COLORADO
Parks and Wildlife
Department of Natural Resources

Water Resources Section
6060 Broadway
Denver, CO 80216

January 16, 2019

Ms. Linda Bassi, Chief
Stream and Lake Protection Section
Colorado Water Conservation Board
1313 Sherman Street, Suite 721
Denver CO 80203

Subject: Instream Flow Recommendations for Streams in Water Division 6, Rio Blanco and Garfield Counties; North Fork White River, Marvine Creek, and West Marvine Creek, to be Presented at the January 28-29, 2019 CWCB Meeting

Dear Ms. Bassi:

The information contained in and referred to in this letter forms the scientific and biological basis for instream flow (ISF) recommendations for Marvine Creek, West Marvine Creek, and three reaches of the North Fork of the White River in Water Division 6. These flow recommendations will be presented for consideration by the Colorado Water Conservation Board (CWCB or Board) at their January 2019 regular meeting. The field investigations relating to these ISF recommendations were conducted by Colorado Parks and Wildlife (CPW) personnel in 2018. These stream reaches were first presented to interested parties at the ISF Workshop in January 2017. It is the CPW staff's opinion that the information contained in this letter is sufficient for the CWCB's staff to recommend ISF appropriations to the Board on the above referenced water bodies and to specifically address the findings required in Rule 5(i) of the Instream Flow Program Rules.

The State of Colorado's Instream Flow (ISF) Program was created in 1973 when the Colorado General Assembly passed Senate Bill 97 which called for the recognition of "the need to correlate the activities of mankind with some reasonable preservation of the natural environment" (see 37-92-102 (3) C.R.S.). This statute vests the Board with the exclusive authority to appropriate and acquire instream flow and natural lake level water rights. In order to encourage other entities to participate in Colorado's ISF Program, the statute directs the Board to request instream flow recommendations from other state and federal agencies. CPW is recommending these segments of the North Fork of the White River, Marvine Creek, and West Marvine Creek to the Board for inclusion into the ISF Program. We believe that these segments should be

considered for inclusion into the ISF Program because they each have a natural environment that can be preserved to a reasonable degree with an instream flow water right.

CPW participates in the ISF Program and develops instream flow recommendations for the Board's consideration in an effort to address CPW's legislative declarations "... that the wildlife and their environment are to be protected, preserved, enhanced, and managed for the use, benefit, and enjoyment of the people of this state and its visitors ... and that, to carry out such program and policy, there shall be a continuous operation of planning, acquisition, and development of wildlife habitats and facilities for wildlife-related opportunities" (See §33-1-101 (1) C.R.S.), and "... that the natural, scenic, scientific, and outdoor recreation areas ... protected, preserved, enhanced and managed for the use, benefit, and enjoyment of the people of this state and (its) visitors ... and that, to carry out such program and policy, there shall be a continuous operation of acquisition, development, and management of ... lands, waters, and facilities." (See §33-10-101 (1) C.R.S.).

In addition to these broad statutory guidelines, CPW's current strategic planning document (CPW Strategic Plan, 2015) explains current agency goals to, "[c]onserve wildlife and habitat to ensure healthy sustainable populations and ecosystems." In order to, "protect and enhance water resources for fish and wildlife populations," by pursuing, "partnerships and agreements to enhance instream flows, protect reservoir levels, and influence water management activities," and to, "[a]dvocate for water quality and quantities to conserve aquatic resources." In addition to the CPW strategic plan, the agency's fish and wildlife conservation activities are also directed by the State Wildlife Action Plan (2002, Revised 2015). The goals and priorities from these documents direct CPW to advocate for the preservation of the state's fish and wildlife resources and natural environment, and therefore link CPW's mission to the goals and priorities of CWCB's ISF/NLL Program.

Recommended Segments

As shown in Figure 1, CPW is proposing ISF recommendations for three reaches of North Fork White River – from the outlet of Trapper's Lake to confluence with Skinny Fish Creek, from the confluence with Skinny Fish Creek to the confluence with Big Fish Creek, and from the confluence with Big Fish Creek to the confluence with Ripple Creek. The North Fork White River below Ripple Creek has an existing decreed ISF water right of 70 cfs year-round (W-3704, 1978).

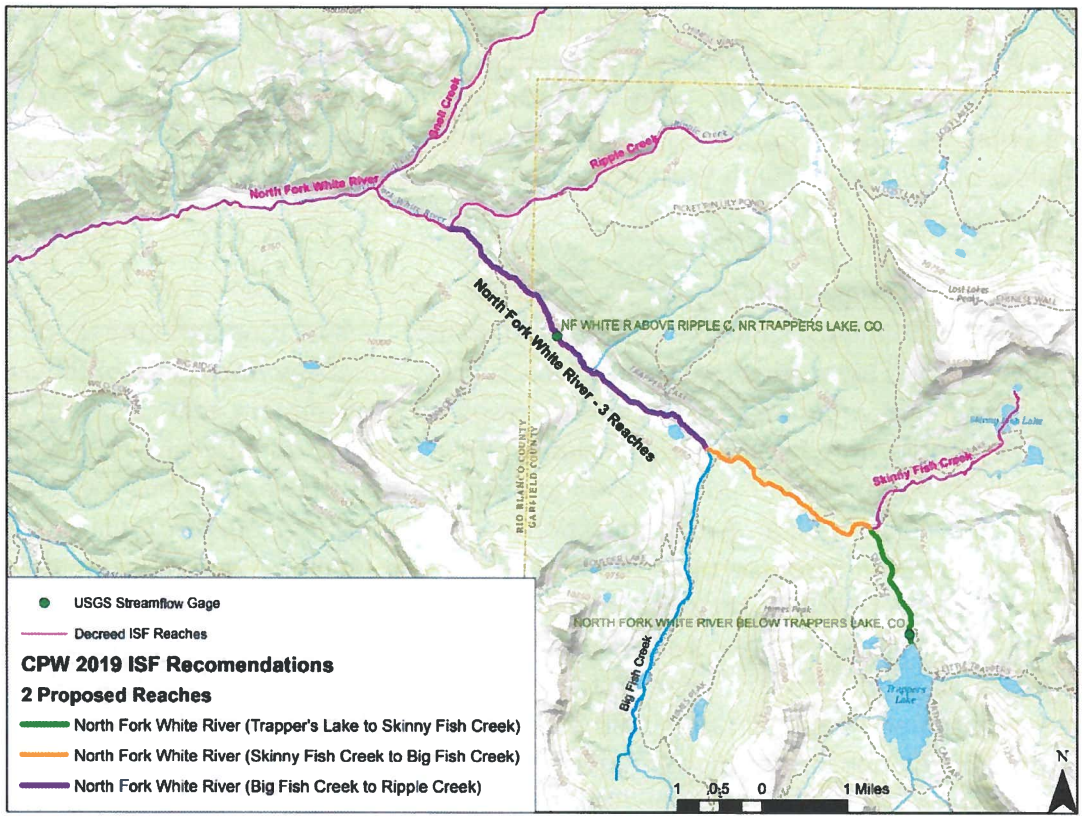


Figure 1. Vicinity map for CPW 2019 ISF Recommendations on North Fork of the White River

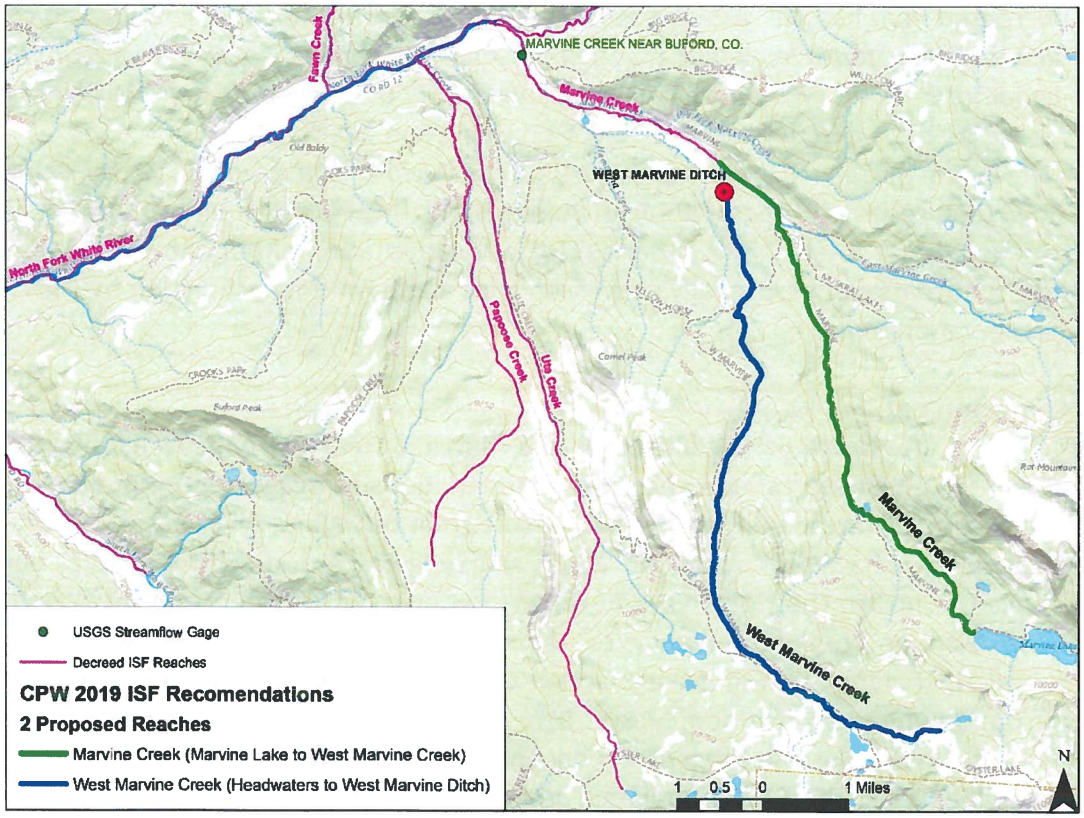


Figure 2. Vicinity map for CPW 2019 ISF Recommendation on in the Marvine Creek Basin

As shown in Figure 2, CPW is also proposing ISF recommendations on reaches of Marvine Creek and West Marvine Creek. The proposed ISF reach on Marvine Creek will extend from the outlet of Marvine Lake to the confluence with West Marvine Creek. The proposed ISF reach on West Marvine Creek will extend from the headwaters to the West Marvine Ditch headgate. Marvine Creek below the confluence with West Marvine Creek has an existing decreed ISF water right of 40 cfs (W-3652,1977).

Colorado Cutthroat Conservation Goals

In 2001, CPW entered into a multi-state and multi-agency conservation agreement and strategy concerning Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*). Colorado's partners in this plan and agreement include the natural resource management agencies from Utah and Wyoming, a number of federal agencies including the USFS, USFWS, BLM and NPS, and the Ute Indian Tribe of the Uintah and Ouray Reservation. This conservation agreement and strategy was developed in order to encourage cooperation and collaboration on conservation measures among various natural resource management agencies to minimize threats to Colorado River cutthroat trout (CRCT) that might result in actions under the Endangered Species Act of 1973. Essentially, the parties to the overall plan agreed that in order to prevent listing of the subspecies, and to reach desired recovery goals without hindering further development of our state resources, continued implementation of the conservation strategy was necessary. The stated goal of the conservation strategy is as follows:

> *"To assure the long-term viability of CRCT throughout their historic range, areas that currently support CRCT will be maintained, while other areas will be managed for increased abundance. New populations will be established where ecologically and economically feasible, while the genetic diversity of the species is maintained. The cooperators envision a future where threats to wild CRCT are either eliminated or reduced to the greatest extent possible."* (CRCT Conservation Team 2006)

One of the main threats to Colorado River cutthroat trout conservation is the depletion of streamflow that results in degradation of habitat and the overall health of the subspecies. Another major threat to cutthroat fisheries is the fragmentation of habitat. CPW believes that both of these threats can be partially addressed with instream flow protection by the Colorado Water Conservation Board.

Natural Environment

As stated above, the North Fork White River and Marvine Creek were identified by CPW at the January 2017 CWCB ISF workshop. These recommendations represent a continuation of efforts by CPW to secure ISF protection for important streams in the White River basin. CPW's interest in these segments is based on historic CPW fish sampling and stocking efforts which confirmed the presence of CRCT in the North Fork of the White River, Marvine Creek, and West Marvine Creek. West Marvine Creek in particular contains a population of CRCT that was very recently stocked. The CRCT population in West Marvine Creek is an important population, as they are isolated from downstream fish populations by a physical barrier, the dry stream channel that exists below the West Marvine Ditch diversion, and are limited to the habitat conditions existing in West Marvine Creek. This CRCT population and others in the North Fork White River basin may become more critical to CRCT conservation efforts in the future.

While CRCT is the main species of concern in this basin, other native species, namely mountain whitefish, would benefit from the conservation efforts for the CRCT. In addition to the native species present in the North Fork White River and Marvine Creek, these reaches support a diverse sport fishery of brook and rainbow trout.

A key component to habitat protection is flow protection. Flow reduction can impact habitat availability and quality, can cause water quality and temperature issues, and can reduce overall population and habitat connectivity. The hydrology of the North Fork White River will likely continue to provide a high annual peak flow for spring spawning species (since minimal water uses presently occur in the basins above the potential ISF segments), but protection of baseflows is an important component of ISF protection. Overwintering adult habitat for CRCT is often a limiting factor for these fish populations. These reaches of the North Fork White River, Marvine Creek, and West Marvine Creek provide good habitat for various life stages of fish. In summary, there is a flow-dependent natural environment that can be preserved to a reasonable degree with instream flow water rights on the proposed reaches.

Flows Necessary to Preserve the Natural Environment

In 2016 and 2017, CPW initiated ISF investigation in the White River basin in an effort to fill in protection gaps and address range-wide needs of CRCT in the White River basin. In 2018, CPW and CWCB staff collected stream cross-section data at sites within the identified reaches of the North Fork White River, Marvine Creek, and West Marvine Creek. Initial biological instream flow recommendations were developed utilizing the standard application of the R2CROSS methodology (Espegren 1996). R2CROSS uses field data that has been collected in a riffle stream habitat types; riffles are the limiting habitat type in streams during low flow events. The field data includes a survey of stream channel geometry, a longitudinal slope of the water surface, and a streamflow measurement at the designated cross-section. After processing this data with R2CROSS, winter and summer flow recommendations were developed utilizing the typical R2CROSS criteria described in Nehring (1979) and Espergren (1996); the R2CROSS hydraulic criteria of interest are average depth, average velocity, and wetted perimeter. Maintaining these hydraulic parameters at adequate levels across riffle habitat types will also maintain aquatic habitat in pools and runs for most life stages of fish and aquatic invertebrates (Nehring 1979).

When flows meeting two and three of the hydraulic criteria fall out of the range for accuracy of applying Manning's equation (40 to 250 percent), the Thorne and Zevenbergen (T&Z) subroutine in R2CROSS is relied upon. The Thorne and Zevenbergen method uses several hydraulic equations depending on relative roughness to calculate velocity within the R2CROSS staging table. This subroutine relies on user-supplied D84 particle size from pebble count data collected at each cross-section location.

Two cross-section data sets were collected on each reach identified above. The field data sheets and resulting R2CROSS outputs are attached. The results of the R2CROSS analysis for each of the five reaches are summarized on the attached Fact Sheets.

R2CROSS biological recommendations are further refined with a preliminary water availability analysis. Average daily gage data from the gages in the North Fork White River and Marvine Creek basins confirm that water appears to be available for an ISF appropriation, and water that is available can be used to preserve the natural environment to a reasonable degree on all five reaches. Final detailed water availability analyses will be performed by CWCB staff and presented in the Executive Summaries provided to the Board prior to the January 2019 meeting.

The R2CROSS-generated and water availability-refined flow recommendations for the reaches discussed above are:

- West Marvine Creek:
  - 4.6 cfs (4/1 to 10/31)
  - 2.9 cfs (11/1 to 3/31)
- Marvine Creek:
  - 13.1 cfs (4/1 to 10/31)
  - 5.9 cfs (11/1 to 3/31)
- North Fork White River (outlet of Trapper's Lake to Skinny Fish Creek):
  - 3.5 cfs (4/1 to 10/31)
  - 2.0 cfs (11/1 to 3/31)
- North Fork White River (Skinny Fish Creek to Big Fish Creek)
  - 34 cfs (5/1 to 10/31)
  - 7.8 cfs (11/1 to 4/30)
- North Fork White River (Big Fish Creek to Ripple Creek):
  - 74 cfs (5/1 to 9/15)
  - 60 cfs (9/16 to 11/15)
  - 23 cfs (11/16 to 4/30)

As stated above, the purpose of this letter is to formally transmit these ISF recommendations from CPW to CWCB for the Board's consideration for the 2019 appropriation year. Please refer to the attached Fact Sheets and supporting documentation for additional information. If CWCB staff has any further questions or needs clarification regarding these flow recommendations, please contact us.

CPW personnel will be present at the January 2019 CWCB meeting to answer any questions that the Board might have regarding these flow recommendations. We appreciate your consideration.

Sincerely,

Katie Birch
CPW Instream Flow Program Coordinator

Attachments (as stated)

FACT SHEET

Marvine Creek

In Water Division 6, Rio Blanco County

Marvine Creek from the outlet of Marvine Lake to the confluence with West Marvine Creek

Upper Terminus: The outlet of Lower Marvine Lake at a point located at 13S 4424055.13 296243.96 UTM.

Lower Terminus: The confluence with West Marvine Creek located at 13T 4432955.16 291464.01 UTM.

Approximate Length: 7 miles

ISF Recommendation: 13.1 cfs (4/1 to 10/31)
5.9 cfs (11/1 to 3/31)

Natural Environment:

Marvine Creek is a major tributary to the North Fork White River with headwaters that originate in the eastern portions of the Flat Tops Wilderness at an elevation of around 11,900 feet. The creek flows northwesterly to its confluence with the North Fork White River at an elevation of 7,500 feet, approximately 15 miles downstream. Hydrology of the creek is also snowmelt driven; the average annual precipitation in the basin is approximately 40 inches. The mean basin elevation is 10,000 feet. The total basin area contributing to the recommended ISF reach is approximately 40 square miles. Only a very small portion of the proposed ISF reach is on private land, the remainder lies entirely on public land managed by the US Forest Service (USFS). The topography of the basin varies from gradual slopes to very steep slopes and high ridges. The physical environment of the basin is predominantly aspen with interspersed stands of lodgepole pine and mixed spruce/fir. Overall, the aquatic environment and fishery of the Marvine Creek basin is quite diverse.

Marvine Creek within the recommended reach is a first and second order stream. The stream channel is primarily a single thread channel flowing through mostly forested cover. Throughout this reach of Marvine Creek there is an abundance of pool, riffle, and glide habitat types. There is some large wood in the stream contributing to side channel and pool habitat. Substrate generally ranges from large boulders to small cobble. Historic CPW fishery surveys indicate presence of Colorado River cutthroat trout (CRCT) and brook trout. The CRCT is a Tier 1 priority species in the 2015 State Wildlife Action Plan, meaning the species has the highest conservation priority in the state. CRCT is classified as a state “species of special concern” and is considered “sensitive” by the Bureau of Land Management (BLM) and USFS.

R2CROSS Results:

In 2018, CPW and CWCB personnel collected R2CROSS data at four cross-sections within the proposed ISF segment. The results of R2CROSS modeling are summarized in the following table:

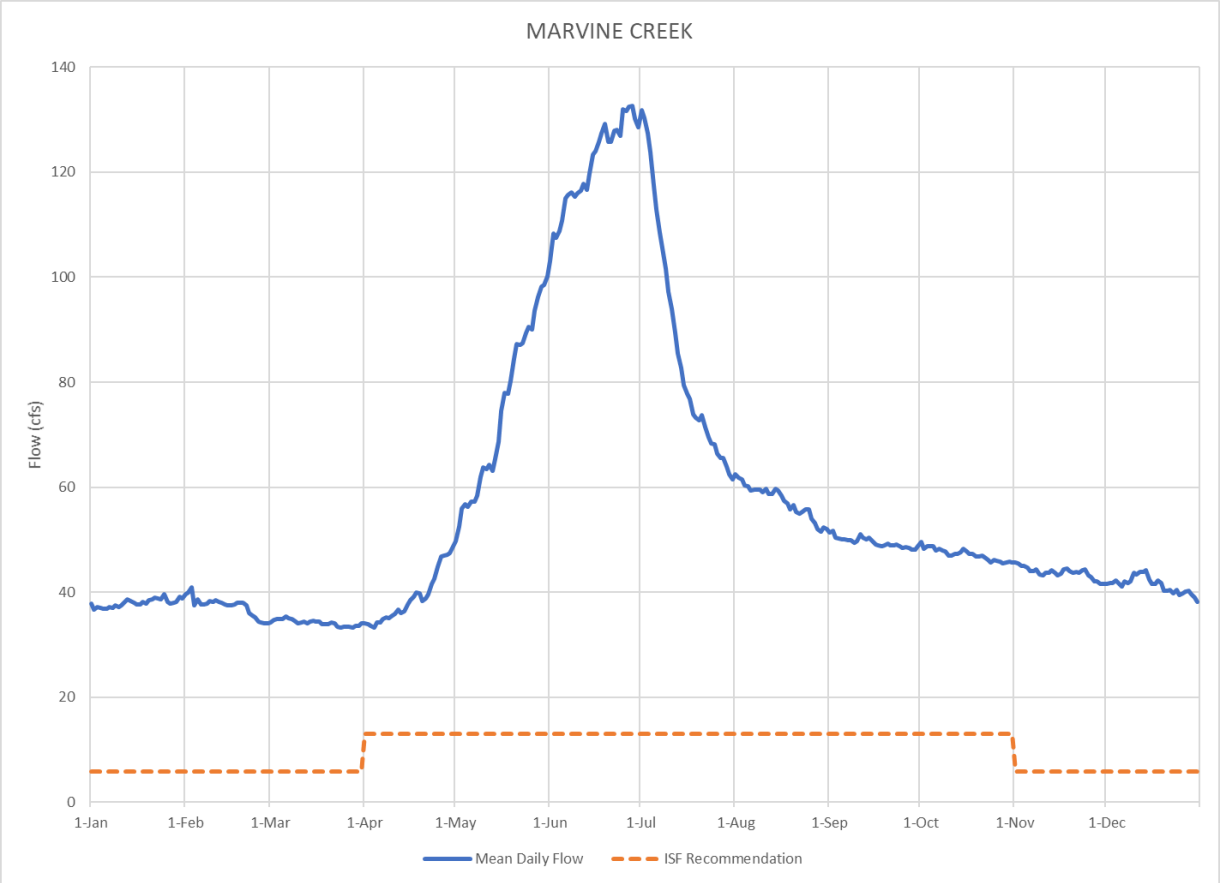
	Entity	Date Measured	Q measured	40%-250%	Hydraulic Equation	Flow Meeting Two Criteria	Flow Meeting Three Criteria
1	CPW	7/12/2018	48 cfs	19-120 cfs	T&Z[1]	2.2 cfs	12.8 cfs
2	CPW	7/12/2018	48 cfs	19-120 cfs	T&Z[1]	6.2 cfs	12.5 cfs
3	CPW	9/13/2018	51 cfs	20-128 cfs	T&Z[1]	7.8 cfs	10.4 cfs
4	CPW	9/13/2018	51 cfs	20-128 cfs	T&Z[1]	7.3 cfs	16.7 cfs
				Mean		**5.9 cfs**	**13.1 cfs**

1= Flow recommendation falls outside the range of accuracy for R2CROSS's use of the Manning's equation (40%-250%); Thorne and Zevenbergen (T&Z) equations and a user-supplied D84 were then utilized.

Preliminary Water Availability:

In order to make a preliminary determination whether water is available for the R2CROSS-based flow recommendations and to determine the appropriate seasonal transition dates, CPW examined basic hydrologic data and basic water rights information for the Marvine Creek basin.

CPW relied upon the USGS gage, Marvine Creek near Buford, CO (09302500), which has a period of record between 1972 to 1984. This gage is located below the proposed ISF reach. The mean daily flow data from this gage was computed to create a representative hydrograph for this reach (shown below). Based on this data, there appears to be ample water available for the proposed ISF recommendation.



Division of Water Resources (DWR) data indicates that there are no major water rights on the proposed reach.

Conclusion:

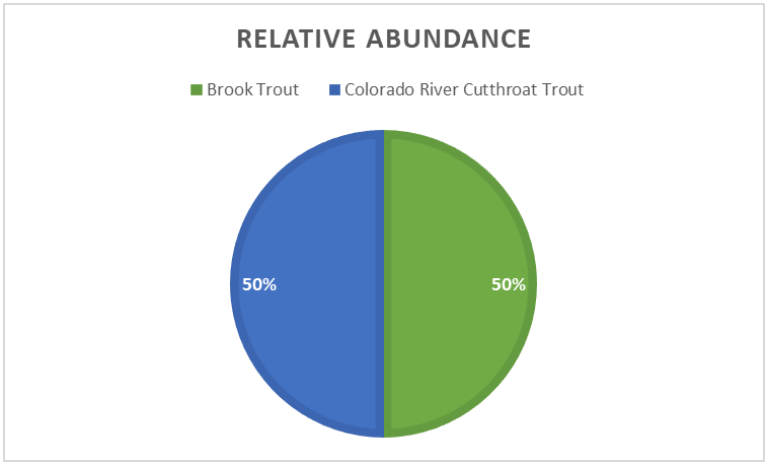
CPW recommends the following R2CROSS-based instream flow rates on Marvine Creek; we believe that these flows are necessary to preserve the natural environment to a reasonable degree:

- 13.1 cfs (4/1 to 10/31)
- 5.9 cfs (11/1 to 3/31)

Marvine Creek

CPW Historic Sampling at Marvine Creek

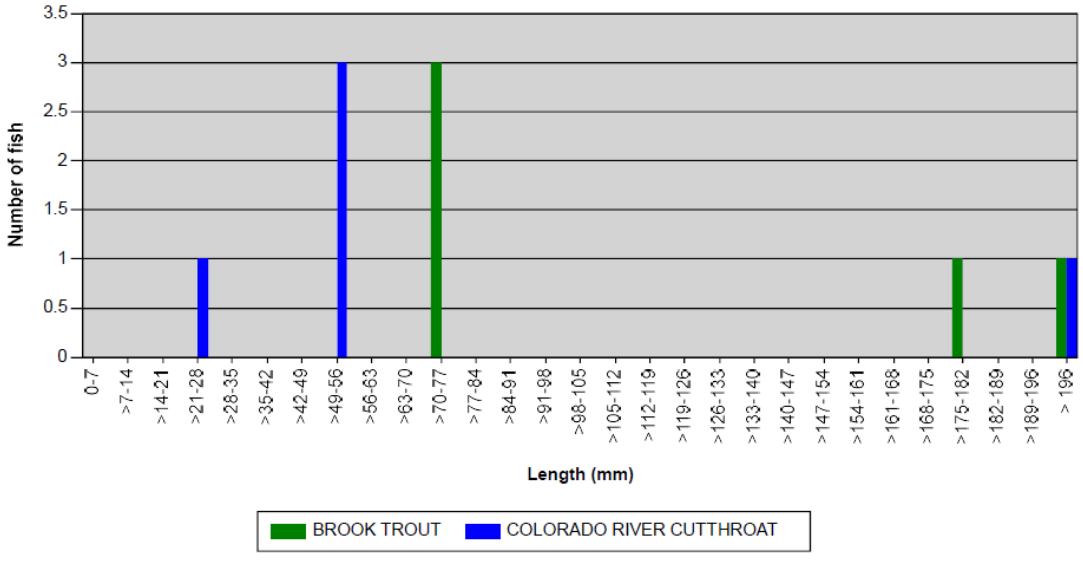
10 fish were observed during the last sampling effort in 1979. Additionally, CPW records indicate Colorado River Cutthroat Trout were stocked over a number of years in the 1990's.



Length/Frequency

Water **23278** **Marvine Creek #2** Date **10/22/1979**
Station **WR0814** **ABT 0.25 MI ABV CONFLUENCE W/ EAST MARVINE CK.**

Drainage **White River** UtmX UtmY Elevation **2468 m**
Length **122 m** Width Area
Surveyors **MARTINEZ, JAMES**
Gear **EF** Effort Metric Protocol **PRESENCE/ABSENCE**



COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: MARVINE CREEK					CROSS-SECTION NO.: Upper Riffle
CROSS-SECTION LOCATION: At Hydrovic Control Ab MR/USFS Bndry (2)					
DATE: 9/13/18 OBSERVERS: RB JS					
LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY: Rio Blanco	WATERSHED: White R.		WATER DIVISION: 5/6		DOW WATER CODE:
MAP(S):	USGS:				
	USFS:				

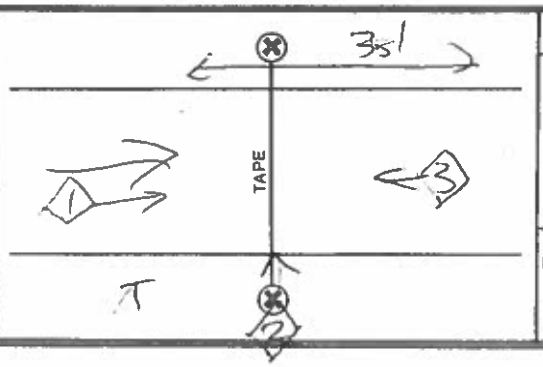
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO	METER TYPE: N/A			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: ____ lbs/foot	TAPE TENSION: ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: See PC Dtl	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	6.93 / 6.88
② WS Upstream	2	6.39
③ WS Downstream	36	7.43
SLOPE	.138	

SKETCH



AQUATIC SAMPLING SUMMARY

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

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:
Tiddis (3 sp), Mcy

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:

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		3.25								
	1.70		4.35								
GL	2.60		5.10								
	3.50		5.65								
	4.2		6.35								
	5.3		5.80								
	6.5		6.25								
WL	6.7		6.93	0							
	7		7.90	1.15							
	9		7.65	1.10							
	11		7.55	1.00							
	3		7.50	0.80							
	5		7.50	0.80							
	7		7.45	~~0~~ 1.05							
	9		7.25	0.85							
	21		7.50	1.25							
	3		7.30	0.80							
R	5		7.50	0.30							
	7		7.00	0.70							
	9		6.95	0.80							
	31	7.90	~~6.90~~	0.90							
	3		7.20	0.90							
	5		7.90	1.00							
	7		7.60	0.60							
	9		7.30	0.40							
	41		7.10	0.20							
WL	~~[illegible]~~	41.6	6.88								
S GL	43.2		5.35								
	45		4.95								
TOTALS:											

Use Q From Lower Site

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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

LOCATION INFORMATION

STREAM NAME: MARVINE CR AB W MARVINE					CROSS-SECTION NO.: Lower
CROSS-SECTION LOCATION: AT MARVINE RANCH BNDRY / USFS					
DATE: 9/13/18	OBSERVERS: KB JS				
LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY:	WATERSHED: White R		WATER DIVISION: 5/6		DOW WATER CODE:
MAP(S):	USGS:				
	USFS:				

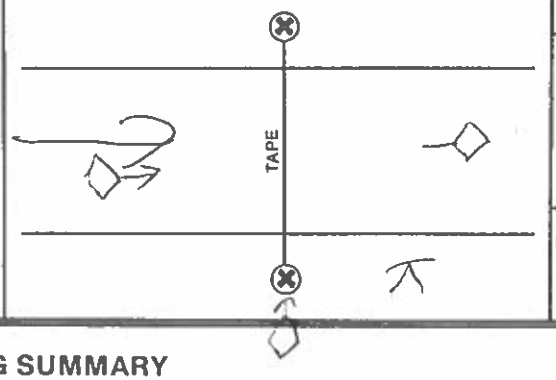
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES)/NO	METER TYPE: Marsh McB			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: ____ lbs/foot	TAPE TENSION: ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: See PC Dtl	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	6.01 / 6.01
② WS Upstream	28.5	5.47
③ WS Downstream	20	6.48
SLOPE		

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

3 Sp Caddis, May, Midges

COMMENTS

DISCHARGE/CROSS SECTION NOTES

STREAM NAME:	CROSS-SECTION NO.:	DATE:	SHEET
MARINE CK		9/13/18	1 OF 1

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE)	LEFT / RIGHT	Gage Reading: ____ ft	TIME: 1115

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)
S	0		3.10								
	1		4.05								
GL	2.2		4.90								
	3.5		5.50								
WL	4		6.01	0							
	4		6.15	0.15				0.0	[illegible]		
	5.5		6.30	0.30					1.09		
	7		6.80	0.95					3.05		
	8.5		6.90	1.00					3.03		
	10		7.00	1.20					3.12		
	11.5		6.95	0.95					4.06		
	13		6.80	0.90					2.40		
	14.5		6.95	0.90					3.85		
	16		6.95	0.95					1.90		
	17.5		7.00	0.95					1.90		
	19		6.75	0.65					2.16		
	20.5		6.90	0.90					2.06		
	22		6.65	0.70					1.54		
	23.5		6.75	0.75					1.62		
	25		6.75	0.80					0.81		
	26.5		6.75	0.80					2.38		
	28		6.65	0.70					2.32		
	29.5		6.60	0.70					1.83		
	31		6.60	0.60					0.63		
	32.5		6.60	0.60					1.42		
	34		6.40	0.40					0.52		
WL	34.2		6.01	0							
	35.8		5.55								
	36.8		5.35								
	37.8		5.00								
S/GL	40.5		4.90								
									Q = 51.21		
TOTALS:											

End of Measurement	Time: 1200	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: MARVINE CK Lower (2018)					CROSS-SECTION NO.:
CROSS-SECTION LOCATION: AB E Marvine					
DATE: 7/12/18	OBSERVERS: KB JS				
LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY:	WATERSHED:	WATER DIVISION:	DOW WATER CODE:		
MAP(S):	USGS:				
	USFS:				

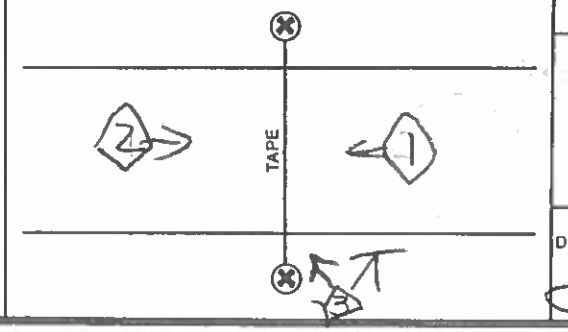
SUPPLEMENTAL DATA

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: Pebble Cobble	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	7.21 / 7.25
② WS Upstream		6.97
③ WS Downstream		7.34
SLOPE	0.37 / 39 =	

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

Caddis, Stone, Mayf

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:

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)
S	0.0		3.95								
	1.5		4.65								
GL	2.8		5.50								
	3.3		6.03								
WL	3.6		7.25	0.0							
	5		7.60	0.3				0.44			
	6.5		7.55	0.3				1.47			
	8		7.55	0.35				1.56			
	9.5		7.45	0.30				1.36			
	11		7.35	0.30				0.75			
	12.5		7.35	0.20				0.45			
	14		7.50	0.35				0.65			
	15.5		7.65	0.55				1.64			
	17		7.80	0.70				2.64			
	18.5		8.15	1.10				3.06			
	20		8.25	1.20				3.84			
	21.5		8.20	1.00				3.18			
	23		8.46	1.35				4.73			
	24.5		8.10	0.90				0.64			
	26		8.15	0.95				2.87			
	27.5		8.30	1.15				2.67			
	29		8.15	0.90				2.77			
	30.5		7.90	0.65				0.71			
	32		7.80	0.60				0.53			
	33.5		7.55	0.30				0.23			
WL	35.1		7.21	0.0							
	35.8		7.10							Q =	48.11
	36.8		6.25								
GL	38		5.80								
S	40.1		5.00								
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: Mervine Cr Upper 2018					CROSS-SECTION NO.:
CROSS-SECTION LOCATION: Ab E Mervine (At Path x'ing)					
DATE: 7/12/18	OBSERVERS: KB, JS				
LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY:	WATERSHED:	WATER DIVISION:	DOW WATER CODE:		
MAP(S): USGS:					
USFS:					

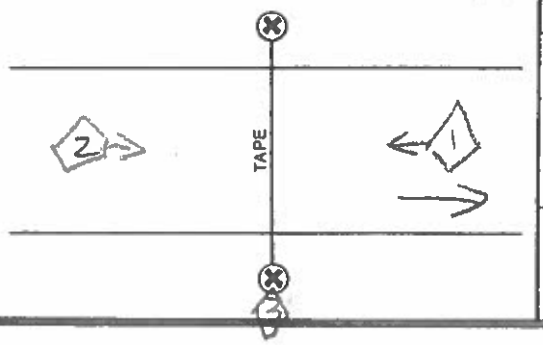
SUPPLEMENTAL DATA

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: Pebble Count	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	5.10 / 5.03
② WS Upstream	—	3.22
③ WS Downstream	—	5.63
SLOPE	2.41 / 38 =	

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

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:

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)
S	0.0		2.60								
GL	2.8		3.90								
WL	3.0		5.03	0					Ø		
	4.0		5.10	0.2					2.52	(measured at	
	5.0		5.60	0.6					"	lower XS)	
	7.0		5.80	0.7					"		
	9		5.90	1.2					"		
	11		5.40	0.3					"		
	13		5.65	0.5							
	15		6.00	0.8							
	17		5.90	0.8							
	19		5.70	0.5							
	21		5.80	0.55							
	23		5.85	0.75							
	25		5.75	0.90							
	27		5.85	0.85							
	29		6.20	1.10							
WL	30		5.10	0							
	30		6.20	1.30							
GLS	32.6		3.30								
	30.6		3.90					Q =	48.11		
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:	Marvine Creek
XS LOCATION:	At Riffle Abv Marvine Ranch/USFS Bound.
XS NUMBER:	2 - Lower
DATE:	13-Sep-18
OBSERVERS:	Birch, Skinner
1/4 SEC:	Lat: 40.019821
SECTION:	Long: -107.441584
TWP:	0
RANGE:	0
PM:	0
COUNTY:	Rio Blanco
WATERSHED:	White
DIVISION:	6
DOW CODE:	21092
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:	0.02736842

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

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

STREAM NAME: Marvine Creek
XS LOCATION: At Riffle Abv Marvine Ranch/USFS Bound.
XS NUMBER: 2 - Lower

DATA POINTS= 29

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	3.25			0.00		0.00	0.00	0.0%
		1.70	4.35			0.00		0.00	0.00	0.0%
1	GL	2.60	5.10			0.00		0.00	0.00	0.0%
		3.50	5.65			0.00		0.00	0.00	0.0%
		4.20	6.35			0.00		0.00	0.00	0.0%
		5.30	5.80			0.00		0.00	0.00	0.0%
		6.50	6.25			0.00		0.00	0.00	0.0%
	WL	6.70	6.93	0.00	0.00	0.00		0.00	0.00	0.0%
		7.00	7.90	1.15	1.82	1.02	1.15	1.32	2.41	4.7%
		9.00	7.65	1.10	1.82	2.02	1.10	2.20	4.01	7.8%
		11.00	7.55	1.00	1.82	2.00	1.00	2.00	3.65	7.1%
		13.00	7.50	0.80	1.82	2.00	0.80	1.60	2.92	5.7%
		15.00	7.50	0.80	1.82	2.00	0.80	1.60	2.92	5.7%
		17.00	7.45	1.05	1.82	2.00	1.05	2.10	3.83	7.5%
		19.00	7.25	0.85	1.82	2.01	0.85	1.70	3.10	6.1%
		21.00	7.50	1.25	1.82	2.02	1.25	2.50	4.56	8.9%
		23.00	7.30	0.80	1.82	2.01	0.80	1.60	2.92	5.7%
		25.00	7.50	0.30	1.82	2.01	0.30	0.60	1.09	2.1%
		27.00	7.00	0.70	1.82	2.06	0.70	1.40	2.55	5.0%
		29.00	3.95	0.80	1.82	3.65	0.80	1.60	2.92	5.7%
		31.00	7.90	0.90	1.82	4.43	0.90	1.80	3.28	6.4%
		33.00	7.20	0.90	1.82	2.12	0.90	1.80	3.28	6.4%
		35.00	7.90	1.00	1.82	2.12	1.00	2.00	3.65	7.1%
		37.00	7.60	0.60	1.82	2.02	0.60	1.20	2.19	4.3%
		39.00	7.30	0.40	1.82	2.02	0.40	0.80	1.46	2.8%
		41.00	7.10	0.20	1.82	2.01	0.20	0.26	0.47	0.9%
	WL	41.60	6.88	0.00	0.00	0.64		0.00	0.00	0.0%
1	GL	43.20	5.35			0.00		0.00	0.00	0.0%
	S	45.00	4.95			0.00		0.00	0.00	0.0%
	TOTALS ----------					40.15	1.25 (Max.)	28.08	51.21	100.0%

Manning's n = 0.1062
Hydraulic Radius= 0.6994722

STREAM NAME: Marvine Creek
XS LOCATION: At Riffle Abv Marvine Ranch/USFS Bound.
XS NUMBER: 2 - Lower

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	28.08	17.61	-37.3%
6.66	28.08	25.55	-9.0%
6.68	28.08	24.91	-11.3%
6.70	28.08	24.27	-13.6%
6.72	28.08	23.63	-15.9%
6.74	28.08	22.99	-18.1%
6.76	28.08	22.35	-20.4%
6.78	28.08	21.72	-22.7%
6.80	28.08	21.08	-24.9%
6.82	28.08	20.45	-27.2%
6.84	28.08	19.82	-29.4%
6.86	28.08	19.18	-31.7%
6.87	28.08	18.87	-32.8%
6.88	28.08	18.55	-33.9%
6.89	28.08	18.24	-35.1%
6.90	28.08	17.92	-36.2%
6.91	28.08	17.61	-37.3%
6.92	28.08	17.30	-38.4%
6.93	28.08	16.98	-39.5%
6.94	28.08	16.67	-40.6%
6.95	28.08	16.36	-41.8%
6.96	28.08	16.04	-42.9%
6.98	28.08	15.42	-45.1%
7.00	28.08	14.80	-47.3%
7.02	28.08	14.18	-49.5%
7.04	28.08	13.56	-51.7%
7.06	28.08	12.95	-53.9%
7.08	28.08	12.34	-56.1%
7.10	28.08	11.73	-58.2%
7.12	28.08	11.13	-60.4%
7.14	28.08	10.53	-62.5%
7.16	28.08	9.94	-64.6%

WATERLINE AT ZERO
AREA ERROR = 6.655

STREAM NAME: Marvine Creek
XS LOCATION: At Riffle Abv Marvine Ranch/USFS Bound.
XS NUMBER: 2 - Lower

Thorne-Zevenbergen D84 Correction Applied
User Supplied D84 = 0.58

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

Velocity based on test of R/D84>1

	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	5.35	38.56	1.86	2.55	71.55	43.90	100.0%	1.63	508.62	7.11
	5.66	37.39	1.60	2.25	59.97	42.17	96.1%	1.42	375.26	6.26
	5.71	37.23	1.56	2.20	58.10	41.91	95.5%	1.39	354.96	6.11
	5.76	37.07	1.52	2.15	56.24	41.66	94.9%	1.35	335.16	5.96
	5.81	36.89	1.47	2.10	54.39	41.37	94.2%	1.31	316.02	5.81
	5.86	36.50	1.44	2.05	52.56	40.86	93.1%	1.29	298.82	5.69
	5.91	36.10	1.41	2.00	50.74	40.35	91.9%	1.26	282.10	5.56
	5.96	35.71	1.37	1.95	48.95	39.83	90.7%	1.23	265.87	5.43
	6.01	35.32	1.34	1.90	47.17	39.32	89.6%	1.20	250.12	5.30
	6.06	34.92	1.30	1.85	45.42	38.81	88.4%	1.17	234.85	5.17
	6.11	34.53	1.27	1.80	43.68	38.29	87.2%	1.14	220.05	5.04
	6.16	34.13	1.23	1.75	41.97	37.78	86.1%	1.11	205.73	4.90
	6.21	33.74	1.19	1.70	40.27	37.27	84.9%	1.08	191.89	4.77
	6.26	33.36	1.16	1.65	38.59	36.76	83.7%	1.05	178.48	4.62
	6.31	33.08	1.12	1.60	36.93	36.34	82.8%	1.02	165.20	4.47
	6.36	32.82	1.07	1.55	35.28	35.94	81.8%	0.98	152.32	4.32
	6.41	32.70	1.03	1.50	33.64	35.70	81.3%	0.94	139.31	4.14
	6.46	32.57	0.98	1.45	32.01	35.45	80.8%	0.90	126.80	3.96
	6.51	32.45	0.94	1.40	30.39	35.21	80.2%	0.86	114.81	3.78
	6.56	32.32	0.89	1.35	28.77	34.97	79.7%	0.82	103.35	3.59
	6.61	32.20	0.84	1.30	27.16	34.73	79.1%	0.78	92.41	3.40
WL	6.66	32.07	0.80	1.25	25.55	34.49	78.6%	0.74	82.02	3.21
	6.71	31.95	0.75	1.20	23.95	34.25	78.0%	0.70	72.17	3.01
	6.76	31.82	0.70	1.15	22.35	34.01	77.5%	0.66	62.89	2.81
	6.81	31.70	0.66	1.10	20.77	33.77	76.9%	0.61	54.18	2.61
	6.86	31.57	0.61	1.05	19.18	33.53	76.4%	0.57	47.87	2.50
	6.91	31.41	0.56	1.00	17.61	33.26	75.7%	0.53	39.40	2.24
	6.96	31.20	0.51	0.95	16.04	32.94	75.0%	0.49	32.09	2.00
	7.01	30.97	0.47	0.90	14.49	32.61	74.3%	0.44	25.80	1.78
	7.06	30.59	0.42	0.85	12.95	32.15	73.2%	0.40	20.53	1.58
	7.11	30.18	0.38	0.80	11.43	31.66	72.1%	0.36	16.05	1.40
	7.16	29.44	0.34	0.75	9.94	30.84	70.2%	0.32	12.44	1.25
	7.21	28.67	0.30	0.70	8.49	29.99	68.3%	0.28	9.40	1.11
	7.26	27.55	0.26	0.65	7.08	28.78	65.6%	0.25	6.96	0.98
	7.31	25.54	0.23	0.60	5.75	26.68	60.8%	0.22	5.08	0.88
	7.36	22.78	0.20	0.55	4.54	23.81	54.2%	0.19	3.63	0.80
	7.41	20.02	0.17	0.50	3.47	20.95	47.7%	0.17	2.47	0.71
	7.46	17.11	0.15	0.45	2.54	17.93	40.8%	0.14	1.58	0.62
	7.51	11.01	0.16	0.40	1.80	11.73	26.7%	0.15	1.03	0.57
	7.56	8.45	0.16	0.35	1.32	9.08	20.7%	0.14	0.67	0.51
	7.61	6.79	0.14	0.30	0.93	7.33	16.7%	0.13	0.39	0.42
	7.66	5.19	0.12	0.25	0.64	5.64	12.8%	0.11	0.22	0.34
	7.71	4.13	0.10	0.20	0.40	4.49	10.2%	0.09	0.10	0.26
	7.76	3.07	0.07	0.15	0.22	3.34	7.6%	0.07	0.04	0.18
	7.81	2.01	0.05	0.10	0.10	2.19	5.0%	0.04	0.01	0.10
	7.86	0.95	0.02	0.05	0.02	1.04	2.4%	0.02	0.00	0.04

STREAM NAME: Marvine Creek
XS LOCATION: At Riffle Abv Marvine Ranch/USFS Bound.
XS NUMBER: 2 - Lower

SUMMARY SHEET

MEASURED FLOW (Qm)=	51.21	cfs
CALCULATED FLOW (Qc)=	48.40	cfs
(Qm-Qc)/Qm * 100 =	5.5	%
MEASURED WATERLINE (WLm)=	6.91	ft
CALCULATED WATERLINE (WLc)=	6.66	ft
(WLm-WLc)/WLm * 100 =	3.6	%
MAX MEASURED DEPTH (Dm)=	1.25	ft
MAX CALCULATED DEPTH (Dc)=	1.25	ft
(Dm-Dc)/Dm * 100	0.4	%
MEAN VELOCITY=	1.89	ft/sec
MANNING'S N=	0.106	
SLOPE=	0.02736842	ft/ft
.4 * Qm =	20.5	cfs
2.5 * Qm=	128.0	cfs

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

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

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

_____
_____
_____
_____
_____
_____
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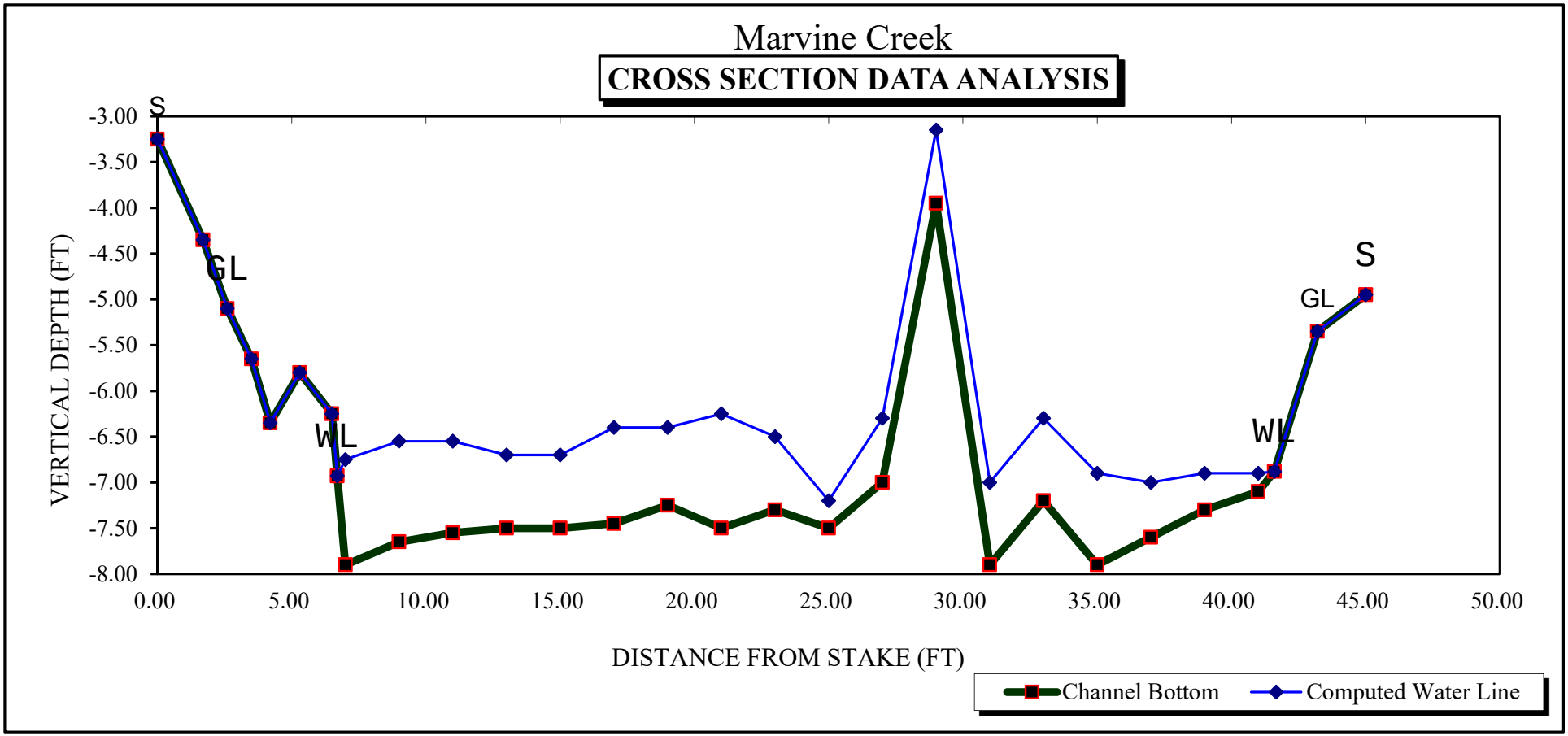
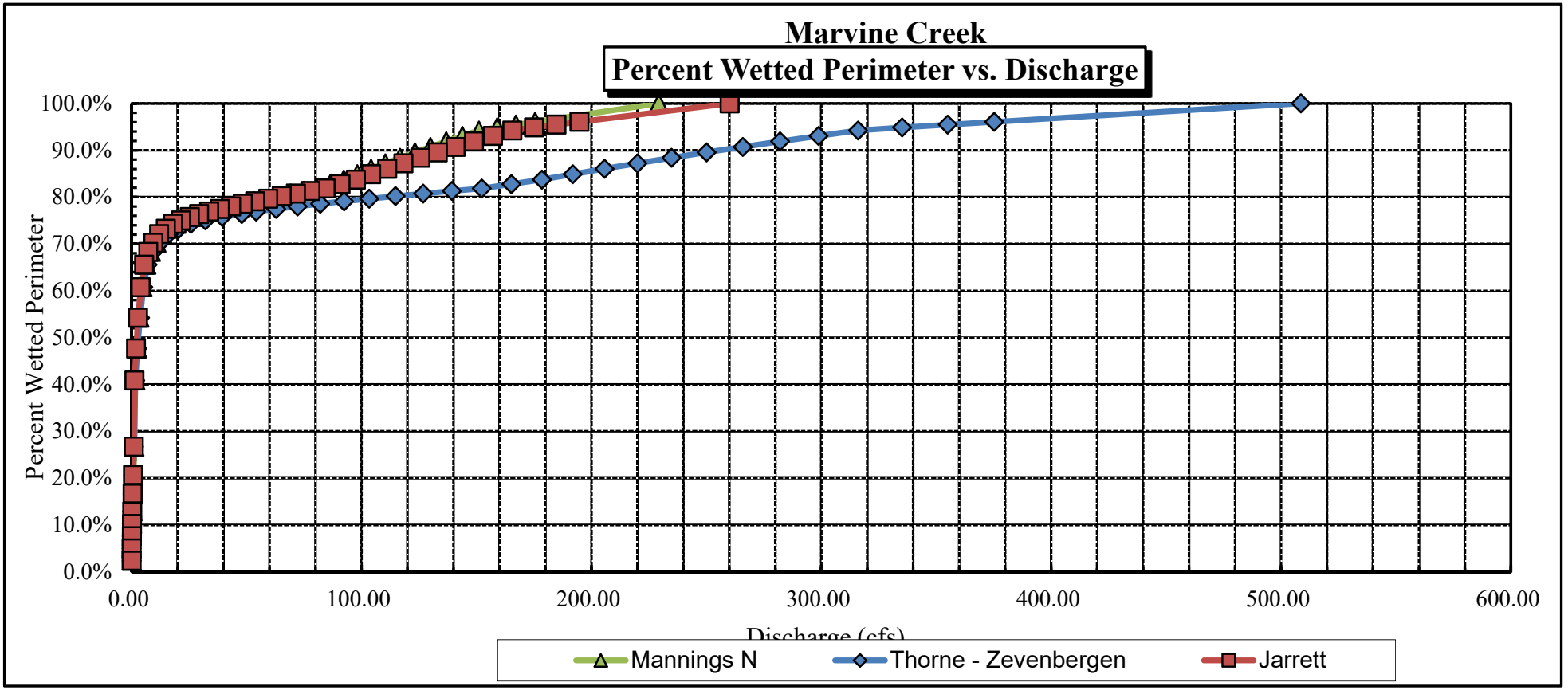
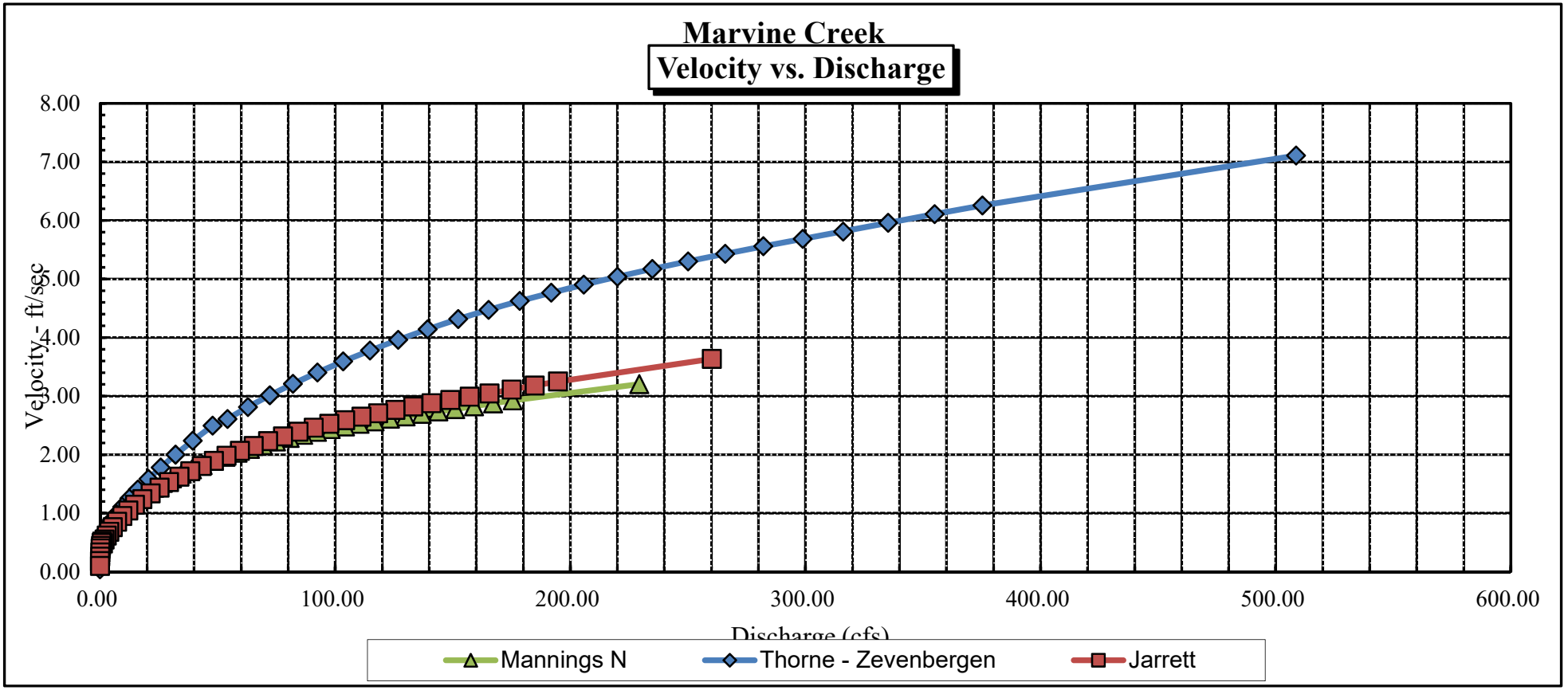
_____
_____
_____
_____

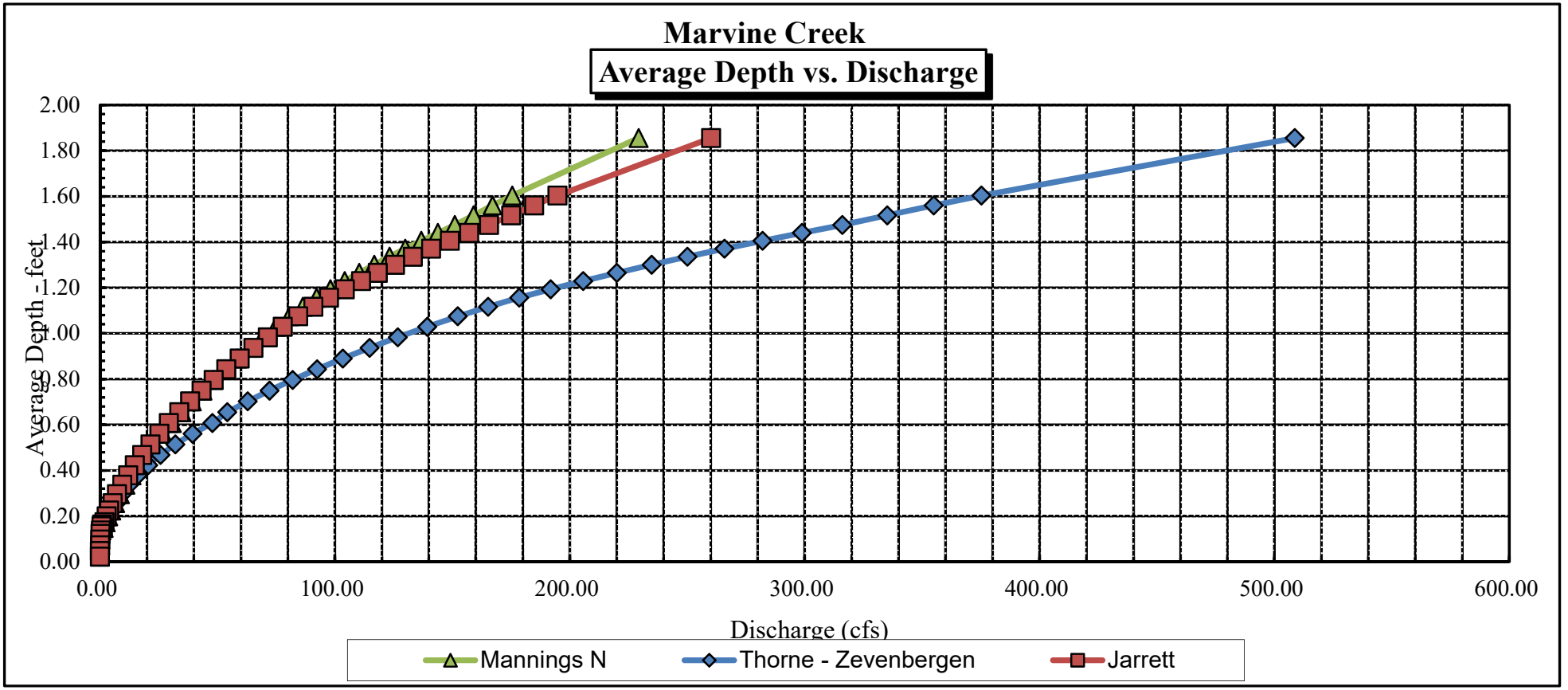
RECOMMENDATION BY: ..... AGENCY..... DATE:.....

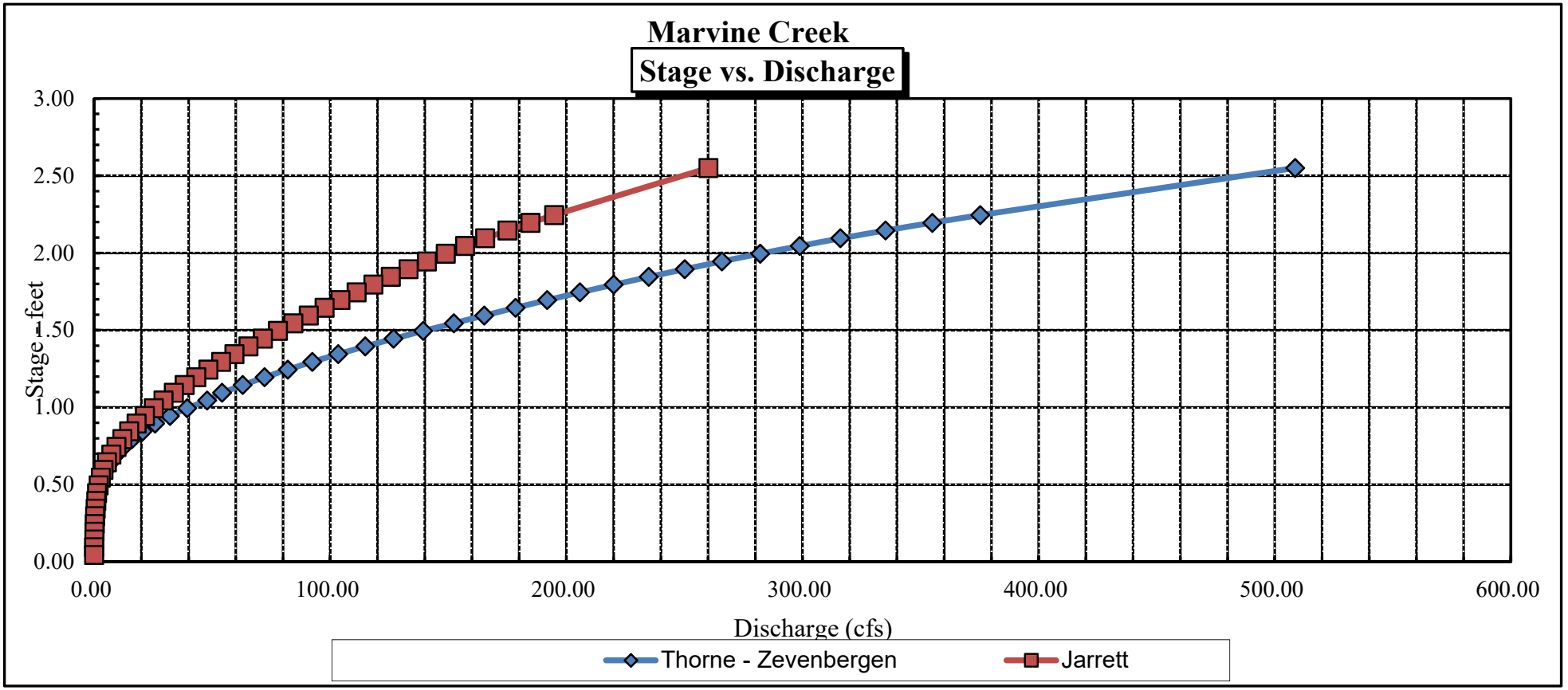
CWCB REVIEW BY: ..... DATE:.....


Marvine Creek
CROSS SECTION DATA ANALYSIS
VERTICAL DEPTH (FT)
-3.00
-3.50
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
-8.00
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
S
GL
WL
WL
GL
S
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Marvine Creek
Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
100.00
200.00
300.00
400.00
500.00
600.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Marvine Creek
Velocity vs. Discharge
Velocity - ft/sec
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
100.00
200.00
300.00
400.00
500.00
600.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Marvine Creek
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


Marvine Creek
Stage vs. Discharge
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

Data Input & Proofing

STREAM NAME:	Marvine Creek
XS LOCATION:	At Riffle Abv Marvine Ranch/USFS Bound.
XS NUMBER:	2 - Lower
DATE:	9/13/2018
OBSERVERS:	Birch, Skinner
1/4 SEC:	Lat: 40.019821
SECTION:	Long: -107.441584
TWP:	
RANGE:	
PM:	
COUNTY:	Rio Blanco
WATERSHED:	White
DIVISION:	6
DOW CODE:	21092
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.027368421 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 = 29					
	S	0.00	3.25			0.00	0.00	0.00
		1.70	4.35			0.00	0.00	0.00
1	GL	2.60	5.10			0.00	0.00	0.00
		3.50	5.65			0.00	0.00	0.00
		4.20	6.35			0.00	0.00	0.00
		5.30	5.80			0.00	0.00	0.00
		6.50	6.25			0.00	0.00	0.00
	WL	6.70	6.93	0.00	0.00	0.00	0.00	0.00
		7.00	7.90	1.15	1.82	1.32	2.41	6.75
		9.00	7.65	1.10	1.82	2.20	4.01	6.55
		11.00	7.55	1.00	1.82	2.00	3.65	6.55
		13.00	7.50	0.80	1.82	1.60	2.92	6.70
		15.00	7.50	0.80	1.82	1.60	2.92	6.70
		17.00	7.45	1.05	1.82	2.10	3.83	6.40
		19.00	7.25	0.85	1.82	1.70	3.10	6.40
		21.00	7.50	1.25	1.82	2.50	4.56	6.25
		23.00	7.30	0.80	1.82	1.60	2.92	6.50
		25.00	7.50	0.30	1.82	0.60	1.09	7.20
		27.00	7.00	0.70	1.82	1.40	2.55	6.30
		29.00	3.95	0.80	1.82	1.60	2.92	3.15
		31.00	7.90	0.90	1.82	1.80	3.28	7.00
		33.00	7.20	0.90	1.82	1.80	3.28	6.30
		35.00	7.90	1.00	1.82	2.00	3.65	6.90
		37.00	7.60	0.60	1.82	1.20	2.19	7.00
		39.00	7.30	0.40	1.82	0.80	1.46	6.90
		41.00	7.10	0.20	1.82	0.26	0.47	6.90
	WL	41.60	6.88	0.00	0.00	0.00	0.00	0.00
1	GL	43.20	5.35			0.00	0.00	0.00
	S	45.00	4.95			0.00	0.00	0.00
					Totals	28.08	51.21	

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

LOCATION INFORMATION

STREAM NAME:	Marvine Creek abv W Marvine Ck
XS LOCATION:	At Marvine Ranch/USFS Boundary
XS NUMBER:	1- Lower
DATE:	13-Sep-18
OBSERVERS:	Birch, Skinner
1/4 SEC:	Lat: 40.019821
SECTION:	Long: -107.441584
TWP:	0
RANGE:	0
PM:	0
COUNTY:	Rio Blanco County
WATERSHED:	White
DIVISION:	6
DOW CODE:	21092
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:	0.02082474

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

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

STREAM NAME: Marvine Creek abv W Marvine Ck
XS LOCATION: At Marvine Ranch/USFS Boundary
XS NUMBER: 1- Lower

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
S	0.00	3.10			0.00		0.00	0.00	0.0%
	1.00	4.05			0.00		0.00	0.00	0.0%
1 GL	2.20	4.90			0.00		0.00	0.00	0.0%
	3.50	5.50			0.00		0.00	0.00	0.0%
WL	4.00	6.01	0.00	0.00	0.00		0.00	0.00	0.0%
	4.00	6.15	0.15	0.00	0.14	0.15	0.11	0.00	0.0%
	5.50	6.30	0.30	1.09	1.51	0.30	0.45	0.49	1.0%
	7.00	6.80	0.95	3.05	1.58	0.95	1.43	4.35	8.5%
	8.50	6.90	1.00	3.03	1.50	1.00	1.50	4.55	8.9%
	10.00	7.00	1.20	3.12	1.50	1.20	1.80	5.62	11.0%
	11.50	6.95	0.95	4.06	1.50	0.95	1.43	5.79	11.3%
	13.00	6.80	0.90	2.40	1.51	0.90	1.35	3.24	6.3%
	14.50	6.95	0.90	3.85	1.51	0.90	1.35	5.20	10.1%
	16.00	6.95	0.95	1.90	1.50	0.95	1.43	2.71	5.3%
	17.50	7.00	0.95	1.90	1.50	0.95	1.43	2.71	5.3%
	19.00	6.75	0.65	0.16	1.52	0.65	0.98	0.16	0.3%
	20.50	6.90	0.90	2.06	1.51	0.90	1.35	2.78	5.4%
	22.00	6.65	0.70	1.54	1.52	0.70	1.05	1.62	3.2%
	23.50	6.75	0.75	1.62	1.50	0.75	1.13	1.82	3.6%
	25.00	6.75	0.80	0.81	1.50	0.80	1.20	0.97	1.9%
	26.50	6.65	0.80	2.38	1.50	0.80	1.20	2.86	5.6%
	28.00	6.60	0.70	2.32	1.50	0.70	1.05	2.44	4.8%
	29.50	6.60	0.70	1.83	1.50	0.70	1.05	1.92	3.8%
	31.00	6.60	0.60	0.63	1.50	0.60	0.90	0.57	1.1%
	32.50	6.40	0.60	1.41	1.51	0.60	0.90	1.27	2.5%
	34.00	6.01	0.40	0.52	1.55	0.40	0.34	0.18	0.3%
WL	34.20	5.55	0.00	0.00	0.50		0.00	0.00	0.0%
	35.80	5.35			0.00		0.00	0.00	0.0%
	36.80	5.00			0.00		0.00	0.00	0.0%
	37.80	4.90			0.00		0.00	0.00	0.0%
1 S/GL	40.50				0.00		0.00	0.00	0.0%
TOTALS ----------					30.87	1.2 (Max.)	23.40	51.21	100.0%

Manning's n = 0.0815
Hydraulic Radius= 0.75802466

STREAM NAME: Marvine Creek abv W Marvine Ck
XS LOCATION: At Marvine Ranch/USFS Boundary
XS NUMBER: 1- Lower

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	23.40	28.21	20.5%
5.53	23.40	35.83	53.1%
5.55	23.40	35.22	50.5%
5.57	23.40	34.61	47.9%
5.59	23.40	34.00	45.3%
5.61	23.40	33.38	42.6%
5.63	23.40	32.77	40.0%
5.65	23.40	32.16	37.4%
5.67	23.40	31.55	34.8%
5.69	23.40	30.94	32.2%
5.71	23.40	30.33	29.6%
5.73	23.40	29.73	27.0%
5.74	23.40	29.42	25.7%
5.75	23.40	29.12	24.4%
5.76	23.40	28.81	23.1%
5.77	23.40	28.51	21.8%
5.78	23.40	28.21	20.5%
5.79	23.40	27.90	19.2%
5.80	23.40	27.60	17.9%
5.81	23.40	27.30	16.6%
5.82	23.40	27.00	15.4%
5.83	23.40	26.69	14.1%
5.85	23.40	26.09	11.5%
5.87	23.40	25.48	8.9%
5.89	23.40	24.88	6.3%
5.91	23.40	24.28	3.7%
5.93	23.40	23.67	1.2%
5.95	23.40	23.07	-1.4%
5.97	23.40	22.47	-4.0%
5.99	23.40	21.87	-6.5%
6.01	23.40	21.27	-9.1%
6.03	23.40	20.67	-11.7%

WATERLINE AT ZERO
AREA ERROR = 5.939

STREAM NAME: Marvine Creek abv W Marvine Ck
XS LOCATION: At Marvine Ranch/USFS Boundary
XS NUMBER: 1- Lower

Thorne-Zevenbergen D84 Correction Applied
User Supplied D84 = 0.58

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

Velocity based on test of R/D84>1

	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	4.90	35.60	1.59	2.10	56.77	36.70	100.0%	1.55	320.94	5.65
	4.94	35.12	1.58	2.06	55.39	36.21	98.7%	1.53	309.45	5.59
	4.99	34.52	1.55	2.01	53.65	35.59	97.0%	1.51	295.16	5.50
	5.04	34.19	1.52	1.96	51.93	35.24	96.0%	1.47	279.47	5.38
	5.09	33.94	1.48	1.91	50.23	34.97	95.3%	1.44	263.70	5.25
	5.14	33.68	1.44	1.86	48.54	34.70	94.6%	1.40	248.37	5.12
	5.19	33.43	1.40	1.81	46.86	34.43	93.8%	1.36	233.47	4.98
	5.24	33.18	1.36	1.76	45.19	34.16	93.1%	1.32	219.02	4.85
	5.29	32.93	1.32	1.71	43.54	33.89	92.3%	1.28	205.00	4.71
	5.34	32.68	1.28	1.66	41.90	33.62	91.6%	1.25	191.42	4.57
	5.39	32.23	1.25	1.61	40.28	33.15	90.3%	1.22	179.21	4.45
	5.44	31.72	1.22	1.56	38.68	32.63	88.9%	1.19	167.68	4.34
	5.49	31.21	1.19	1.51	37.11	32.10	87.5%	1.16	156.58	4.22
	5.54	30.75	1.16	1.46	35.56	31.62	86.2%	1.12	145.74	4.10
	5.59	30.60	1.11	1.41	34.02	31.42	85.6%	1.08	134.19	3.94
	5.64	30.52	1.06	1.36	32.50	31.30	85.3%	1.04	122.79	3.78
	5.69	30.45	1.02	1.31	30.97	31.17	84.9%	0.99	111.83	3.61
	5.74	30.38	0.97	1.26	29.45	31.05	84.6%	0.95	101.32	3.44
	5.79	30.31	0.92	1.21	27.93	30.92	84.3%	0.90	91.27	3.27
	5.84	30.24	0.87	1.16	26.42	30.80	83.9%	0.86	81.69	3.09
	5.89	30.17	0.83	1.11	24.91	30.67	83.6%	0.81	72.58	2.91
WL	5.94	30.10	0.78	1.06	23.40	30.55	83.2%	0.77	63.95	2.73
	5.99	30.03	0.73	1.01	21.90	30.42	82.9%	0.72	55.81	2.55
	6.04	29.89	0.68	0.96	20.40	30.23	82.4%	0.67	48.28	2.37
	6.09	29.70	0.64	0.91	18.91	29.98	81.7%	0.63	41.33	2.19
	6.14	29.50	0.59	0.86	17.43	29.73	81.0%	0.59	34.88	2.00
	6.19	28.92	0.55	0.81	15.97	29.13	79.4%	0.55	32.22	2.02
	6.24	28.23	0.52	0.76	14.54	28.43	77.5%	0.51	26.77	1.84
	6.29	27.54	0.48	0.71	13.15	27.73	75.6%	0.47	21.96	1.67
	6.34	27.12	0.43	0.66	11.78	27.29	74.4%	0.43	17.48	1.48
	6.39	26.78	0.39	0.61	10.43	26.94	73.4%	0.39	13.61	1.30
	6.44	26.29	0.35	0.56	9.11	26.44	72.0%	0.34	10.43	1.15
	6.49	25.77	0.30	0.51	7.80	25.90	70.6%	0.30	7.80	1.00
	6.54	25.24	0.26	0.46	6.53	25.37	69.1%	0.26	5.65	0.87
	6.59	24.72	0.21	0.41	5.28	24.83	67.7%	0.21	3.94	0.75
	6.64	20.31	0.21	0.36	4.19	20.42	55.6%	0.21	2.96	0.71
	6.69	18.43	0.17	0.31	3.22	18.52	50.5%	0.17	1.99	0.62
	6.74	16.48	0.14	0.26	2.35	16.55	45.1%	0.14	1.25	0.53
	6.79	13.57	0.12	0.21	1.62	13.63	37.1%	0.12	0.74	0.46
	6.84	11.07	0.09	0.16	1.00	11.11	30.3%	0.09	0.38	0.38
	6.89	8.22	0.06	0.11	0.52	8.25	22.5%	0.06	0.15	0.29
	6.94	6.00	0.03	0.06	0.16	6.01	16.4%	0.03	0.04	0.26
	6.99	0.89	0.01	0.01	0.00	0.89	2.4%	0.01	0.00	0.06

STREAM NAME: Marvine Creek abv W Marvine Ck
XS LOCATION: At Marvine Ranch/USFS Boundary
XS NUMBER: 1- Lower

SUMMARY SHEET

MEASURED FLOW (Qm)=	51.21	cfs
CALCULATED FLOW (Qc)=	51.57	cfs
(Qm-Qc)/Qm * 100 =	-0.7	%
MEASURED WATERLINE (WLm)=	5.78	ft
CALCULATED WATERLINE (WLc)=	5.94	ft
(WLm-WLc)/WLm * 100 =	-2.8	%
MAX MEASURED DEPTH (Dm)=	1.20	ft
MAX CALCULATED DEPTH (Dc)=	1.06	ft
(Dm-Dc)/Dm * 100	11.6	%
MEAN VELOCITY=	2.20	ft/sec
MANNING'S N=	0.081	
SLOPE=	0.02082474	ft/ft
.4 * Qm =	20.5	cfs
2.5 * Qm=	128.0	cfs

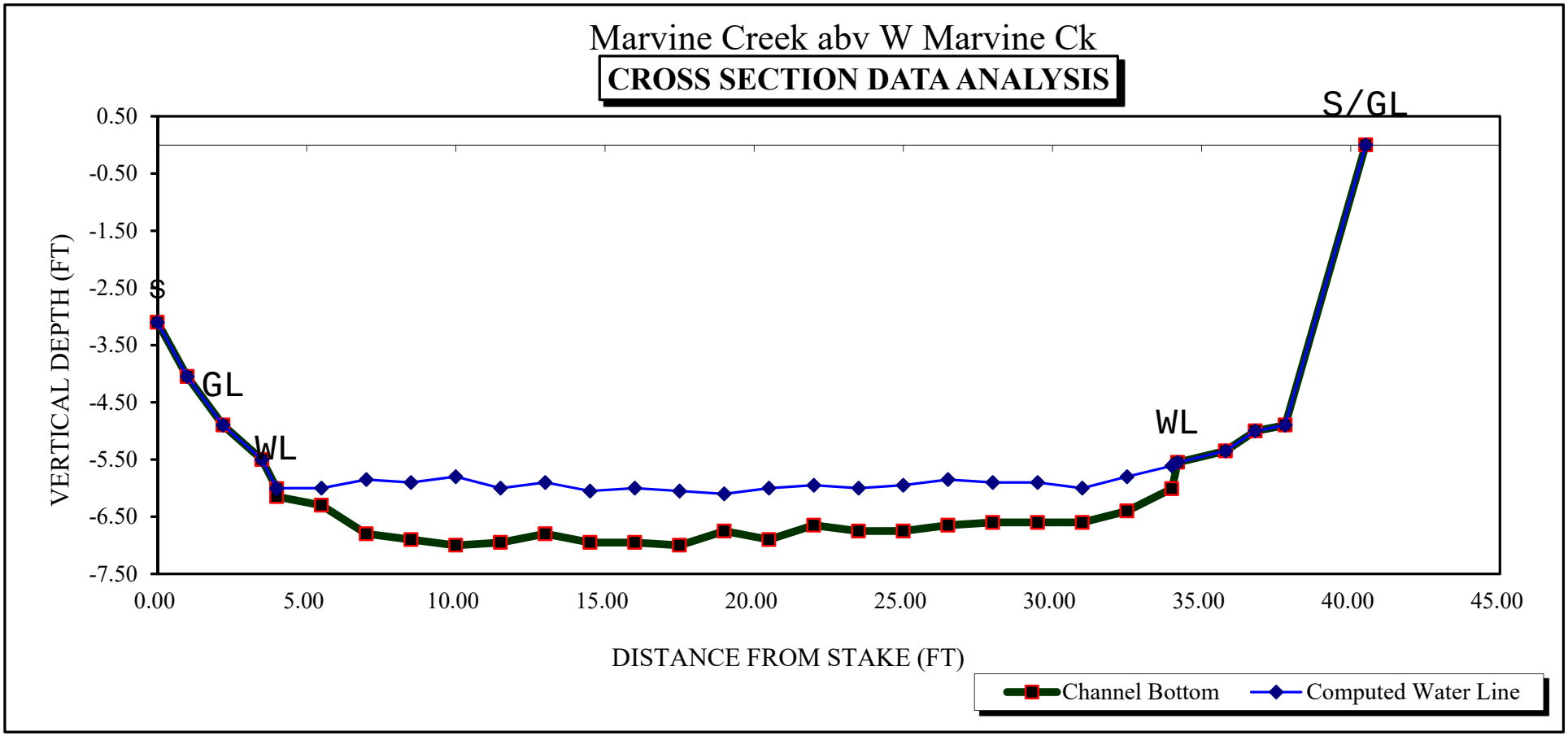
RECOMMENDED INSTREAM FLOW:
==========

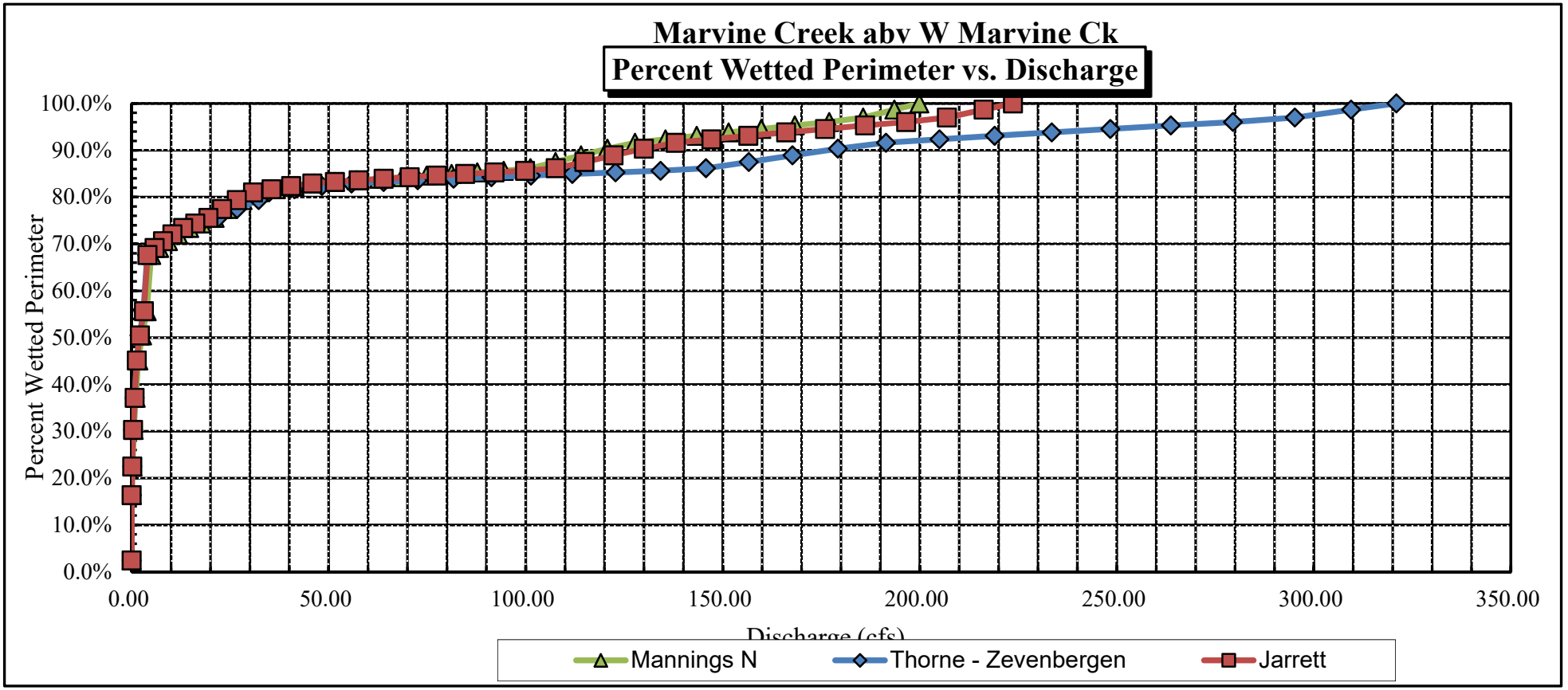
FLOW (CFS)	PERIOD
==========	========
_____	_____
_____	_____
_____	_____
_____	_____

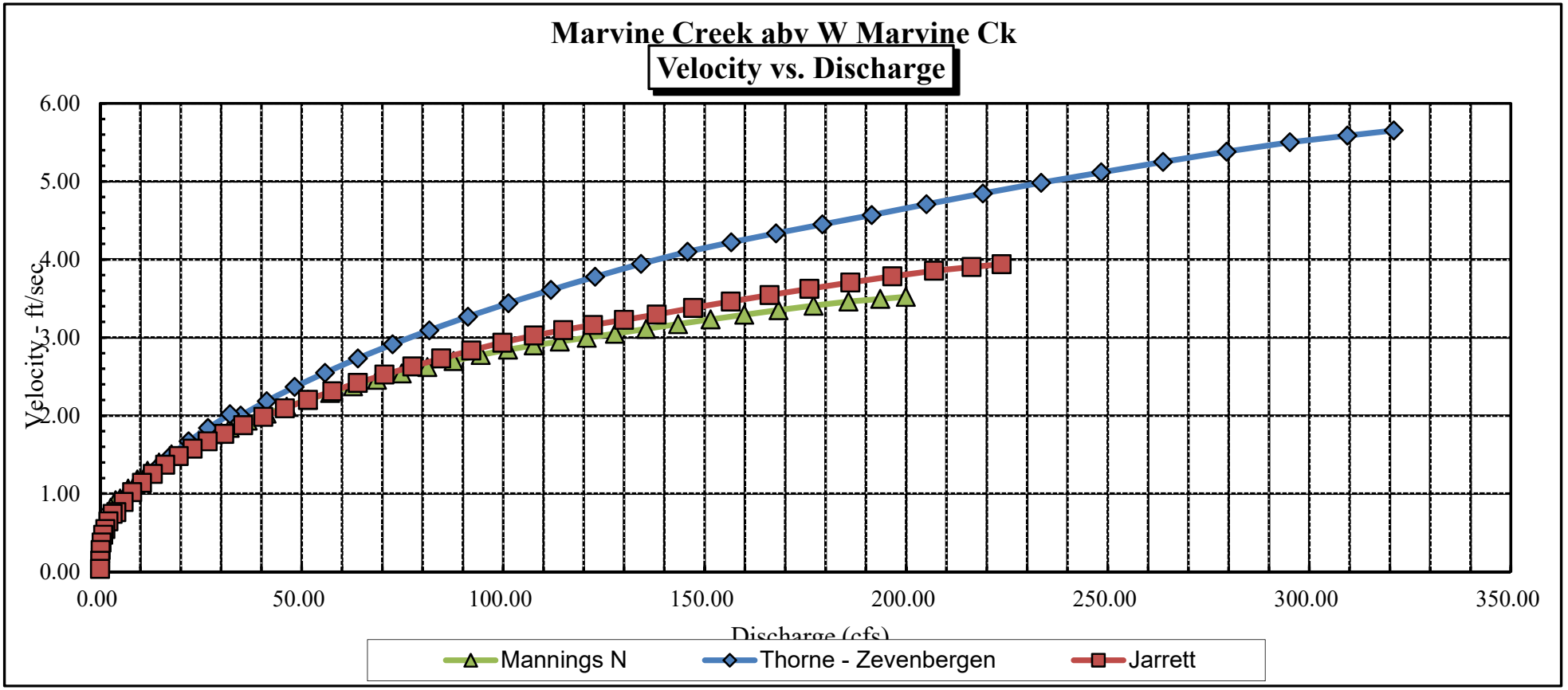
RATIONALE FOR RECOMMENDATION:
==========

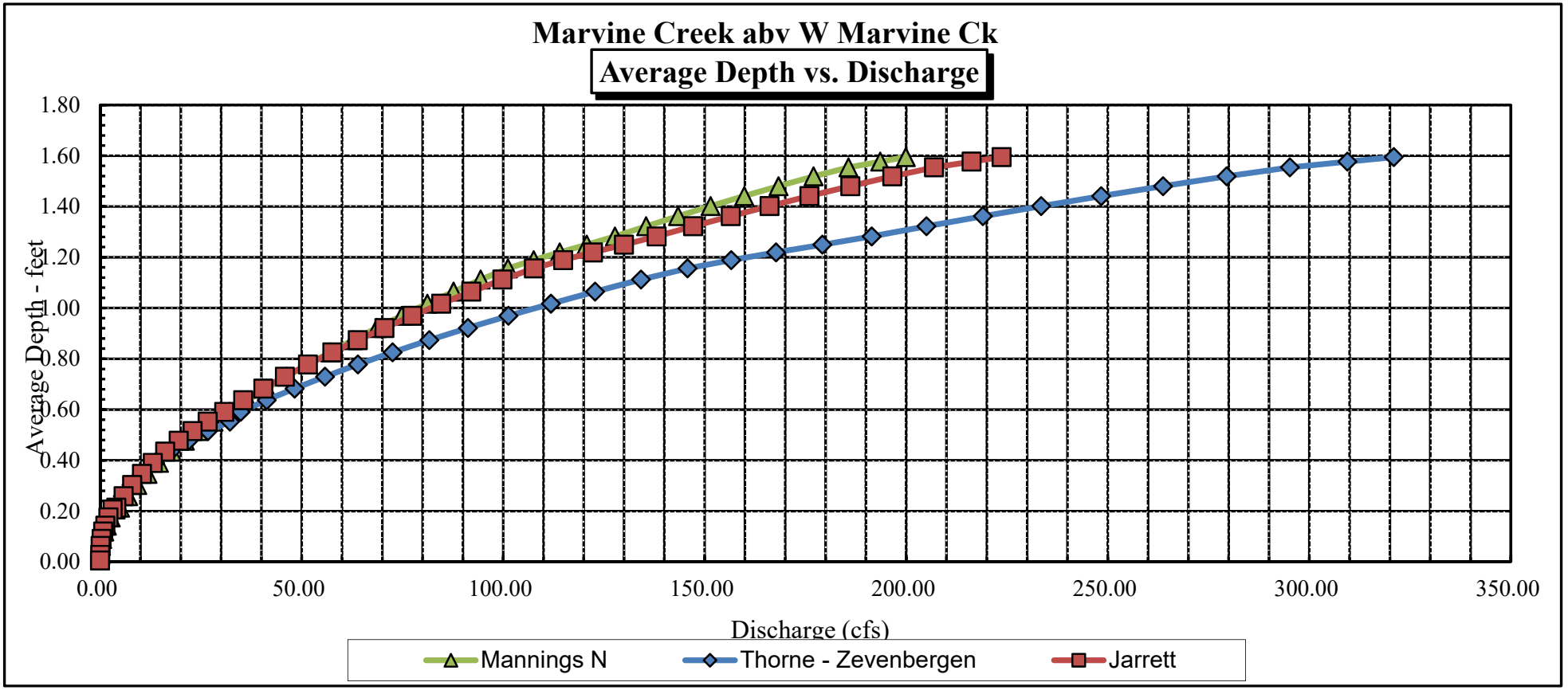
RECOMMENDATION BY: …….. AGENCY…….. DATE:……

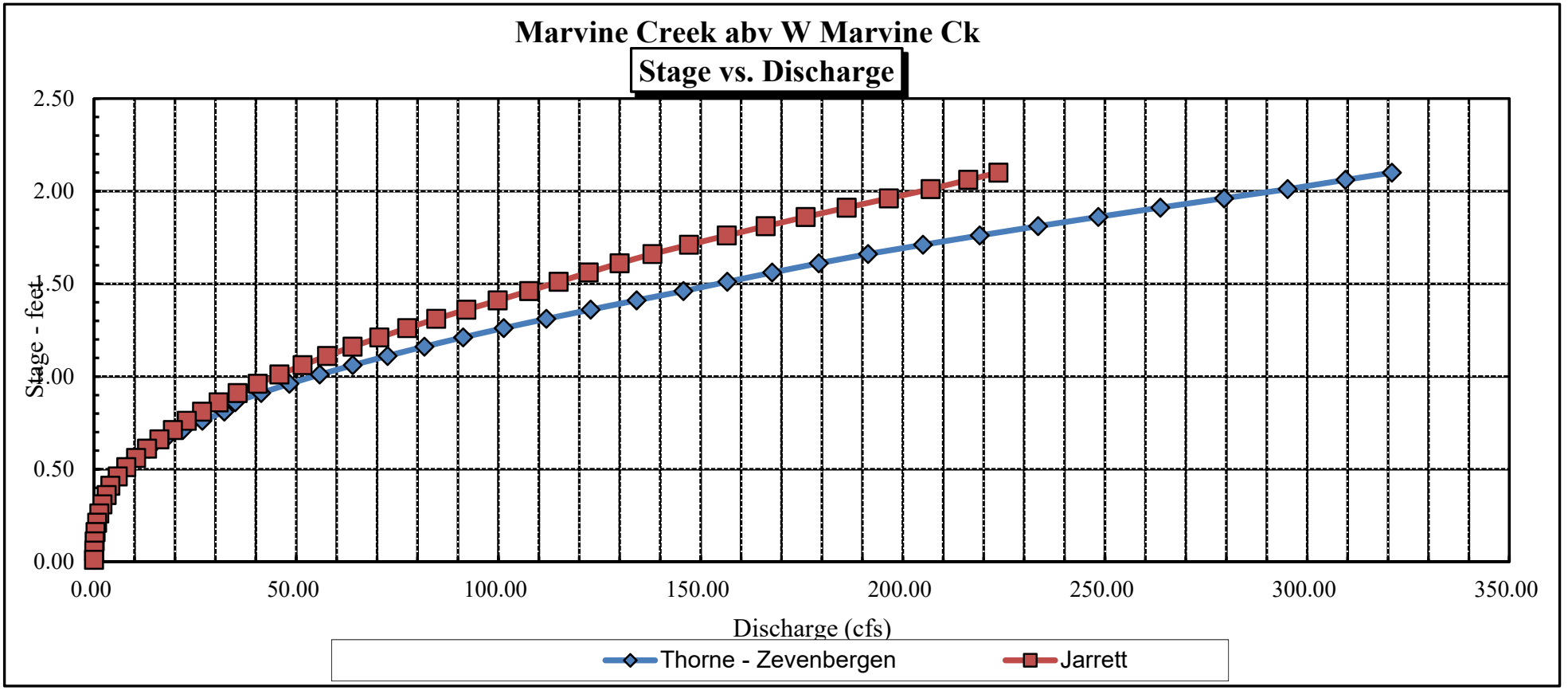
CWCB REVIEW BY: …….. DATE:……


Marvine Creek abv W Marvine Ck
CROSS SECTION DATA ANALYSIS
S/GL
S
GL
WL
WL
0.50
-0.50
-1.50
-2.50
-3.50
-4.50
-5.50
-6.50
-7.50
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Marvine Creek abv W Marvine Ck
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
50.00
100.00
150.00
200.00
250.00
300.00
350.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Marvine Creek abv W Marvine Ck
Velocity vs. Discharge
Velocity - ft/sec
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Marvine Creek abv W Marvine Ck
Average Depth vs. Discharge
Average Depth - feet
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Marvine Creek abv W Marvine Ck
Stage vs. Discharge
Stage - feet
2.50
2.00
1.50
1.00
0.50
0.00
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

Data Input & Proofing

STREAM NAME:	Marvine Creek abv W Marvine Ck
XS LOCATION:	At Marvine Ranch/USFS Boundary
XS NUMBER:	1- Lower
DATE:	9/13/2018
OBSERVERS:	Birch, Skinner
1/4 SEC:	Lat: 40.019821
SECTION:	Long: -107.441584
TWP:	
RANGE:	
PM:	
COUNTY:	Rio Blanco County
WATERSHED:	White
DIVISION:	6
DOW CODE:	21092
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.020824742 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					
	S	0.00	3.10			0.00	0.00	0.00
		1.00	4.05			0.00	0.00	0.00
1	GL	2.20	4.90			0.00	0.00	0.00
		3.50	5.50			0.00	0.00	0.00
	WL	4.00	6.01	0.00	0.00	0.00	0.00	0.00
		4.00	6.15	0.15	0.00	0.11	0.00	6.00
		5.50	6.30	0.30	1.09	0.45	0.49	6.00
		7.00	6.80	0.95	3.05	1.43	4.35	5.85
		8.50	6.90	1.00	3.03	1.50	4.55	5.90
		10.00	7.00	1.20	3.12	1.80	5.62	5.80
		11.50	6.95	0.95	4.06	1.43	5.79	6.00
		13.00	6.80	0.90	2.40	1.35	3.24	5.90
		14.50	6.95	0.90	3.85	1.35	5.20	6.05
		16.00	6.95	0.95	1.90	1.43	2.71	6.00
		17.50	7.00	0.95	1.90	1.43	2.71	6.05
		19.00	6.75	0.65	0.16	0.98	0.16	6.10
		20.50	6.90	0.90	2.06	1.35	2.78	6.00
		22.00	6.65	0.70	1.54	1.05	1.62	5.95
		23.50	6.75	0.75	1.62	1.13	1.82	6.00
		25.00	6.75	0.80	0.81	1.20	0.97	5.95
		26.50	6.65	0.80	2.38	1.20	2.86	5.85
		28.00	6.60	0.70	2.32	1.05	2.44	5.90
		29.50	6.60	0.70	1.83	1.05	1.92	5.90
		31.00	6.60	0.60	0.63	0.90	0.57	6.00
		32.50	6.40	0.60	1.41	0.90	1.27	5.80
		34.00	6.01	0.40	0.52	0.34	0.18	5.61
	WL	34.20	5.55	0.00	0.00	0.00	0.00	0.00
		35.80	5.35			0.00	0.00	0.00
		36.80	5.00			0.00	0.00	0.00
		37.80	4.90			0.00	0.00	0.00
1	S/GL	40.50				0.00	0.00	0.00
					Totals	23.40	51.21	

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

LOCATION INFORMATION

STREAM NAME:	Marvine Creek
XS LOCATION:	Abv E Marvine (at footpath Xing)
XS NUMBER:	2
DATE:	12-Jul-18
OBSERVERS:	Birch, Skinner
1/4 SEC:	Lat: 40.010911
SECTION:	Long: -107.430305
TWP:	0
RANGE:	0
PM:	0
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	23278
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:	0.00948718

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

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

STREAM NAME: Marvine Creek
XS LOCATION: Abv E Marvine (at footpath Xing)
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
	S	0.00	3.95			0.00		0.00	0.00	0.0%
		1.50	4.65			0.00		0.00	0.00	0.0%
1	GL	2.80	5.50			0.00		0.00	0.00	0.0%
		3.30	6.05			0.00		0.00	0.00	0.0%
	WL	3.60	7.25	0.00	0.00	0.00		0.00	0.00	0.0%
		5.00	7.60	0.30	0.44	1.44	0.30	0.44	0.19	0.4%
		6.50	7.55	0.30	1.47	1.50	0.30	0.45	0.66	1.4%
		8.00	7.55	0.35	1.56	1.50	0.35	0.53	0.82	1.7%
		9.50	7.45	0.30	1.36	1.50	0.30	0.45	0.61	1.3%
		11.00	7.35	0.30	0.75	1.50	0.30	0.45	0.34	0.7%
		12.50	7.35	0.20	0.45	1.50	0.20	0.30	0.14	0.3%
		14.00	7.50	0.35	0.65	1.51	0.35	0.53	0.34	0.7%
		15.50	7.65	0.55	1.64	1.51	0.55	0.83	1.35	2.8%
		17.00	7.80	0.70	2.64	1.51	0.70	1.05	2.77	5.8%
		18.50	8.15	1.10	3.06	1.54	1.10	1.65	5.05	10.5%
		20.00	8.25	1.20	3.84	1.50	1.20	1.80	6.91	14.4%
		21.50	8.20	1.00	3.18	1.50	1.00	1.50	4.77	9.9%
		23.00	8.40	1.35	4.73	1.51	1.35	2.03	9.58	19.9%
		24.50	8.10	0.90	0.64	1.53	0.90	1.35	0.86	1.8%
		26.00	8.15	0.95	2.87	1.50	0.95	1.43	4.09	8.5%
		27.50	8.30	1.15	2.67	1.51	1.15	1.73	4.61	9.6%
		29.00	8.15	0.90	2.77	1.51	0.90	1.35	3.74	7.8%
		30.50	7.90	0.65	0.71	1.52	0.65	0.98	0.69	1.4%
		32.00	7.80	0.60	0.53	1.50	0.60	0.90	0.48	1.0%
		33.50	7.55	0.30	0.23	1.52	0.30	0.47	0.11	0.2%
	WL	35.10	7.21	0.00	0.00	1.64		0.00	0.00	0.0%
		35.80	7.10			0.00		0.00	0.00	0.0%
		36.80	6.25			0.00		0.00	0.00	0.0%
1	GL	38.00	5.80			0.00		0.00	0.00	0.0%
	S	40.10	5.00			0.00		0.00	0.00	0.0%
	TOTALS ----------					31.76	1.35 (Max.)	20.18	48.11	100.0%

Manning's n = 0.0449
Hydraulic Radius= 0.63529918

STREAM NAME: Marvine Creek
XS LOCATION: Abv E Marvine (at footpath Xing)
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	20.18	18.22	-9.7%
6.98	20.18	26.24	30.0%
7.00	20.18	25.59	26.8%
7.02	20.18	24.94	23.6%
7.04	20.18	24.29	20.4%
7.06	20.18	23.65	17.2%
7.08	20.18	23.00	14.0%
7.10	20.18	22.36	10.8%
7.12	20.18	21.71	7.6%
7.14	20.18	21.07	4.5%
7.16	20.18	20.43	1.3%
7.18	20.18	19.80	-1.9%
7.19	20.18	19.48	-3.4%
7.20	20.18	19.17	-5.0%
7.21	20.18	18.85	-6.6%
7.22	20.18	18.54	-8.1%
7.23	20.18	18.22	-9.7%
7.24	20.18	17.91	-11.2%
7.25	20.18	17.59	-12.8%
7.26	20.18	17.28	-14.3%
7.27	20.18	16.97	-15.9%
7.28	20.18	16.66	-17.4%
7.30	20.18	16.04	-20.5%
7.32	20.18	15.42	-23.5%
7.34	20.18	14.81	-26.6%
7.36	20.18	14.22	-29.5%
7.38	20.18	13.65	-32.3%
7.40	20.18	13.10	-35.1%
7.42	20.18	12.56	-37.7%
7.44	20.18	12.04	-40.3%
7.46	20.18	11.53	-42.9%
7.48	20.18	11.03	-45.3%

WATERLINE AT ZERO
AREA ERROR = 7.168

STREAM NAME: Marvine Creek
XS LOCATION: Abv E Marvine (at footpath Xing)
XS NUMBER: 2

Thorne-Zevenbergen D84 Correction Applied
User Supplied D84 = 0.34

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

Velocity based on test of R/D84>1

	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	5.80	34.93	1.88	2.60	65.64	36.63	100.0%	1.79	362.32	5.52
	6.17	33.69	1.57	2.23	53.02	35.13	95.9%	1.51	253.47	4.78
	6.22	33.54	1.53	2.18	51.34	34.93	95.4%	1.47	239.96	4.67
	6.27	33.42	1.49	2.13	49.67	34.76	94.9%	1.43	226.66	4.56
	6.32	33.35	1.44	2.08	48.00	34.63	94.5%	1.39	213.48	4.45
	6.37	33.28	1.39	2.03	46.33	34.50	94.2%	1.34	200.63	4.33
	6.42	33.21	1.35	1.98	44.67	34.38	93.8%	1.30	188.12	4.21
	6.47	33.14	1.30	1.93	43.01	34.25	93.5%	1.26	175.95	4.09
	6.52	33.07	1.25	1.88	41.36	34.12	93.1%	1.21	164.12	3.97
	6.57	33.00	1.20	1.83	39.70	33.99	92.8%	1.17	152.65	3.84
	6.62	32.92	1.16	1.78	38.06	33.86	92.4%	1.12	141.52	3.72
	6.67	32.85	1.11	1.73	36.41	33.73	92.1%	1.08	130.76	3.59
	6.72	32.78	1.06	1.68	34.77	33.60	91.7%	1.03	120.36	3.46
	6.77	32.71	1.01	1.63	33.13	33.47	91.4%	0.99	110.32	3.33
	6.82	32.64	0.97	1.58	31.50	33.35	91.0%	0.94	100.66	3.20
	6.87	32.57	0.92	1.53	29.87	33.22	90.7%	0.90	91.39	3.06
	6.92	32.50	0.87	1.48	28.24	33.09	90.3%	0.85	82.50	2.92
	6.97	32.43	0.82	1.43	26.62	32.96	90.0%	0.81	74.00	2.78
	7.02	32.35	0.77	1.38	25.00	32.83	89.6%	0.76	65.91	2.64
	7.07	32.28	0.72	1.33	23.38	32.70	89.3%	0.72	58.22	2.49
	7.12	32.12	0.68	1.28	21.77	32.48	88.7%	0.67	51.07	2.35
WL	7.17	31.79	0.63	1.23	20.17	32.11	87.7%	0.63	44.54	2.21
	7.22	31.47	0.59	1.18	18.59	31.75	86.7%	0.59	38.41	2.07
	7.27	31.15	0.55	1.13	17.03	31.40	85.7%	0.54	32.68	1.92
	7.32	30.72	0.50	1.08	15.48	30.96	84.5%	0.50	27.46	1.77
	7.37	28.33	0.49	1.03	13.99	28.55	77.9%	0.49	24.16	1.73
	7.42	26.64	0.47	0.98	12.61	26.85	73.3%	0.47	20.79	1.65
	7.47	24.96	0.45	0.93	11.32	25.15	68.7%	0.45	17.79	1.57
	7.52	23.27	0.43	0.88	10.12	23.45	64.0%	0.43	15.12	1.49
	7.57	19.79	0.46	0.83	9.02	19.95	54.5%	0.45	13.93	1.54
	7.62	17.91	0.45	0.78	8.09	18.06	49.3%	0.45	12.24	1.51
	7.67	17.11	0.42	0.73	7.22	17.25	47.1%	0.42	10.10	1.40
	7.72	16.31	0.39	0.68	6.38	16.45	44.9%	0.39	8.19	1.28
	7.77	15.51	0.36	0.63	5.59	15.64	42.7%	0.36	6.50	1.16
	7.82	14.65	0.33	0.58	4.83	14.77	40.3%	0.33	5.51	1.14
	7.87	13.69	0.30	0.53	4.12	13.80	37.7%	0.30	4.18	1.02
	7.92	12.88	0.27	0.48	3.46	12.99	35.5%	0.27	3.02	0.87
	7.97	12.37	0.23	0.43	2.83	12.47	34.0%	0.23	2.01	0.71
	8.02	11.86	0.19	0.38	2.22	11.95	32.6%	0.19	1.25	0.56
	8.07	11.34	0.14	0.33	1.64	11.42	31.2%	0.14	0.71	0.43
	8.12	10.19	0.11	0.28	1.10	10.26	28.0%	0.11	0.36	0.33
	8.17	8.02	0.08	0.23	0.64	8.08	22.0%	0.08	0.17	0.26
	8.22	5.34	0.06	0.18	0.30	5.38	14.7%	0.06	0.05	0.18
	8.27	2.28	0.05	0.13	0.12	2.31	6.3%	0.05	0.01	0.12
	8.32	1.02	0.04	0.08	0.04	1.04	2.8%	0.04	0.00	0.06
	8.37	0.40	0.02	0.03	0.01	0.40	1.1%	0.02	0.00	0.01

STREAM NAME: Marvine Creek
XS LOCATION: Abv E Marvine (at footpath Xing)
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	48.11	cfs
CALCULATED FLOW (Qc)=	47.75	cfs
(Qm-Qc)/Qm * 100 =	0.7	%
MEASURED WATERLINE (WLm)=	7.23	ft
CALCULATED WATERLINE (WLc)=	7.17	ft
(WLm-WLc)/WLm * 100 =	0.9	%
MAX MEASURED DEPTH (Dm)=	1.35	ft
MAX CALCULATED DEPTH (Dc)=	1.23	ft
(Dm-Dc)/Dm * 100	8.8	%
MEAN VELOCITY=	2.37	ft/sec
MANNING'S N=	0.045	
SLOPE=	0.00948718	ft/ft
.4 * Qm =	19.2	cfs
2.5 * Qm=	120.3	cfs

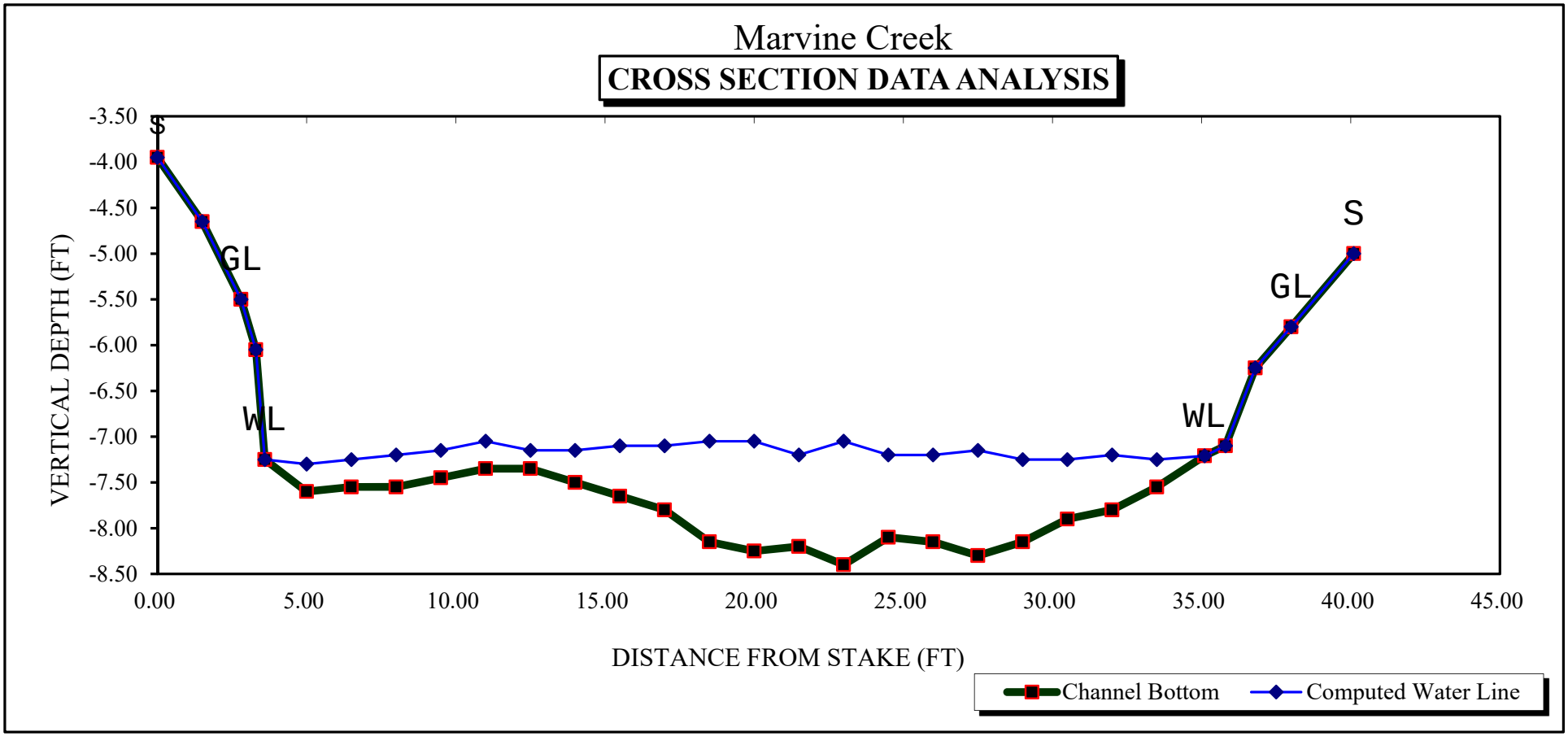
RECOMMENDED INSTREAM FLOW:
============================

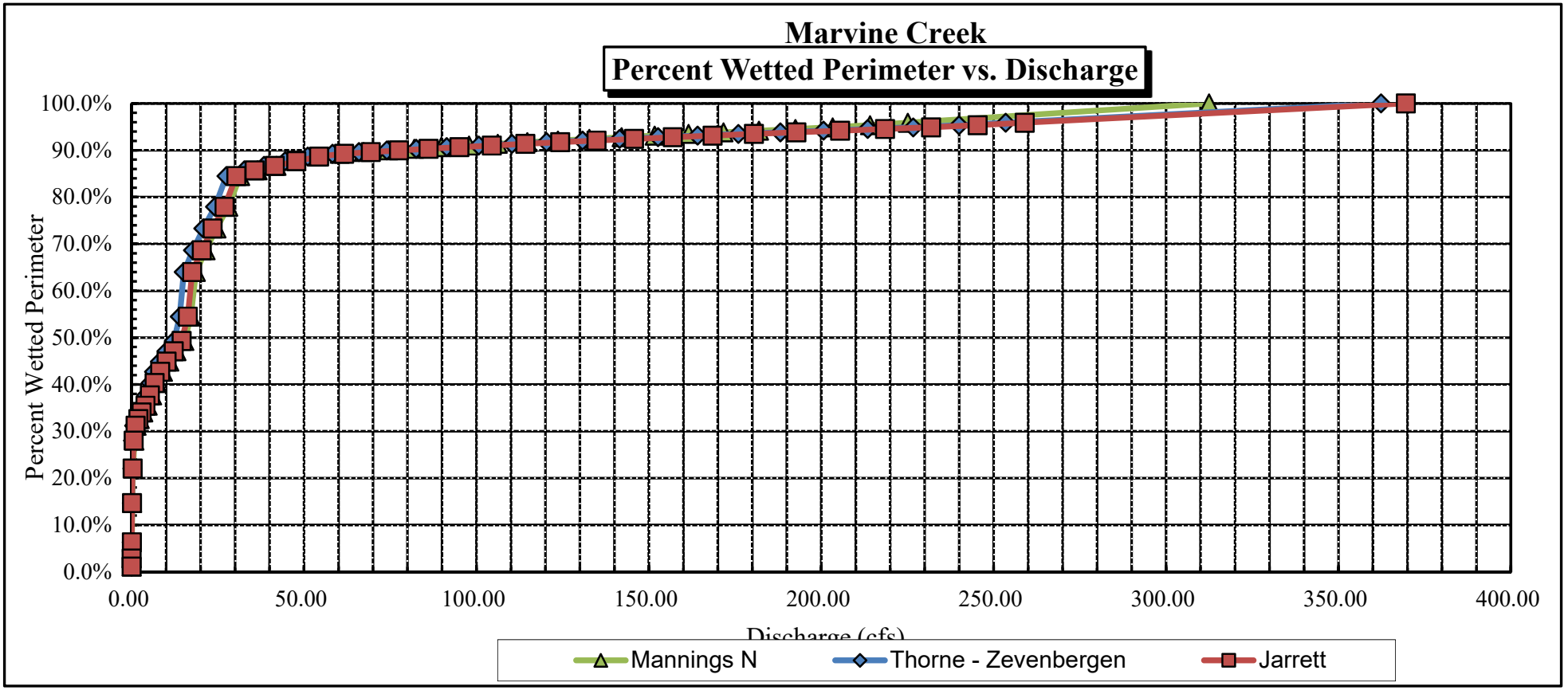
FLOW (CFS)	PERIOD
===========	========
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

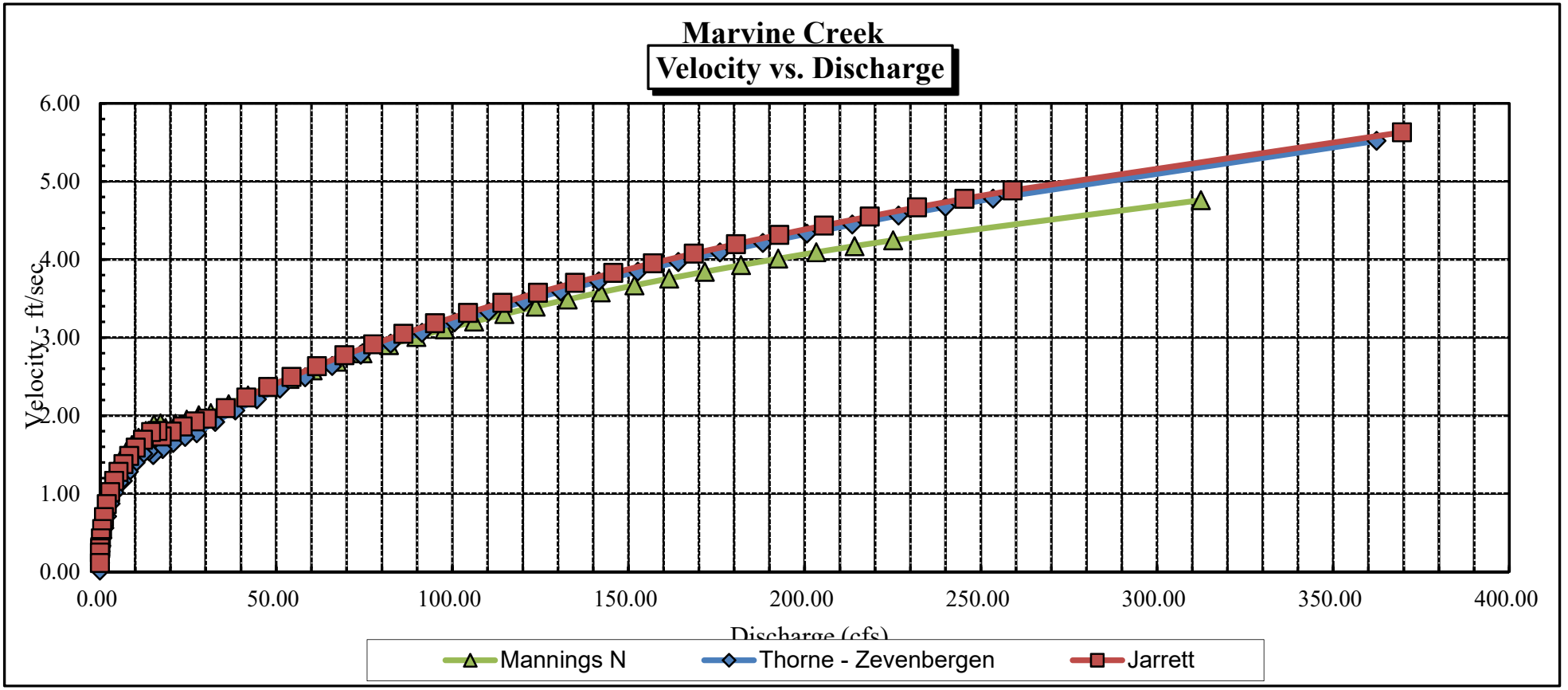
RATIONALE FOR RECOMMENDATION:
============================

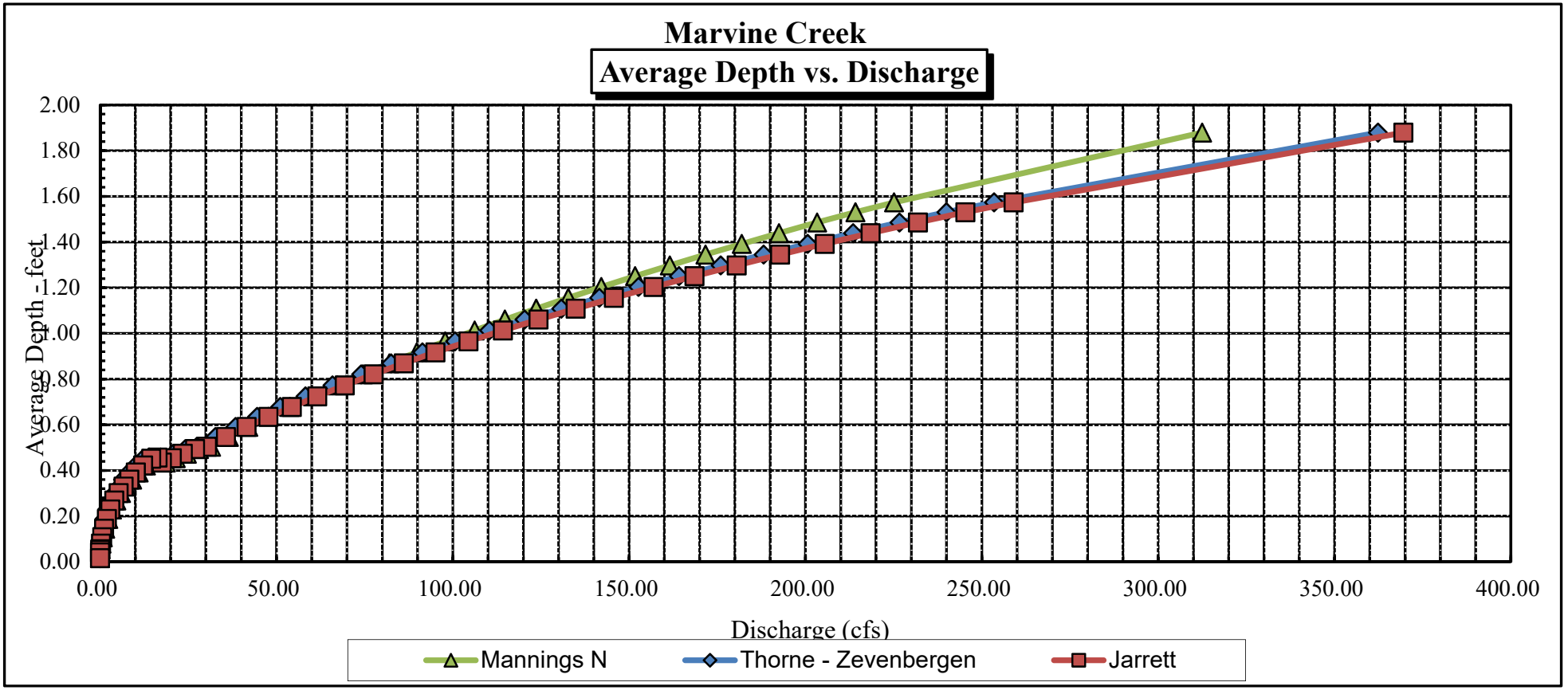
RECOMMENDATION BY: .... AGENCY.. DATE:..............................

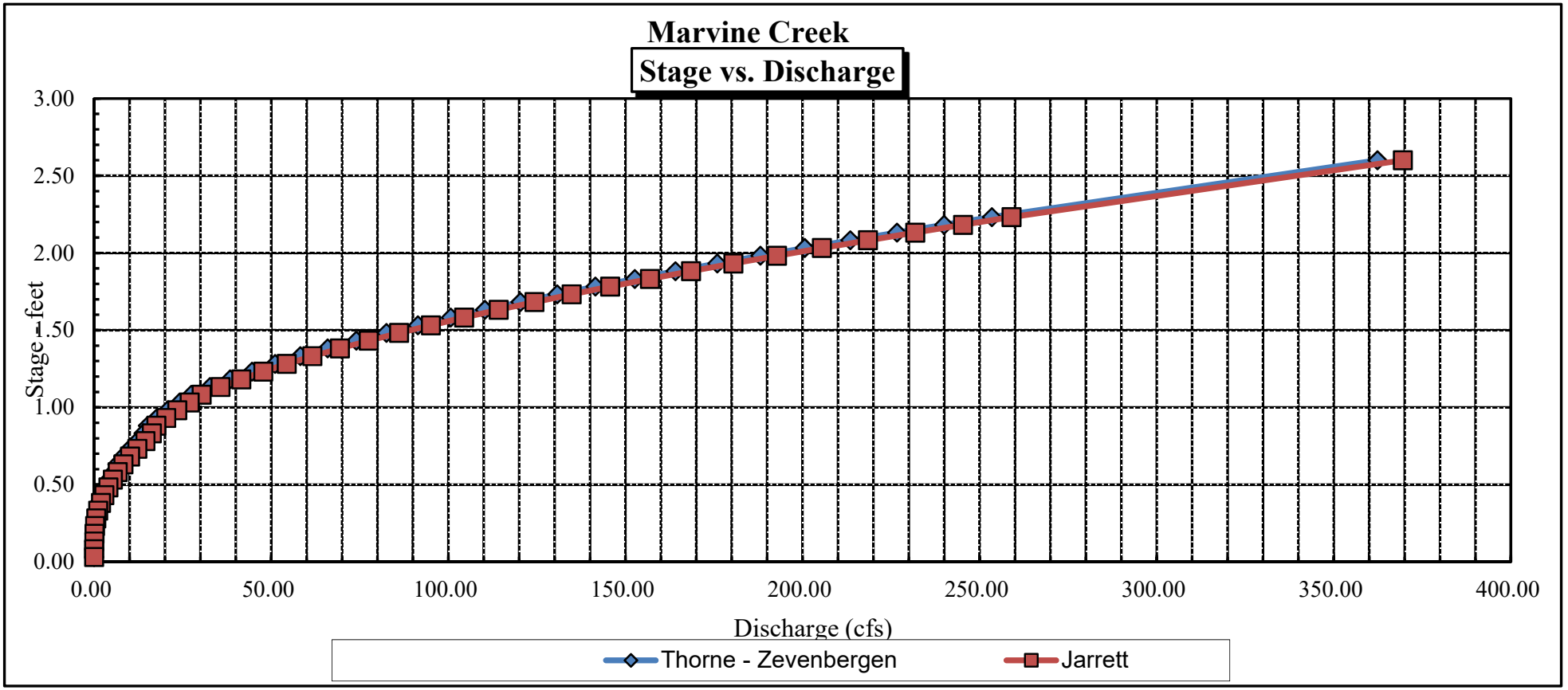
CWCB REVIEW BY: .... DATE:..............................


Marvine Creek
CROSS SECTION DATA ANALYSIS
VERTICAL DEPTH (FT)
-3.50
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
-8.00
-8.50
S
GL
WL
WL
GL
S
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Marvine Creek
Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Marvine Creek
Velocity vs. Discharge
Velocity - ft/sec
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Marvine Creek
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
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Marvine Creek
Stage vs. Discharge
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Stage - feet
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

Data Input & Proofing

STREAM NAME:	Marvine Creek
XS LOCATION:	Abv E Marvine (at footpath Xing)
XS NUMBER:	2
DATE:	7/12/2018
OBSERVERS:	Birch, Skinner
1/4 SEC:	Lat: 40.010911
SECTION:	Long: -107.430305
TWP:	
RANGE:	
PM:	
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	23278
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.009487179 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 = 30					
	S	0.00	3.95			0.00	0.00	0.00
		1.50	4.65			0.00	0.00	0.00
1	GL	2.80	5.50			0.00	0.00	0.00
		3.30	6.05			0.00	0.00	0.00
	WL	3.60	7.25	0.00	0.00	0.00	0.00	0.00
		5.00	7.60	0.30	0.44	0.44	0.19	7.30
		6.50	7.55	0.30	1.47	0.45	0.66	7.25
		8.00	7.55	0.35	1.56	0.53	0.82	7.20
		9.50	7.45	0.30	1.36	0.45	0.61	7.15
		11.00	7.35	0.30	0.75	0.45	0.34	7.05
		12.50	7.35	0.20	0.45	0.30	0.14	7.15
		14.00	7.50	0.35	0.65	0.53	0.34	7.15
		15.50	7.65	0.55	1.64	0.83	1.35	7.10
		17.00	7.80	0.70	2.64	1.05	2.77	7.10
		18.50	8.15	1.10	3.06	1.65	5.05	7.05
		20.00	8.25	1.20	3.84	1.80	6.91	7.05
		21.50	8.20	1.00	3.18	1.50	4.77	7.20
		23.00	8.40	1.35	4.73	2.03	9.58	7.05
		24.50	8.10	0.90	0.64	1.35	0.86	7.20
		26.00	8.15	0.95	2.87	1.43	4.09	7.20
		27.50	8.30	1.15	2.67	1.73	4.61	7.15
		29.00	8.15	0.90	2.77	1.35	3.74	7.25
		30.50	7.90	0.65	0.71	0.98	0.69	7.25
		32.00	7.80	0.60	0.53	0.90	0.48	7.20
		33.50	7.55	0.30	0.23	0.47	0.11	7.25
	WL	35.10	7.21	0.00	0.00	0.00	0.00	0.00
		35.80	7.10			0.00	0.00	0.00
		36.80	6.25			0.00	0.00	0.00
1	GL	38.00	5.80			0.00	0.00	0.00
					Totals	20.18	48.11	

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

LOCATION INFORMATION

STREAM NAME:	Marvine Creek
XS LOCATION:	Abv E Marvine Creek (at foot path Xing)
XS NUMBER:	2 Upper
DATE:	12-Jul-18
OBSERVERS:	Birch, Skinner
1/4 SEC:	Lat: 40.010911
SECTION:	Long: -107.430305
TWP:	0
RANGE:	0
PM:	0
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	23278
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:	0.06342105

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

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

STREAM NAME: Marvine Creek
XS LOCATION: Abv E Marvine Creek (at foot path Xing)
XS NUMBER: 2 Upper

DATA POINTS= 21

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
S	0.00	2.60			0.00		0.00	0.00	0.0%
1 GL	2.80	3.90			0.00		0.00	0.00	0.0%
WL	3.00	5.03	0.00	2.52	0.00		0.00	0.00	0.0%
	4.00	5.10	0.20	2.52	1.00	0.20	0.20	0.50	1.0%
	5.00	5.60	0.60	2.52	1.12	0.60	0.90	2.27	4.7%
	7.00	5.80	0.70	2.52	2.01	0.70	1.40	3.53	7.3%
	9.00	5.90	1.20	2.52	2.00	1.20	2.40	6.05	12.6%
	11.00	5.40	0.30	2.52	2.06	0.30	0.60	1.51	3.1%
	13.00	5.65	0.50	2.52	2.02	0.50	1.00	2.52	5.2%
	15.00	6.00	0.80	2.52	2.03	0.80	1.60	4.03	8.4%
	17.00	5.90	0.80	2.52	2.00	0.80	1.60	4.03	8.4%
	19.00	5.70	0.50	2.52	2.01	0.50	1.00	2.52	5.2%
	21.00	5.80	0.55	2.52	2.00	0.55	1.10	2.77	5.8%
	23.00	5.85	0.75	2.52	2.00	0.75	1.50	3.78	7.9%
	25.00	5.75	0.90	2.52	2.00	0.90	1.80	4.53	9.4%
	27.00	5.85	0.85	2.52	2.00	0.85	1.70	4.28	8.9%
	29.00	6.20	1.10	2.52	2.03	1.10	1.65	4.16	8.6%
	30.00	6.20	1.30	2.52	1.00	1.30	0.65	1.64	3.4%
WL	30.00	5.10	0.00	2.52	1.10		0.00	0.00	0.0%
	30.60	3.90			0.00		0.00	0.00	0.0%
1 GL	32.60	3.30			0.00		0.00	0.00	0.0%
TOTALS ----------					28.39	1.3 (Max.)	19.10	48.11	100.0%

Manning's n = 0.1141
Hydraulic Radius= 0.67273766

STREAM NAME: Marvine Creek
XS LOCATION: Abv E Marvine Creek (at foot path Xing)
XS NUMBER: 2 Upper

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	19.10	18.87	-1.2%
4.82	19.10	25.63	34.2%
4.84	19.10	25.09	31.4%
4.86	19.10	24.55	28.5%
4.88	19.10	24.00	25.7%
4.90	19.10	23.46	22.8%
4.92	19.10	22.92	20.0%
4.94	19.10	22.38	17.2%
4.96	19.10	21.84	14.3%
4.98	19.10	21.29	11.5%
5.00	19.10	20.75	8.7%
5.02	19.10	20.21	5.8%
5.03	19.10	19.94	4.4%
5.04	19.10	19.67	3.0%
5.05	19.10	19.40	1.6%
5.06	19.10	19.14	0.2%
5.07	19.10	18.87	-1.2%
5.08	19.10	18.60	-2.6%
5.09	19.10	18.34	-4.0%
5.10	19.10	18.08	-5.3%
5.11	19.10	17.82	-6.7%
5.12	19.10	17.56	-8.1%
5.14	19.10	17.04	-10.8%
5.16	19.10	16.52	-13.5%
5.18	19.10	16.01	-16.2%
5.20	19.10	15.49	-18.9%
5.22	19.10	14.97	-21.6%
5.24	19.10	14.46	-24.3%
5.26	19.10	13.94	-27.0%
5.28	19.10	13.43	-29.7%
5.30	19.10	12.92	-32.4%
5.32	19.10	12.41	-35.0%

WATERLINE AT ZERO
AREA ERROR = 5.056

STREAM NAME: Marvine Creek
XS LOCATION: Abv E Marvine Creek (at foot path Xing)
XS NUMBER: 2 Upper

Thorne-Zevenbergen D84 Correction Applied
User Supplied D84 = 0.34

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

Velocity based on test of R/D84>1

	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	3.90	27.80	1.83	2.30	50.79	30.88	100.0%	1.64	650.43	12.81
	4.06	27.69	1.68	2.14	46.45	30.55	98.9%	1.52	556.73	11.99
	4.11	27.66	1.63	2.09	45.07	30.44	98.6%	1.48	528.00	11.72
	4.16	27.63	1.58	2.04	43.68	30.33	98.2%	1.44	499.89	11.44
	4.21	27.59	1.53	1.99	42.30	30.23	97.9%	1.40	472.40	11.17
	4.26	27.56	1.49	1.94	40.93	30.12	97.5%	1.36	445.55	10.89
	4.31	27.52	1.44	1.89	39.55	30.01	97.2%	1.32	419.34	10.60
	4.36	27.49	1.39	1.84	38.17	29.91	96.8%	1.28	393.78	10.32
	4.41	27.46	1.34	1.79	36.80	29.80	96.5%	1.23	368.88	10.02
	4.46	27.42	1.29	1.74	35.43	29.69	96.2%	1.19	344.65	9.73
	4.51	27.39	1.24	1.69	34.06	29.59	95.8%	1.15	321.10	9.43
	4.56	27.36	1.19	1.64	32.69	29.48	95.5%	1.11	298.25	9.12
	4.61	27.32	1.15	1.59	31.32	29.37	95.1%	1.07	276.09	8.81
	4.66	27.29	1.10	1.54	29.96	29.27	94.8%	1.02	254.65	8.50
	4.71	27.25	1.05	1.49	28.59	29.16	94.4%	0.98	233.94	8.18
	4.76	27.22	1.00	1.44	27.23	29.05	94.1%	0.94	213.96	7.86
	4.81	27.19	0.95	1.39	25.87	28.95	93.7%	0.89	194.74	7.53
	4.86	27.15	0.90	1.34	24.51	28.84	93.4%	0.85	176.29	7.19
	4.91	27.12	0.85	1.29	23.16	28.73	93.0%	0.81	158.62	6.85
	4.96	27.08	0.80	1.24	21.80	28.63	92.7%	0.76	141.75	6.50
	5.01	27.05	0.76	1.19	20.45	28.52	92.4%	0.72	125.69	6.15
WL	5.06	26.65	0.72	1.14	19.10	28.06	90.9%	0.68	111.68	5.85
	5.11	25.99	0.68	1.09	17.79	27.37	88.6%	0.65	99.31	5.58
	5.16	25.89	0.64	1.04	16.49	27.21	88.1%	0.61	86.09	5.22
	5.21	25.79	0.59	0.99	15.20	27.04	87.6%	0.56	73.71	4.85
	5.26	25.69	0.54	0.94	13.91	26.88	87.1%	0.52	62.18	4.47
	5.31	25.59	0.49	0.89	12.63	26.72	86.5%	0.47	51.53	4.08
	5.36	25.49	0.45	0.84	11.35	26.56	86.0%	0.43	41.78	3.68
	5.41	25.31	0.40	0.79	10.08	26.32	85.2%	0.38	33.05	3.28
	5.46	24.61	0.36	0.74	8.83	25.55	82.7%	0.35	25.85	2.93
	5.51	23.91	0.32	0.69	7.62	24.78	80.2%	0.31	17.74	2.33
	5.56	23.21	0.28	0.64	6.44	24.01	77.7%	0.27	12.79	1.99
	5.61	22.46	0.24	0.59	5.30	23.19	75.1%	0.23	8.86	1.67
	5.66	21.38	0.20	0.54	4.20	22.04	71.4%	0.19	5.92	1.41
	5.71	20.20	0.16	0.49	3.16	20.80	67.4%	0.15	3.69	1.17
	5.76	17.46	0.13	0.44	2.21	18.00	58.3%	0.12	2.21	1.00
	5.81	12.79	0.11	0.39	1.45	13.25	42.9%	0.11	1.28	0.88
	5.86	7.27	0.13	0.34	0.96	7.67	24.8%	0.13	0.86	0.90
	5.91	5.09	0.13	0.29	0.65	5.42	17.5%	0.12	0.53	0.82
	5.96	3.52	0.12	0.24	0.44	3.79	12.3%	0.12	0.32	0.73
	6.01	2.11	0.14	0.19	0.30	2.32	7.5%	0.13	0.24	0.80
	6.06	1.82	0.11	0.14	0.20	1.98	6.4%	0.10	0.11	0.55
	6.11	1.54	0.08	0.09	0.12	1.64	5.3%	0.07	0.04	0.33
	6.16	1.25	0.04	0.04	0.05	1.30	4.2%	0.04	0.01	0.16

STREAM NAME: Marvine Creek
XS LOCATION: Abv E Marvine Creek (at foot path Xing)
XS NUMBER: 2 Upper

SUMMARY SHEET

MEASURED FLOW (Qm)=	48.11	cfs
CALCULATED FLOW (Qc)=	48.48	cfs
(Qm-Qc)/Qm * 100 =	-0.8	%
MEASURED WATERLINE (WLm)=	5.07	ft
CALCULATED WATERLINE (WLc)=	5.06	ft
(WLm-WLc)/WLm * 100 =	0.2	%
MAX MEASURED DEPTH (Dm)=	1.30	ft
MAX CALCULATED DEPTH (Dc)=	1.14	ft
(Dm-Dc)/Dm * 100	12.0	%
MEAN VELOCITY=	2.54	ft/sec
MANNING'S N=	0.114	
SLOPE=	0.06342105	ft/ft
.4 * Qm =	19.2	cfs
2.5 * Qm=	120.3	cfs

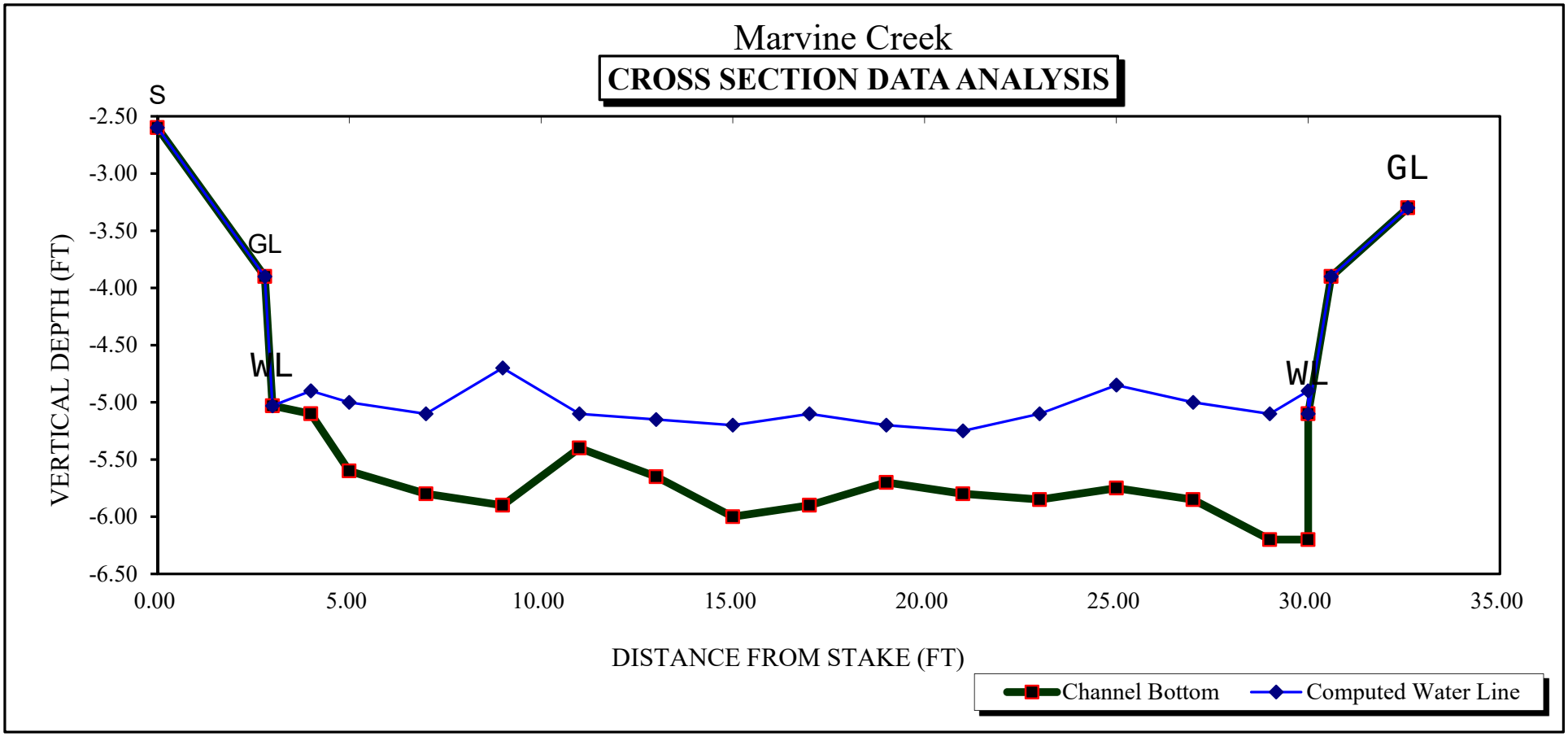
RECOMMENDED INSTREAM FLOW:
==========

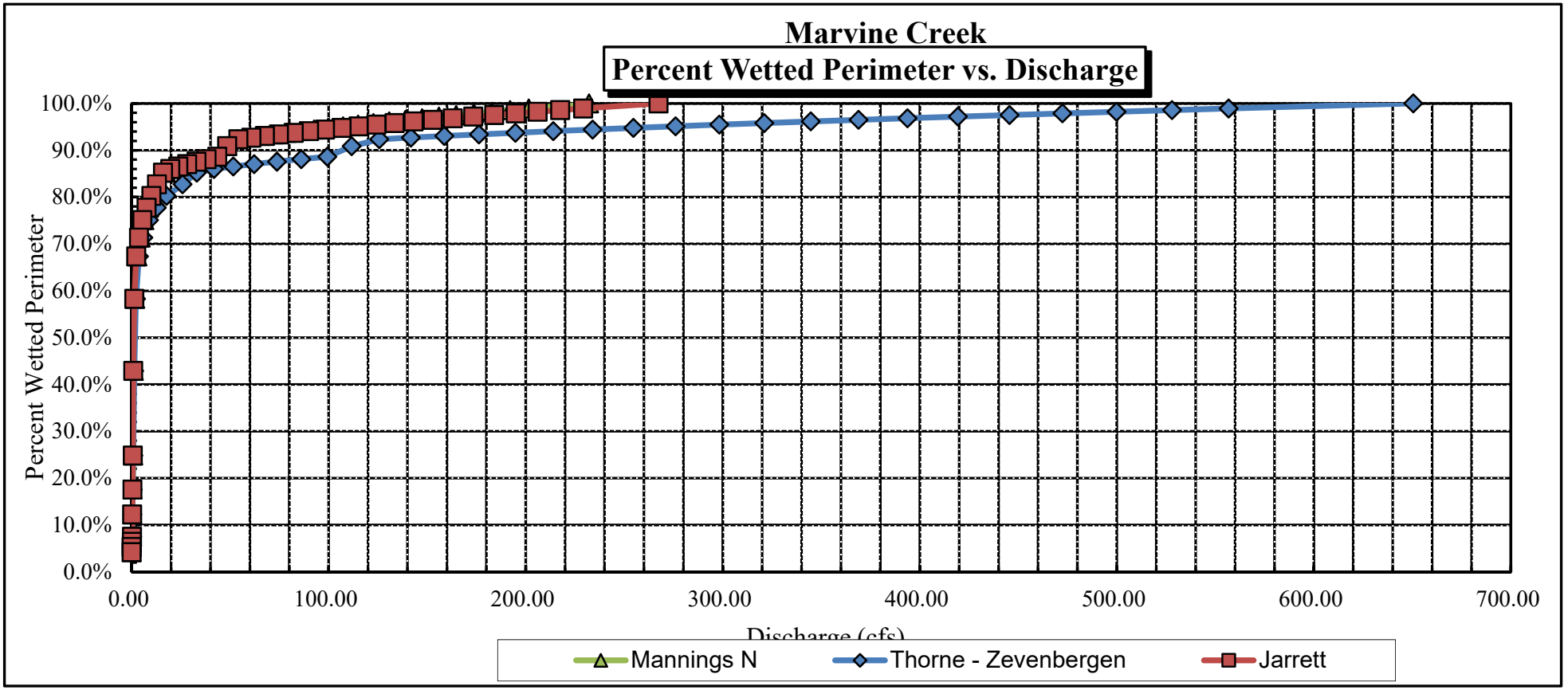
FLOW (CFS)	PERIOD
==========	========
_____	_____
_____	_____
_____	_____
_____	_____

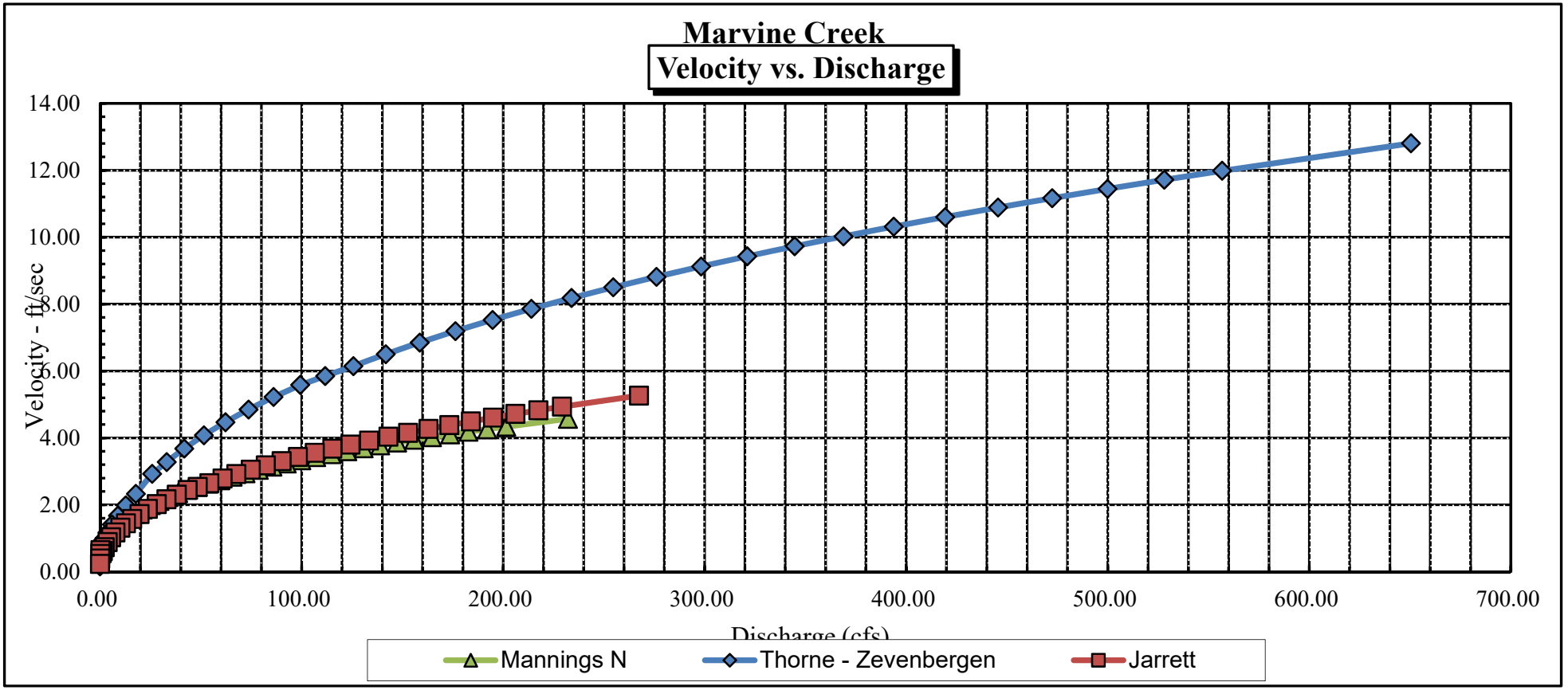
RATIONALE FOR RECOMMENDATION:
==========

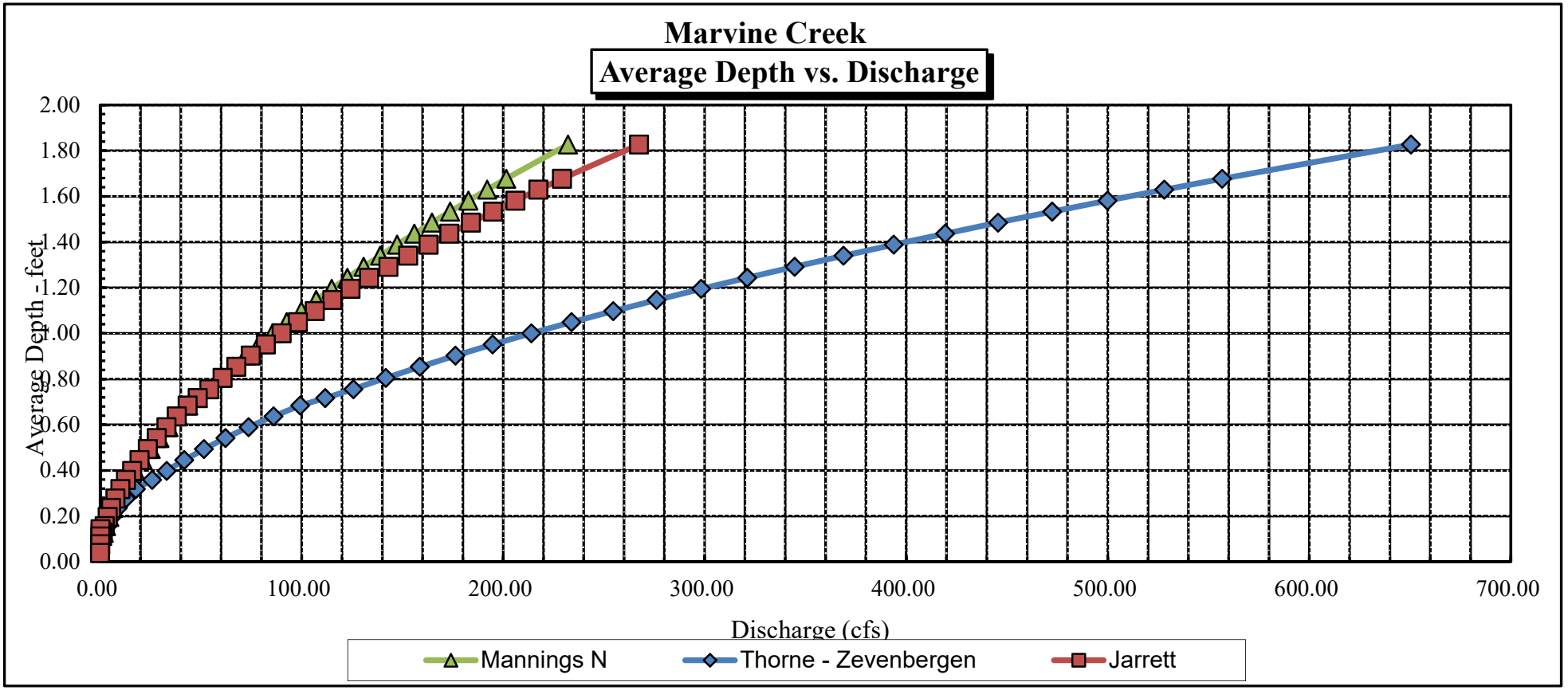
RECOMMENDATION BY: …….. AGENCY…….. DATE:……

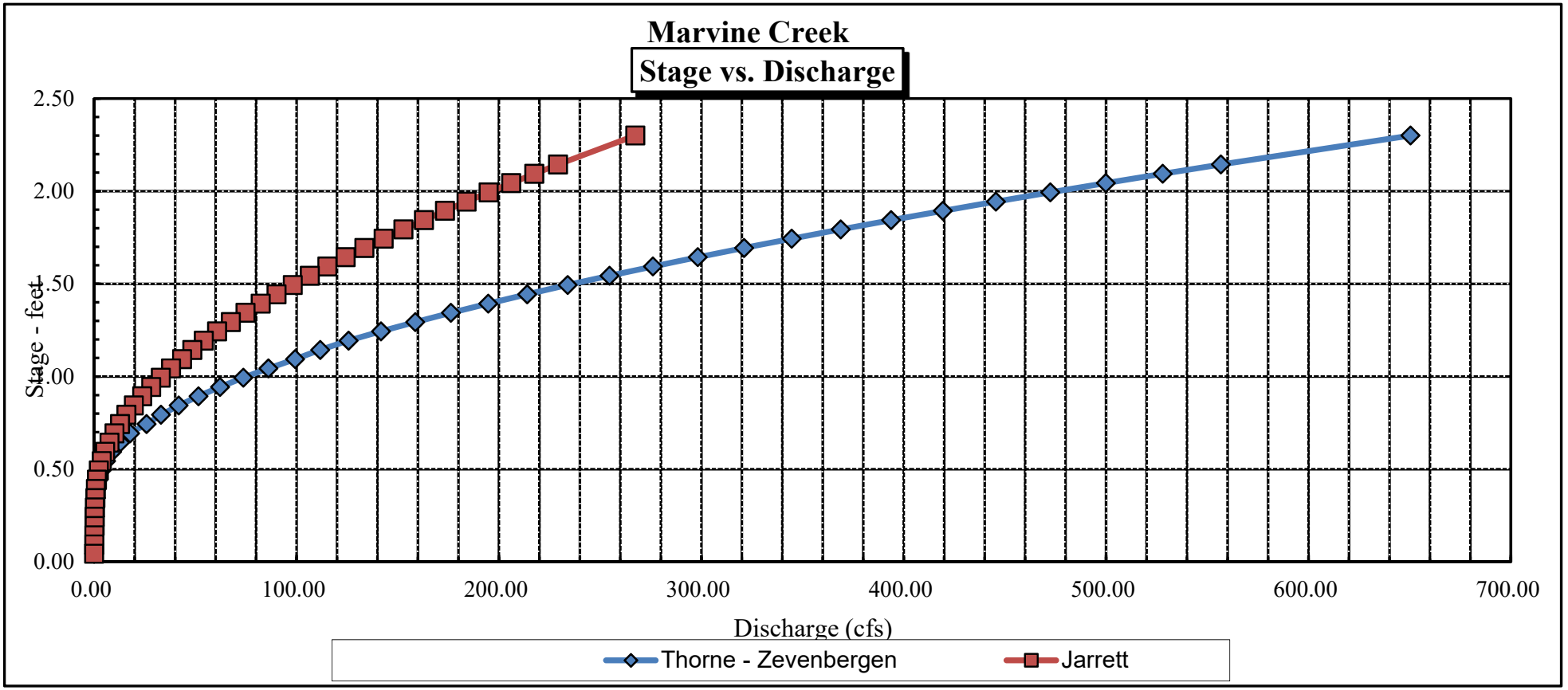
CWCB REVIEW BY: …….. DATE:……


Marvine Creek
CROSS SECTION DATA ANALYSIS
S
GL
WL
WL
GL
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Marvine Creek
Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
100.00
200.00
300.00
400.00
500.00
600.00
700.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Marvine Creek
Velocity vs. Discharge
14.00
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
700.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Marvine Creek
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
700.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Marvine Creek
Stage vs. Discharge
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
700.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

Data Input & Proofing

STREAM NAME:	Marvine Creek
XS LOCATION:	Abv E Marvine Creek (at foot path Xing)
XS NUMBER:	2 Upper
DATE:	7/12/2018
OBSERVERS:	Birch, Skinner
1/4 SEC:	Lat: 40.010911
SECTION:	Long: -107.430305
TWP:	
RANGE:	
PM:	
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	23278
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.063421053 ft / ft

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

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

Total Data Points = 21

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
	S	0.00	2.60			0.00	0.00	0.00
1	GL	2.80	3.90			0.00	0.00	0.00
	WL	3.00	5.03	0.00	2.52	0.00	0.00	0.00
		4.00	5.10	0.20	2.52	0.20	0.50	4.90
		5.00	5.60	0.60	2.52	0.90	2.27	5.00
		7.00	5.80	0.70	2.52	1.40	3.53	5.10
		9.00	5.90	1.20	2.52	2.40	6.05	4.70
		11.00	5.40	0.30	2.52	0.60	1.51	5.10
		13.00	5.65	0.50	2.52	1.00	2.52	5.15
		15.00	6.00	0.80	2.52	1.60	4.03	5.20
		17.00	5.90	0.80	2.52	1.60	4.03	5.10
		19.00	5.70	0.50	2.52	1.00	2.52	5.20
		21.00	5.80	0.55	2.52	1.10	2.77	5.25
		23.00	5.85	0.75	2.52	1.50	3.78	5.10
		25.00	5.75	0.90	2.52	1.80	4.53	4.85
		27.00	5.85	0.85	2.52	1.70	4.28	5.00
		29.00	6.20	1.10	2.52	1.65	4.16	5.10
		30.00	6.20	1.30	2.52	0.65	1.64	4.90
	WL	30.00	5.10	0.00	2.52	0.00	0.00	0.00
		30.60	3.90			0.00	0.00	0.00
1	GL	32.60	3.30			0.00	0.00	0.00

Totals	19.10	48.11

Page 1 of 2	State of Colorado	Meas. No.:	001
YYYY: 2017	**Colorado Water Conservation Board**	Division:	6
MM-DD: 06-28	ADV Discharge Measurement Notes	District:	43 ADE

Station Name:	MVCACWMC
Marvine	River, (Creek), Canal, Ditch
At, Near, (Above), Below	.01886721° Confl West Marvine Creek
Latitude: 40. ~~02169036~~°	Longitude: ~~-107.44440596~~ -107.44013130°
Party:	Jack Landess, Brian Epstein

Conditions

Weather:	Partly Sunny ~72°F		
Wind Spd / Dir:	calm	Water Temp:	
X-Sec Desc:	Middle straight section, boulder/cobble bed		
Flow Conds:	slightly turbulent		
Control Desc.:	N/A		

Measurement Rated: Excellent (2%) / (Good (5%)) / Fair (8%) / Poor (>8%) [based on the above conditions]

Water Level Reading

Time	Staff Gage	Pressure Trans.	Time	Staff Gage	Pressure Trans.
N/A					

Pressure Transducer Download		Weighted MGH	
File Name:	N/A	GH Corr.	
Time:		Correct MGH	

Discharge Measurement

Manufacturer:	SonTek	Model:	FlowTracker	S/N:	P2354 / (P2355)
Firmware:	3.9	Software:	2.20		
Diag Test File:	(Yes) or No	Raw Data File:	MVACWMC.001		
Meas Type:	(Wading) / Boat / Bridge / Cableway			Method:	0.6
			ft. or mi / upstream or downstream of gage		
Start Edge:	1.7	End Edge:	28.4	Total Width:	
Start Time:	15:43 REE	End Time:	4:14 pm		
Discharge:	102.701 cfs	Uncertainty:	3.2 %	# Stations:	23
Mean v:	3.153	Width:	26.699	Mean d:	1.22 ft
Max v:	4.759	Area:	32.567	Max d:	1.70 ft
Mean SNR:	37.9	σV:	0.113	Mean Temp:	53.7°F

Meas. By:	JEL	Notes By:	JEL
Processed By:		Reviewed By:	JEL

Remarks: Marvine Creek

GPS point: MVC001 Marvine Creek discharge measurement point

State of Colorado

Colorado Water Conservation Board

Field Notes

Marvine Creek — Party: Brian Epstein & Jack Landers

14:45 Depart truck

14:50 arrive Marvine Creek

14:50 – 15:05 hike along creek from private up about 650'

- plentiful woody debris
- single channel, high gradient
- cobble / boulder bed
- abundant bank vegitation
- communication with flood plain
- minimal sinuosity

typical scehen of observed area

15:05 Pic ~~973~~ 976 From LEW looking upstream ~ 650' upstream of private

15:39 Pic 973 From left bank, Jack working on fieldnotes at q meas x-section

- obsrved mayflies hovering above creek at x-section (MUCG04)

15:50 Pic 974 from left bank, looking downstream Marvine Creek ~ 900' upstream of private

15:57 Pic 975 from left bank, looking downstream Marvine Creek ~ 950' upstream of private

16:30 departed Q meas site

16:16 Pic 0976 from LEW, looking upstream Q measurement X-section

Notes By: Brian Epstein YYYY-MM-DD: 2017-06-28 Page 1 of 1

State of Colorado - Colorado Water Conservation Board - Field Notes (Continued)

Notes By: YYYY-MM-DD: Page ___ of ___

Discharge Measurement Summary

Date Generated: Mon Dec 18 2017

File Information

File Name	MVCACWMC.001.WAD
Start Date and Time	2017/06/28 15:43:35

Site Details

Site Name	MARVINE CR A W MV CR
Operator(s)	JACK LANDERS

System Information

Sensor Type	FlowTracker
Serial #	P2355
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units (Metric Units)

Distance	m
Velocity	m/s
Area	m^2
Discharge	m^3/s

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.2%	1.9%
Velocity	1.0%	4.7%
Width	0.1%	0.1%
Method	1.8%	-
# Stations	2.2%	-
Overall	**3.2%**	**5.2%**

Summary

Averaging Int.	40	# Stations	23
Start Edge	LEW	Total Width	8.138
Mean SNR	37.9 dB	Total Area	3.026
Mean Temp	12.03 °C	Mean Depth	0.372
Disch. Equation	Mid-Section	Mean Velocity	0.9612
		Total Discharge	**2.9082**

Measurement Results

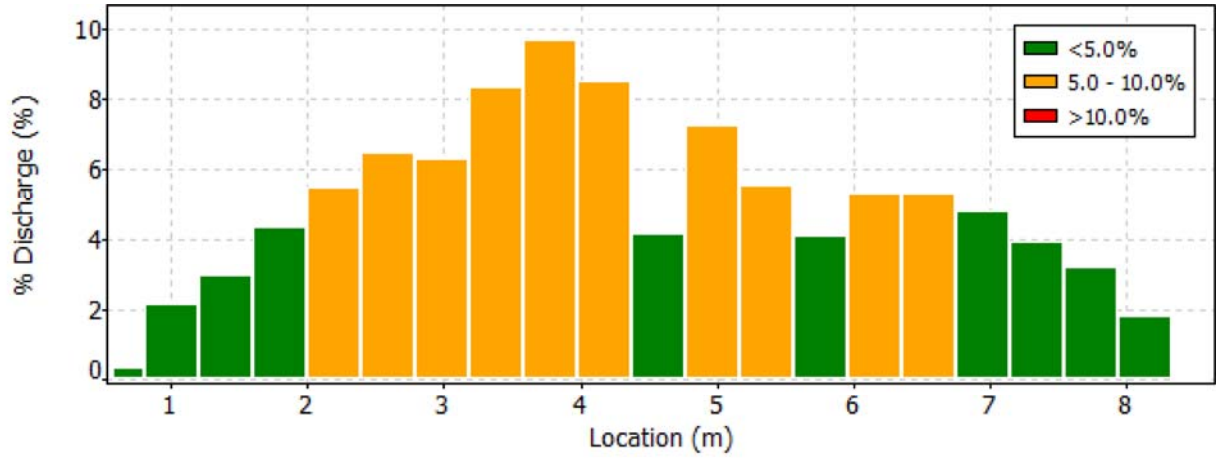
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	15:43	0.52	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	15:44	0.61	0.6	0.168	0.6	0.067	0.2786	1.00	0.2786	0.041	0.0114	0.4
2	15:47	1.01	0.6	0.271	0.6	0.109	0.5861	1.00	0.5861	0.107	0.0630	2.2
3	15:48	1.40	0.6	0.412	0.6	0.165	0.5308	1.00	0.5308	0.163	0.0865	3.0
4	15:49	1.80	0.6	0.457	0.6	0.183	0.6975	1.00	0.6975	0.181	0.1263	4.3
5	15:51	2.19	0.6	0.518	0.6	0.207	0.7752	1.00	0.7752	0.205	0.1592	5.5
6	15:52	2.59	0.6	0.433	0.6	0.173	1.0949	1.00	1.0949	0.171	0.1877	6.5
7	15:53	2.99	0.6	0.503	0.6	0.201	0.9170	1.00	0.9170	0.199	0.1827	6.3
8	15:55	3.38	0.6	0.488	0.6	0.195	1.2490	1.00	1.2490	0.193	0.2413	8.3
9	15:56	3.78	0.6	0.518	0.6	0.207	1.3760	1.00	1.3760	0.205	0.2825	9.7
10	15:58	4.18	0.6	0.472	0.6	0.189	1.3193	1.00	1.3193	0.187	0.2469	8.5
11	15:59	4.57	0.6	0.442	0.6	0.177	0.6909	1.00	0.6909	0.175	0.1210	4.2
12	16:00	4.97	0.6	0.433	0.6	0.173	1.2329	1.00	1.2329	0.171	0.2114	7.3
13	*16:01*	*5.36*	*0.6*	*0.412*	*0.6*	*0.165*	*0.9853*	*1.00*	*0.9853*	*0.163*	*0.1606*	*5.5*
14	16:04	5.76	0.6	0.320	0.6	0.128	0.9401	1.00	0.9401	0.127	0.1192	4.1
15	16:05	6.16	0.6	0.268	0.6	0.107	1.4506	1.00	1.4506	0.106	0.1541	5.3
16	16:07	6.55	0.6	0.329	0.6	0.132	1.1828	1.00	1.1828	0.130	0.1543	5.3
17	16:08	6.95	0.6	0.290	0.6	0.116	1.2150	1.00	1.2150	0.115	0.1394	4.8
18	16:09	7.35	0.6	0.305	0.6	0.122	0.9561	1.00	0.9561	0.121	0.1155	4.0
19	16:10	7.74	0.6	0.305	0.6	0.122	0.7796	1.00	0.7796	0.121	0.0941	3.2
20	16:12	8.14	0.6	0.229	0.6	0.091	0.5946	1.00	0.5946	0.091	0.0539	1.9
21	*16:13*	*8.53*	*0.6*	*0.198*	*0.6*	*0.079*	*-0.0588*	*1.00*	*-0.0588*	*0.051*	*-0.0030*	*-0.1*
22	16:13	8.66	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

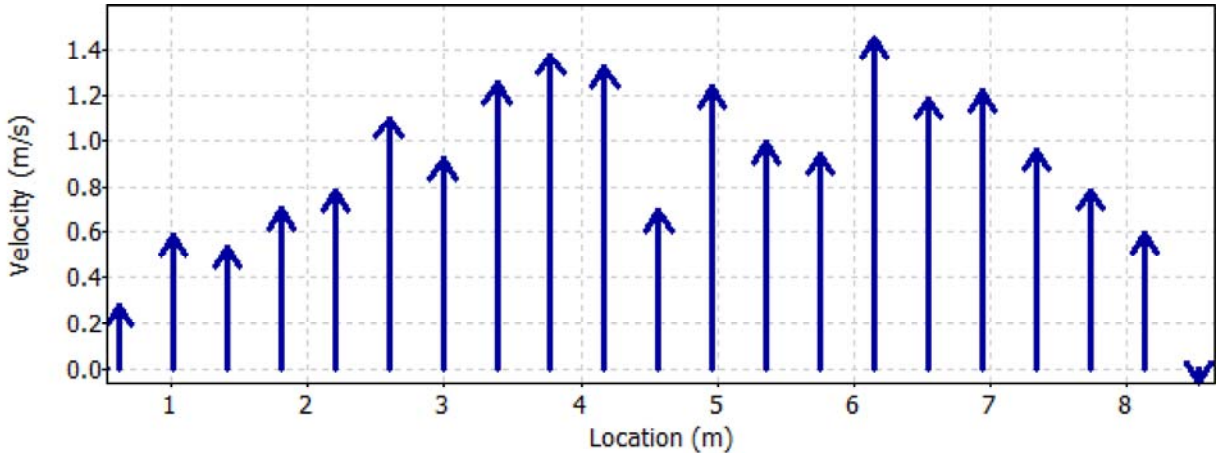
Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

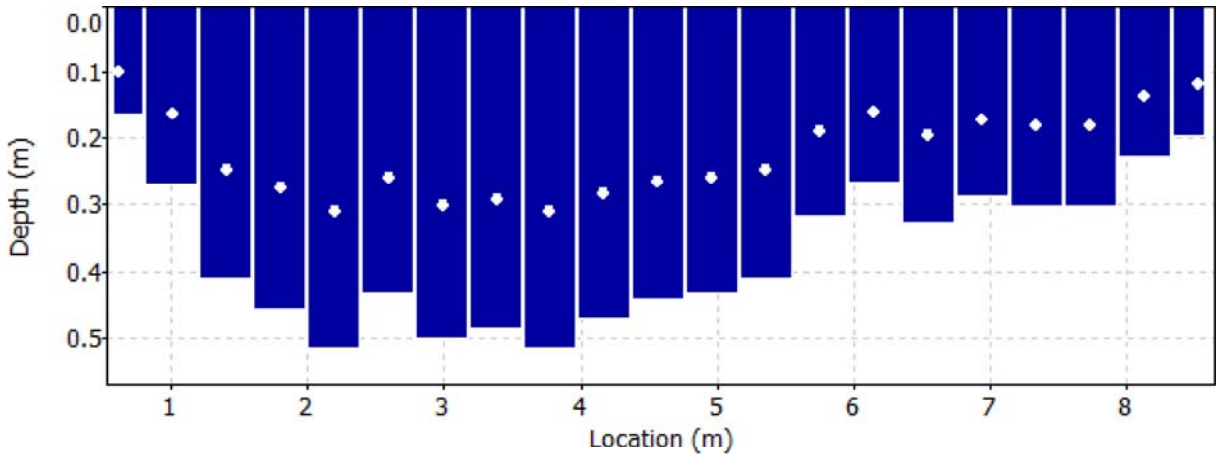
Discharge Measurement Summary

Date Generated: Mon Dec 18 2017

File Information		Site Details	
File Name	MVCACWMC.001.WAD	Site Name	MARVINE CR A W MV CR
Start Date and Time	2017/06/28 15:43:35	Operator(s)	JACK LANDERS







Discharge Measurement Summary

Date Generated: Mon Dec 18 2017

File Information

File Name	MVCACWMC.001.WAD
Start Date and Time	2017/06/28 15:43:35

Site Details

Site Name	MARVINE CR A W MV CR
Operator(s)	JACK LANDERS

Quality Control

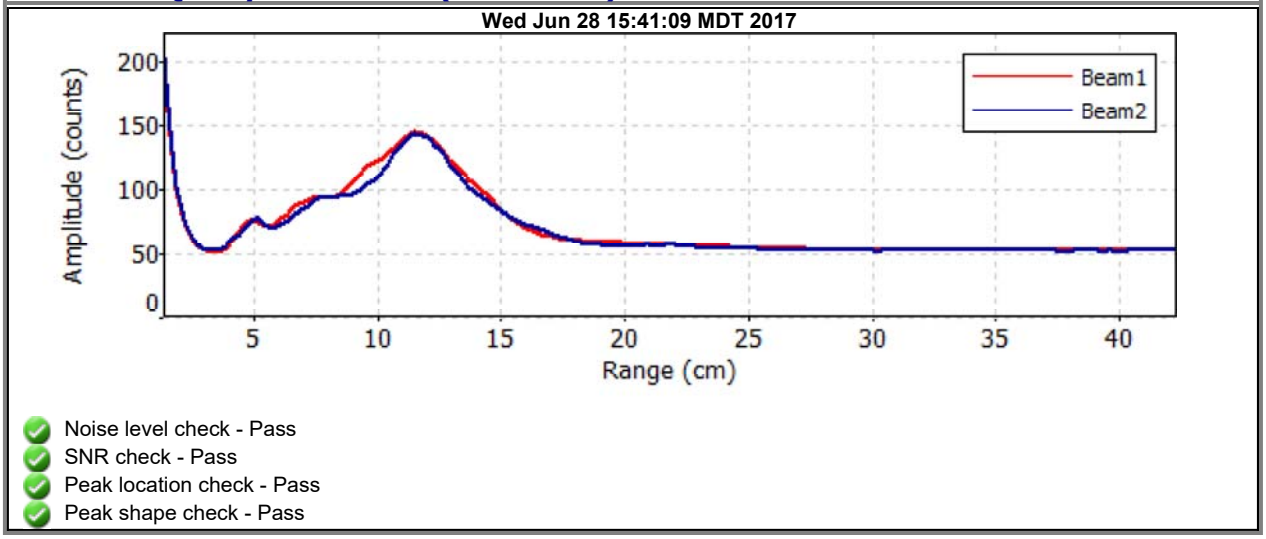
St	Loc	%Dep	Message
13	5.36	0.6	High standard error: 0.067
21	8.53	0.6	High angle: 137

Discharge Measurement Summary

Date Generated: Mon Dec 18 2017

File Information		Site Details	
File Name	MVCACWMC.001.WAD	Site Name	MARVINE CR A W MV CR
Start Date and Time	2017/06/28 15:43:35	Operator(s)	JACK LANDERS

Automatic Quality Control Test (BeamCheck)



- Noise level check - Pass
- SNR check - Pass
- Peak location check - Pass
- Peak shape check - Pass

Marvine Creek Cross Section 1, looking upstream.

Marvine Creek Cross Section 1, looking downstream.

Marvine Creek Cross Section 1, looking across from left bank.

Marvine Creek Cross Section 1, looking upstream.

Marvine Creek Cross Section 2, looking downstream.

Marvine Creek Cross Section 2, looking across from left bank.

Marvine Creek Cross Section 3, looking upstream.

Marvine Creek Cross Section 3, looking downstream.

Marvine Creek Cross Section 3, looking across from left bank.

Marvine Creek Cross Section 4, looking upstream.

Marvine Creek Cross Section 4, looking downstream.

Marvine Creek Cross Section 4, looking downstream from left bank.