United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Colorado State Office
2850 Youngfield Street
Lakewood, Colorado 80215-7210
www.co.blm.gov

In Reply Refer To:
7250 (CO-930)

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 Government Creek, located in Water Division 6.

Location and Land Status: Government Creek originates on the Colorado State Forest approximately eight miles east of Cowdrey. This recommendation covers the stream reach beginning at the headwaters of Government Creek and extends downstream to the headgate of Government Ditch No. 2, a distance of approximately 4.9 miles. Of this mileage, the BLM manages 0.9 miles, the Colorado State Forest manages 3.5 miles, and private owners manage 0.45 miles.

Biological Summary: Government Creek is a cold-water, moderate gradient stream in a narrow canyon. In the upper portion of the recommended reach, the stream is confined by bedrock and generally has large substrate. In the lower part of the recommended reach, the stream is less confined by bedrock, flows through areas with sand and gravel soils, and has smaller substrate. The stream has a good mix of riffle, run, and deep pool habitats to support a salmonid fishery.

Fishery surveys revealed an abundant and self-sustaining brook trout fishery. Even though Government Creek is a small stream, the fish population survived the 2002-2003 drought, indicating that base flows are sufficient to support the trout fishery through all types of climate conditions. Intensive macro-invertebrate surveys have not been conducted, but spot samples have revealed various species of mayfly, caddisfly, and stonefly.

The health of the riparian community along Government Creek is on upward trend, providing increasing amounts of cover and shading for the stream. The riparian community is comprised mainly of alder, willow, sedges, and rushes, but the creek does have some problems with weedy species in the riparian zone.

R2Cross Analysis: The BLM collected the following R2Cross data from Government Creek:

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (meets 3 of 3 hydraulic criteria)
07/12/2011 #1	2.66 cfs	8.87 feet	1.13 cfs	3.18 cfs
07/12/2011 #2	2.90 cfs	11.99 feet	1.23 cfs	3.99 cfs
		Averages:	1.18 cfs	3.59 cfs

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

> 3.6 cubic feet per second is recommended for the snowmelt runoff period, from May 1 through July 31. This recommendation is driven by the average velocity criteria. This creek experiences consistently low flows during late summer and fall, so it is important to protect as much physical habitat as possible during the limited time when snowmelt runoff flows are available.
>
> 1.0 cubic feet per second is recommended for the late-summer period, from August 1 to September 30. This recommendation is driven by a combination of more limited water availability and the average depth criteria. This flow rate is capable of preventing excessively high water temperatures during late summer.
>
> 0.5 cubic feet per second is recommended for the fall/winter period from October 1 to April 30. This recommendation is driven by limited water availability. This flow rate meets the wetted perimeter criteria and provides an average depth of approximately 0.14 feet. It should provide sufficient flow to prevent pools from freezing and protect overwintering fish.

Water Availability: There is no readily available gage data for this creek or for any of the adjacent watersheds. The BLM recommends using the StreamStats package developed jointly between the U.S. Geological Survey and the Colorado Water Conservation Board (CWCB). The BLM's experience is that for applications in the area, this package is very reliable in terms of estimating average monthly flow rates that can be expected.

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

Relationship to Land Management Plans: The BLM is investing in a long-term effort to improve natural resource conditions within the North Sand Hills Recreation Management Area, which is heavily used by off-road vehicles. These efforts have included designation of travel routes, construction of exclosures around riparian zones, reduction in the number of locations in which roads cross streams or run parallel to streams, and modification of grazing regimes in the

riparian zone. These efforts have yielded improved riparian conditions and improved water quality. Appropriation of an instream flow water right would assist the BLM in long-term management of riparian values and fishery values.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with the BLM's draft recommendation in February 2012. We thank both the Division of Parks and Wildlife and the CWCB for their cooperation in this effort.

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

Sincerely,

Leigh D. Espy
Deputy State Director
Resources and Fire

cc: Dave Stout, Kremmling FO
Paula Belcher, Kremmling FO

DRAFT INSTREAM FLOW RECOMMENDATION

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

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Fishery surveys revealed an abundant and self-sustaining brook trout fishery. Even though Government Creek is a small stream, the fish population survived the 2002-2003 drought, indicating that base flows are sufficient to support the trout fishery through all types of climate conditions. Intensive macro-invertebrate surveys have not been conducted, but spot samples have revealed various species of mayfly, caddisfly, and stonefly.

The health of the riparian community along Government Creek is on upward trend, providing increasing amounts of cover and shading for the stream. The riparian community is comprised mainly of alder, willow, sedges, and rushes, but the creek does have some problems with weedy species in the riparian zone.

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> 3.6 cubic feet per second is recommended for the snowmelt runoff period, from May 1 through July 31. This recommendation is driven by the average velocity criteria. This creek experiences consistently low flows during late summer and fall, so it is important to protect as much physical habitat as possible during the limited time when snowmelt runoff flows are available.
>
> 1.15 cubic feet per second is recommended for the late-summer period, from August 1 to September 30. This recommendation is driven by the average velocity criteria. This flow rate is capable of preventing excessively high water temperatures during late summer.
>
> 0.5 cubic feet per second is recommended for the fall/winter period from October 1 to March 31. This recommendation is driven by limited water availability. This flow rate meets the wetted perimeter criteria and provides an average depth of approximately 0.14 feet. It should provide sufficient flow to prevent pools from freezing and protect overwintering fish.

Water Availability. There is no readily available gage data for this creek or for any of the adjacent watersheds. BLM recommends using the StreamStats package developed jointly between the U.S. Geological Survey and the CWCB. BLM's experience is that for applications in the area, this package is very reliable in terms of estimating average monthly flow rates that can be expected.

BLM is aware of only one decreed water right within the proposed instream flow reach. The Livingstone Ditch is decreed for 1.0 cfs for irrigation use. The decreed headgate location is within the SW ¼ NE ¼, Section 35, T11N R79W. The Colorado Decision Support System gives the GPS location of the Government No 2 Ditch as the point of diversion for this water right, which is the same as the proposed lower terminus for the proposed instream flow water right. Accordingly, it appears that the historic point of diversion for the Livingstone Ditch is not being exercised at this time.

Relationship to Land Management Plans. BLM is investing in a long-term effort to improve natural resource conditions within the North Sand Hills Recreation Management Area, which is heavily used by off-road vehicles. These efforts have included designation of travel routes, construction of exclosures around riparian zones, reduction in the number of locations in which roads cross streams or run parallel to streams, and modification of grazing regimes in the riparian zone. These efforts have yielded improved riparian conditions and improved water quality. Appropriation of an instream flow water right would assist BLM in long-term management of riparian values and fishery values.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2012. We thank both the Division of Parks and Wildlife and the CWCB for their cooperation in this effort.

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

Sincerely,

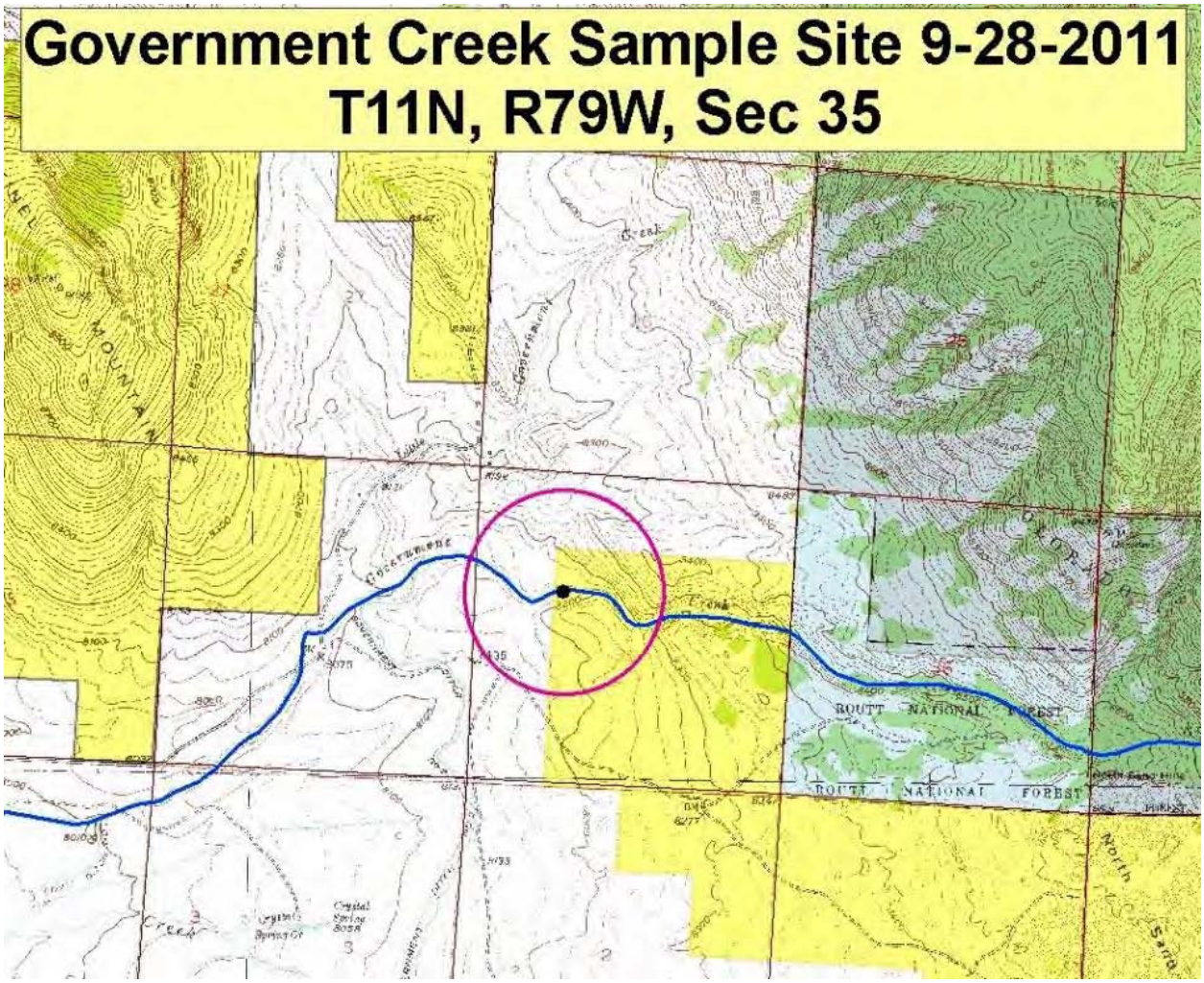
Leigh Espy
Deputy State Director
Resources and Fire

Cc: Dave Stout, Kremmling FO
Paula Belcher, Kremmling FO

Kremmling Field Office Stream Surveys
September 2011

Government Creek - Water Code #11041

Governement Creek, located northeast of Cowdrey, Colorado on BLM lands managed by the Kremmling Field Office was sampled on September 28, 2011. Government Creek is tributary to the Canadian River. Sampling was done in support of the instream flow program. A two-pass removal population estimate was completed. Brook trout were the only fish seen or collected. Sampling was conducted via one backpack electro-shocker and approximately 250 feet of stream was sampled. Personnel present were Tom Fresques, Gregor Dekleva, Zachary Hughes, and Charlton Blair, BLM.



Government Creek

Government Creek

Brook trout

STREAM SURVEY FISH SAMPLING FORM

Water Government Creek **H_2O Code** 11041 **Date** 9/28/2011

Gear BPE **Effort** 245feet **Station #** 1 **Pass #** 1 & 2

Crew Fresques, Dekleva, Hughes, Blair **Drainage** North Platte **Location** GPS

PASS	SPECIES	LENGTH	WEIGHT		PASS	SPECIES	LENGTH	WEIGHT
1	BRK	230	123.3		1	BRK	175	58
1	BRK	237	164		1	BRK	171	51
1	BRK	251	194		1	BRK	189	63
1	BRK	174	65		1	BRK	237	125
1	BRK	231	145		1	BRK	131	22
1	BRK	210	91		1	BRK	225	111
1	BRK	188	73		1	BRK	183	59
1	BRK	139	28		1	BRK	219	102
1	BRK	244	124		1	BRK	270	180
1	BRK	190	77		1	BRK	173	53
1	BRK	219	95		1	BRK	233	120
1	BRK	138	23		1	BRK	178	65
1	BRK	194	75		1	BRK	188	64
1	BRK	203	128		1	BRK	72	2.7
1	BRK	185	62					
1	BRK	92	71					
1	BRK	200	82		2	BRK	231	121
1	BRK	147	27		2	BRK	181	57
1	BRK	129	21		2	BRK	121	16
1	BRK	144	24		2	BRK	70	3
1	BRK	75	4					
1	BRK	135	20					
1	BRK	168	45					
1	BRK	140	27					
1	BRK	142	28					

GPS LOCATION: 13S 396226, 4526577

STREAM WIDTH: 6.60 ft.

SAMPLE REACH: 245 ft.

CONDUCTIVITY:

ELECTROSHOCKER SETTINGS :

Discussion:
Government Creek at the time of sampling contained limited but consistent flow (estimated at 1.5 cfs at the time of sampling) and had a good mix of riffle, run, and pool habitats. The stream appeared to be a Rosgen C channel type. Riparian vegetation consisted of willows, alder, tufted hair grass, red top, sedge, rush, clover, dandelion, and scattered Canada thistle. Based on limited visual observation, the stream contained midges, caddis flies, stoneflies, and mayflies.

Brook trout were the only fish collected or seen. A diversity of age-classes was noted and the stream appeared to be productive.

Recommendations:

- This stream would benefit from an instream flow recommendation.
- Periodically monitor the fishery and stream habitats.
- Consider treating thistle along the creek.

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Government Creek						CROSS-SECTION NO. 1.	
CROSS-SECTION LOCATION: 1/3 mile upstream from middle road crossing in North Sand Hills Recreation Area							
DATE: 7-12-11	OBSERVERS: R. Smith, P. Belcher						
LEGAL DESCRIPTION	¼ SECTION: NE	SECTION: 35	TOWNSHIP: 11 (N)/S	RANGE: 79 E/(W)	PM: 6th		
COUNTY: Jackson	WATERSHED: N. Platte	WATER DIVISION: 6	DOW WATER CODE: 11041				
MAP(S): USGS:	0397330						
USFS:	N526421						

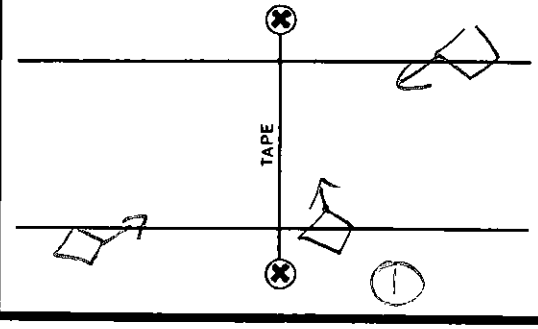
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: gravels to 4" cobbles	PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 5		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	5.65 / 5.70
② WS Upstream	8.2	5.58
③ WS Downstream	20.0	5.78
SLOPE	0.40 / 28.2 = .014	

SKETCH



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

AQUATIC SAMPLING SUMMARY

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

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

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

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

mayfly, caddisfly

COMMENTS

pH = 8.06 Alder - Willow riparian

Temp = 20.0°C

Cond = 47.2 µs

Salinity = 0.0 ppt

FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Government Creek	CROSS-SECTION NO.: 2	DATE: 7-12-11	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 11:00 am

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		2.95								
	1.0		3.23								
G	2.7		5.05								
W	2.8		5.65								
	2.9		5.80	.15				0			
	3.1		6.05	.40				0.04			
	3.5		6.15	.50				0.34			
	3.7		6.00	.35				0.72			
	4.3		6.15	.50				0.91			
	4.7		6.05	.40				1.05			
	5.1		6.00	.35				0.87			
	5.5		6.20	.5				0.84			
	5.9		6.10	.4				0.68			
	6.3		6.20	.5				0.79			
	6.7		6.10	.4				0.51			
	7.1		6.05	.4				0.91			
	7.5		6.10	.4				0.89			
	7.9		5.85	.2				1.15			
	8.3		6.00	.3				1.40			
	8.7		5.90	.2				1.56			
	9.1		5.90	.2				1.45			
	9.5		5.90	.2				1.77			
	9.9		6.00	.3				1.62			
	10.3		5.90	.2				1.52			
	10.7		6.00	.3				1.44			
	11.1		5.90	.2				1.07			
W	11.4		5.70								
G	11.6		5.23								
	13.2		4.55								
RS	14.9		2.95								
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:	Government Creek
XS LOCATION:	0.3 mile up fr N Sand Hills Rd. crossing
XS NUMBER:	2
DATE:	12-Jul-11
OBSERVERS:	R. Smith, P. Belcher
1/4 SEC:	NE
SECTION:	35
TWP:	11N
RANGE:	79W
PM:	6th
COUNTY:	Jackson
WATERSHED:	North Platte
DIVISION:	6
DOW CODE:	11041
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:	0.014

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

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

STREAM NAME: Government Creek
XS LOCATION: 0.3 mile up fr N Sand Hills Rd. crossing
XS NUMBER: 2

DATA POINTS= 30

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
LS	0.00	2.95			0.00		0.00	0.00	0.0%
	1.00	3.23			0.00		0.00	0.00	0.0%
1 G	2.70	5.05			0.00		0.00	0.00	0.0%
W	2.80	5.65	0.00	0.00	0.00		0.00	0.00	0.0%
	2.90	5.80	0.15	0.00	0.18	0.15	0.02	0.00	0.0%
	3.10	6.05	0.40	0.04	0.32	0.40	0.12	0.00	0.2%
	3.50	6.15	0.50	0.34	0.41	0.50	0.20	0.07	2.6%
	3.90	6.00	0.35	0.72	0.43	0.35	0.14	0.10	3.8%
	4.30	6.15	0.50	0.91	0.43	0.50	0.20	0.18	6.9%
	4.70	6.05	0.40	1.05	0.41	0.40	0.16	0.17	6.3%
	5.10	6.00	0.35	0.87	0.40	0.35	0.14	0.12	4.6%
	5.50	6.20	0.50	0.84	0.45	0.50	0.20	0.17	6.3%
	5.90	6.10	0.40	0.68	0.41	0.40	0.16	0.11	4.1%
	6.30	6.20	0.50	0.79	0.41	0.50	0.20	0.16	5.9%
	6.70	6.10	0.40	0.51	0.41	0.40	0.16	0.08	3.1%
	7.10	6.05	0.40	0.91	0.40	0.40	0.16	0.15	5.5%
	7.50	6.10	0.40	0.89	0.40	0.40	0.16	0.14	5.4%
	7.90	5.85	0.20	1.15	0.47	0.20	0.08	0.09	3.5%
	8.30	6.00	0.30	1.40	0.43	0.30	0.12	0.17	6.3%
	8.70	5.90	0.20	1.56	0.41	0.20	0.08	0.12	4.7%
	9.10	5.90	0.20	1.45	0.40	0.20	0.08	0.12	4.4%
	9.50	5.90	0.20	1.77	0.40	0.20	0.08	0.14	5.3%
	9.90	6.00	0.30	1.62	0.41	0.30	0.12	0.19	7.3%
	10.30	5.90	0.20	1.52	0.41	0.20	0.08	0.12	4.6%
	10.70	6.00	0.30	1.44	0.41	0.30	0.12	0.17	6.5%
	11.10	5.90	0.20	1.07	0.41	0.20	0.07	0.07	2.8%
W	11.40	5.70	0.00	0.00	0.36		0.00	0.00	0.0%
1 G	11.60	5.23			0.00		0.00	0.00	0.0%
	13.20	4.55			0.00		0.00	0.00	0.0%
RS	14.90	2.95			0.00		0.00	0.00	0.0%
TOTALS ----------					9.19	0.5 (Max.)	2.85	2.66	100.0%

Manning's n = 0.0865
Hydraulic Radius= 0.3102585

STREAM NAME: Government Creek
XS LOCATION: 0.3 mile up fr N Sand Hills Rd. crossing
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	2.85	2.90	1.8%
5.43	2.85	5.07	77.8%
5.45	2.85	4.90	71.7%
5.47	2.85	4.72	65.6%
5.49	2.85	4.55	59.5%
5.51	2.85	4.37	53.4%
5.53	2.85	4.20	47.3%
5.55	2.85	4.03	41.2%
5.57	2.85	3.85	35.1%
5.59	2.85	3.68	29.0%
5.61	2.85	3.51	22.9%
5.63	2.85	3.33	16.9%
5.64	2.85	3.25	13.8%
5.65	2.85	3.16	10.8%
5.66	2.85	3.07	7.8%
5.67	2.85	2.99	4.8%
5.68	2.85	2.90	1.8%
5.69	2.85	2.82	-1.2%
5.70	2.85	2.73	-4.3%
5.71	2.85	2.65	-7.3%
5.72	2.85	2.56	-10.3%
5.73	2.85	2.47	-13.2%
5.75	2.85	2.31	-19.2%
5.77	2.85	2.14	-25.1%
5.79	2.85	1.97	-31.0%
5.81	2.85	1.80	-36.9%
5.83	2.85	1.63	-42.7%
5.85	2.85	1.47	-48.5%
5.87	2.85	1.31	-54.2%
5.89	2.85	1.14	-59.9%
5.91	2.85	0.99	-65.3%
5.93	2.85	0.85	-70.0%

WATERLINE AT ZERO
AREA ERROR = 5.681

STREAM NAME: Government Creek
XS LOCATION: 0.3 mile up fr N Sand Hills Rd. crossing
XS NUMBER: 2 Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.23	8.87	0.77	0.97	6.79	10.13	100.0%	0.67	10.57	1.56
	5.23	8.87	0.76	0.97	6.78	10.13	100.0%	0.67	10.55	1.56
	5.28	8.84	0.72	0.92	6.34	10.02	98.9%	0.63	9.49	1.50
	5.33	8.81	0.67	0.87	5.90	9.92	97.9%	0.59	8.48	1.44
	5.38	8.78	0.62	0.82	5.46	9.81	96.9%	0.56	7.50	1.37
	5.43	8.75	0.57	0.77	5.02	9.71	95.8%	0.52	6.57	1.31
	5.48	8.72	0.53	0.72	4.58	9.60	94.8%	0.48	5.69	1.24
	5.53	8.69	0.48	0.67	4.15	9.50	93.8%	0.44	4.85	1.17
	5.58	8.66	0.43	0.62	3.72	9.39	92.7%	0.40	4.07	1.09
	5.63	8.63	0.38	0.57	3.28	9.29	91.7%	0.35	3.33	1.02
WL	5.68	8.59	0.33	0.52	2.85	9.18	90.6%	0.31	2.66	0.93
	5.73	8.50	0.29	0.47	2.42	9.04	89.2%	0.27	2.05	0.84
	5.78	8.39	0.24	0.42	2.00	8.89	87.8%	0.23	1.51	0.75
	5.83	8.28	0.19	0.37	1.59	8.74	86.3%	0.18	1.03	0.65
	5.88	8.03	0.15	0.32	1.18	8.44	83.3%	0.14	0.64	0.55
	5.93	6.33	0.13	0.27	0.82	6.67	65.8%	0.12	0.41	0.50
	5.98	5.08	0.10	0.22	0.53	5.33	52.7%	0.10	0.23	0.44
	6.03	4.05	0.08	0.17	0.31	4.23	41.8%	0.07	0.11	0.35
	6.08	2.70	0.05	0.12	0.13	2.81	27.8%	0.05	0.04	0.26
	6.13	1.22	0.03	0.07	0.04	1.28	12.6%	0.03	0.01	0.19
	6.18	0.27	0.01	0.02	0.00	0.28	2.8%	0.01	0.00	0.09

STREAM NAME: Government Creek
XS LOCATION: 0.3 mile up fr N Sand Hills Rd. crossing
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	2.66	cfs
CALCULATED FLOW (Qc)=	2.66	cfs
(Qm-Qc)/Qm * 100 =	-0.1	%
MEASURED WATERLINE (WLm)=	5.68	ft
CALCULATED WATERLINE (WLc)=	5.68	ft
(WLm-WLc)/WLm * 100 =	-0.1	%
MAX MEASURED DEPTH (Dm)=	0.50	ft
MAX CALCULATED DEPTH (Dc)=	0.52	ft
(Dm-Dc)/Dm * 100	-3.8	%
MEAN VELOCITY=	0.93	ft/sec
MANNING'S N=	0.087	
SLOPE=	0.014	ft/ft
.4 * Qm =	1.1	cfs
2.5 * Qm=	6.6	cfs

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

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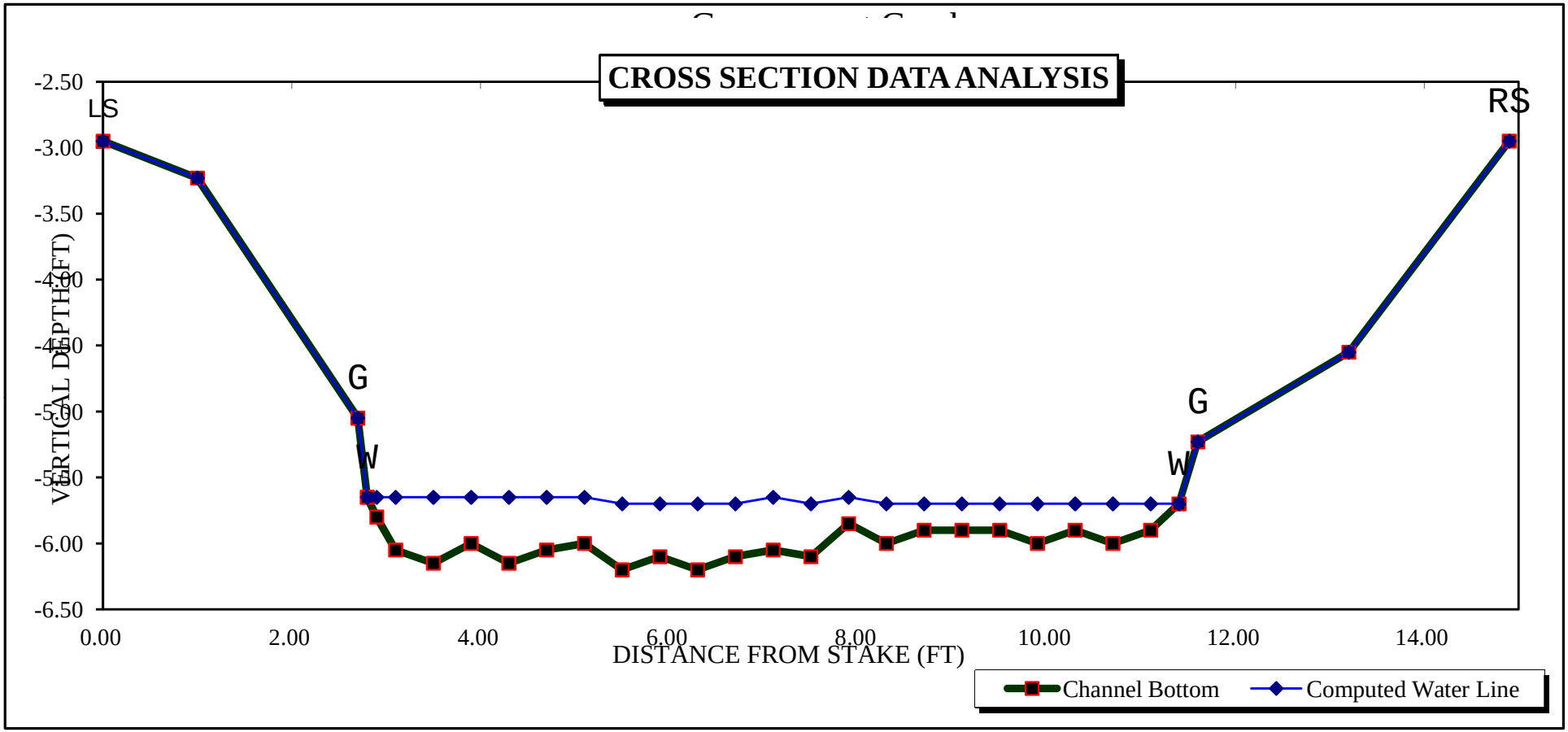
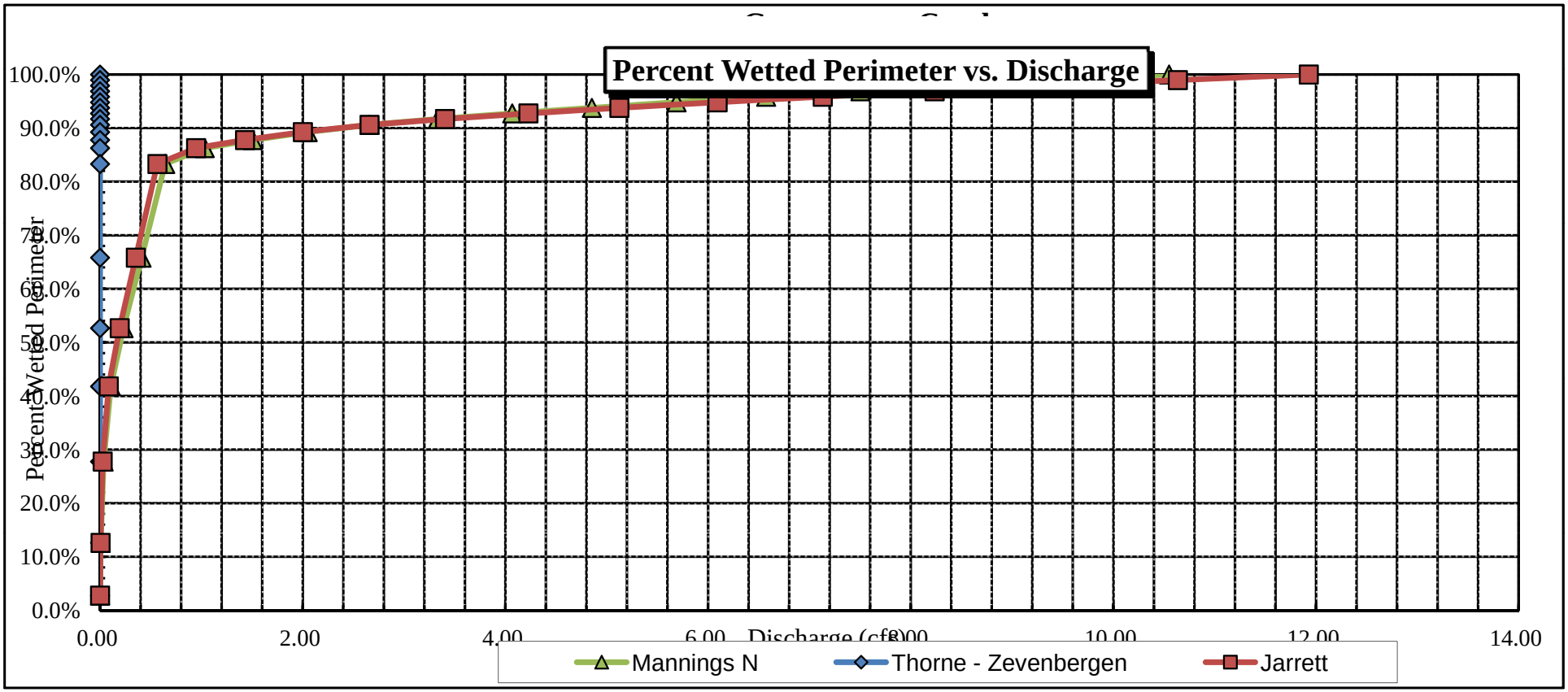
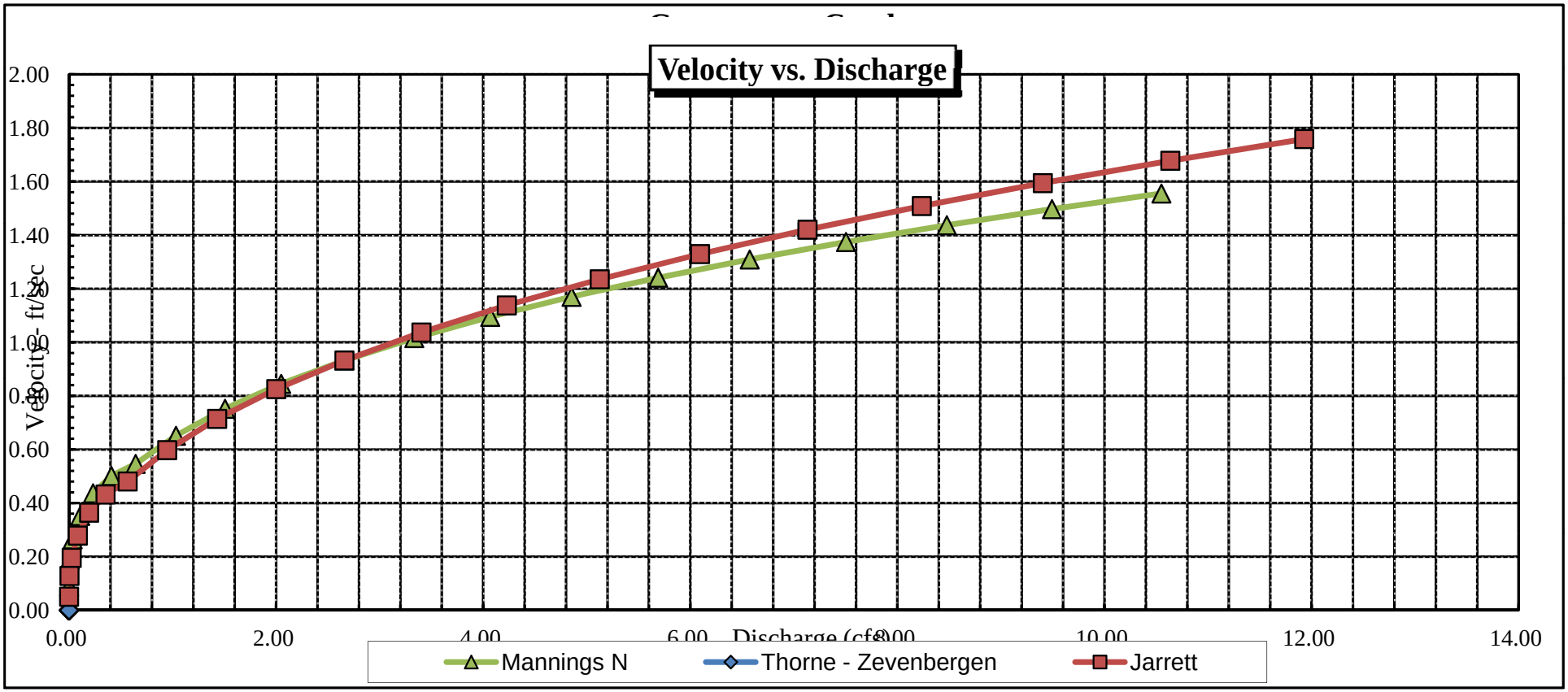
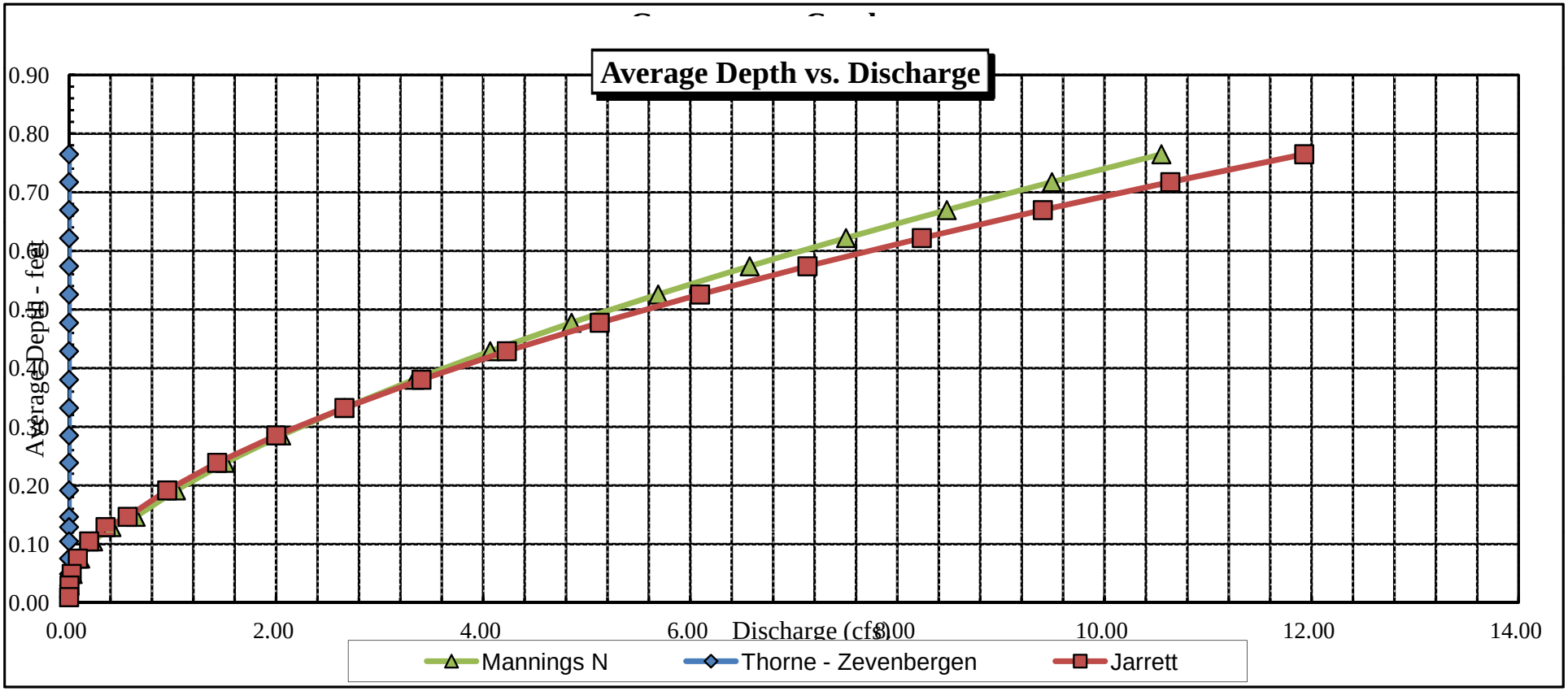
RECOMMENDATION BY: ……………………...………..…….............................. AGENCY..…………………………......……......…....………...... DATE:.......…..…......……………

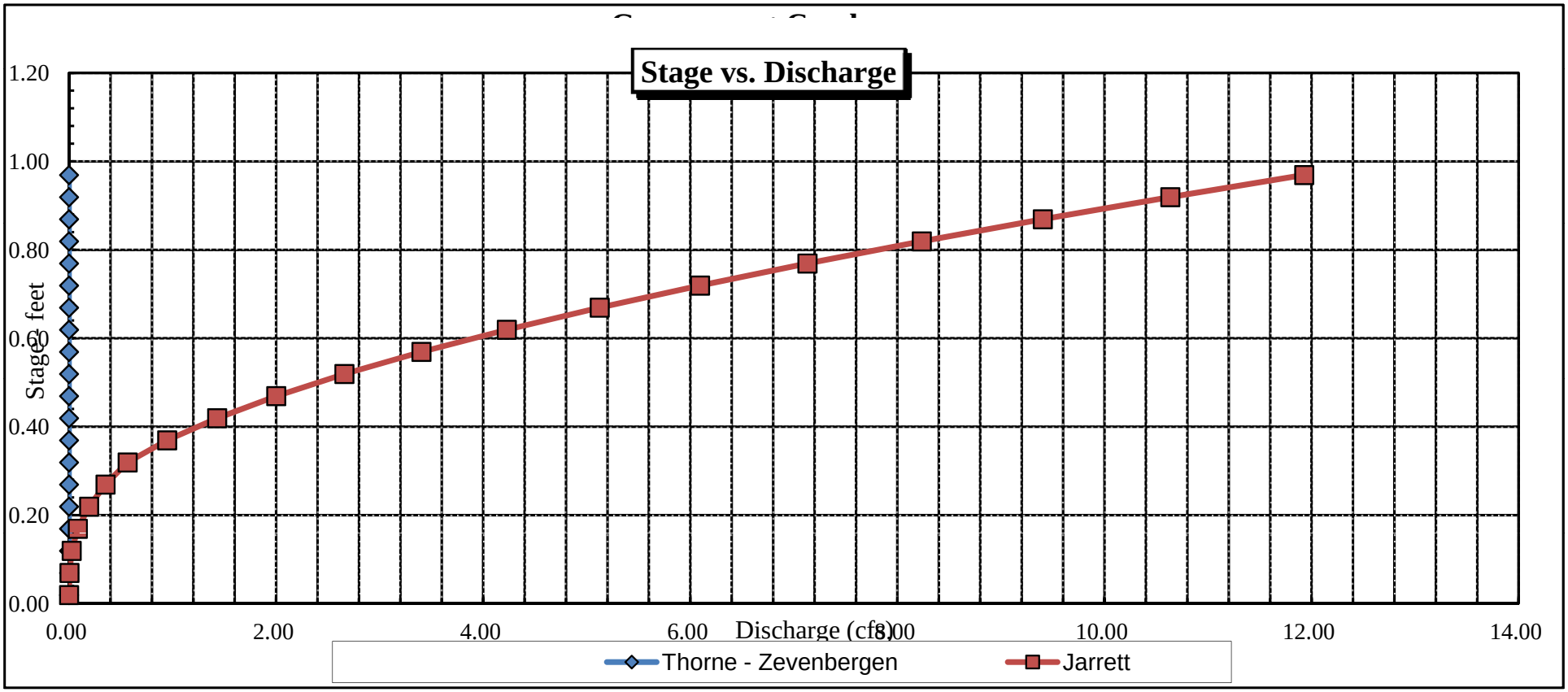
CWCB REVIEW BY: ..……………………………....………………………………………………………...…............. DATE:.................…………….....….


CROSS SECTION DATA ANALYSIS
LS
G
W
G
W
RS
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
VERTICAL DEPTH (FT)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


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


Velocity vs. Discharge
Velocity - ft/sec
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
2.00
4.00
6.00
10.00
12.00
14.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Average Depth - feet
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

LOCATION INFORMATION

STREAM NAME: Government Creek						CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: 1000 fd. downstream from state forest ATV road crossing						
DATE: 7-12-11	OBSERVERS: R. Smith, P. Belcher, J. Wilk					
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 36	TOWNSHIP: 11 (N)/S	RANGE: 79 E(W)	PM: Sixth	
COUNTY: Jackson	WATERSHED: N. Platte	WATER DIVISION: 6	DOW WATER CODE: 11041			
MAP(S): USGS:		GPS Z13 397793				
USFS:		4526142.				

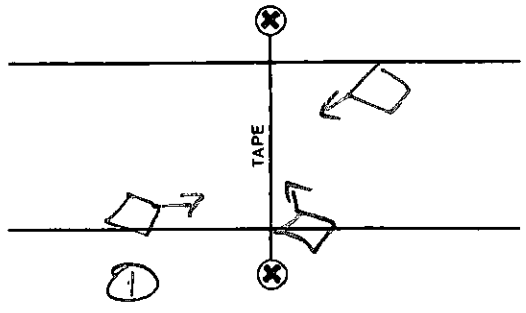
SUPPLEMENTAL DATA

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: 5		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(X) Tape @ Stake LB	0.0	surveyed
(X) Tape @ Stake RB	0.0	surveyed
(1) WS @ Tape LB/RB	0.0	6.17 / 6.15
(2) WS Upstream	28.3	5.35
(3) WS Downstream	22.5	7.14
SLOPE	1.79 / 50.8 =	.035

SKETCH



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

AQUATIC SAMPLING SUMMARY

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

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

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

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

mayfly, stonefly, caddisfly

COMMENTS

pH = 8.06
Cond = 47.2 µS
Temp = 10.0° C
Salinity = 0

DISCHARGE/CROSS SECTION NOTES

STREAM NAME:	CROSS-SECTION NO.:	DATE:	SHEET ___ OF ___
Government Creek	3	7-12-11	

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 12:20 pm

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Obser-vation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		5.48								
G	4.3		5.64								
	5.3		5.76								
W	6.2		6.15								
	6.5		6.55	.4				0.78			
	6.9		6.55	.4				1.19			
	7.3		6.55	.4				0.61			
	7.7		6.45	.3				0.38			
	8.2		6.45	.3				0.28			
	8.7		6.45	.3				0.96			
	9.2		6.45	.3				0.39			
	9.7		6.45	.3		(-0.2)		0	rock		
	10.2		6.35	.2				0.38			
	10.7		6.40	.25				1.13			
	11.2		6.45	.3				0.73			
	11.7		6.35	.2				1.36			
	12.2		6.55	.4				0.11			
	12.7		6.60	.45				1.26			
	13.2		6.60	.45				1.33			
	13.7		6.65	.5				1.93			
	14.2		6.60	.45				1.66			
	14.7		6.50	.35				0.72			
	15.2		6.45	.3				0.88			
	15.7		6.45	.3				0.44			
W	16.2		6.15								
G	16.3		5.60								
LS	20.3		4.80								
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:	Government Creek
XS LOCATION:	1000' down fr State Forest Rd. crossing
XS NUMBER:	3
DATE:	12-Jul-11
OBSERVERS:	R. Smith, P. Belcher, J. Wilk
1/4 SEC:	SW
SECTION:	36
TWP:	11N
RANGE:	79W
PM:	6th
COUNTY:	Jackson
WATERSHED:	North Platte
DIVISION:	6
DOW CODE:	11041
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:	0.035

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

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

STREAM NAME: Government Creek
XS LOCATION: 1000' down fr State Forest Rd. crossing
XS NUMBER: 3

DATA POINTS= 27

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	LS	0.00	5.48			0.00		0.00	0.00	0.0%
1	G	4.30	5.64			0.00		0.00	0.00	0.0%
		5.30	5.76			0.00		0.00	0.00	0.0%
	W	6.20	6.15	0.00	0.00	0.00		0.00	0.00	0.0%
		6.50	6.55	0.40	0.78	0.50	0.40	0.14	0.11	3.8%
		6.90	6.55	0.40	1.19	0.40	0.40	0.16	0.19	6.6%
		7.30	6.55	0.40	0.61	0.40	0.40	0.16	0.10	3.4%
		7.70	6.45	0.30	0.38	0.41	0.30	0.14	0.05	1.8%
		8.20	6.45	0.30	0.28	0.50	0.30	0.15	0.04	1.4%
		8.70	6.45	0.30	0.96	0.50	0.30	0.15	0.14	5.0%
		9.20	6.45	0.30	0.39	0.50	0.30	0.15	0.06	2.0%
		9.70	6.45	0.30	0.00	0.50	0.30	0.15	0.00	0.0%
		10.20	6.35	0.20	0.38	0.51	0.20	0.10	0.04	1.3%
		10.70	6.40	0.25	1.13	0.50	0.25	0.13	0.14	4.9%
		11.20	6.45	0.30	0.73	0.50	0.30	0.15	0.11	3.8%
		11.70	6.35	0.20	1.36	0.51	0.20	0.10	0.14	4.7%
		12.20	6.55	0.40	0.11	0.54	0.40	0.20	0.02	0.8%
		12.70	6.60	0.45	1.26	0.50	0.45	0.23	0.28	9.8%
		13.20	6.60	0.45	1.33	0.50	0.45	0.23	0.30	10.3%
		13.70	6.65	0.50	1.93	0.50	0.50	0.25	0.48	16.6%
		14.20	6.60	0.45	1.66	0.50	0.45	0.23	0.37	12.9%
		14.70	6.50	0.35	0.72	0.51	0.35	0.18	0.13	4.3%
		15.20	6.45	0.30	0.88	0.50	0.30	0.15	0.13	4.5%
		15.70	6.45	0.30	0.44	0.50	0.30	0.15	0.07	2.3%
	W	16.20	6.15	0.00	0.00	0.58		0.00	0.00	0.0%
1	G	16.30	5.60			0.00		0.00	0.00	0.0%
	RS	20.30	4.80			0.00		0.00	0.00	0.0%
	TOTALS ----------					10.38	0.5 (Max.)	3.27	2.90	100.0%

Manning's n = 0.1450
Hydraulic Radius= 0.31507168

STREAM NAME: Government Creek
XS LOCATION: 1000' down fr State Forest Rd. crossing
XS NUMBER: 3

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.27	3.27	0.0%
5.90	3.27	5.85	78.8%
5.92	3.27	5.64	72.4%
5.94	3.27	5.42	65.9%
5.96	3.27	5.21	59.5%
5.98	3.27	5.01	53.1%
6.00	3.27	4.80	46.7%
6.02	3.27	4.59	40.4%
6.04	3.27	4.39	34.1%
6.06	3.27	4.18	27.8%
6.08	3.27	3.98	21.6%
6.10	3.27	3.77	15.4%
6.11	3.27	3.67	12.3%
6.12	3.27	3.57	9.2%
6.13	3.27	3.47	6.1%
6.14	3.27	3.37	3.1%
6.15	3.27	3.27	0.0%
6.16	3.27	3.17	-3.1%
6.17	3.27	3.07	-6.1%
6.18	3.27	2.97	-9.1%
6.19	3.27	2.87	-12.2%
6.20	3.27	2.77	-15.2%
6.22	3.27	2.58	-21.2%
6.24	3.27	2.38	-27.2%
6.26	3.27	2.18	-33.2%
6.28	3.27	1.99	-39.1%
6.30	3.27	1.80	-45.0%
6.32	3.27	1.60	-50.9%
6.34	3.27	1.41	-56.8%
6.36	3.27	1.22	-62.6%
6.38	3.27	1.04	-68.1%
6.40	3.27	0.87	-73.3%

WATERLINE AT ZERO
AREA ERROR = 6.150

STREAM NAME: Government Creek
XS LOCATION: 1000' down fr State Forest Rd. crossing
XS NUMBER: 3 Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.64	11.99	0.73	1.01	8.74	12.88	100.0%	0.68	12.93	1.48
	5.65	11.91	0.72	1.00	8.62	12.79	99.3%	0.67	12.70	1.47
	5.70	11.48	0.70	0.95	8.03	12.32	95.6%	0.65	11.58	1.44
	5.75	11.06	0.68	0.90	7.47	11.85	92.0%	0.63	10.53	1.41
	5.80	10.87	0.64	0.85	6.92	11.61	90.1%	0.60	9.40	1.36
	5.85	10.75	0.59	0.80	6.38	11.44	88.8%	0.56	8.29	1.30
	5.90	10.62	0.55	0.75	5.85	11.26	87.4%	0.52	7.24	1.24
	5.95	10.50	0.51	0.70	5.32	11.08	86.0%	0.48	6.25	1.18
	6.00	10.37	0.46	0.65	4.80	10.91	84.7%	0.44	5.32	1.11
	6.05	10.25	0.42	0.60	4.28	10.73	83.3%	0.40	4.45	1.04
	6.10	10.12	0.37	0.55	3.77	10.56	81.9%	0.36	3.64	0.97
WL	6.15	10.00	0.33	0.50	3.27	10.38	80.5%	0.32	2.90	0.89
	6.20	9.88	0.28	0.45	2.77	10.22	79.3%	0.27	2.23	0.80
	6.25	9.76	0.23	0.40	2.28	10.06	78.1%	0.23	1.63	0.71
	6.30	9.64	0.19	0.35	1.80	9.90	76.8%	0.18	1.10	0.61
	6.35	9.52	0.14	0.30	1.32	9.74	75.6%	0.14	0.67	0.51
	6.40	8.27	0.11	0.25	0.87	8.43	65.4%	0.10	0.37	0.42
	6.45	4.52	0.11	0.20	0.49	4.63	35.9%	0.11	0.21	0.43
	6.50	3.66	0.08	0.15	0.29	3.72	28.9%	0.08	0.10	0.35
	6.55	2.25	0.05	0.10	0.12	2.26	17.6%	0.05	0.03	0.27
	6.60	1.00	0.02	0.05	0.02	1.00	7.8%	0.02	0.00	0.16

STREAM NAME: Government Creek
XS LOCATION: 1000' down fr State Forest Rd. crossing
XS NUMBER: 3

SUMMARY SHEET

MEASURED FLOW (Qm)=	2.90	cfs
CALCULATED FLOW (Qc)=	2.90	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	6.15	ft
CALCULATED WATERLINE (WLc)=	6.15	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.50	ft
MAX CALCULATED DEPTH (Dc)=	0.50	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	0.89	ft/sec
MANNING'S N=	0.145	
SLOPE=	0.035	ft/ft
.4 * Qm =	1.2	cfs
2.5 * Qm=	7.3	cfs

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

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

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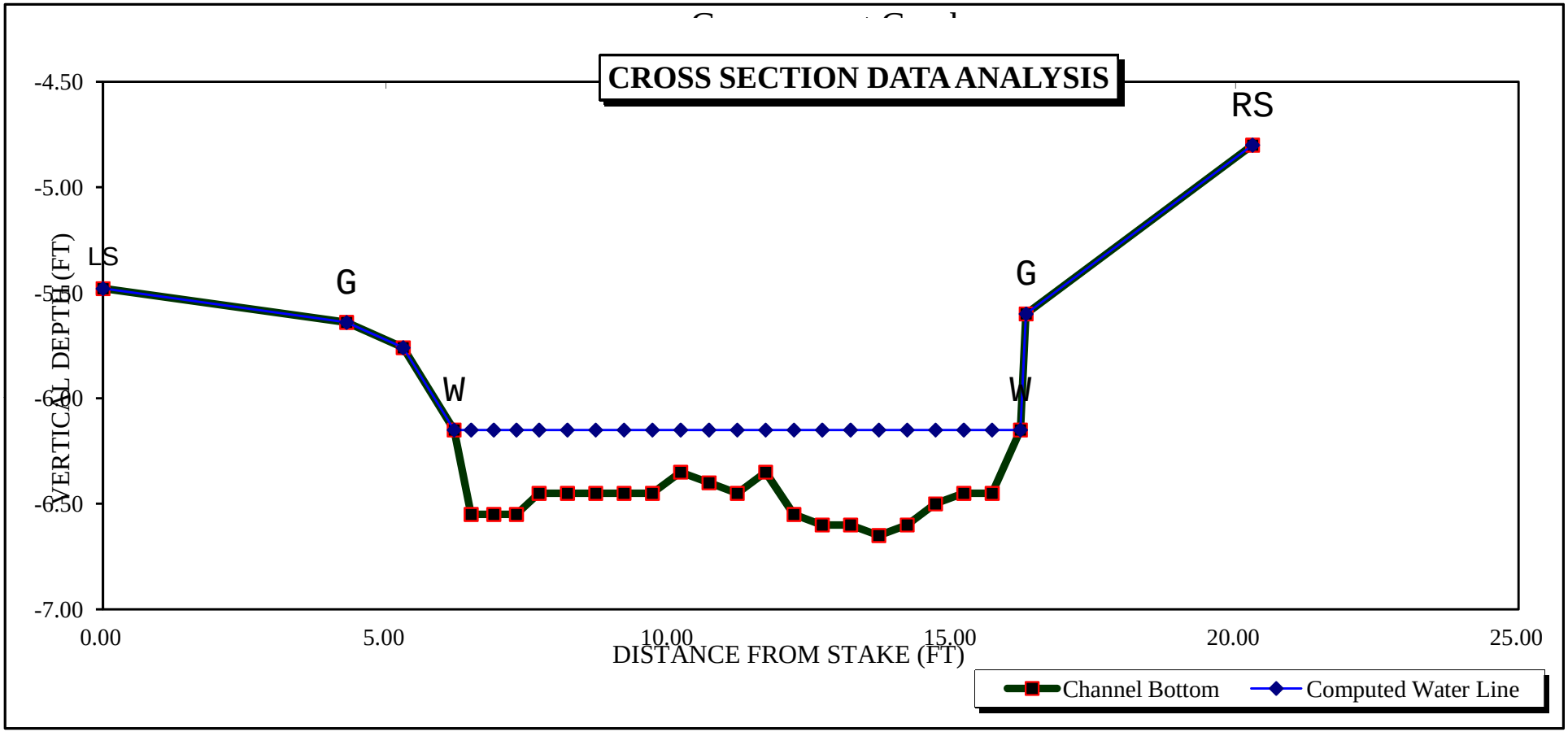
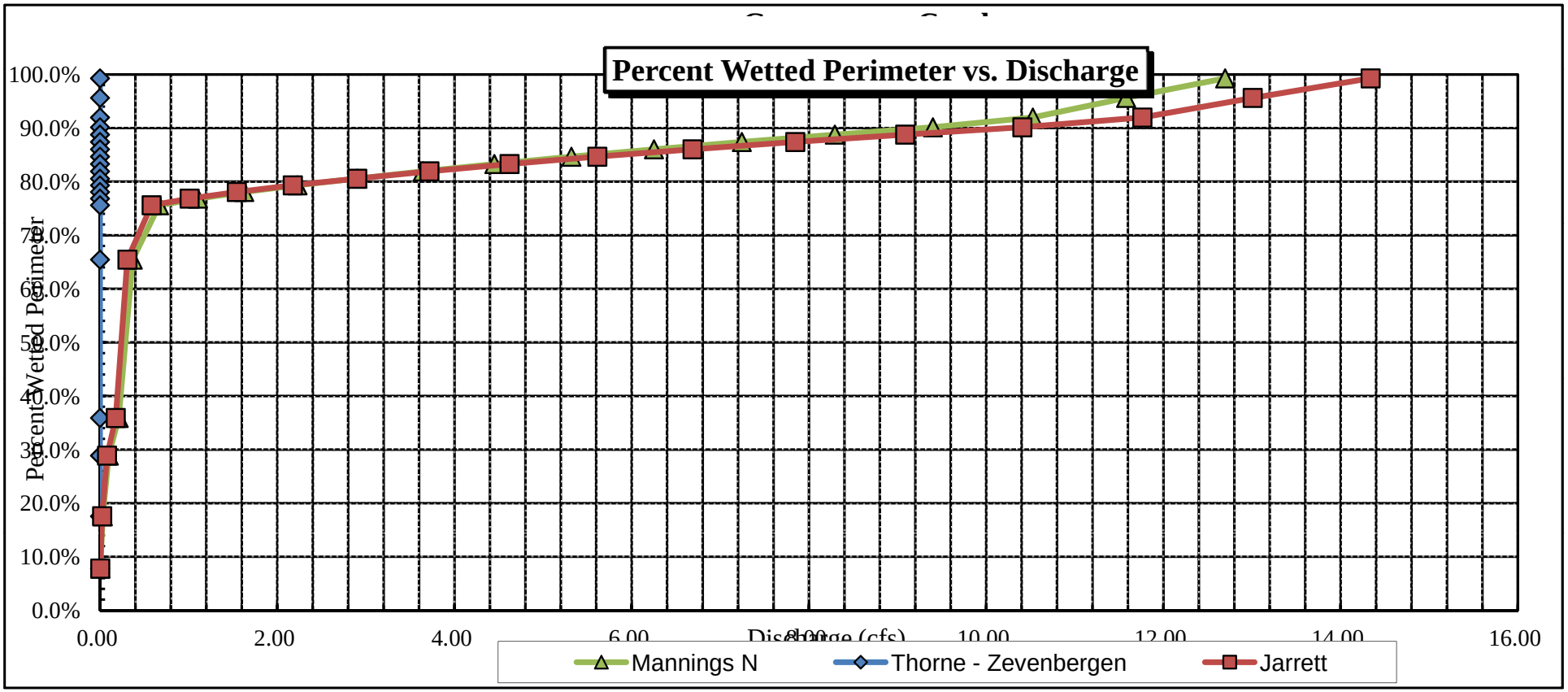
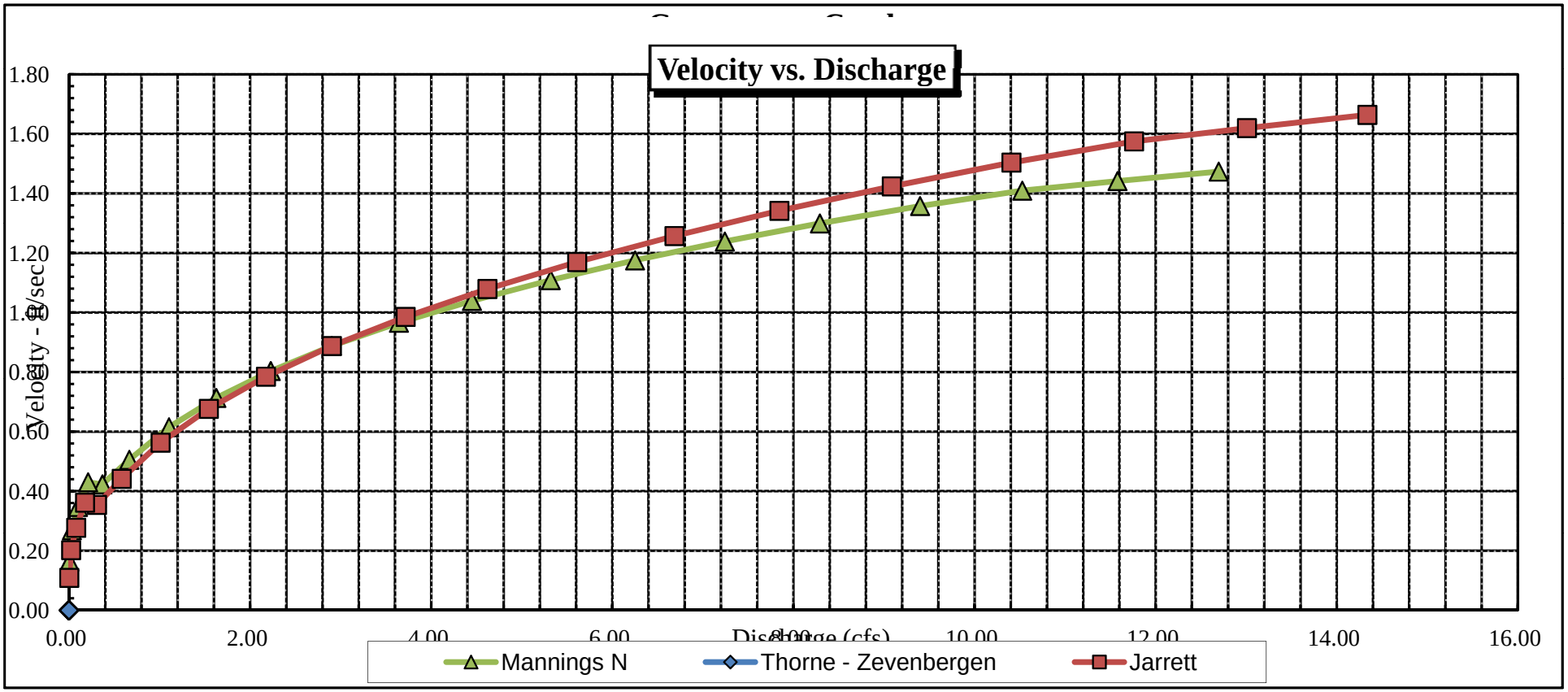
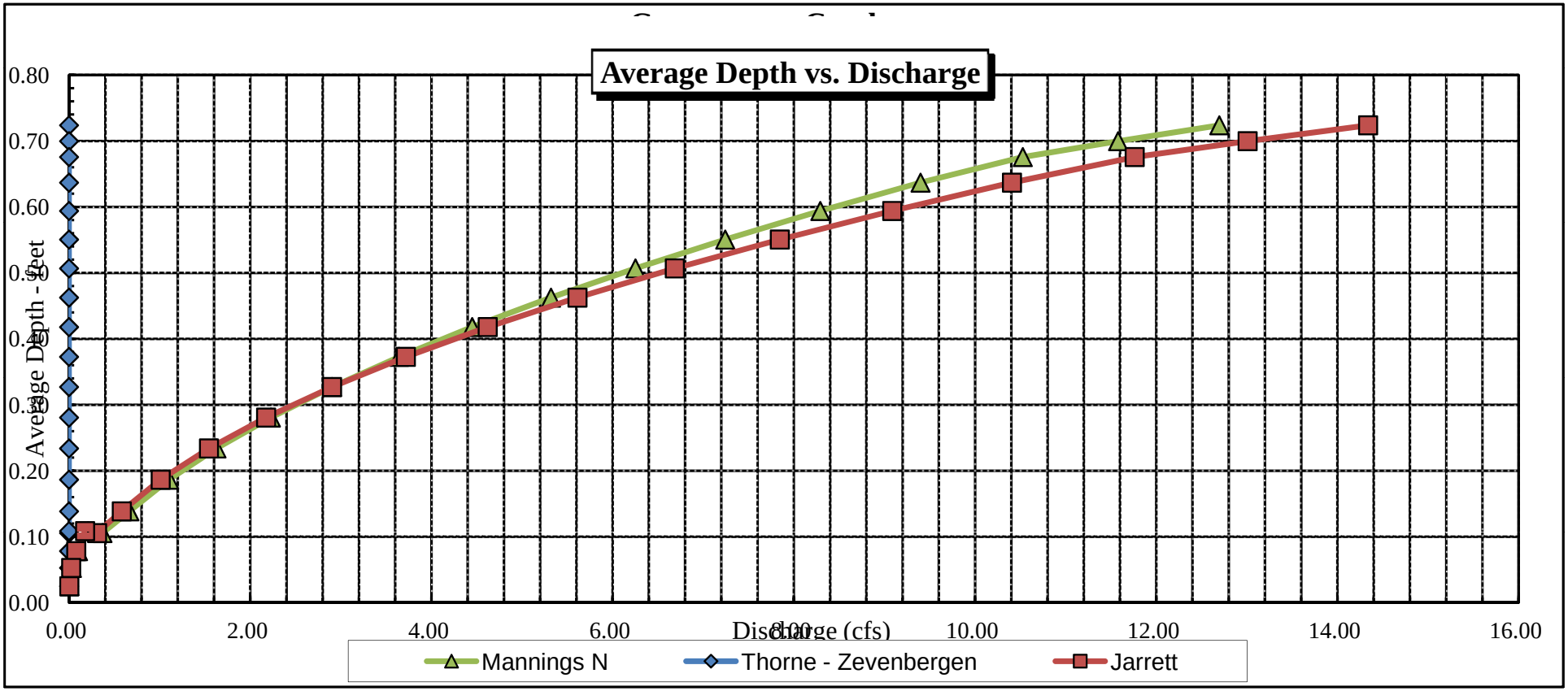
RECOMMENDATION BY: ………………………………………………… AGENCY………………………………………………… DATE:………………………………

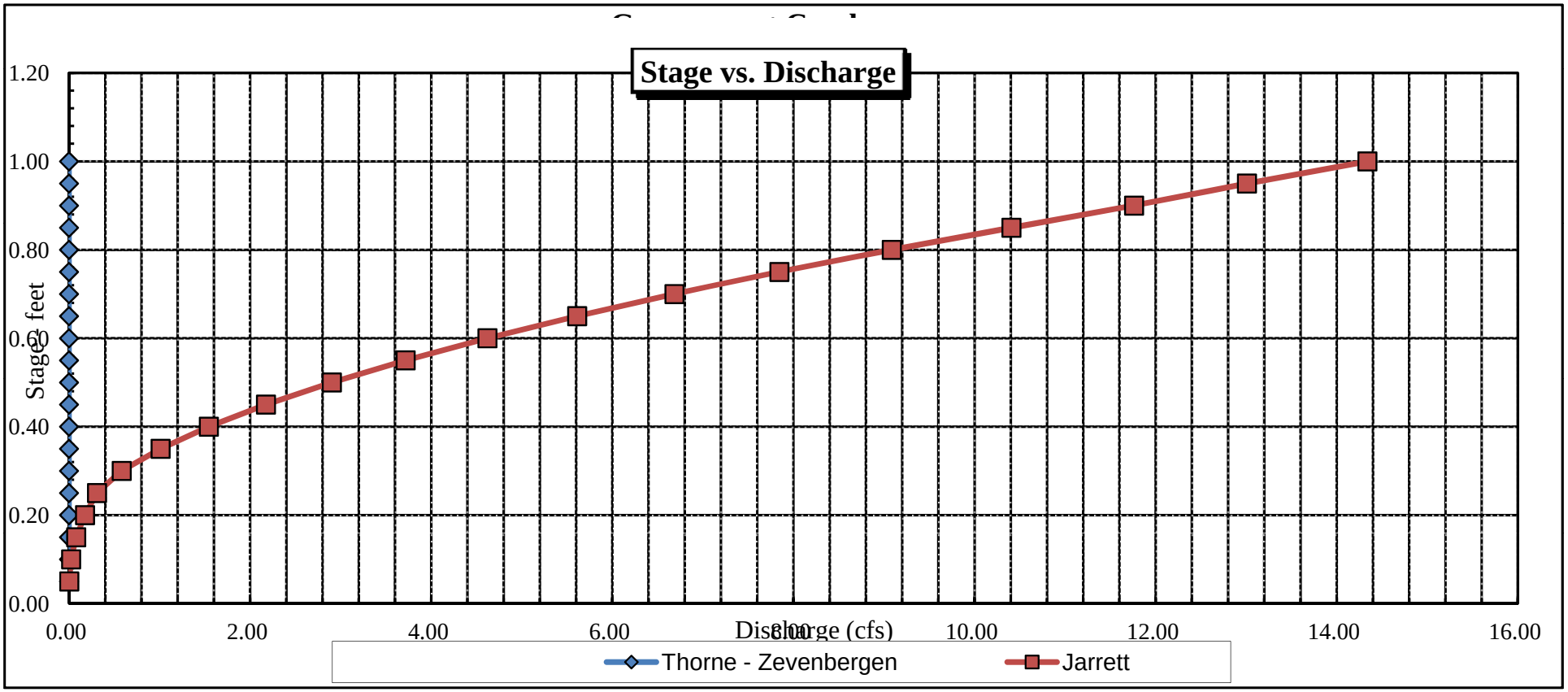
CWCB REVIEW BY: ……………………………………………………………………………………………………… DATE:………………………………


CROSS SECTION DATA ANALYSIS
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
VERTICAL DEPTH (FT)
LS
G
W
W
G
RS
0.00
5.00
10.00
15.00
20.00
25.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


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


Velocity vs. Discharge
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


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