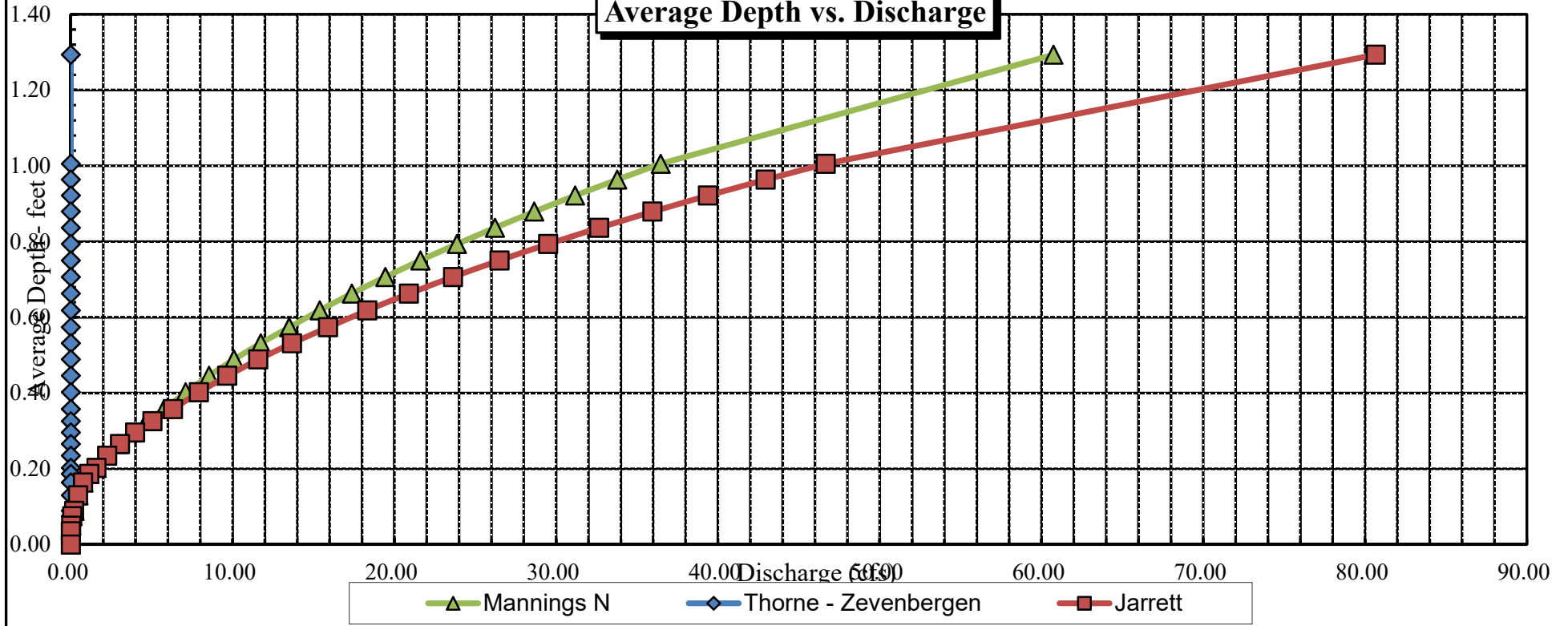
Percent Wetted Perimeter vs. Discharge





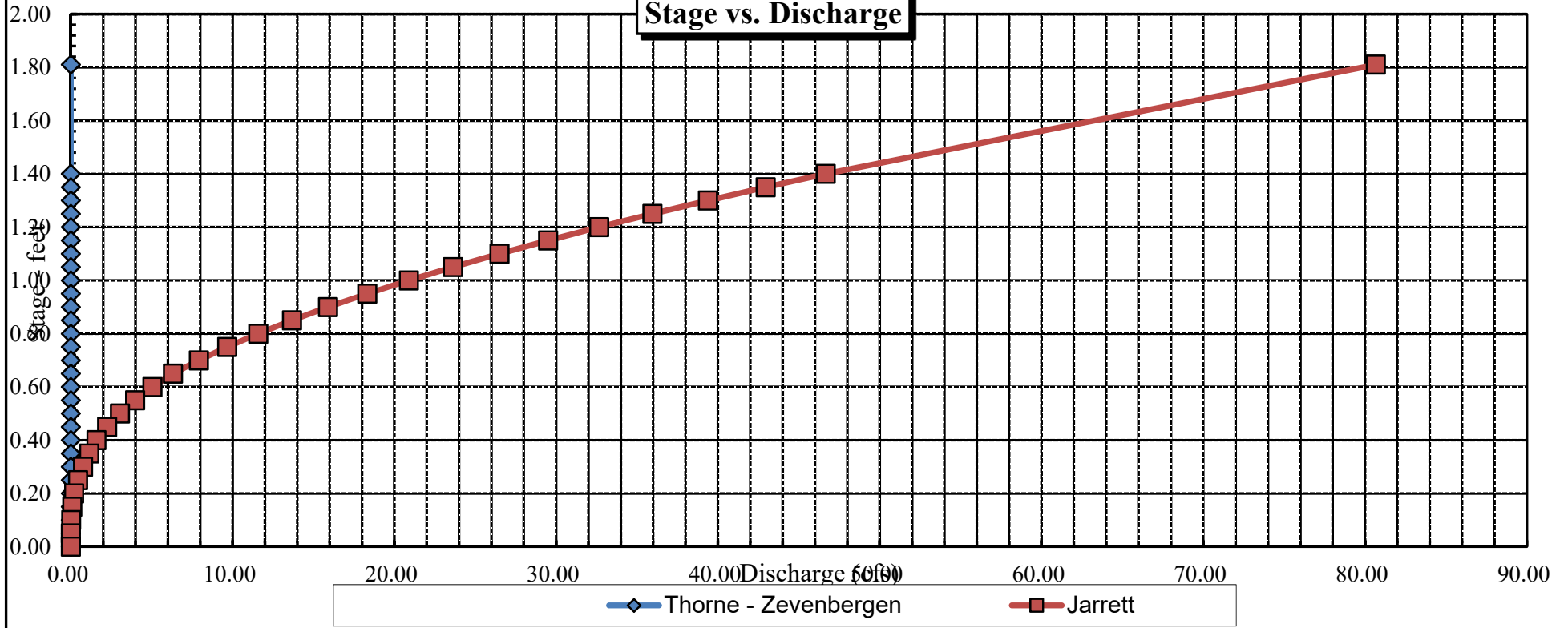
Iowa Gulch

Average Depth vs. Discharge



Iowa Gulch

Stage vs. Discharge





FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



COLORADO WATER
CONSERVATION BOARD

LOCATION INFORMATION

STREAM NAME: Iowa Gulch		CROSS-SECTION NO.: 2	
CROSS-SECTION LOCATION: Approx. 150 ft. downstream from confluence with Byer Gulch			
DATE: 9-18-18	OBSERVERS: R. Smith, T. Thompson, J. Abeles		
LEGAL DESCRIPTION	% SECTION: NW	SECTION: 35	TOWNSHIP: 9 N/S
		RANGE: 79 E/W	PM: 6:44
COUNTY: Lake	WATERSHED: Arkansas	WATER DIVISION: 2	DOW WATER CODE: 33198
MAP(S):	USGS: Zone 13 396099		
	USFS: 4342643		

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	6.30 / 6.30
② WS Upstream	13.5'	6.05
③ WS Downstream	8.5	6.79
SLOPE	0.74 / 22.0 = .034	

SKETCH

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

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: YES/NO	DISTANCE ELECTROFISHED: ft	FISH CAUGHT: YES/NO	WATER CHEMISTRY SAMPLED: YES/NO														
LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.)																	
SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL
AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME:																	
mayfly																	

COMMENTS

sedge-willow riparian
water quality same as downstream site

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: _____					
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		
R/S	0.0		4.27								
	1.5		4.69								
G	1.7		4.91								
	1.9		6.12								
R/W	2.5		6.30								
	2.8		6.4	0.10				0.10			
	3.1		6.45	0.15				0.52			
	3.4		6.4	0.10				1.49			
	3.7		6.55	0.25				0.25			
	4.0		6.55	0.25				0.20			
	4.3		6.50	0.20				0.88			
	4.6		6.70	0.40				1.95			
	4.9		6.63	0.35				1.87			
	5.2		6.55	0.25				1.95			
	5.5		6.55	0.25				0.44			
	5.8		6.50	0.20				0.89			
	6.1		6.5	0.20				1.14			
	6.4		6.5	0.20				1.44			
	6.7		6.45	0.15				1.41			
	7.0		6.55	0.25				1.98			
	7.3		6.55	0.25				1.96			
	7.6		6.55	0.25				1.32			
	7.9		6.50	0.20				1.27			
	8.2		6.50	0.20				1.27			
	8.5		6.50	0.20				0.64			
	8.8		6.45	0.15				0.54			
	9.1		6.40	0.10				0.05			
LW	9.9		6.30								
	10.2		5.84								
G	11.0		5.34								
LS	12.0		4.80								
TOTALS:											
End of Measurement	Time:	Gage Reading:	CALCULATIONS PERFORMED BY:				CALCULATIONS CHECKED BY:				

Data Input & Proofing

STREAM NAME: Iowa Gulch
 XS LOCATION: 150 ft downst fr conf w Dyer Gulch
 XS NUMBER: 2
 DATE: 9/18/2018
 OBSERVERS: R. Smith, J. Thompson, J. Abeles

1/4 SEC: NW
 SECTION: 35
 TWP: 9N
 RANGE: 79W
 PM: Sixth

COUNTY: Lake
 WATERSHED: Arkansas
 DIVISION: 2
 DOW CODE: 33198
 USGS MAP:
 USFS MAP:

TAPE WT: 0.0106 lbs / ft
 TENSION: 99999 lbs

SLOPE: 0.034 ft / ft

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

ASSIGNED TO:DATE.....

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
Total Data Points = 31								
1	RS	0.00	4.27			0.00	0.00	0.00
		1.50	4.69			0.00	0.00	0.00
	G	1.70	4.91			0.00	0.00	0.00
		1.90	6.12			0.00	0.00	0.00
	RW	2.50	6.30	0.00	0.00	0.00	0.00	0.00
		2.80	6.40	0.10	0.10	0.03	0.00	6.30
		3.10	6.45	0.15	0.52	0.05	0.02	6.30
		3.40	6.40	0.10	1.49	0.03	0.04	6.30
		3.70	6.55	0.25	0.25	0.08	0.02	6.30
		4.00	6.55	0.25	0.20	0.08	0.02	6.30
		4.30	6.50	0.20	0.88	0.06	0.05	6.30
		4.60	6.70	0.40	1.95	0.12	0.23	6.30
		4.90	6.65	0.35	1.87	0.11	0.20	6.30
		5.20	6.55	0.25	1.95	0.08	0.15	6.30
		5.50	6.55	0.25	0.44	0.08	0.03	6.30
1		5.80	6.50	0.20	0.89	0.06	0.05	6.30
		6.10	6.50	0.20	1.14	0.06	0.07	6.30
		6.40	6.50	0.20	1.44	0.06	0.09	6.30
		6.70	6.45	0.16	1.41	0.05	0.07	6.29
		7.00	6.55	0.25	1.98	0.08	0.15	6.30
		7.30	6.55	0.25	1.96	0.08	0.15	6.30
		7.60	6.55	0.25	1.32	0.08	0.10	6.30
		7.90	6.50	0.20	1.27	0.06	0.08	6.30
		8.20	6.50	0.20	1.27	0.06	0.08	6.30
		8.50	6.50	0.20	0.64	0.06	0.04	6.30
		8.80	6.45	0.15	0.54	0.05	0.02	6.30
		9.10	6.40	0.10	0.05	0.06	0.00	6.30
	LW	9.90	6.30	0.00	0.00	0.00	0.00	0.00
		10.20	5.84			0.00	0.00	0.00
	G	11.00	5.34			0.00	0.00	0.00
	LS	12.00	4.80			0.00	0.00	0.00

Totals	1.42	1.65
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COLORADO WATER CONSERVATION BOARD
INSTREAM FLOW / NATURAL LAKE LEVEL PROGRAM
STREAM CROSS-SECTION AND FLOW ANALYSIS

LOCATION INFORMATION

STREAM NAME: Iowa Gulch
XS LOCATION: 150 ft dwnst fr conf w Dyer Gulch
XS NUMBER: 2

DATE: 18-Sep-18
OBSERVERS: R. Smith, J. Thompson, J. Abeles

1/4 SEC: NW
SECTION: 35
TWP: 9N
RANGE: 79W
PM: Sixth

COUNTY: Lake
WATERSHED: Arkansas
DIVISION: 2
DOW CODE: 33198

USGS MAP: 0
USFS MAP: 0

SUPPLEMENTAL DATA

*** NOTE ***

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

TAPE WT: 0.0106
TENSION: 99999

CHANNEL PROFILE DATA

SLOPE: 0.034

INPUT DATA CHECKED BY:DATE.....

ASSIGNED TO:DATE.....

STREAM NAME: Iowa Gulch
 XS LOCATION: 150 ft dwnst fr conf w Dyer Gulch
 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
RS	0.00	4.27			0.00		0.00	0.00	0.0%
	1.50	4.69			0.00		0.00	0.00	0.0%
1 G	1.70	4.91			0.00		0.00	0.00	0.0%
	1.90	6.12			0.00		0.00	0.00	0.0%
RW	2.50	6.30	0.00	0.00	0.00		0.00	0.00	0.0%
	2.80	6.40	0.10	0.10	0.32	0.10	0.03	0.00	0.2%
	3.10	6.45	0.15	0.52	0.30	0.15	0.05	0.02	1.4%
	3.40	6.40	0.10	1.49	0.30	0.10	0.03	0.04	2.7%
	3.70	6.55	0.25	0.25	0.34	0.25	0.08	0.02	1.1%
	4.00	6.55	0.25	0.20	0.30	0.25	0.08	0.02	0.9%
	4.30	6.50	0.20	0.88	0.30	0.20	0.06	0.05	3.2%
	4.60	6.70	0.40	1.95	0.36	0.40	0.12	0.23	14.1%
	4.90	6.65	0.35	1.87	0.30	0.35	0.11	0.20	11.9%
	5.20	6.55	0.25	1.95	0.32	0.25	0.08	0.15	8.8%
	5.50	6.55	0.25	0.44	0.30	0.25	0.08	0.03	2.0%
	5.80	6.50	0.20	0.89	0.30	0.20	0.06	0.05	3.2%
	6.10	6.50	0.20	1.14	0.30	0.20	0.06	0.07	4.1%
	6.40	6.50	0.20	1.44	0.30	0.20	0.06	0.09	5.2%
	6.70	6.45	0.16	1.41	0.30	0.16	0.05	0.07	4.0%
	7.00	6.55	0.25	1.98	0.32	0.25	0.08	0.15	9.0%
	7.30	6.55	0.25	1.96	0.30	0.25	0.08	0.15	8.9%
	7.60	6.55	0.25	1.32	0.30	0.25	0.08	0.10	6.0%
	7.90	6.50	0.20	1.27	0.30	0.20	0.06	0.08	4.6%
	8.20	6.50	0.20	1.27	0.30	0.20	0.06	0.08	4.6%
	8.50	6.50	0.20	0.64	0.30	0.20	0.06	0.04	2.3%
	8.80	6.45	0.15	0.54	0.30	0.15	0.05	0.02	1.5%
	9.10	6.40	0.10	0.05	0.30	0.10	0.06	0.00	0.2%
LW	9.90	6.30	0.00	0.00	0.81		0.00	0.00	0.0%
	10.20	5.84			0.00		0.00	0.00	0.0%
1 G	11.00	5.34			0.00		0.00	0.00	0.0%
LS	12.00	4.80			0.00		0.00	0.00	0.0%

TOTALS -----

7.59 0.4 1.42 1.65 100.0%
 (Max.)

Manning's n = 0.0771
 Hydraulic Radius= 0.1873719

STREAM NAME: Iowa Gulch
 XS LOCATION: 150 ft dwnst fr conf w Dyer Gulch
 XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.42	1.42	-0.1%
6.05	1.42	3.39	138.2%
6.07	1.42	3.22	126.7%
6.09	1.42	3.06	115.3%
6.11	1.42	2.90	103.8%
6.13	1.42	2.74	92.4%
6.15	1.42	2.57	81.1%
6.17	1.42	2.42	69.9%
6.19	1.42	2.26	58.8%
6.21	1.42	2.10	47.9%
6.23	1.42	1.95	37.0%
6.25	1.42	1.79	26.2%
6.26	1.42	1.72	20.9%
6.27	1.42	1.64	15.6%
6.28	1.42	1.57	10.3%
6.29	1.42	1.49	5.1%
6.30	1.42	1.42	-0.1%
6.31	1.42	1.35	-5.3%
6.32	1.42	1.27	-10.4%
6.33	1.42	1.20	-15.4%
6.34	1.42	1.13	-20.3%
6.35	1.42	1.06	-25.2%
6.37	1.42	0.93	-34.7%
6.39	1.42	0.80	-43.8%
6.41	1.42	0.67	-52.7%
6.43	1.42	0.56	-61.0%
6.45	1.42	0.45	-68.7%
6.47	1.42	0.34	-75.9%
6.49	1.42	0.25	-82.7%
6.51	1.42	0.17	-88.0%
6.53	1.42	0.11	-91.9%
6.55	1.42	0.07	-95.1%

WATERLINE AT ZERO

AREA ERROR = 6.300

STREAM NAME: Iowa Gulch
 XS LOCATION: 150 ft downst fr conf w Dyer Gulch
 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	5.34	9.23	1.03	1.36	9.52	10.50	100.0%	0.91	31.66	3.33
	5.35	9.21	1.02	1.35	9.43	10.47	99.7%	0.90	31.22	3.31
	5.40	9.12	0.98	1.30	8.97	10.32	98.3%	0.87	29.00	3.23
	5.45	9.04	0.94	1.25	8.51	10.18	97.0%	0.84	26.84	3.15
	5.50	8.95	0.90	1.20	8.06	10.03	95.6%	0.80	24.76	3.07
	5.55	8.86	0.86	1.15	7.62	9.89	94.2%	0.77	22.74	2.99
	5.60	8.77	0.82	1.10	7.18	9.74	92.8%	0.74	20.80	2.90
	5.65	8.68	0.78	1.05	6.74	9.60	91.4%	0.70	18.92	2.81
	5.70	8.59	0.73	1.00	6.31	9.45	90.1%	0.67	17.12	2.71
	5.75	8.51	0.69	0.95	5.88	9.31	88.7%	0.63	15.39	2.62
	5.80	8.42	0.65	0.90	5.46	9.16	87.3%	0.60	13.73	2.51
	5.85	8.34	0.60	0.85	5.04	9.03	86.0%	0.56	12.14	2.41
	5.90	8.30	0.56	0.80	4.62	8.92	84.9%	0.52	10.60	2.29
	5.95	8.26	0.51	0.75	4.21	8.81	83.9%	0.48	9.15	2.17
	6.00	8.22	0.46	0.70	3.80	8.69	82.8%	0.44	7.77	2.05
	6.05	8.17	0.41	0.65	3.39	8.58	81.8%	0.39	6.48	1.91
	6.10	8.13	0.37	0.60	2.98	8.47	80.7%	0.35	5.28	1.77
	6.15	8.00	0.32	0.55	2.58	8.29	79.0%	0.31	4.20	1.63
	6.20	7.80	0.28	0.50	2.18	8.06	76.7%	0.27	3.24	1.49
	6.25	7.60	0.24	0.45	1.80	7.82	74.5%	0.23	2.39	1.33
WL	6.30	7.40	0.19	0.40	1.42	7.59	72.3%	0.19	1.65	1.16
	6.35	6.85	0.16	0.35	1.07	7.03	67.0%	0.15	1.08	1.01
	6.40	6.30	0.12	0.30	0.74	6.47	61.6%	0.11	0.61	0.83
	6.45	5.30	0.08	0.25	0.45	5.45	51.9%	0.08	0.30	0.67
	6.50	3.26	0.06	0.20	0.20	3.37	32.1%	0.06	0.11	0.54
	6.55	0.83	0.08	0.15	0.07	0.89	8.5%	0.08	0.05	0.65
	6.60	0.60	0.06	0.10	0.03	0.64	6.1%	0.05	0.02	0.50
	6.65	0.38	0.03	0.05	0.01	0.40	3.8%	0.02	0.00	0.29
	6.70	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Iowa Gulch
XS LOCATION: 150 ft dwntst fr conf w Dyer Gulch
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)= 1.65 cfs
CALCULATED FLOW (Qc)= 1.65 cfs
(Qm-Qc)/Qm * 100 = 0.0 %

MEASURED WATERLINE (WLm)= 6.30 ft
CALCULATED WATERLINE (WLc)= 6.30 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 = -0.1 %

MEAN VELOCITY= 1.16 ft/sec
MANNING'S N= 0.077
SLOPE= 0.034 ft/ft

.4 * Qm = 0.7 cfs
2.5 * Qm= 4.1 cfs

RECOMMENDED INSTREAM FLOW:
=====

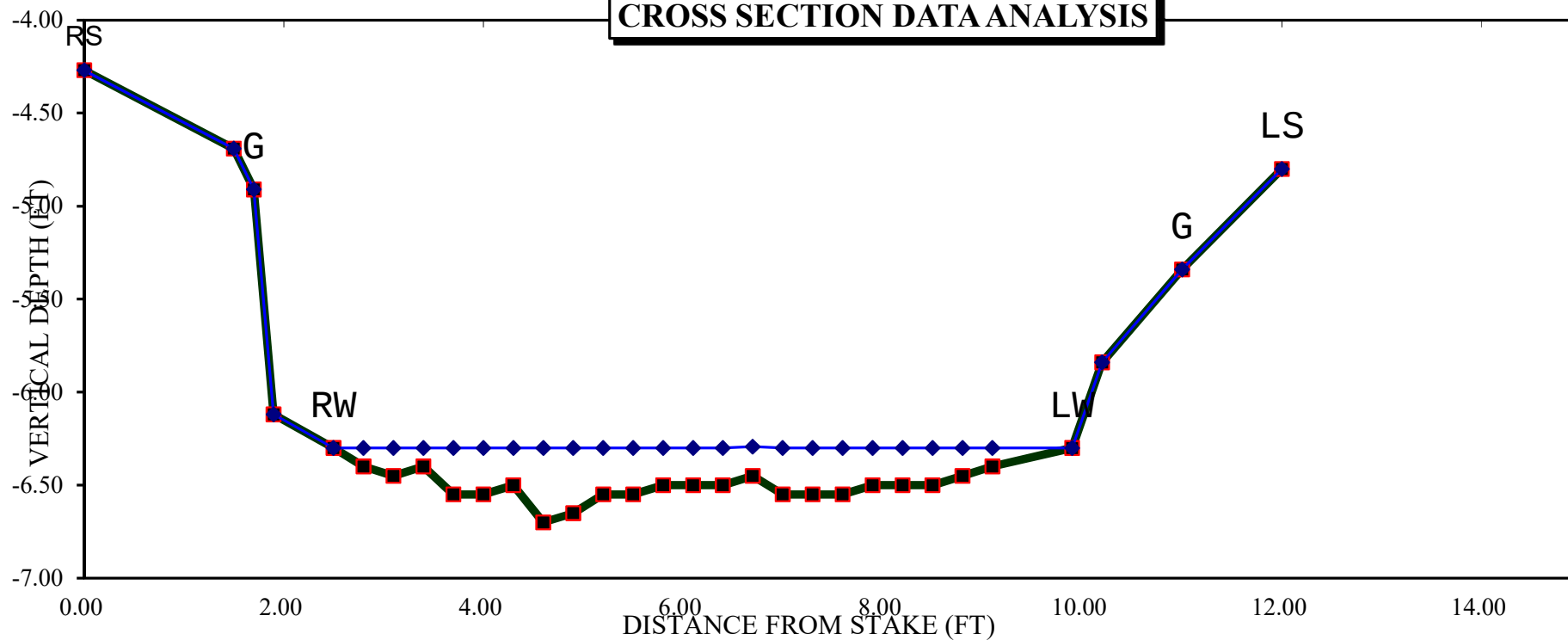
FLOW (CFS)	PERIOD
=====	=====
_____	_____
_____	_____
_____	_____
_____	_____

RATIONALE FOR RECOMMENDATION:
=====

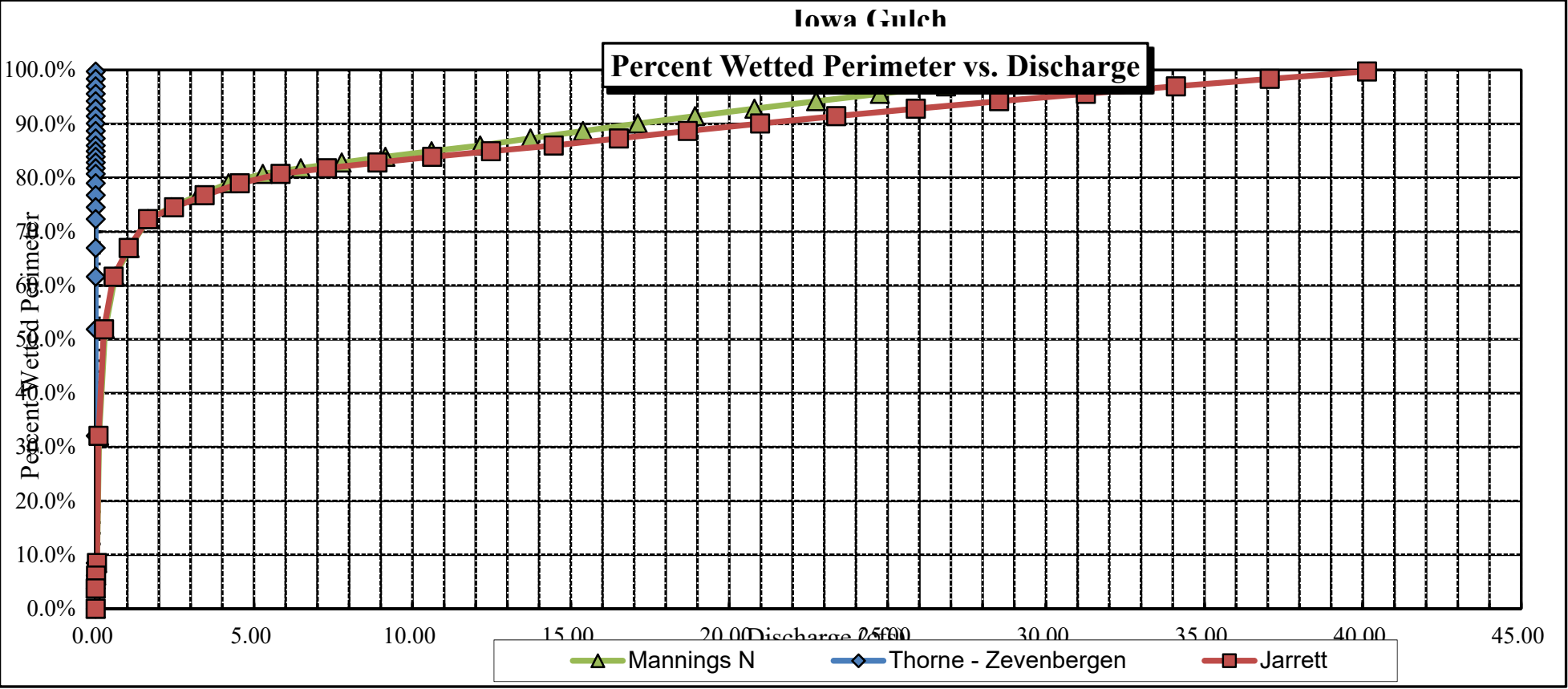
RECOMMENDATION BY: AGENCY..... DATE:.....
CWCB REVIEW BY: DATE:.....

Iowa Gulch

CROSS SECTION DATA ANALYSIS

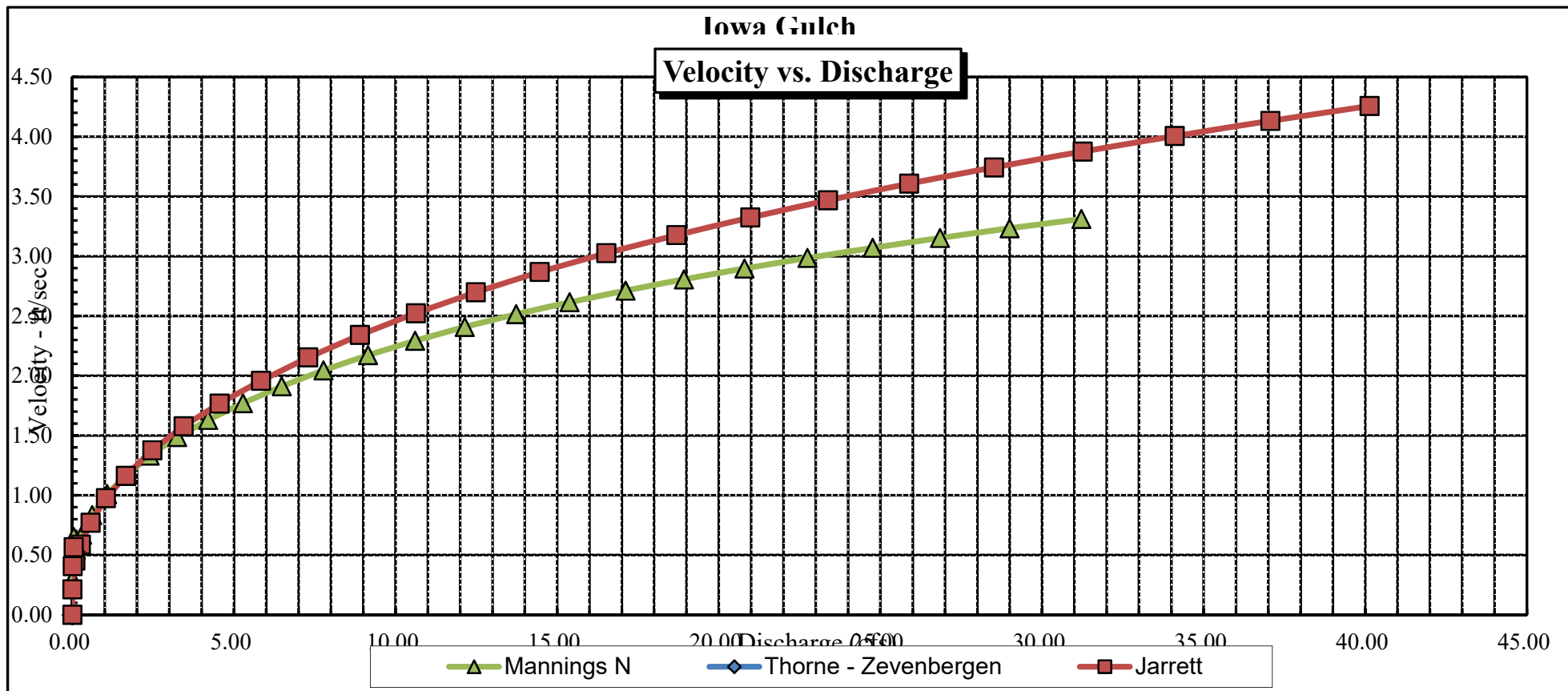


Channel Bottom Computed Water Line



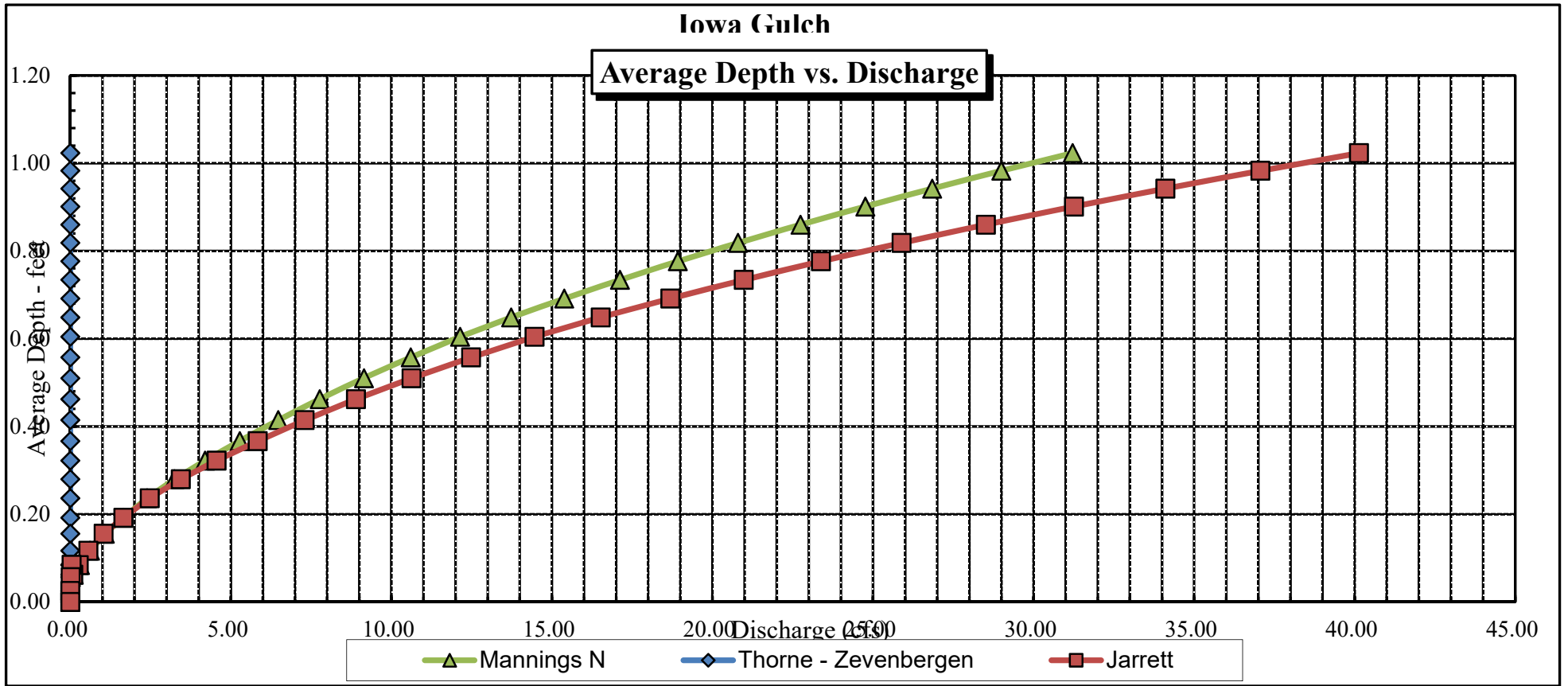
Iowa Gulch

Velocity vs. Discharge



Iowa Gulch

Average Depth vs. Discharge



Iowa Gulch

Stage vs. Discharge

