United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Colorado State Office
2850 Youngfield Street
Lakewood, Colorado 80215-7093
www.blm.gov/co

TAKE PRIDE IN AMERICA

MAR 7 2012

In Reply Refer To:
7250 (CO-932)

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

Dear Ms. Bassi:

The Bureau of Land Management (BLM) is writing this letter to formally communicate its instream flow recommendations for Johnson Creek, located in Water Division 1. The BLM is recommending new instream flow rights for upper reaches of this creek and an increase for the existing instream flow water right on the lowest reach of the creek.

In 1978, the Colorado Water Conservation Board appropriated an instream flow water right for 2.0 cubic feet per second year-round on lower Johnson Creek, from the confluence with Pole Creek to the Colorado-Wyoming border. Currently, there are no instream flow water rights on portions of the creek upstream from the confluence with Pole Creek.

Location and Land Status: Johnson Creek is located within the Laramie River watershed. It is tributary to the Laramie River approximately three miles north of the Colorado-Wyoming border. This recommendation covers three stream reaches totaling 3.65 stream miles:

- Johnson Creek Reach 1 – Confluence with unnamed tributary (40 ° 59' 21.82" N, 106° 6' 11.9" W) to the confluence with Fish Creek, a distance of approximately 1.7 miles. Approximately 0.68 miles of this stream reach are managed by the BLM, and 0.86 miles are managed by the U.S. Forest Service. Private lands are located along 0.14 mile of this reach.

- Johnson Creek Reach 2 - Confluence with Fish Creek to confluence with Pole Creek, a distance of 1.33 miles. Approximately 1.16 miles of this stream reach are managed by the BLM, while private lands are located along 0.17 mile of this reach.

- Johnson Creek Reach 3 - Confluence with Pole Creek to Colorado-Wyoming border, a distance of approximately 0.63 miles. This entire reach is managed by the BLM.

Biological Summary: Johnson Creek is a cold-water stream with moderate to high gradients. The stream includes moderate gradient valleys with wider floodplains, but the stream also includes high gradient reaches in narrow gulches that are constrained by bedrock. The stream has a good mixture of pool, riffle, and run habitat. Fish surveys show that Johnson Creek supports a higher diversity of fish species than any other creek managed by the BLM on the west side of the Laramie River valley.

Fish surveys documented naturally reproducing population of brown trout, brook trout, creek chubs, and white suckers. Intensive macroinvertebrate surveys have not been conducted, but spot samples have revealed various species of mayfly, stonefly, and caddisfly. The riparian community is approximately 150 feet wide and is comprised primarily of willows, alders, spruce, and sedges.

R2Cross Analysis: The BLM's R2Cross analysis, along with specific flow rate recommendations, is provided in enclosures to this letter.

Water Availability: For water availability analysis, the BLM recommends analysis of U.S. Geological Survey stream gage 06657500 (Laramie River near Glendevey, CO). This gage has a long period of record between 1904 and 1982, and the State of Colorado has continued to operate the gage from 1982 to the present. This gage is located in a different part of the Laramie River watershed than Johnson Creek. However, this gage should provide an excellent indication of the volume of runoff to be expected per acre within this watershed, along with an indication of the timing and distribution of that runoff. When utilizing this gage, it should be understood that the gage may have been affected by icing during the winter.

The BLM is not aware of any decreed water rights that operate within the recommended stream reaches.

Relationship to Land Management Plans: The BLM considers the creeks it manages on the west side of the Laramie River watershed to be in very good condition. The streams possess largely intact natural hydrology. Grazing management has been significantly improved during the last 20 years. Impacts from roads, timber management, and other surface disturbances are very light. The BLM believes it is important to protect flow rates on these creeks and prevent hydrologic stresses, because these creeks will experience other stresses within the watershed as the pine beetle epidemic changes the vegetation community.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2011. We thank both Colorado Parks and Wildlife and the Water Conservation Board for their cooperation in this effort.

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

Sincerely,

for Leigh D. Espy
Deputy State Director, Resources and Fire

Enclosures

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

Johnson Creek Reach 1
Unnamed Tributary To Confluence With Fish Creek

R2Cross Analysis: The BLM collected the following R2Cross data:

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (meets 3 of 3 hydraulic criteria)
08/03/2010 #1	5.28 cfs	11.18 feet	Out of range	2.10 cfs
08/03/2010 #2	5.63 cfs	12.28 feet	Out of range	2.30 cfs
09/17/2010 #7	1.79 cfs	12.00 feet	1.95 cfs	2.50 cfs
		Averages:	1.95 cfs	2.30 cfs

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

2.30 cubic feet per second is recommended for the annual warm temperature period, from May 1 through October 31. This recommendation is driven by the average velocity criteria and average depth criteria. It is important to maintain as much usable physical habitat as possible during the summer growing season for the four fish species found in the creek.

1.6 cubic feet per second is recommended for the annual cold temperature period, from November 1 to April 30. This flow rate meets the wetted perimeter criteria, provides an average velocity of 0.85 feet per second, and an average depth 0.18 feet. During winter, this flow rate should provide sufficient velocity and depth to prevent icing of all physical habitat within the stream.

Johnson Creek Reach 2
Fish Creek To Confluence With Pole Creek

R2Cross Analysis: The BLM collected the following R2Cross data:

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (meets 3 of 3 hydraulic criteria)
09/17/2010 #3	2.21 cfs	19.33 feet	1.85 cfs	5.34 cfs
09/17/2010 #4	2.16 cfs	18.00 feet	1.40 cfs	3.65 cfs
		Averages:	1.63 cfs	4.50 cfs

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

3.80 cubic feet per second is recommended for the snowmelt runoff period, from April 1 through October 31. This recommendation is driven by the average velocity criteria and average depth criteria. The BLM is recommending 3.80 cfs, even though the average of the two cross section results is 4.50 cfs, to maintain consistency with the flow rates recommended for the reach immediately downstream. The 3.80 cubic feet per second recommendation will meet the depth and wetted perimeter criteria while providing 0.88 feet per second average velocity, which is close to meeting the velocity criteria. It is important to maintain as much usable physical habitat as possible during the summer growing season for the four fish species found in the creek.

1.6 cubic feet per second is recommended for the cold temperature period, from November 1 to March 31. This flow rate is driven by the wetted perimeter and depth criteria. During winter, this flow rate should provide sufficient velocity and depth to prevent icing of all physical habitat within the stream.

Johnson Creek Reach 3
Confluence with Pole Creek to Colorado-Wyoming Border

R2Cross Analysis: The BLM collected the following R2Cross data:

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (meets 3 of 3 hydraulic criteria)
09/17/2010 #5	2.44 cfs	15.80 feet	1.97 cfs	3.72 cfs
09/17/2010 #6	2.44 cfs	11.49 feet	1.26 cfs	3.87 cfs
		Averages:	1.62 cfs	3.80 cfs

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

> An increase of 1.80 cubic feet per second is recommended for warm temperature period, from April 1 through October 31. This enlargement will bring the total instream flow rate up to 3.80 cubic feet per second. This recommendation is driven by the average velocity criteria. It is important to maintain as much usable physical habitat as possible during the summer growing season for the four fish species found in the creek.
>
> Based upon the data collected, the existing instream flow rate appears to be adequate for the cold temperature months from November 1 to March 31.

Rationale for Increase of Instream Flow Water Right: The BLM does not consider the current instream flow water right to be fully protective of the natural environment in Johnson Creek, pursuant to modern analytical procedures used by the CWCB. While 2.0 cfs does meet two of the three instream flow criteria, it does not meet all three intream flow criteria during the spring and summer, which is a critical growth and spawning period for the fish population. BLM deliberately surveyed a typical riffle with a narrow top width, and the 2.0 cfs flow rate appears to be inadequate even in the narrowest riffles that are typical in this stream.

DRAFT INSTREAM FLOW RECOMMENDATION

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

Dear Ms. Bassi:

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- Johnson Creek Reach 3 - Confluence with Pole Creek to Colorado-Wyoming border, a distance of approximately 0.63 miles. This entire reach is managed by the BLM.

Biological Summary. Johnson Creek is a cold-water stream with moderate to high gradients. The stream includes moderate gradient valleys with wider floodplains, but the stream also includes high gradient reaches in narrow gulches that are constrained by bedrock. The stream has a good mixture of pool, riffle, and run habitat. Fish surveys show that Johnson Creek supports a higher diversity of fish species that any other creek managed by BLM on the west side of the Laramie River valley. Fish surveys documented naturally reproducing population of brown trout, brook trout, creek chubs, and white suckers. Intensive macroinvertebrate surveys have not been conducted, but spot samples have revealed various species of mayfly, stonefly, and caddisfly. The riparian community is approximately 150 feet wide and is comprised primarily of willows, alders, spruce, and sedges.

R2Cross Analysis. BLM's R2Cross analysis, along with specific flow rate recommendations, is provided in enclosures to this letter.

Water Availability. For water availability analysis, BLM recommends analysis of U.S. Geological Survey stream gage 06657500 (Laramie River near Glendevey, CO). This gage has a long period of record between 1904 and 1982, and the State of Colorado has continued to operate the gage from 1982 to the present. This gage is located in a different part of the Laramie River watershed than Johnson Creek. However, this gage should provide an excellent indication of the volume of runoff to be expected per acre within this watershed, along with an indication of the timing and distribution of that runoff. When utilizing this gage, it should be understood that the gage may have been affected by icing during the winter.

BLM is not aware of any decreed water rights that operate within the recommended stream reaches.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2011. We thank both the Division of Wildlife and the Water Conservation Board for their cooperation in this effort.

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

Sincerely,

Leigh Espy
Deputy State Director
Resources and Fire

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

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Unnamed Tributary To Confluence With Fish Creek

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09/17/2010 #7	1.79 cfs	12.00 feet	1.95 cfs	2.50 cfs
		Averages:	1.95 cfs	2.30 cfs

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

> 2.30 cubic feet per second is recommended for the snowmelt runoff period, from April 1 through July 15. This recommendation is driven by the average velocity criteria and average depth critera. It is important to maintain as much usable physical habitat as possible during the summer growing season for the four fish species found in the creek.
>
> 1.6 cubic feet per second is recommended for the remainder of the year, from July 16 to March 31. This preliminary recommendation has been reduced based upon water availability. This flow rate meets the wetted perimeter criteria, provides an average velocity of 0.85 feet per second, and an average depeth 0.18 feet. During winter, this flow rate should provide sufficient velocity and depth to prevent icing of all physical habitat within the stream.

Johnson Creek Reach 2
Fish Creek To Confluence With Pole Creek

R2Cross Analysis. BLM collected the following R2Cross data:

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (meets 3 of 3 hydraulic criteria)
09/17/2010 #3	2.21 cfs	19.33 feet	1.85 cfs	5.34 cfs
09/17/2010 #4	2.16 cfs	18.00 feet	1.40 cfs	3.65 cfs
		Averages:	1.63 cfs	4.50 cfs

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

3.80 cubic feet per second is recommended for the snowmelt runoff period, from April 1 through July 15. This recommendation is driven by the average velocity criteria and average depth criteria. BLM is recommending 3.80 cfs even though the average of the two cross section results is 4.50 cfs because 3.80 cubic feet per second will meet the depth and wetted perimeter criteria while providing 0.88 feet per second velocity, which is close to meeting the velocity criteria. The 3.80 cfs recommendation will also make this reach consistent with BLM's recommendation with the reach immediately downstream. It is important to maintain as much usable physical habitat as possible during the summer growing season for the four fish species found in the creek.

2.1 cubic feet per second is recommended during late summer and early fall, from July 16 to October 31. This preliminary recommendation has been reduced because of water availability. This flow rate will meet two of the three instream flow criteria will still provide an average velocity of 0.7 feet per second in the slowest riffle that was surveyed.

1.6 cubic feet per second is recommended for the remainder of the year, from November 1 to March 31. This flow rate is driven by the wetted perimeter and depth criteria. During winter, this flow rate should provide sufficient velocity and depth to prevent icing of all physical habitat within the stream.

Johnson Creek Reach 3
Confluence with Pole Creek to Colorado-Wyoming Border

R2Cross Analysis. BLM collected the following R2Cross data:

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (meets 3 of 3 hydraulic criteria)
09/17/2010 #5	2.44 cfs	15.80 feet	1.97 cfs	3.72 cfs
09/17/2010 #6	2.44 cfs	11.49 feet	1.26 cfs	3.87 cfs
		Averages:	1.62 cfs	3.80 cfs

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

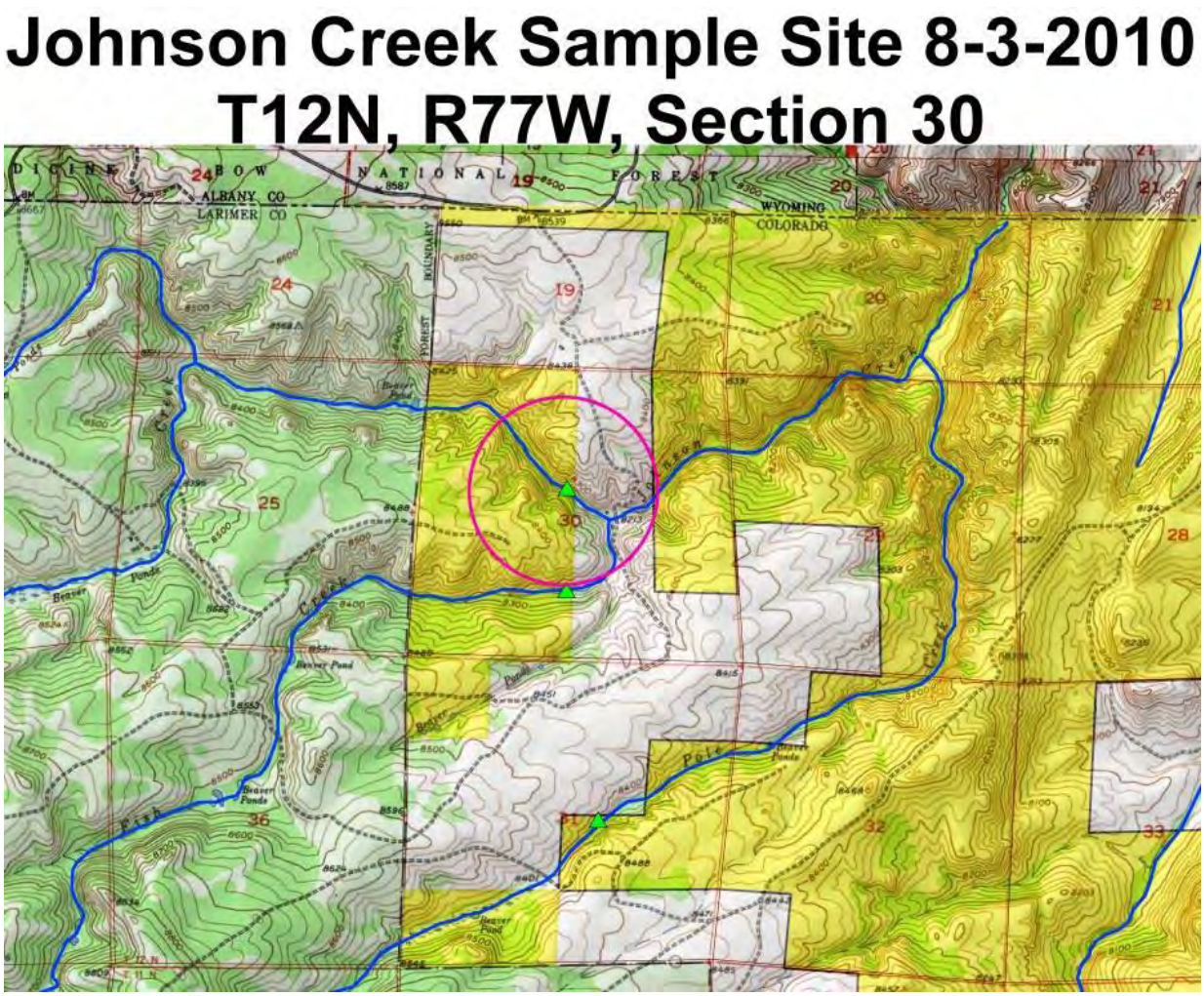
> An enlargement of 1.80 cubic feet per second is recommended for the snowmelt runoff period, from April 1 through July 15. This enlargement will bring the total instream flow rate up to 3.80 cubic feet per second. This recommendation is driven by the average velocity criteria. It is important to maintain as much usable physical habitat as possible during the summer growing season for the four fish species found in the creek.
>
> An enlargement of 0.4 cubic feet per second is recommended during late summer and early fall, from July 16 to October 31. This enlargement will bring the total instream flow rate up to 2.4 cubic feet per second. This preliminary recommendation has been reduced because of water availability. This flow rate will meet two of the three instream flow criteria, while providing an average velocity of 0.85 feet per second.
>
> Based upon the data collected, the existing instream flow rate appears to be adequate for the cold temperature months from November 1 to March 31.

Rationale for Enlargement of Instream Flow Water Right. BLM does not consider the current instream flow water right to be fully protective of the natural environment in Johnson Creek, pursuant to modern analytical procedures used by the CWCB. While 2.0 cfs does meet two of the three instream flow criteria, it does not meet all three intream flow criteria during the spring and summer, which is a critical growth and spawning period for the fish population. BLM deliberately surveyed a typical riffle with a narrow top width, and the 2.0 cfs flow rate appears to be inadequate even in the narrowest riffles that are typical in this stream.

Kremmling Field Office Stream Surveys
August 2010

Johnson Creek - Water Code #11320

Johnson Creek, located northwest of Hohnholz Lakes State Wildlife Area on BLM lands managed by the Kremmling Field Office, was sampled on August 3, 2010. Johnson Creek is tributary to the Laramie River. Sampling was done is support of the instream flow program. A two-pass removal population estimate was completed. Brown trout, brook trout, creek chubs, and white sucker were collected. Sampling was conducted via two backpack electro-shockers and a 302-foot station was sampled. Personnel present were Tom Fresques, Fish Biologist, and Gregor Dekleva and Kristy Wallner, Biological Technicians.



Johnson Creek

Johnson Creek

STREAM SURVEY FISH SAMPLING FORM

WATER _Johnson Creek_____ H2O CODE __11320_____ DATE _8/3/2010_

GEAR __Backpack Shocker_- 2_ EFFORT _____ STATION # _1_____ PASS # _1_& 2_

CREW _Fresques, Wallner, Dekleva, Johnson__DRAINAGE Laramie River_ LOCATION GPS___

Pass	species	length	weight		Pass	species	length	weight
1	WHS	324	520		2	LOC	242	150
1	CRC	117	NW		2	LOC	231	131
1	CRC	110	19					
1	CRC	112	14					
1	LOC	222	115					
1	LOC	158	NW					
1	LOC	236	132					
1	LOC	62	5					
1	LOC	176	55					
1	BRK	169	55					

GPS Location:

Notes: Stream Width __9.2_ ft. Sample Reach __302__ft.
Conductivity: ~100 ms Electroshocker settings

Discussion:

Johnson Creek was flowing at a rate of approximately 5.5 cfs 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 thick willows, sedge, alder, spruce, lodge pole pine, poa, tufted hairgrass, and redtop. The riparian area was approximately 150 feet wide. Based on limited visual observation, the stream contained caddis flies, mayflies, and stoneflies.

Brown trout of a few different age classes were collected as wells as creek chubs, brook trout, and white sucker. Conductivity was very low (approximately 100 ms) which made shocking difficult as voltage was high and fish response was fair.

Recommendations:

- Johnson Creek represents a substantial fisheries resource on BLM lands, especially since it supports four species of fish and contains more than two miles of good quality habitat. In addition, several portions of this creek do not have any instream flow protection for the fish habitat. This stream would benefit from additional instream flow appropriations.

- Periodically monitor to ensure that stream habitats remain in good condition.

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Johnson Creek					CROSS-SECTION NO.: 1	
CROSS-SECTION LOCATION: 1/2 mile upstream from conf. w/ Fish Creek						
DATE: 8-3-10	OBSERVERS: R. Smith, P. Belcher					
LEGAL DESCRIPTION	¼ SECTION: SE NW	SECTION: 30	TOWNSHIP: 12 (N)S	RANGE: 77 E(W)	PM: 6th	
COUNTY: Larimer	WATERSHED: Laramie	WATER DIVISION: 1	DOW WATER CODE: 11320			
MAP(S): USGS:	C-PS: 409127					
USFS:	4537518					

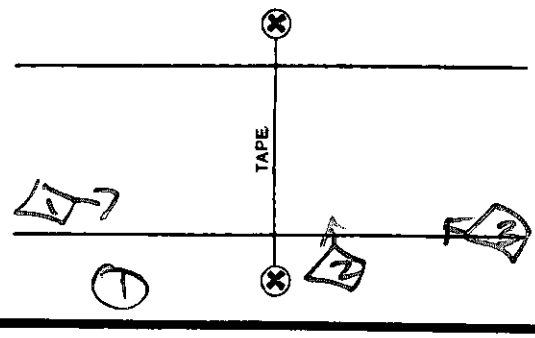
SUPPLEMENTAL DATA

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: ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: gravel to 3" cobbles	PHOTOGRAPHS TAKEN: (YES) NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	5.70 / 5.66
② WS Upstream	44.5	5.46
③ WS Downstream	43.5	6.75
SLOPE	1.29 / 88.0 = .015	

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
see report																	

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

mayfly, caddisfly, stonefly

COMMENTS

TDS: 120 Phe 8.0 Temp: 16.5°C

Willow - alder - sedge - rush riparian

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Johnson Creek | CROSS-SECTION NO.: 1 | DATE: 8-3-10 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 11 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) A Point ↓	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	0.0		4.28								
	1.4		4.78								
G	1.9		4.98								
W	2.0		5.70								
	2.1		6.10	.40	-			1.90			
	2.5		6.30	.60				1.76			
	3		6.35	.65				1.73			
	3.5		6.20	.50				1.82			
	4		6.15	.45				1.78			
	4.5		6.00	.30				1.61			
	5		6.10	.40				2.04			
	5.5		5.95	.25				1.96			
	6		6.05	.35				1.48			
	6.5		6.05	.35				2.22			
	7		6.05	.35				1.18			
	7.5		6.10	.40				1.40			
	8		6.00	.30				1.31			
	8.5		6.05	.35				1.94			
	9		6.00	.30				1.16			
	9.5		6.10	.40				0.67			
	10		5.95	.25				0.75			
	10.5		5.90	.20				1.15			
	11		5.90	.20				.94			
	11.5		5.85	.15				.15			
	12		5.95	.25				.08			
	12.5		5.80	.10				0			
W	12.8		5.70								
G	13.1		4.92								
	14.0		4.58								
LS	14.5		4.50								
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:	Johnson Creek
XS LOCATION:	0.5 mile u/s from conf. w/ Fish Creek
XS NUMBER:	1
DATE:	3-Aug-10
OBSERVERS:	R. Smith, P. Belcher
1/4 SEC:	SE NW
SECTION:	30
TWP:	12N
RANGE:	77W
PM:	6th
COUNTY:	Larimer
WATERSHED:	Laramie River
DIVISION:	1
DOW CODE:	11320
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

SLOPE:	0.015

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

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

STREAM NAME: Johnson Creek
XS LOCATION: 0.5 mile u/s from conf. w/ Fish Creek
XS NUMBER: 1

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
RS	0.00	4.28			0.00		0.00	0.00	0.0%
	1.40	4.78			0.00		0.00	0.00	0.0%
1 G	1.90	4.98			0.00		0.00	0.00	0.0%
W	2.00	5.70	0.00	0.00	0.00		0.00	0.00	0.0%
	2.10	6.10	0.40	1.90	0.41	0.40	0.10	0.19	3.6%
	2.50	6.30	0.60	1.76	0.45	0.60	0.27	0.48	9.0%
	3.00	6.35	0.65	1.73	0.50	0.65	0.33	0.56	10.6%
	3.50	6.20	0.50	1.82	0.52	0.50	0.25	0.46	8.6%
	4.00	6.15	0.45	1.78	0.50	0.45	0.23	0.40	7.6%
	4.50	6.00	0.30	1.61	0.52	0.30	0.15	0.24	4.6%
	5.00	6.10	0.40	2.04	0.51	0.40	0.20	0.41	7.7%
	5.50	5.95	0.25	1.96	0.52	0.25	0.13	0.25	4.6%
	6.00	6.05	0.35	1.48	0.51	0.35	0.18	0.26	4.9%
	6.50	6.05	0.35	2.22	0.50	0.35	0.18	0.39	7.4%
	7.00	6.05	0.35	1.18	0.50	0.35	0.18	0.21	3.9%
	7.50	6.10	0.40	1.40	0.50	0.40	0.20	0.28	5.3%
	8.00	6.00	0.30	1.31	0.51	0.30	0.15	0.20	3.7%
	8.50	6.05	0.35	1.94	0.50	0.35	0.18	0.34	6.4%
	9.00	6.00	0.30	1.16	0.50	0.30	0.15	0.17	3.3%
	9.50	6.10	0.40	0.67	0.51	0.40	0.20	0.13	2.5%
	10.00	5.95	0.25	0.75	0.52	0.25	0.13	0.09	1.8%
	10.50	5.90	0.20	1.15	0.50	0.20	0.10	0.12	2.2%
	11.00	5.90	0.20	0.94	0.50	0.20	0.10	0.09	1.8%
	11.50	5.85	0.15	0.15	0.50	0.15	0.08	0.01	0.2%
	12.00	5.95	0.25	0.08	0.51	0.25	0.13	0.01	0.2%
	12.50	5.80	0.10	0.00	0.52	0.10	0.04	0.00	0.0%
W	12.80	5.70	0.00	0.00	0.32		0.00	0.00	0.0%
1 G	13.10	4.92			0.00		0.00	0.00	0.0%
	14.00	4.58			0.00		0.00	0.00	0.0%
LS	14.50	4.56			0.00		0.00	0.00	0.0%
TOTALS ----------					11.35	0.65 (Max.)	3.61	5.28	100.0%

Manning's n = 0.0580
Hydraulic Radius= 0.31798338

STREAM NAME: Johnson Creek
XS LOCATION: 0.5 mile u/s from conf. w/ Fish Creek
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.61	3.61	0.0%
5.45	3.61	6.33	75.2%
5.47	3.61	6.11	69.2%
5.49	3.61	5.89	63.1%
5.51	3.61	5.67	57.1%
5.53	3.61	5.45	51.1%
5.55	3.61	5.24	45.0%
5.57	3.61	5.02	39.0%
5.59	3.61	4.80	33.0%
5.61	3.61	4.58	27.0%
5.63	3.61	4.37	21.0%
5.65	3.61	4.15	15.0%
5.66	3.61	4.04	12.0%
5.67	3.61	3.93	9.0%
5.68	3.61	3.83	6.0%
5.69	3.61	3.72	3.0%
5.70	3.61	3.61	0.0%
5.71	3.61	3.50	-3.0%
5.72	3.61	3.39	-6.0%
5.73	3.61	3.29	-8.9%
5.74	3.61	3.18	-11.9%
5.75	3.61	3.07	-14.8%
5.77	3.61	2.86	-20.7%
5.79	3.61	2.65	-26.6%
5.81	3.61	2.44	-32.4%
5.83	3.61	2.23	-38.1%
5.85	3.61	2.03	-43.9%
5.87	3.61	1.82	-49.5%
5.89	3.61	1.63	-54.8%
5.91	3.61	1.45	-59.9%
5.93	3.61	1.28	-64.6%
5.95	3.61	1.12	-69.1%

WATERLINE AT ZERO
AREA ERROR = 5.700

STREAM NAME: Johnson Creek
XS LOCATION: 0.5 mile u/s from conf. w/ Fish Creek
XS NUMBER: 1

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.98	11.18	1.03	1.37	11.52	12.85	100.0%	0.90	33.63	2.92
	5.00	11.17	1.01	1.35	11.30	12.81	99.7%	0.88	32.62	2.89
	5.05	11.14	0.96	1.30	10.74	12.71	98.9%	0.85	30.14	2.81
	5.10	11.11	0.92	1.25	10.18	12.60	98.1%	0.81	27.74	2.72
	5.15	11.09	0.87	1.20	9.63	12.50	97.2%	0.77	25.41	2.64
	5.20	11.06	0.82	1.15	9.08	12.39	96.4%	0.73	23.15	2.55
	5.25	11.04	0.77	1.10	8.52	12.29	95.6%	0.69	20.96	2.46
	5.30	11.01	0.72	1.05	7.97	12.19	94.8%	0.65	18.86	2.37
	5.35	10.98	0.68	1.00	7.42	12.08	94.0%	0.61	16.84	2.27
	5.40	10.96	0.63	0.95	6.87	11.98	93.2%	0.57	14.90	2.17
	5.45	10.93	0.58	0.90	6.33	11.87	92.4%	0.53	13.05	2.06
	5.50	10.90	0.53	0.85	5.78	11.77	91.6%	0.49	11.30	1.95
	5.55	10.88	0.48	0.80	5.24	11.66	90.8%	0.45	9.64	1.84
	5.60	10.85	0.43	0.75	4.69	11.56	90.0%	0.41	8.08	1.72
	5.65	10.83	0.38	0.70	4.15	11.46	89.2%	0.36	6.62	1.60
WL	5.70	10.80	0.33	0.65	3.61	11.35	88.3%	0.32	5.28	1.46
	5.75	10.64	0.29	0.60	3.07	11.14	86.7%	0.28	4.09	1.33
	5.80	10.47	0.24	0.55	2.55	10.93	85.1%	0.23	3.03	1.19
	5.85	10.30	0.20	0.50	2.03	10.71	83.3%	0.19	2.10	1.03
	5.90	8.87	0.17	0.45	1.54	9.22	71.8%	0.17	1.46	0.95
	5.95	7.94	0.14	0.40	1.12	8.24	64.1%	0.14	0.92	0.83
	6.00	7.34	0.10	0.35	0.73	7.59	59.0%	0.10	0.48	0.66
	6.05	3.83	0.11	0.30	0.43	3.99	31.0%	0.11	0.30	0.71
	6.10	2.07	0.14	0.25	0.28	2.15	16.7%	0.13	0.23	0.81
	6.15	1.80	0.10	0.20	0.18	1.86	14.5%	0.10	0.12	0.67
	6.20	1.20	0.09	0.15	0.11	1.25	9.7%	0.09	0.07	0.62
	6.25	0.93	0.06	0.10	0.06	0.96	7.5%	0.06	0.03	0.48
	6.30	0.67	0.02	0.05	0.02	0.68	5.3%	0.02	0.00	0.27

STREAM NAME: Johnson Creek
XS LOCATION: 0.5 mile u/s from conf. w/ Fish Creek
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	5.28	cfs
CALCULATED FLOW (Qc)=	5.28	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	5.70	ft
CALCULATED WATERLINE (WLc)=	5.70	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.65	ft
MAX CALCULATED DEPTH (Dc)=	0.65	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.46	ft/sec
MANNING'S N=	0.058	
SLOPE=	0.015	ft/ft
.4 * Qm =	2.1	cfs
2.5 * Qm=	13.2	cfs

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

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

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

_____
_____
_____
_____
_____
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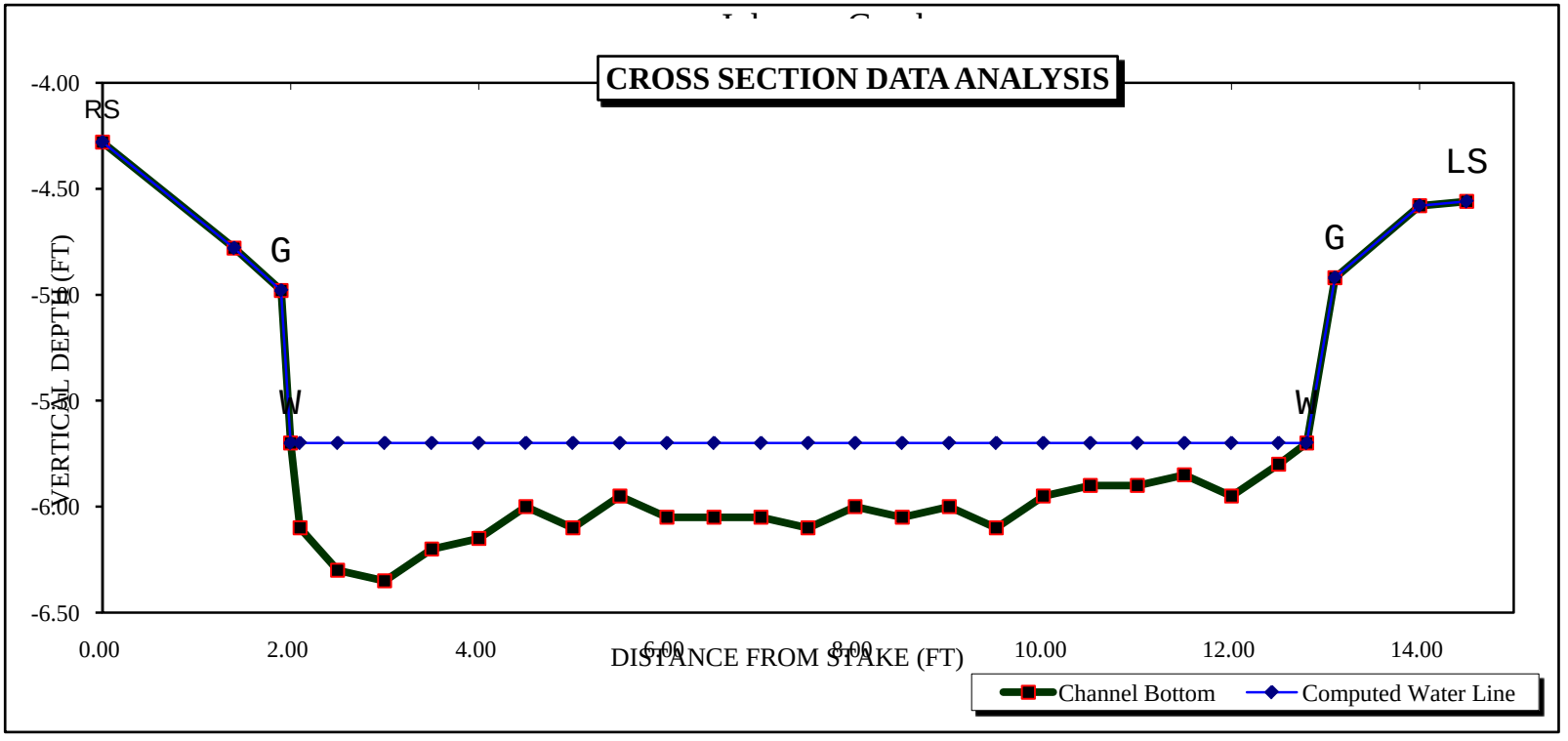
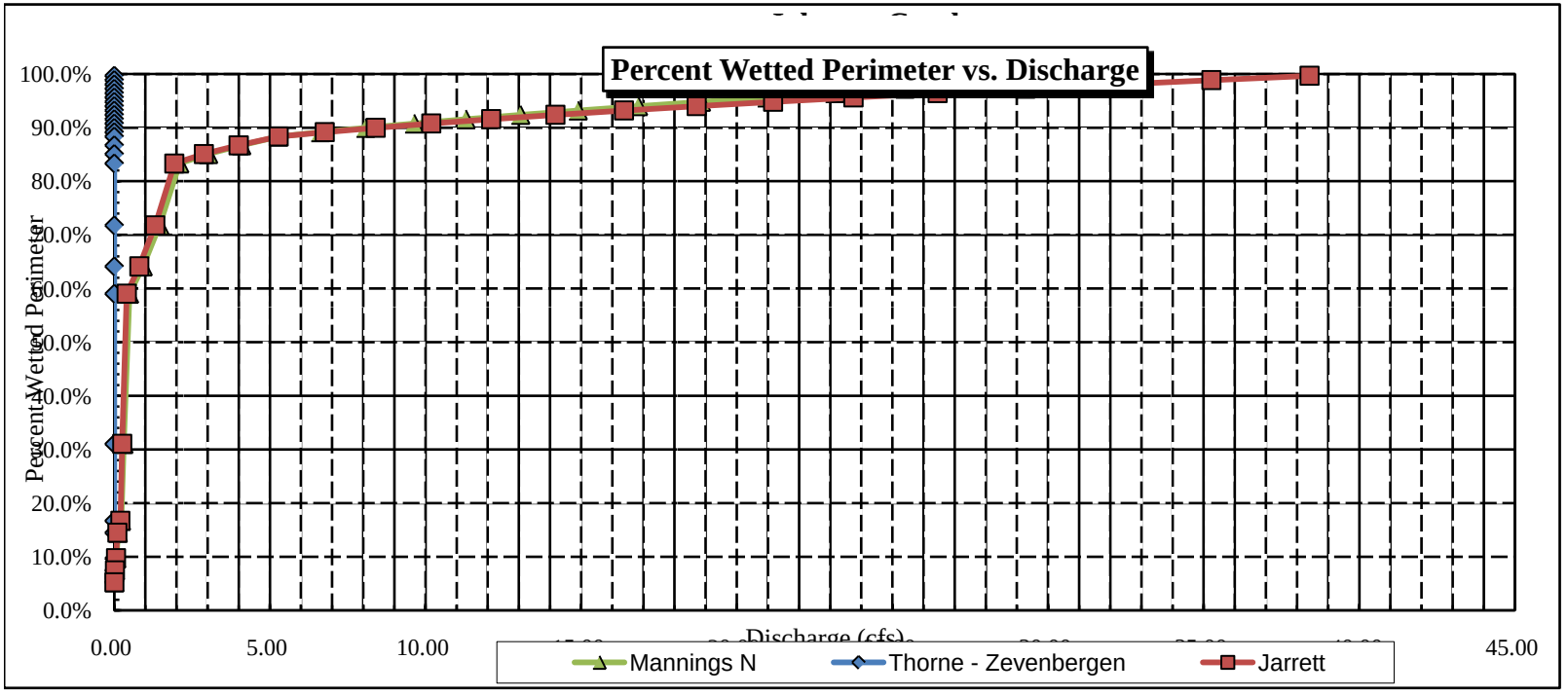
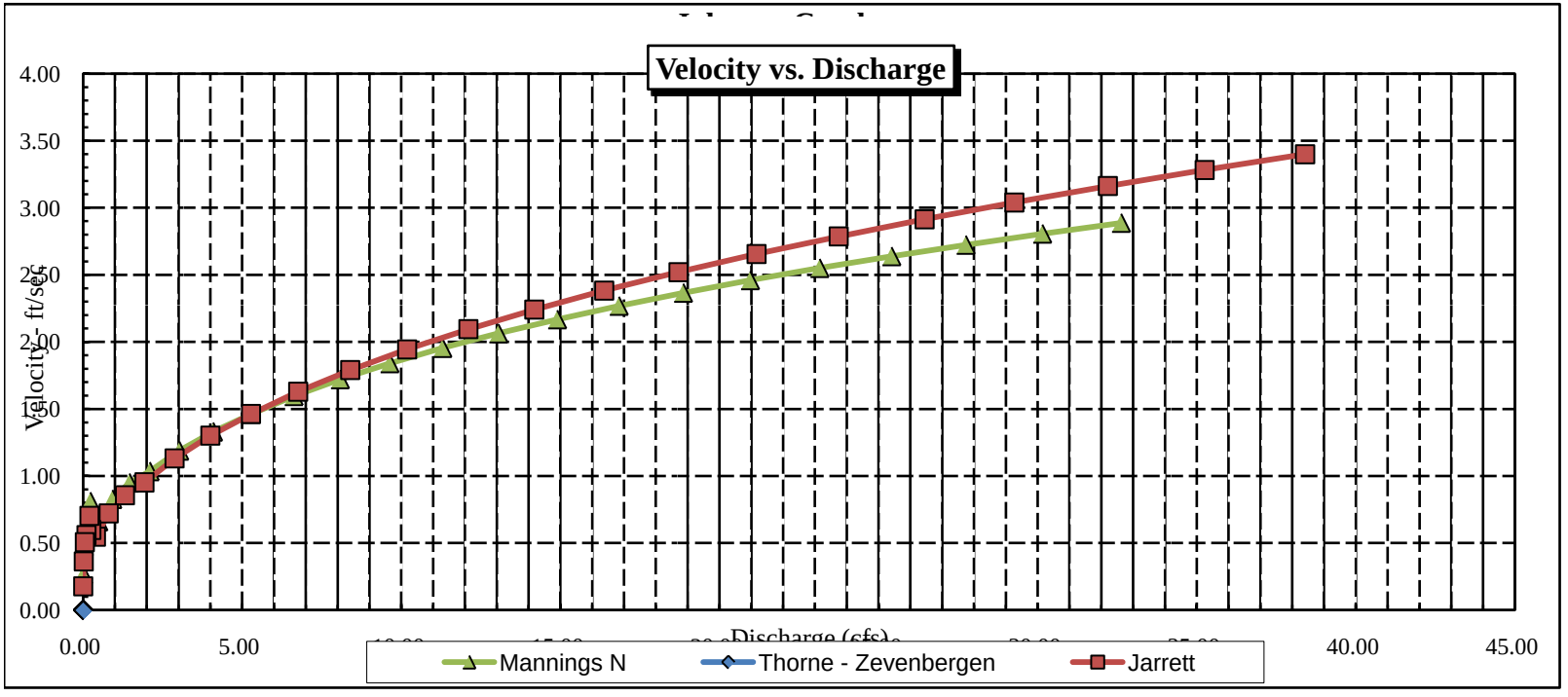
_____

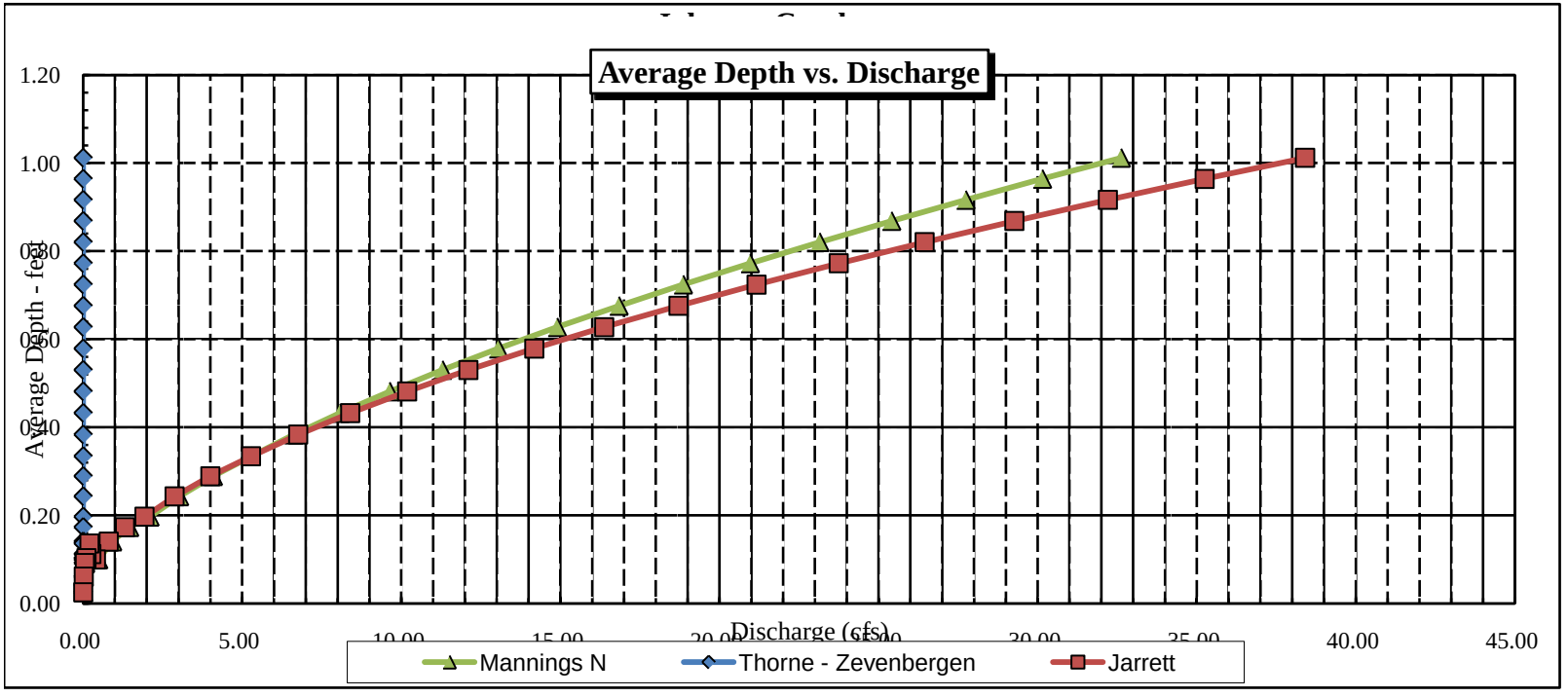
RECOMMENDATION BY: ..... AGENCY..... DATE:.....

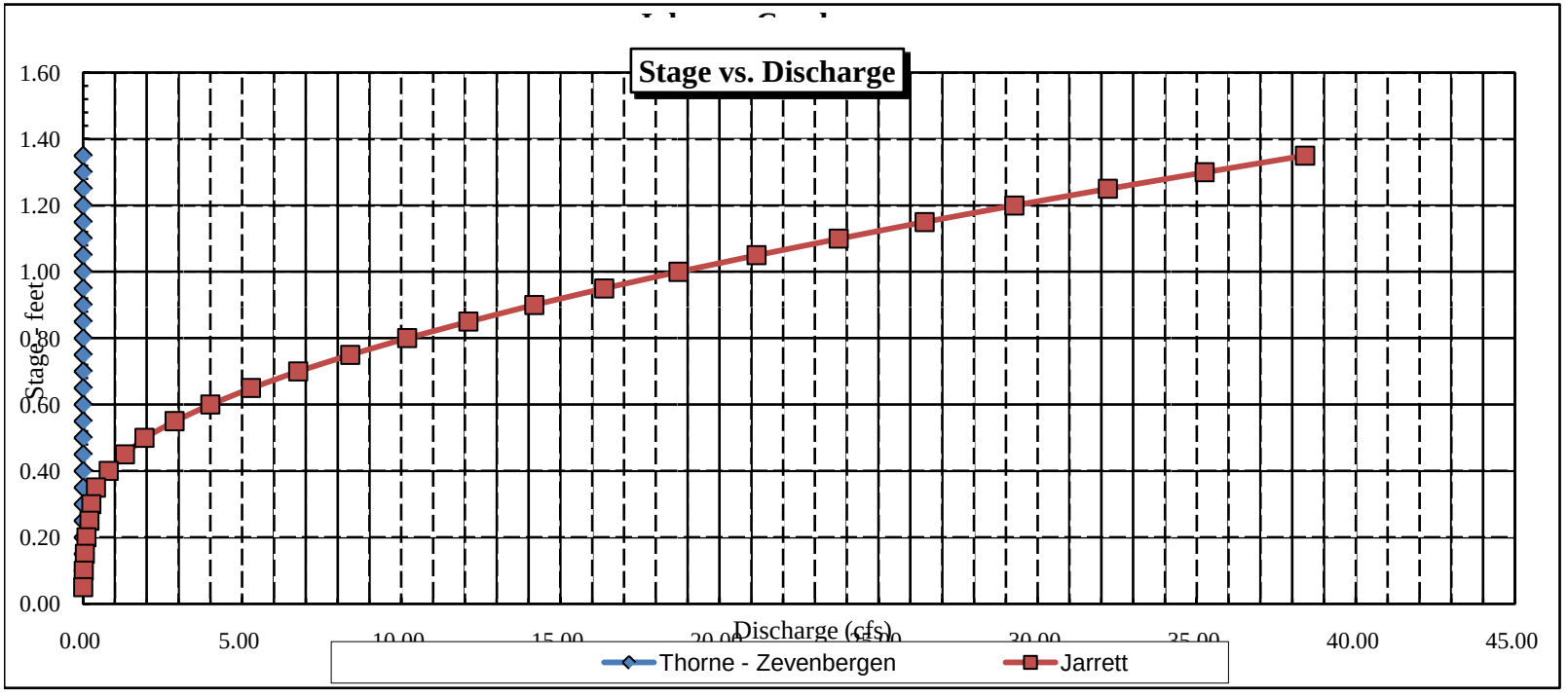
CWCB REVIEW BY: ..... DATE:.....


CROSS SECTION DATA ANALYSIS
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
VERTICAL DEPTH (FT)
RS
G
W
G
W
LS
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
5.00
10.00
45.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Velocity - ft/sec
0.00
5.00
40.00
45.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
Stage - feet
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
5.00
40.00
45.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Johnson Creek					CROSS-SECTION NO.: 2	
CROSS-SECTION LOCATION: 1/3 mile upstream from conf. w/ Fish Creek						
DATE: 8-3-10	OBSERVERS: R. Smith, P. Belcher					
LEGAL DESCRIPTION	¼ SECTION: SE NW	SECTION: 30	TOWNSHIP: 12 (N)/S	RANGE: 77 E/(W)	PM: 6th	
COUNTY: Larimer	WATERSHED: Laramie R.	WATER DIVISION: 1	DOW WATER CODE: 11320			
MAP(S): USGS:	C-DS 409047					
USFS:	4537608					

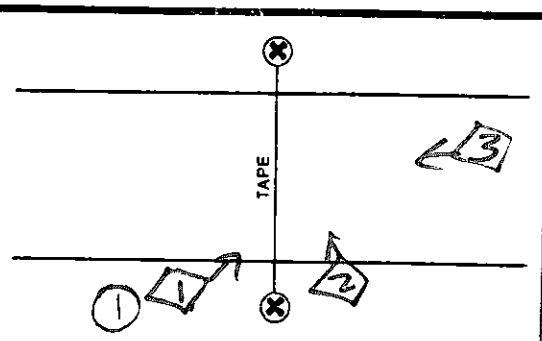
SUPPLEMENTAL DATA

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: ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: gravel to 8" cobbles	PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(X) Tape @ Stake LB	0.0	surveyed
(X) Tape @ Stake RB	0.0	surveyed
(1) WS @ Tape LB/RB	0.0	6.40 / 6.40
(2) WS Upstream	43.0	5.75
(3) WS Downstream	36.4	6.95
SLOPE	1.20 / 79.4 = .015	

SKETCH



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

AQUATIC SAMPLING SUMMARY

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

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

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

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

mayfly, caddisfly, stonefly

COMMENTS

TDS = 120 Ph = 8.0 Temp = 16.5°C

Willow - alder - sedge - rush riparian community.

FD 1-86

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Johnson Creek	CROSS-SECTION NO.: 2	DATE: 8-3-10	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 11:45 GW

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft) ↓	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) ↓ At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		4.96								
	1.0		5.22								
G	1.5		5.55								
W	1.7		6.40								
	2.0		6.70	.30				1.34			
	2.5		6.60	.20				1.54			
	3.0		6.50	.10				.58			
	3.5		6.50	.10				1.41			
	4.0		6.60	.20				1.45			
	4.5		6.65	.25				1.43			
	5.0		6.70	.30				1.32			
	5.5		6.75	.40				1.57			
	6.0		6.85	.45				1.96			
	6.5		6.90	.50				2.47			
	7.0		6.90	.50				2.54			
	7.5		6.90	.50				2.64			
	8.0		6.90	.50				2.51			
	8.5		6.80	.40				1.34			
	9.0		6.80	.40				1.21			
	9.5		6.80	.40				1.55			
	10.0		6.65	.25				.88			
	10.5		6.65	.25				1.96			
	11.0		6.55	.15				1.49			
	11.5		6.50	.10				1.32			
	12.0		6.50	.10				1.02			
W	12.4		6.40								
	13.8		5.65								
	15.0		5.35								
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:	Johnson Creek
XS LOCATION:	0.33 mile upstream fr conf. w/ Fish Ck.
XS NUMBER:	2
DATE:	3-Aug-10
OBSERVERS:	R. Smith, P. Belcher
1/4 SEC:	SE NW
SECTION:	30
TWP:	12N
RANGE:	77W
PM:	6th
COUNTY:	Larimer
WATERSHED:	Laramie River
DIVISION:	1
DOW CODE:	11320
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

SLOPE:	0.015

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

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

STREAM NAME: Johnson Creek
XS LOCATION: 0.33 mile upstream fr conf. w/ Fish Ck.
XS NUMBER: 2

DATA POINTS= 28

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	LS	0.00	4.96			0.00		0.00	0.00	0.0%
		1.00	5.22			0.00		0.00	0.00	0.0%
1	G	1.50	5.55			0.00		0.00	0.00	0.0%
	W	1.70	6.40	0.00	0.00	0.00		0.00	0.00	0.0%
		2.00	6.70	0.30	1.34	0.42	0.30	0.12	0.16	2.9%
		2.50	6.60	0.20	1.54	0.51	0.20	0.10	0.15	2.7%
		3.00	6.50	0.10	0.58	0.51	0.10	0.05	0.03	0.5%
		3.50	6.50	0.10	1.41	0.50	0.10	0.05	0.07	1.3%
		4.00	6.60	0.20	1.45	0.51	0.20	0.10	0.15	2.6%
		4.50	6.65	0.25	1.43	0.50	0.25	0.13	0.18	3.2%
		5.00	6.70	0.30	1.32	0.50	0.30	0.15	0.20	3.5%
		5.50	6.75	0.40	1.57	0.50	0.40	0.20	0.31	5.6%
		6.00	6.85	0.45	1.96	0.51	0.45	0.23	0.44	7.8%
		6.50	6.90	0.50	2.47	0.50	0.50	0.25	0.62	11.0%
		7.00	6.90	0.50	2.54	0.50	0.50	0.25	0.64	11.3%
		7.50	6.90	0.50	2.64	0.50	0.50	0.25	0.66	11.7%
		8.00	6.90	0.50	2.51	0.50	0.50	0.25	0.63	11.1%
		8.50	6.80	0.40	1.34	0.51	0.40	0.20	0.27	4.8%
		9.00	6.80	0.40	1.21	0.50	0.40	0.20	0.24	4.3%
		9.50	6.80	0.40	1.55	0.50	0.40	0.20	0.31	5.5%
		10.00	6.65	0.25	0.88	0.52	0.25	0.13	0.11	2.0%
		10.50	6.65	0.25	1.96	0.50	0.25	0.13	0.25	4.4%
		11.00	6.55	0.15	1.49	0.51	0.15	0.08	0.11	2.0%
		11.50	6.50	0.10	1.32	0.50	0.10	0.05	0.07	1.2%
		12.00	6.50	0.10	1.02	0.50	0.10	0.05	0.05	0.8%
	W	12.40	6.40	0.00	0.00	0.41		0.00	0.00	0.0%
1	G	13.80	5.65			0.00		0.00	0.00	0.0%
	RS	15.00	5.35			0.00		0.00	0.00	0.0%
	TOTALS ----------					10.93	0.5 (Max.)	3.14	5.63	100.0%

Manning's n = 0.0442
Hydraulic Radius= 0.28727034

STREAM NAME: Johnson Creek
XS LOCATION: 0.33 mile upstream fr conf. w/ Fish Ck.
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.14	3.12	-0.8%
6.15	3.14	5.86	86.5%
6.17	3.14	5.63	79.4%
6.19	3.14	5.41	72.2%
6.21	3.14	5.19	65.2%
6.23	3.14	4.96	58.1%
6.25	3.14	4.74	51.1%
6.27	3.14	4.52	44.1%
6.29	3.14	4.30	37.1%
6.31	3.14	4.09	30.1%
6.33	3.14	3.87	23.2%
6.35	3.14	3.65	16.3%
6.36	3.14	3.54	12.9%
6.37	3.14	3.44	9.5%
6.38	3.14	3.33	6.0%
6.39	3.14	3.22	2.6%
6.40	3.14	3.12	-0.8%
6.41	3.14	3.01	-4.2%
6.42	3.14	2.90	-7.6%
6.43	3.14	2.80	-10.9%
6.44	3.14	2.69	-14.3%
6.45	3.14	2.59	-17.6%
6.47	3.14	2.38	-24.3%
6.49	3.14	2.17	-30.8%
6.51	3.14	1.98	-37.0%
6.53	3.14	1.80	-42.6%
6.55	3.14	1.64	-47.9%
6.57	3.14	1.48	-53.0%
6.59	3.14	1.32	-57.9%
6.61	3.14	1.18	-62.5%
6.63	3.14	1.04	-67.0%
6.65	3.14	0.91	-71.1%

WATERLINE AT ZERO
AREA ERROR = 6.398

STREAM NAME: Johnson Creek
XS LOCATION: 0.33 mile upstream fr conf. w/ Fish Ck.
XS NUMBER: 2

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.65	12.28	0.96	1.25	11.73	13.29	100.0%	0.88	44.46	3.79
	5.70	12.18	0.92	1.20	11.15	13.14	98.9%	0.85	41.15	3.69
	5.75	12.07	0.87	1.15	10.54	12.98	97.7%	0.81	37.79	3.58
	5.80	11.97	0.83	1.10	9.94	12.82	96.5%	0.78	34.55	3.48
	5.85	11.86	0.79	1.05	9.35	12.67	95.3%	0.74	31.42	3.36
	5.90	11.76	0.74	1.00	8.76	12.51	94.1%	0.70	28.42	3.25
	5.95	11.65	0.70	0.95	8.17	12.35	93.0%	0.66	25.54	3.13
	6.00	11.55	0.66	0.90	7.59	12.20	91.8%	0.62	22.78	3.00
	6.05	11.44	0.61	0.85	7.02	12.04	90.6%	0.58	20.16	2.87
	6.10	11.34	0.57	0.80	6.45	11.88	89.4%	0.54	17.66	2.74
	6.15	11.23	0.52	0.75	5.88	11.72	88.2%	0.50	15.29	2.60
	6.20	11.13	0.48	0.70	5.32	11.57	87.0%	0.46	13.07	2.45
	6.25	11.02	0.43	0.65	4.77	11.41	85.9%	0.42	10.98	2.30
	6.30	10.92	0.39	0.60	4.22	11.25	84.7%	0.38	9.04	2.14
	6.35	10.81	0.34	0.55	3.68	11.10	83.5%	0.33	7.25	1.97
WL	6.40	10.70	0.29	0.50	3.14	10.94	82.3%	0.29	5.63	1.79
	6.45	10.46	0.25	0.45	2.61	10.67	80.3%	0.24	4.21	1.61
	6.50	10.21	0.21	0.40	2.09	10.39	78.2%	0.20	2.96	1.42
	6.55	8.20	0.20	0.35	1.66	8.34	62.8%	0.20	2.32	1.40
	6.60	7.39	0.17	0.30	1.27	7.50	56.4%	0.17	1.59	1.26
	6.65	6.35	0.15	0.25	0.92	6.43	48.4%	0.14	1.04	1.13
	6.70	4.88	0.13	0.20	0.65	4.92	37.0%	0.13	0.70	1.07
	6.75	4.20	0.10	0.15	0.43	4.23	31.8%	0.10	0.38	0.89
	6.80	3.77	0.06	0.10	0.23	3.79	28.5%	0.06	0.14	0.63
	6.85	2.27	0.04	0.05	0.10	2.28	17.2%	0.04	0.05	0.51
	6.90	1.54	0.00	0.00	0.00	1.54	11.6%	0.00	0.00	0.07

STREAM NAME: Johnson Creek
XS LOCATION: 0.33 mile upstream fr conf. w/ Fish Ck.
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	5.63	cfs
CALCULATED FLOW (Qc)=	5.63	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	6.40	ft
CALCULATED WATERLINE (WLc)=	6.40	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	-0.5	%
MEAN VELOCITY=	1.79	ft/sec
MANNING'S N=	0.044	
SLOPE=	0.015	ft/ft
.4 * Qm =	2.3	cfs
2.5 * Qm=	14.1	cfs

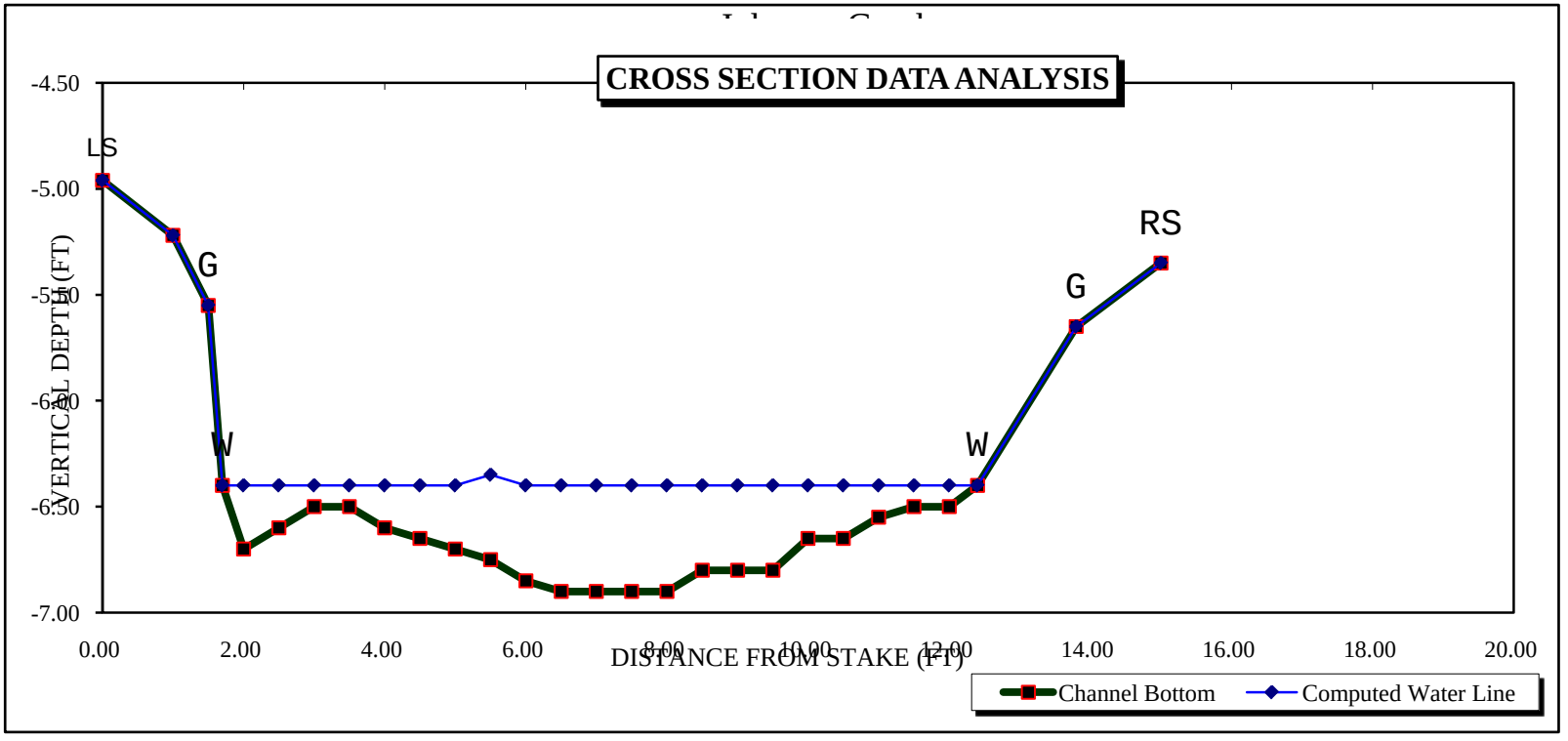
RECOMMENDED INSTREAM FLOW:
=============================

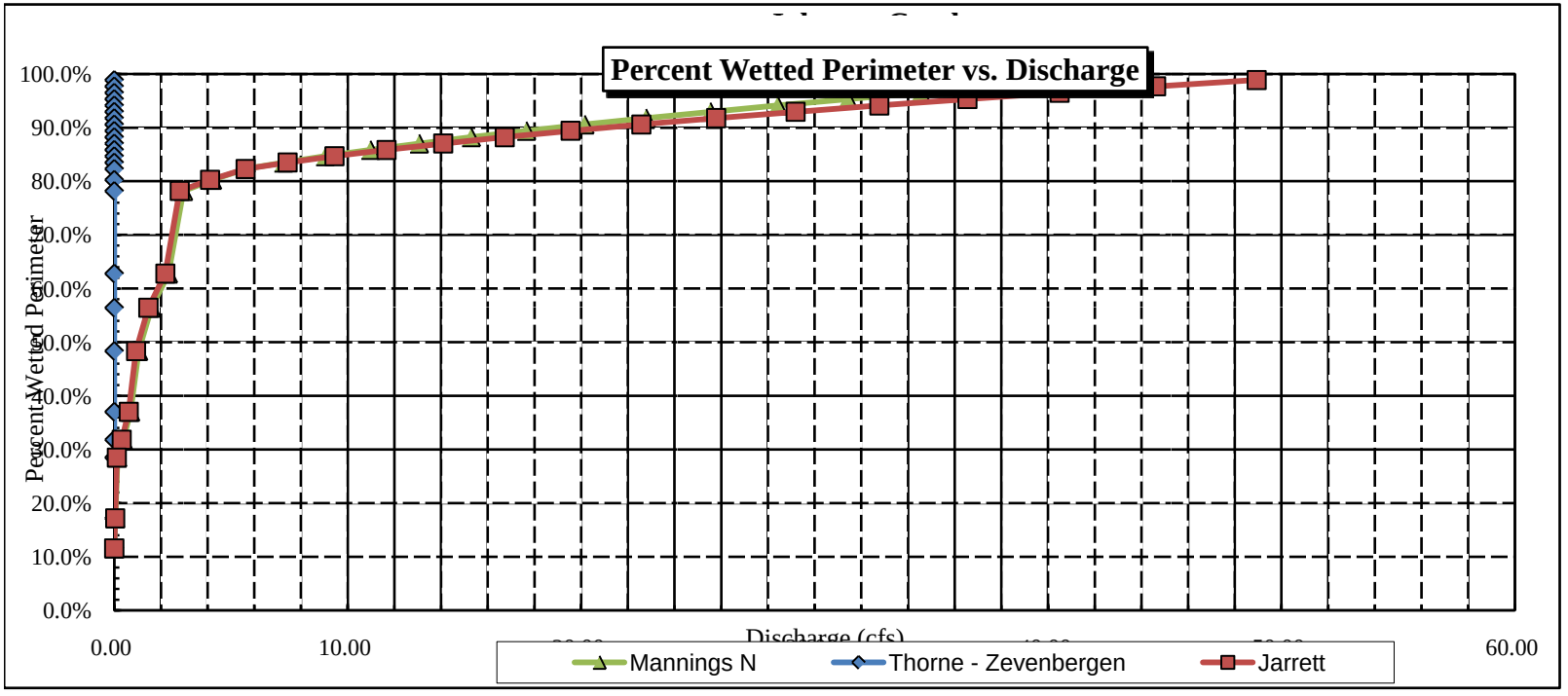
FLOW (CFS)	PERIOD
___________	___________
___________	___________
___________	___________
___________	___________

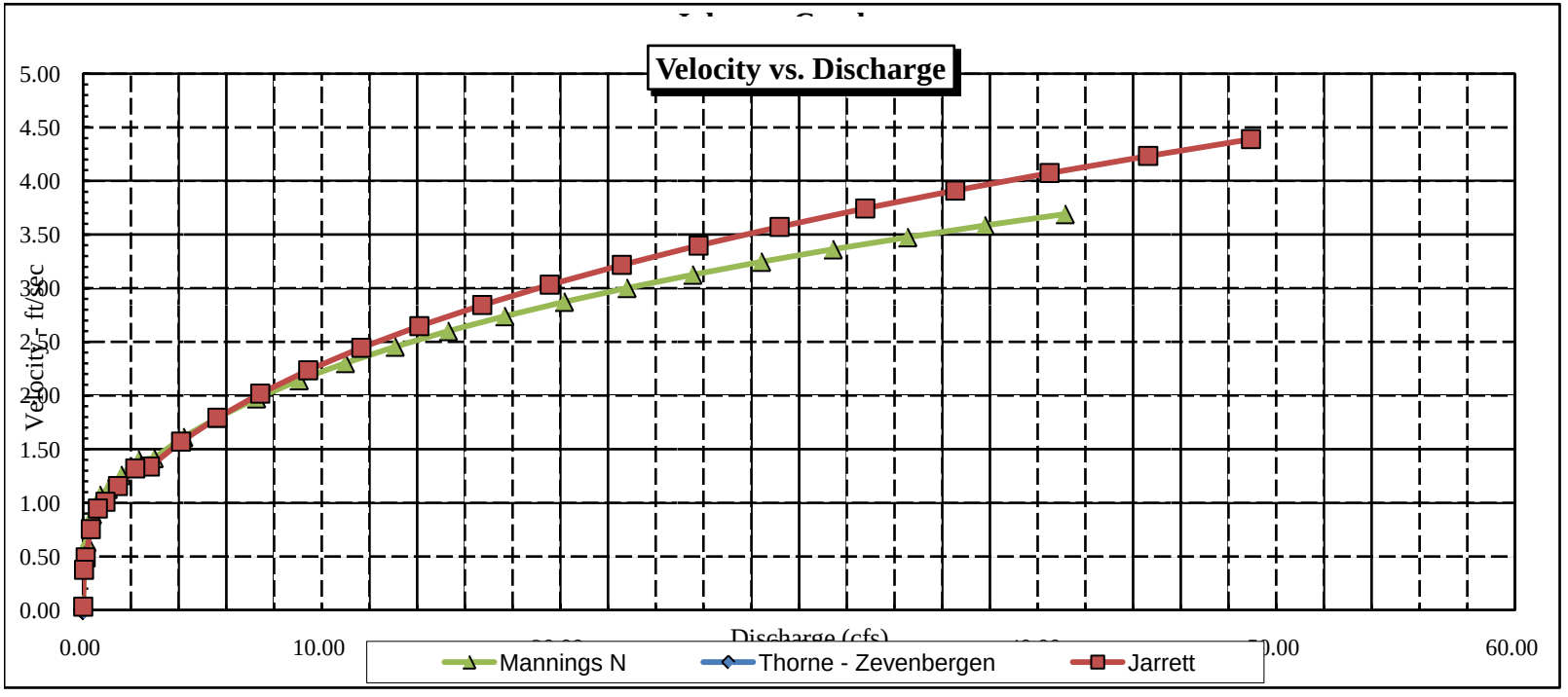
RATIONALE FOR RECOMMENDATION:
=============================

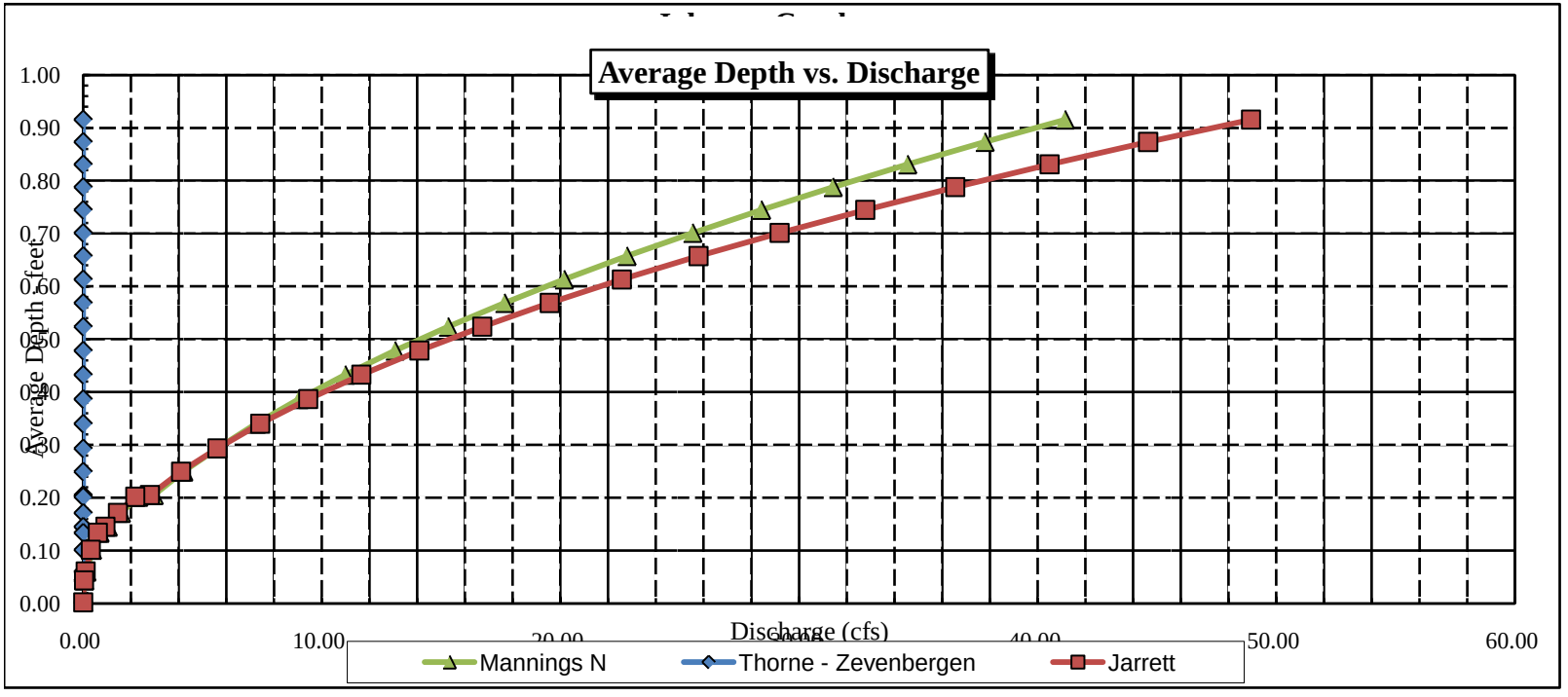
RECOMMENDATION BY: ………………………………………………… AGENCY…………………………………………… DATE:…………………………

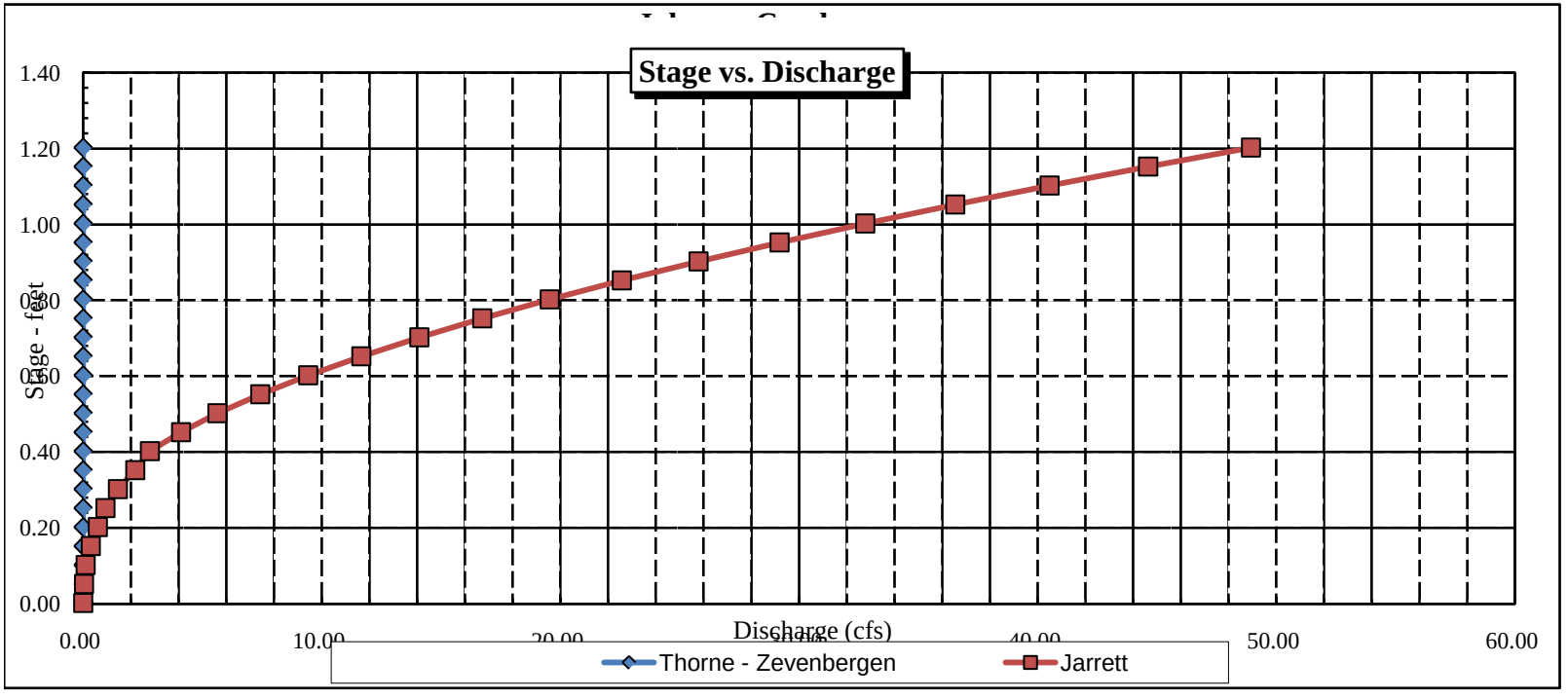
CWCB REVIEW BY: ……………………………………………………………………………………………………… DATE:…………………………


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
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
10.00
60.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Velocity - ft/sec
0.00
10.00
60.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
10.00
20.00
40.00
50.00
60.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
Stage - feet
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
10.00
20.00
40.00
50.00
60.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Johnson Creek					CROSS-SECTION NO.: 3	
CROSS-SECTION LOCATION: 1/4 mile upstream from conf. w/ Pole Creek						
DATE: 9-17-10	OBSERVERS: R. Smith, P Belcher, J. Thompson					
LEGAL DESCRIPTION	¼ SECTION: SW SE	SECTION: 20	TOWNSHIP: 12 (N)S	RANGE: 77 E(W)	PM: 6th	
COUNTY: Larimer	WATERSHED: Laramie R.	WATER DIVISION: 1	DOW WATER CODE: 11320			
MAP(S): USGS:	GPS = 410883					
USFS:	4538094					

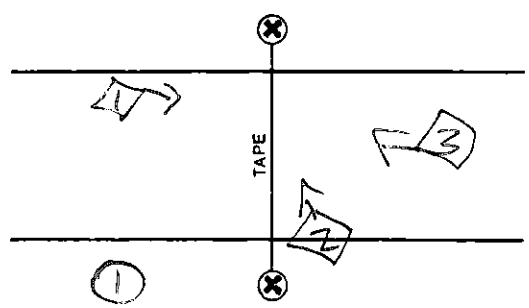
SUPPLEMENTAL DATA

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: ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: 4" cobbles to 2-foot boulders	PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(X) Tape @ Stake LB	0.0	surveyed
(X) Tape @ Stake RB	0.0	surveyed
(1) WS @ Tape LB/RB	0.0	6.06 / 6.04
(2) WS Upstream	20.8	5.86
(3) WS Downstream	15.5	6.73
SLOPE	0.87 / 36.3 = .024	

SKETCH



AQUATIC SAMPLING SUMMARY

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

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

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

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

caddisfly, mayfly, stonefly

COMMENTS

pH: 8.2

Temp: 8.5°C

TDS: 100

willow - sedge - rush riparian

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Johnson Creek	CROSS-SECTION NO.: 3	DATE: 9-17-10	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM. (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: ____ ft	TIME: 11 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)
RS	0.0		4.04								
G	1.0		4.81								
	2.0		5.29								
	2.8		5.46								
W	3.3		6.05	0	-						
4.5 >	4.0		6.20	.15	< .25			1.75	< 1.74		
	5.0		6.25	.20				0.10			
	6.0		6.30	.25				0.0			
	7.0		6.35	.30				.62			
	7.5		6.45	.40				.75			
	8.0		6.40	.35	< .25			1.70	< 1.51		
	8.5		6.35	.30				1.31			
	9.0		6.30	.25				1.64			
	9.5		6.35	.30				0.97			
	10.0		6.35	.30				0.17			
	10.5		6.40	.35				0.08			
	11.0		6.40	.35				1.26			
	11.5		6.40	.35				1.17			
	12.0		6.20	.15				0.03			
	12.5		6.25	.20				0.44			
	13.0		6.45	.40				0.24			
	14.0		6.25	.20				0.67			
	15.0		6.10	.05				0.0			
	16.0		6.10	.05				0.0			
	17.0		6.10	.05				0.0			
W	17.4		6.05	0							
	18.0		5.62								
	19.0		5.36								
LST G	20.5		4.89								
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:	Johnson Creek
XS LOCATION:	1/4 mi u/s fr conf. w/ Pole Creek
XS NUMBER:	3
DATE:	17-Sep-10
OBSERVERS:	R. Smith, P. Belcher, J. Thompson
1/4 SEC:	SW SE
SECTION:	20
TWP:	12N
RANGE:	77W
PM:	Sixth
COUNTY:	Larimer
WATERSHED:	Laramie River
DIVISION:	1
DOW CODE:	11320
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

SLOPE:	0.024

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

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

STREAM NAME: Johnson Creek
XS LOCATION: 1/4 mi u/s fr conf. w/ Pole Creek
XS NUMBER: 3

DATA POINTS= 31

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
RS	0.00	4.04			0.00		0.00	0.00	0.0%
1 G	1.00	4.81			0.00		0.00	0.00	0.0%
	2.00	5.29			0.00		0.00	0.00	0.0%
	2.80	5.46			0.00		0.00	0.00	0.0%
W	3.30	6.05	0.00	0.00	0.00		0.00	0.00	0.0%
	4.00	6.20	0.15	1.75	0.72	0.15	0.09	0.16	7.1%
	4.50	6.25	0.25	1.74	0.50	0.25	0.13	0.22	9.8%
	5.00	6.25	0.20	0.10	0.50	0.20	0.15	0.02	0.7%
	6.00	6.30	0.25	0.00	1.00	0.25	0.25	0.00	0.0%
	7.00	6.35	0.30	0.62	1.00	0.30	0.23	0.14	6.3%
	7.50	6.45	0.40	0.75	0.51	0.40	0.20	0.15	6.8%
	8.00	6.40	0.35	1.70	0.50	0.35	0.13	0.22	10.1%
	8.25	6.30	0.25	1.51	0.27	0.25	0.06	0.09	4.3%
	8.50	6.35	0.30	1.31	0.25	0.30	0.11	0.15	6.7%
	9.00	6.30	0.25	1.64	0.50	0.25	0.13	0.21	9.3%
	9.50	6.35	0.30	0.97	0.50	0.30	0.15	0.15	6.6%
	10.00	6.35	0.30	0.17	0.50	0.30	0.15	0.03	1.2%
	10.50	6.40	0.35	0.08	0.50	0.35	0.18	0.01	0.6%
	11.00	6.40	0.35	1.26	0.50	0.35	0.18	0.22	10.0%
	11.50	6.40	0.35	1.17	0.50	0.35	0.18	0.20	9.3%
	12.00	6.20	0.15	0.03	0.54	0.15	0.08	0.00	0.1%
	12.50	6.25	0.20	0.44	0.50	0.20	0.10	0.04	2.0%
	13.00	6.45	0.40	0.24	0.54	0.40	0.30	0.07	3.3%
	14.00	6.25	0.20	0.67	1.02	0.20	0.20	0.13	6.1%
	15.00	6.10	0.05	0.00	1.01	0.05	0.05	0.00	0.0%
	16.00	6.10	0.05	0.00	1.00	0.05	0.05	0.00	0.0%
	17.00	6.10	0.05	0.00	1.00	0.05	0.04	0.00	0.0%
W	17.40	6.05	0.00	0.00	0.40		0.00	0.00	0.0%
	18.00	5.62			0.00		0.00	0.00	0.0%
	19.00	5.36			0.00		0.00	0.00	0.0%
1 LS &G	20.50	4.89			0.00		0.00	0.00	0.0%
TOTALS ----------					14.28	0.4 (Max.)	3.11	2.21	100.0%

Manning's n = 0.1169
Hydraulic Radius= 0.21754583

STREAM NAME: Johnson Creek
XS LOCATION: 1/4 mi u/s fr conf. w/ Pole Creek
XS NUMBER: 3

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.11	3.08	-0.8%
5.80	3.11	6.68	114.9%
5.82	3.11	6.38	105.5%
5.84	3.11	6.09	96.1%
5.86	3.11	5.80	86.7%
5.88	3.11	5.51	77.4%
5.90	3.11	5.22	68.1%
5.92	3.11	4.93	58.8%
5.94	3.11	4.65	49.6%
5.96	3.11	4.36	40.3%
5.98	3.11	4.07	31.1%
6.00	3.11	3.79	22.0%
6.01	3.11	3.65	17.4%
6.02	3.11	3.51	12.8%
6.03	3.11	3.36	8.3%
6.04	3.11	3.22	3.7%
6.05	3.11	3.08	-0.8%
6.06	3.11	2.94	-5.3%
6.07	3.11	2.80	-9.8%
6.08	3.11	2.66	-14.2%
6.09	3.11	2.53	-18.6%
6.10	3.11	2.39	-23.0%
6.12	3.11	2.17	-30.3%
6.14	3.11	1.94	-37.5%
6.16	3.11	1.72	-44.5%
6.18	3.11	1.51	-51.4%
6.20	3.11	1.30	-58.1%
6.22	3.11	1.10	-64.5%
6.24	3.11	0.91	-70.6%
6.26	3.11	0.74	-76.2%
6.28	3.11	0.58	-81.2%
6.30	3.11	0.44	-85.8%

WATERLINE AT ZERO
AREA ERROR = 6.048

STREAM NAME: Johnson Creek
XS LOCATION: 1/4 mi u/s fr conf. w/ Pole Creek
XS NUMBER: 3

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.89	19.33	1.14	1.56	21.94	20.14	100.0%	1.09	45.75	2.08
	5.05	18.50	1.02	1.40	18.95	19.24	95.6%	0.98	36.93	1.95
	5.10	18.23	0.99	1.35	18.03	18.96	94.2%	0.95	34.33	1.90
	5.15	17.97	0.95	1.30	17.13	18.68	92.7%	0.92	31.83	1.86
	5.20	17.71	0.92	1.25	16.24	18.39	91.3%	0.88	29.41	1.81
	5.25	17.44	0.88	1.20	15.36	18.11	89.9%	0.85	27.08	1.76
	5.30	17.16	0.84	1.15	14.49	17.81	88.4%	0.81	24.87	1.72
	5.35	16.76	0.81	1.10	13.64	17.40	86.4%	0.78	22.84	1.67
	5.40	16.34	0.78	1.05	12.82	16.97	84.3%	0.76	20.92	1.63
	5.45	15.92	0.75	1.00	12.01	16.53	82.1%	0.73	19.11	1.59
	5.50	15.64	0.72	0.95	11.22	16.22	80.6%	0.69	17.28	1.54
	5.55	15.40	0.68	0.90	10.44	15.96	79.3%	0.65	15.50	1.48
	5.60	15.17	0.64	0.85	9.68	15.70	77.9%	0.62	13.81	1.43
	5.65	15.00	0.60	0.80	8.93	15.49	76.9%	0.58	12.17	1.36
	5.70	14.89	0.55	0.75	8.18	15.34	76.2%	0.53	10.59	1.29
	5.75	14.78	0.50	0.70	7.44	15.19	75.4%	0.49	9.10	1.22
	5.80	14.66	0.46	0.65	6.70	15.04	74.7%	0.45	7.70	1.15
	5.85	14.55	0.41	0.60	5.97	14.89	73.9%	0.40	6.39	1.07
	5.90	14.44	0.36	0.55	5.25	14.74	73.2%	0.36	5.19	0.99
	5.95	14.33	0.32	0.50	4.53	14.59	72.4%	0.31	4.09	0.90
	6.00	14.22	0.27	0.45	3.81	14.44	71.7%	0.26	3.09	0.81
WL	6.05	14.10	0.22	0.40	3.11	14.28	70.9%	0.22	2.21	0.71
	6.10	13.49	0.18	0.35	2.42	13.66	67.8%	0.18	1.50	0.62
	6.15	10.92	0.17	0.30	1.85	11.08	55.0%	0.17	1.11	0.60
	6.20	10.35	0.13	0.25	1.32	10.51	52.2%	0.13	0.65	0.49
	6.25	8.93	0.09	0.20	0.84	9.06	45.0%	0.09	0.34	0.40
	6.30	6.93	0.07	0.15	0.45	7.04	34.9%	0.06	0.14	0.32
	6.35	4.10	0.04	0.10	0.18	4.17	20.7%	0.04	0.04	0.24
	6.40	2.17	0.01	0.05	0.03	2.20	10.9%	0.01	0.00	0.12
	6.45	0.04	0.00	0.00	0.00	0.04	0.2%	0.00	0.00	0.02

STREAM NAME: Johnson Creek
XS LOCATION: 1/4 mi u/s fr conf. w/ Pole Creek
XS NUMBER: 3

SUMMARY SHEET

MEASURED FLOW (Qm)=	2.21	cfs
CALCULATED FLOW (Qc)=	2.21	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	6.05	ft
CALCULATED WATERLINE (WLc)=	6.05	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.40	ft
MAX CALCULATED DEPTH (Dc)=	0.40	ft
(Dm-Dc)/Dm * 100	-0.4	%
MEAN VELOCITY=	0.71	ft/sec
MANNING'S N=	0.117	
SLOPE=	0.024	ft/ft
.4 * Qm =	0.9	cfs
2.5 * Qm=	5.5	cfs

RECOMMENDED INSTREAM FLOW:
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FLOW (CFS)	PERIOD
___________________	__________________
___________________	__________________
___________________	__________________
___________________	__________________

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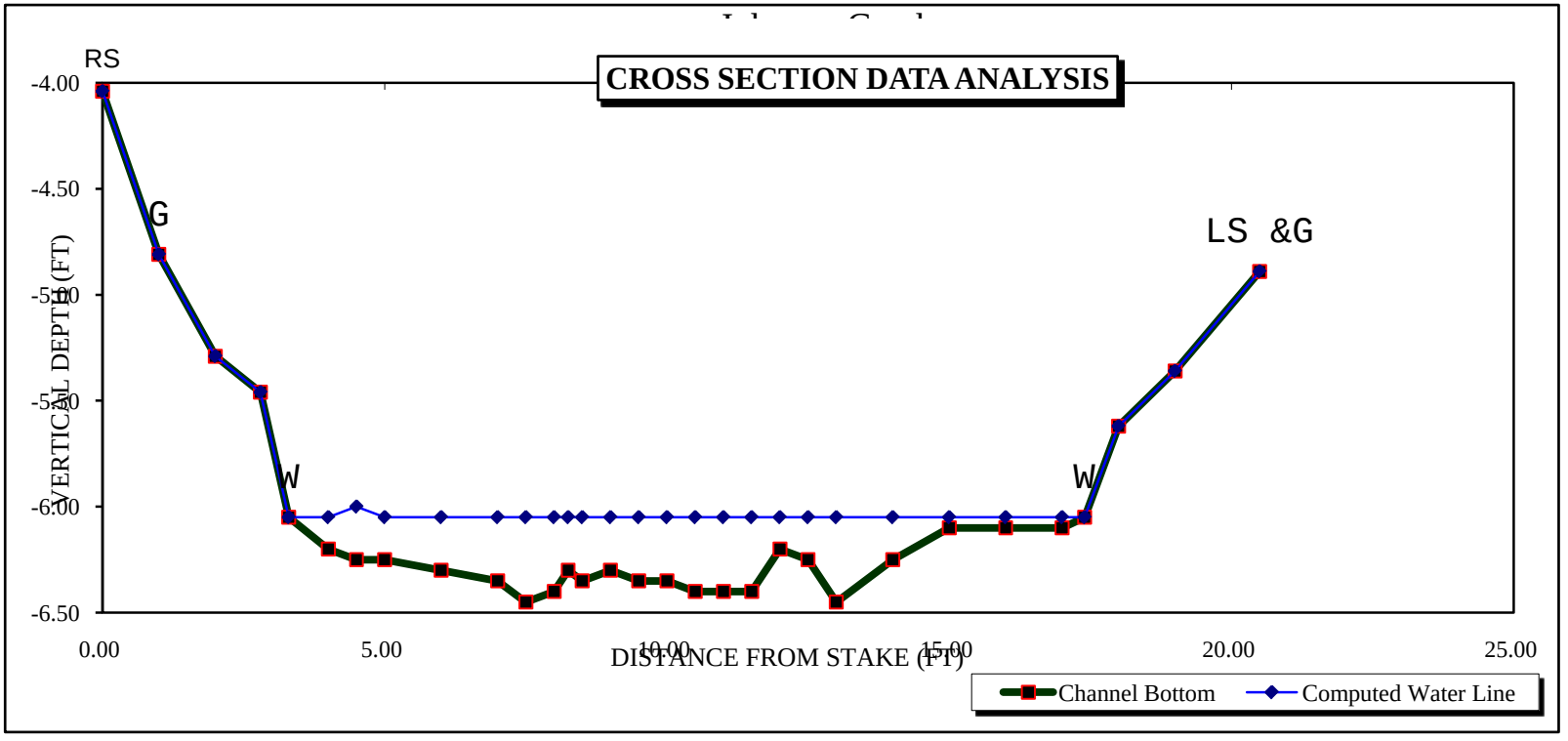
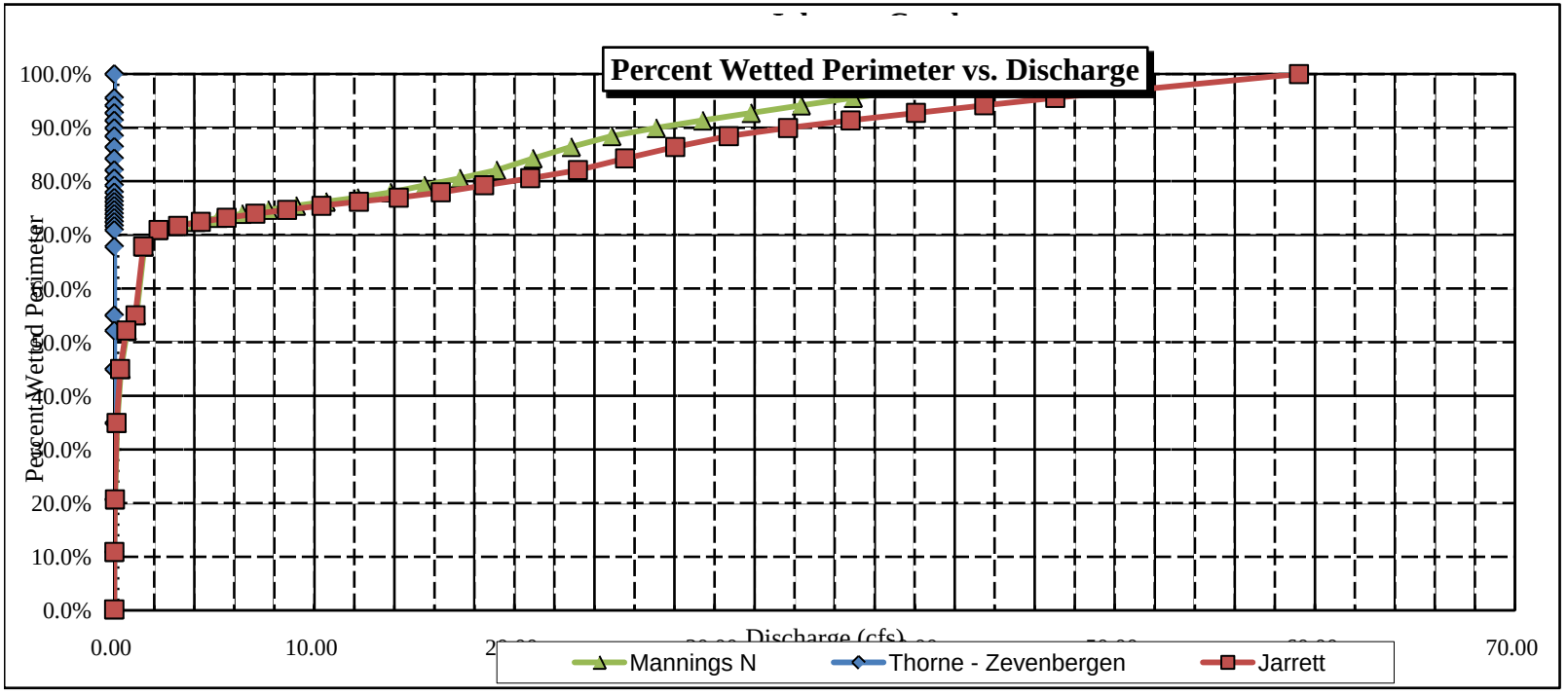
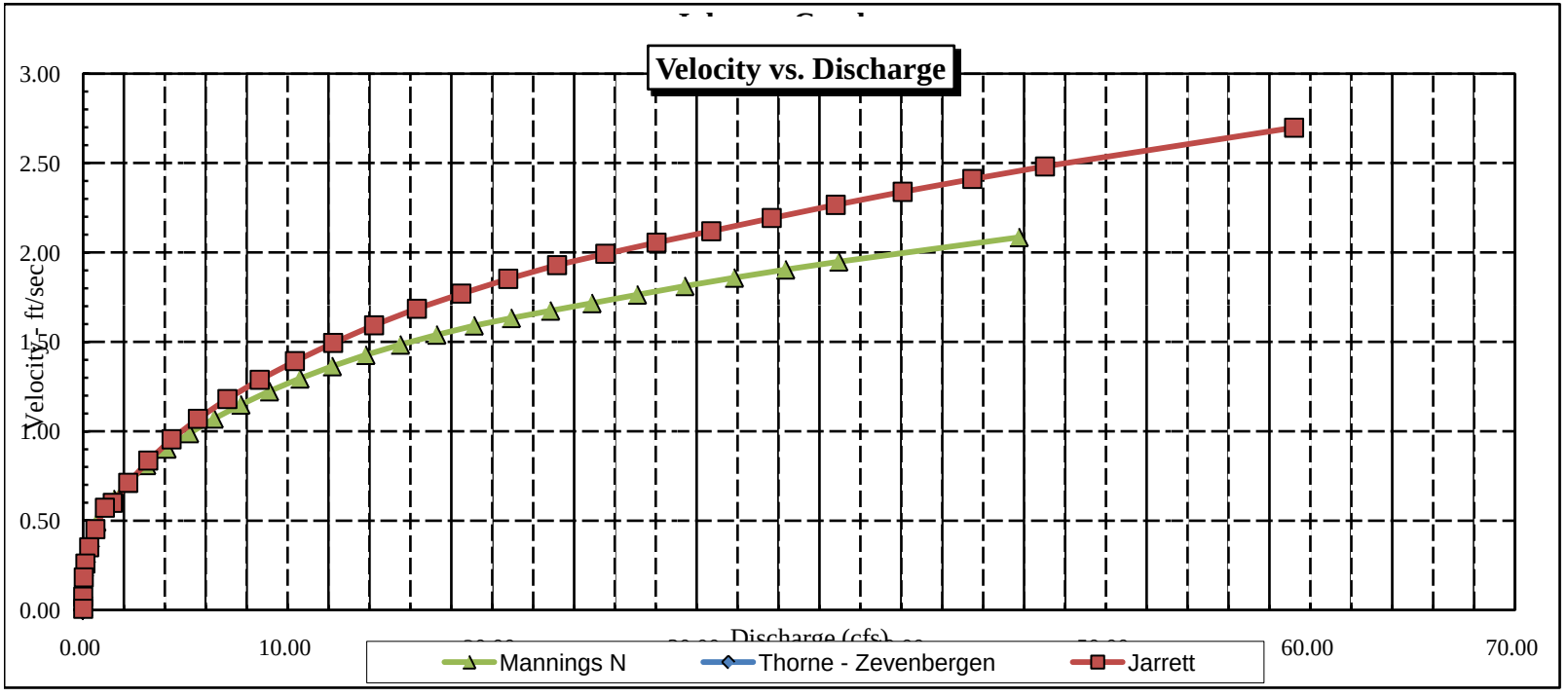
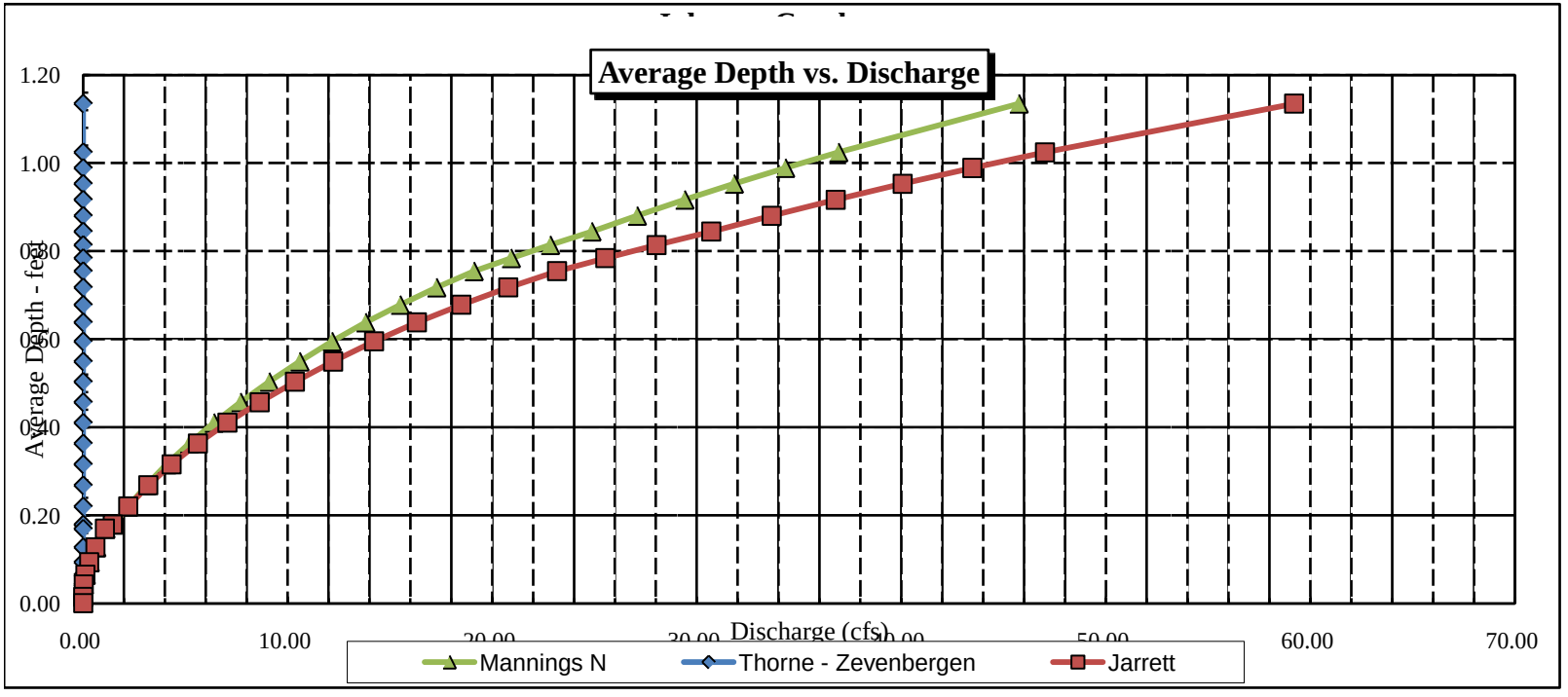
RECOMMENDATION BY: ………………………………………… AGENCY……………………………………… DATE:……………………

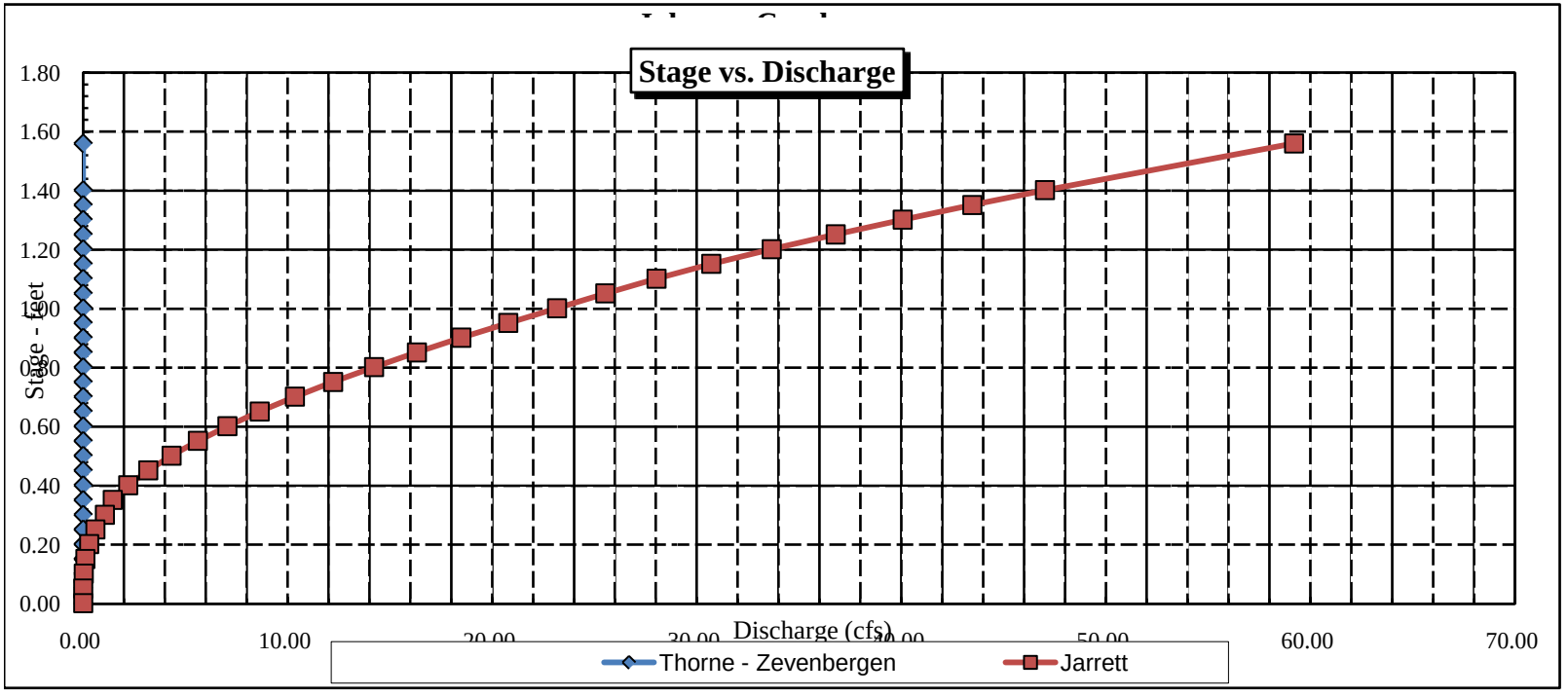
CWCB REVIEW BY: ……………………………………………………………………………………………… DATE:……………………


CROSS SECTION DATA ANALYSIS
RS
G
W
W
LS &G
-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
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
10.00
70.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
10.00
60.00
70.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
Stage - feet
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Johnson Creek						CROSS-SECTION NO.: 4
CROSS-SECTION LOCATION: 1/8 mile upstream from conf. w/ Pole Creek						
DATE: 9-17-10	OBSERVERS: R. Smith, P. Belcher, J. Thompson					
LEGAL DESCRIPTION	¼ SECTION: SW SE	SECTION: 20	TOWNSHIP: 12 (N) S	RANGE: 77 E (W)	PM: 6th	
COUNTY: Larimer	WATERSHED: Laramie R.	WATER DIVISION: 1	OOW WATER CODE: 11320			
MAP(S):	USGS:					
	USFS:					

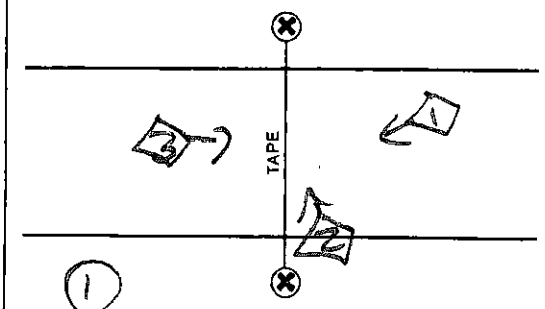
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: gravel to 4" 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	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	6.90 / 6.86
② WS Upstream	25.3	6.73
③ WS Downstream	11.8	7.18
SLOPE	0.45/37.1 = 0.012	

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, stonefly

COMMENTS

pH = 8.2
Temp = 8.5°C
TDS = 100

willow - sedge - rush riparian

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Johnson Creek | CROSS-SECTION NO.: 4 | DATE: 9-17-10 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 11:50

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	0.0		4.05								
G	1.6		5.92								
	1.7		6.42								
	2.5		6.65								
W	2.8		6.85	0	-						
	3.0		6.90	.05				0.97			
	3.5		7.10	.25				1.76			
	4.0		7.10	.25				2.08			
	4.5		7.05	.20				1.61			
	5.0		7.00	.15				1.55			
	5.5		6.95	.10				0.84			
	6.0		6.90	.05				0.53			
	6.5		6.90	.05				0.69			
	7.0		6.90	.05				0.23			
	8.0		6.90	.05				—			
	9.0		7.05	0.2				0.57			
	9.5		7.05	0.2				0.91			
	10.0		7.15	0.25				1.28			
	10.5		7.10	0.25				1.18			
	11.0		7.10	0.2				1.20			
	11.5		7.10	0.2				1.24			
	12.0		7.15	0.25				1.58			
	12.5		7.15	0.25				1.26			
	13.0		7.15	0.25				0.81			
	13.5		7.10	0.2				0.55			
	14.0		7.05	0.15				0.70			
	14.5		6.95	0.05				0.49			
	15.0		6.90	0				—			
W	15.8	6.90 →		0							
	16.9	6.77 →									
	18.6	6.41 →									
G	19.6	5.92 →									
	21.7	5.87 →									
LS	25.5	4.34 →									
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:	Johnson Creek
XS LOCATION:	1/8 mi u/s fr conf w/ Pole Creek
XS NUMBER:	4
DATE:	17-Sep-10
OBSERVERS:	R. Smith, P. Belcher, J. Thompson
1/4 SEC:	SW SE
SECTION:	20
TWP:	12N
RANGE:	77W
PM:	Sixth
COUNTY:	Larimer
WATERSHED:	Laramie River
DIVISION:	1
DOW CODE:	11320
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: 0.012

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

ASSIGNED TO: ….....…….....DATE.....

STREAM NAME: Johnson Creek
XS LOCATION: 1/8 mi u/s fr conf w/ Pole Creek
XS NUMBER: 4

DATA POINTS= 34

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	RS	0.00	4.05			0.00		0.00	0.00	0.0%
1	G	1.60	5.92			0.00		0.00	0.00	0.0%
		1.70	6.42			0.00		0.00	0.00	0.0%
		2.50	6.65			0.00		0.00	0.00	0.0%
	W	2.80	6.85	0.00	0.00	0.00		0.00	0.00	0.0%
		3.00	6.90	0.05	0.97	0.21	0.05	0.02	0.02	0.8%
		3.50	7.10	0.25	1.76	0.54	0.25	0.13	0.22	10.2%
		4.00	7.10	0.25	2.08	0.50	0.25	0.13	0.26	12.0%
		4.50	7.05	0.20	1.61	0.50	0.20	0.10	0.16	7.5%
		5.00	7.00	0.15	1.55	0.50	0.15	0.08	0.12	5.4%
		5.50	6.95	0.10	0.84	0.50	0.10	0.05	0.04	1.9%
		6.00	6.90	0.05	0.53	0.50	0.05	0.03	0.01	0.6%
		6.50	6.90	0.05	0.69	0.50	0.05	0.03	0.02	0.8%
		7.00	6.90	0.05	0.23	0.50	0.05	0.04	0.01	0.4%
		8.00	6.90	0.05	0.00	1.00	0.05	0.05	0.00	0.0%
		9.00	7.05	0.20	0.57	1.01	0.20	0.15	0.09	4.0%
		9.50	7.05	0.20	0.91	0.50	0.20	0.10	0.09	4.2%
		10.00	7.15	0.25	1.28	0.51	0.25	0.13	0.16	7.4%
		10.50	7.10	0.25	1.18	0.50	0.25	0.13	0.15	6.8%
		11.00	7.10	0.20	1.20	0.50	0.20	0.10	0.12	5.6%
		11.50	7.10	0.20	1.24	0.50	0.20	0.10	0.12	5.7%
		12.00	7.15	0.25	1.58	0.50	0.25	0.13	0.20	9.1%
		12.50	7.15	0.25	1.26	0.50	0.25	0.13	0.16	7.3%
		13.00	7.15	0.25	0.81	0.50	0.25	0.13	0.10	4.7%
		13.50	7.10	0.20	0.55	0.50	0.20	0.10	0.06	2.5%
		14.00	7.05	0.15	0.70	0.50	0.15	0.08	0.05	2.4%
		14.50	6.95	0.05	0.49	0.51	0.05	0.03	0.01	0.6%
		15.00	6.90	0.00	0.00	0.50		0.00	0.00	0.0%
	W	15.80	6.90	0.00	0.00	0.00		0.00	0.00	0.0%
		16.90	6.27			0.00		0.00	0.00	0.0%
		18.60	6.41			0.00		0.00	0.00	0.0%
1	G	19.60	5.92			0.00		0.00	0.00	0.0%
		21.70	5.87			0.00		0.00	0.00	0.0%
	LS	25.50	4.34			0.00		0.00	0.00	0.0%
	TOTALS ----------					12.30	0.25 (Max.)	1.91	2.16	100.0%

Manning's n = 0.0414
Hydraulic Radius= 0.15490189

STREAM NAME: Johnson Creek
XS LOCATION: 1/8 mi u/s fr conf w/ Pole Creek
XS NUMBER: 4

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.91	1.86	-2.4%
6.63	1.91	5.21	173.6%
6.65	1.91	4.94	159.1%
6.67	1.91	4.66	144.7%
6.69	1.91	4.39	130.4%
6.71	1.91	4.12	116.1%
6.73	1.91	3.85	101.9%
6.75	1.91	3.58	87.8%
6.77	1.91	3.31	73.7%
6.79	1.91	3.04	59.7%
6.81	1.91	2.78	45.8%
6.83	1.91	2.51	31.9%
6.84	1.91	2.38	25.0%
6.85	1.91	2.25	18.1%
6.86	1.91	2.12	11.3%
6.87	1.91	1.99	4.4%
6.88	1.91	1.86	-2.4%
6.89	1.91	1.73	-9.2%
6.90	1.91	1.60	-15.9%
6.91	1.91	1.49	-21.9%
6.92	1.91	1.39	-27.0%
6.93	1.91	1.30	-31.9%
6.95	1.91	1.12	-41.4%
6.97	1.91	0.95	-50.2%
6.99	1.91	0.79	-58.5%
7.01	1.91	0.64	-66.4%
7.03	1.91	0.50	-73.7%
7.05	1.91	0.37	-80.5%
7.07	1.91	0.26	-86.4%
7.09	1.91	0.16	-91.6%
7.11	1.91	0.08	-95.8%
7.13	1.91	0.04	-98.1%

WATERLINE AT ZERO
AREA ERROR = 6.871

STREAM NAME: Johnson Creek
XS LOCATION: 1/8 mi u/s fr conf w/ Pole Creek
XS NUMBER: 4

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.92	18.00	0.93	1.23	16.73	18.89	100.0%	0.89	60.64	3.62
	5.92	18.00	0.93	1.23	16.70	18.88	100.0%	0.88	60.49	3.62
	5.97	17.88	0.88	1.18	15.81	18.72	99.1%	0.84	55.49	3.51
	6.02	17.77	0.84	1.13	14.91	18.55	98.2%	0.80	50.67	3.40
	6.07	17.66	0.79	1.08	14.03	18.39	97.4%	0.76	46.03	3.28
	6.12	17.55	0.75	1.03	13.15	18.22	96.5%	0.72	41.57	3.16
	6.17	17.44	0.70	0.98	12.27	18.06	95.6%	0.68	37.28	3.04
	6.22	17.32	0.66	0.93	11.40	17.90	94.7%	0.64	33.19	2.91
	6.27	17.19	0.61	0.88	10.54	17.71	93.8%	0.60	29.31	2.78
	6.32	16.39	0.59	0.83	9.70	16.84	89.1%	0.58	26.40	2.72
	6.37	15.58	0.57	0.78	8.90	15.96	84.5%	0.56	23.71	2.66
	6.42	14.93	0.55	0.73	8.14	15.25	80.7%	0.53	21.06	2.59
	6.47	14.67	0.50	0.68	7.40	14.97	79.2%	0.49	18.20	2.46
	6.52	14.41	0.46	0.63	6.68	14.69	77.8%	0.45	15.51	2.32
	6.57	14.15	0.42	0.58	5.96	14.40	76.3%	0.41	13.01	2.18
	6.62	13.89	0.38	0.53	5.26	14.12	74.8%	0.37	10.70	2.03
	6.67	13.67	0.33	0.48	4.57	13.88	73.5%	0.33	8.57	1.87
	6.72	13.50	0.29	0.43	3.89	13.69	72.5%	0.28	6.62	1.70
	6.77	13.34	0.24	0.38	3.22	13.50	71.5%	0.24	4.87	1.51
	6.82	13.18	0.19	0.33	2.56	13.31	70.5%	0.19	3.35	1.31
WL	6.87	12.96	0.15	0.28	1.90	13.07	69.2%	0.15	2.07	1.09
	6.92	9.37	0.14	0.23	1.33	9.46	50.1%	0.14	1.41	1.06
	6.97	8.02	0.11	0.18	0.90	8.09	42.8%	0.11	0.81	0.91
	7.02	6.81	0.08	0.13	0.53	6.86	36.3%	0.08	0.37	0.71
	7.07	5.03	0.04	0.08	0.23	5.06	26.8%	0.04	0.11	0.50
	7.12	2.00	0.02	0.03	0.04	2.01	10.6%	0.02	0.01	0.30

STREAM NAME: Johnson Creek
XS LOCATION: 1/8 mi u/s fr conf w/ Pole Creek
XS NUMBER: 4

SUMMARY SHEET

MEASURED FLOW (Qm)=	2.16	cfs
CALCULATED FLOW (Qc)=	2.07	cfs
(Qm-Qc)/Qm * 100 =	4.0	%
MEASURED WATERLINE (WLm)=	6.88	ft
CALCULATED WATERLINE (WLc)=	6.87	ft
(WLm-WLc)/WLm * 100 =	0.1	%
MAX MEASURED DEPTH (Dm)=	0.25	ft
MAX CALCULATED DEPTH (Dc)=	0.28	ft
(Dm-Dc)/Dm * 100	-11.4	%
MEAN VELOCITY=	1.09	ft/sec
MANNING'S N=	0.041	
SLOPE=	0.012	ft/ft
.4 * Qm =	0.9	cfs
2.5 * Qm=	5.4	cfs

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

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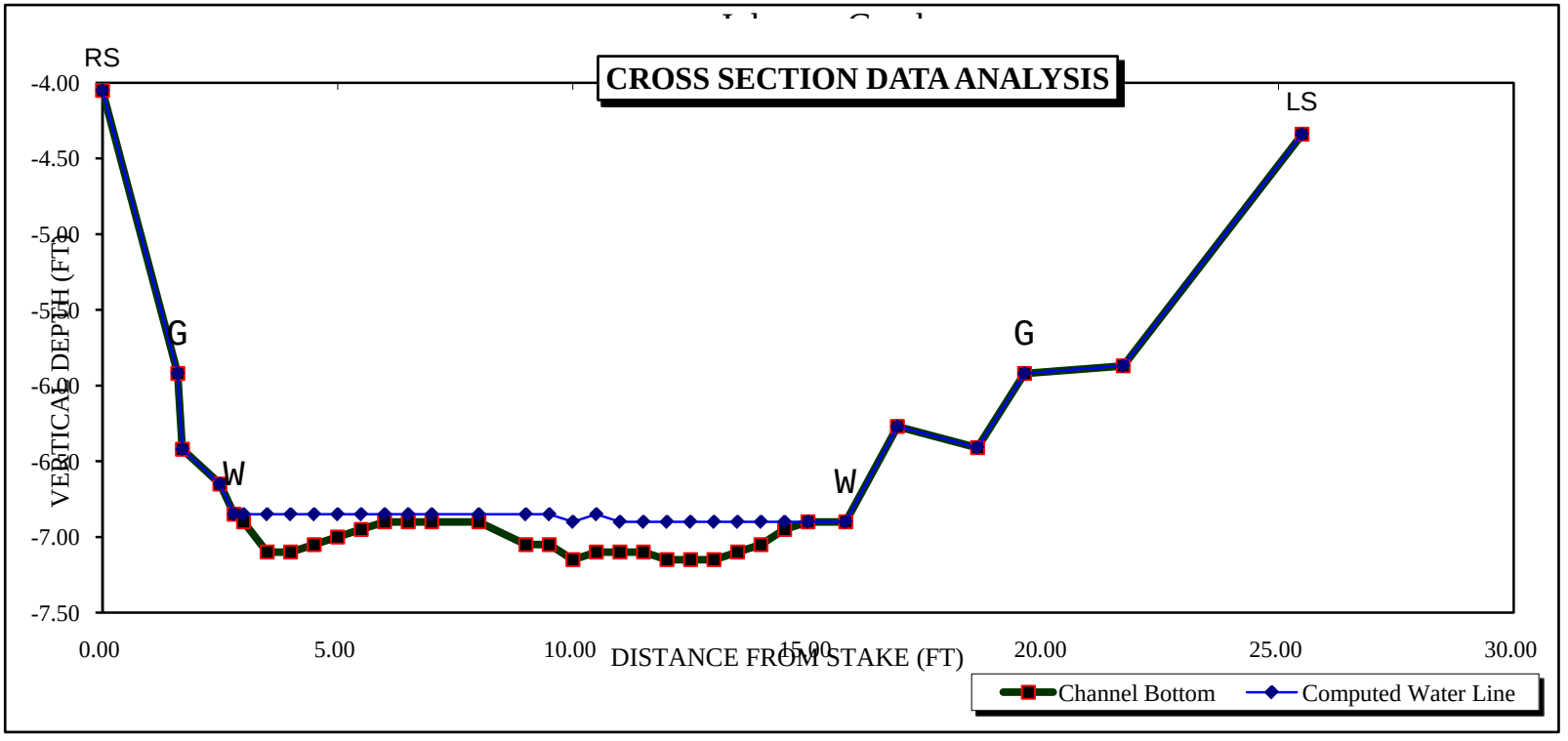
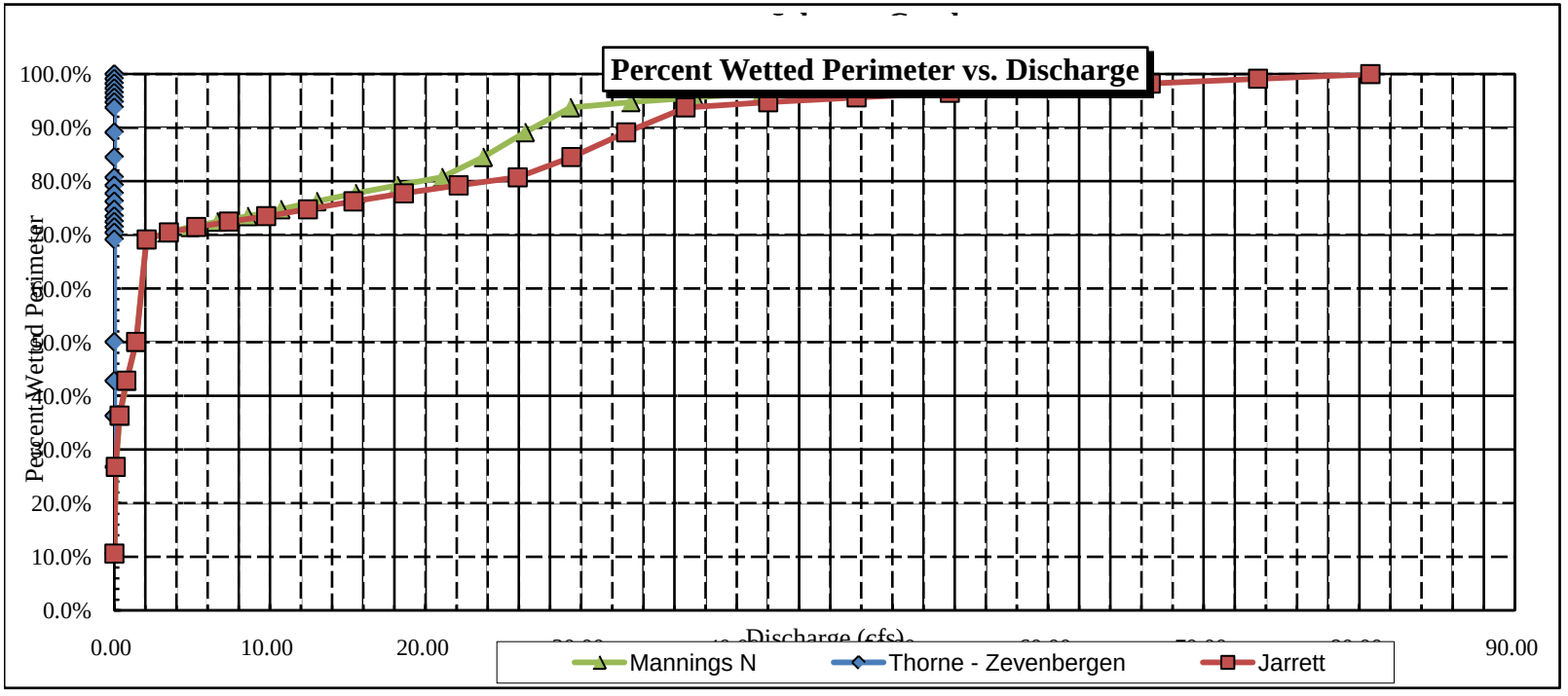
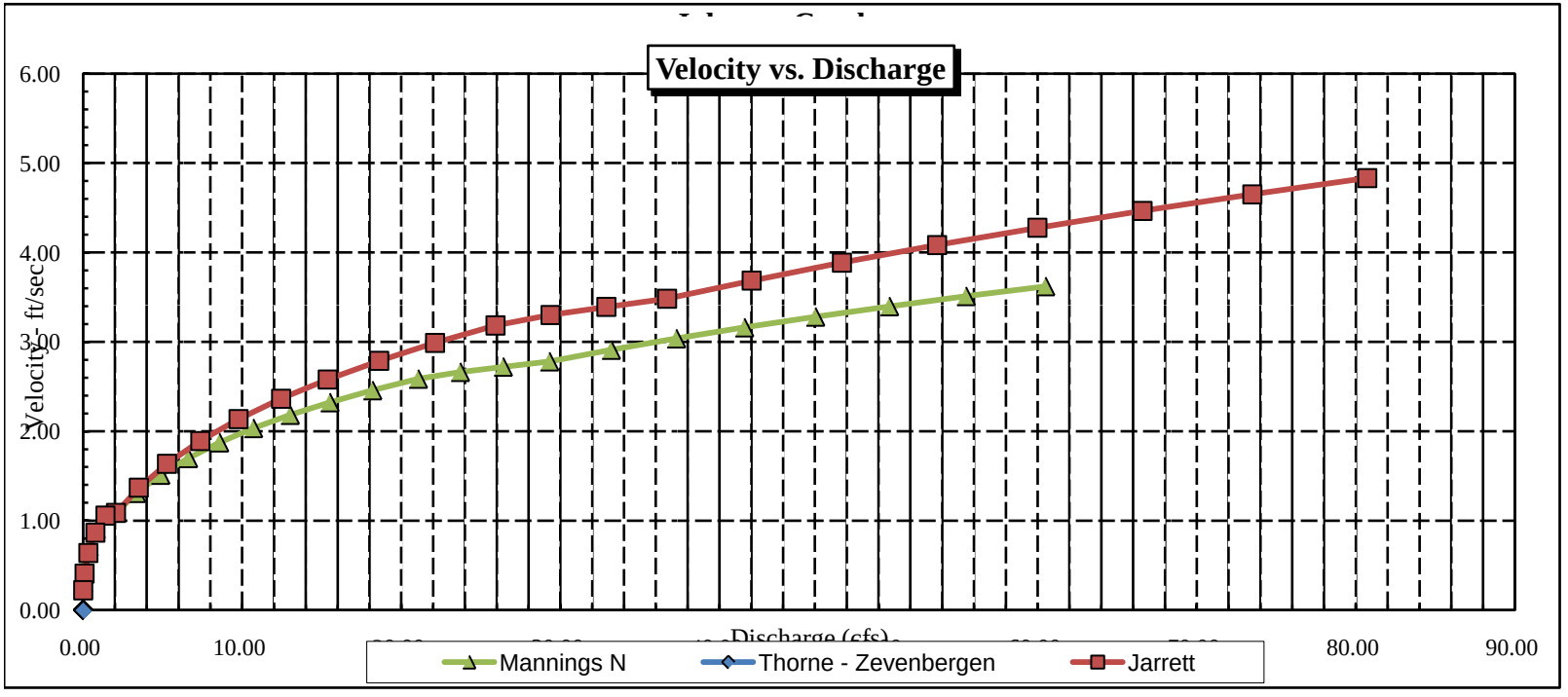
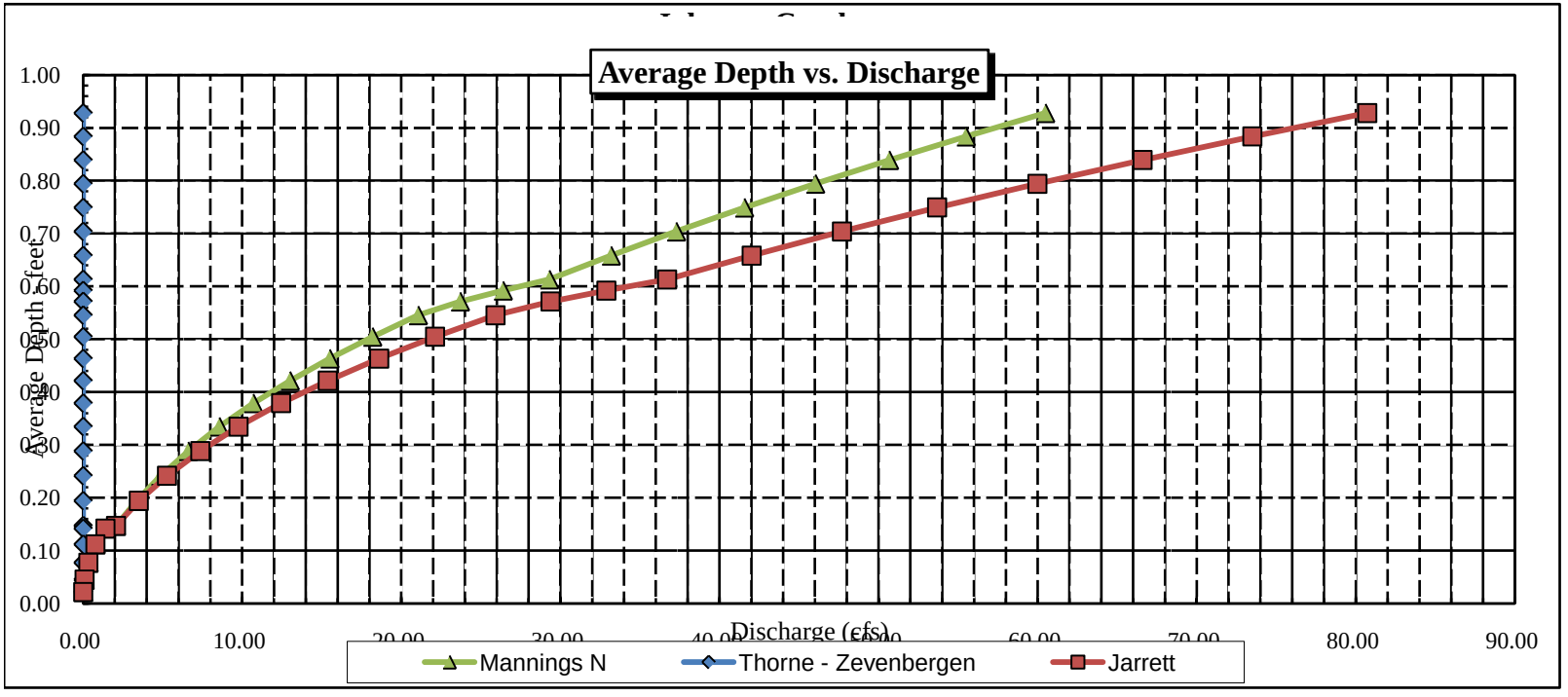
RECOMMENDATION BY: ..... AGENCY..... DATE:.....

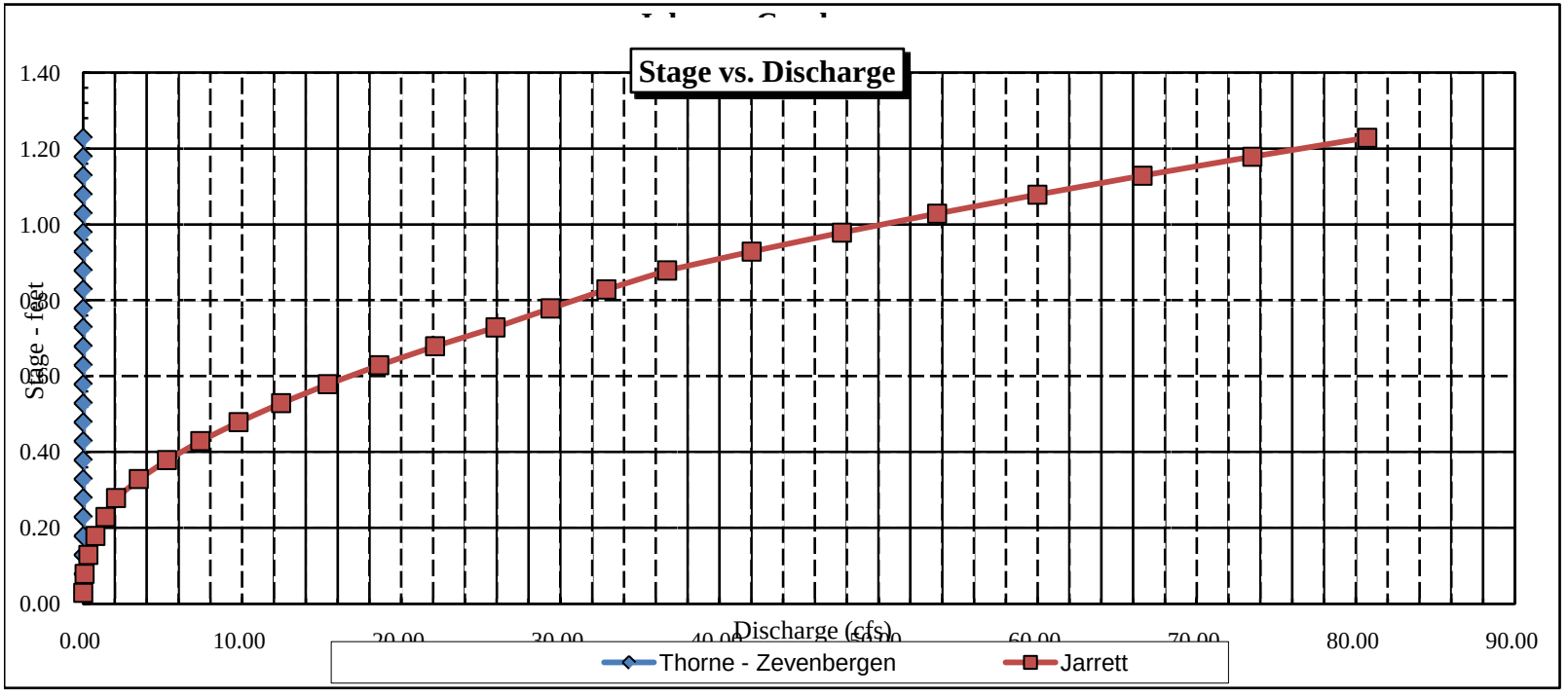
CWCB REVIEW BY: ..... DATE:.....


CROSS SECTION DATA ANALYSIS
RS
LS
G
W
W
G
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Percent Wetted Perimeter vs. Discharge
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Percent Wetted Perimeter
0.00
10.00
20.00
90.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Velocity - ft/sec
0.00
10.00
80.00
90.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
10.00
80.00
90.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
Stage - feet
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
10.00
80.00
90.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Johnson Creek						CROSS-SECTION NO.: 5
CROSS-SECTION LOCATION: 1/4 mile below conf. w/ Pole Creek						
DATE: 9-17-10	OBSERVERS: R. Smith, P Belcher, J. Thompson					
LEGAL DESCRIPTION	¼ SECTION: SW SE	SECTION: 20	TOWNSHIP: 12 (N) S	RANGE: 77 E (W)	PM: 6th	
COUNTY: Larimer	WATERSHED: Laramie R.	WATER DIVISION: 1	DOW WATER CODE: 11320			
MAP(S): USGS:	GPS 411150					
USFS:	4538336					

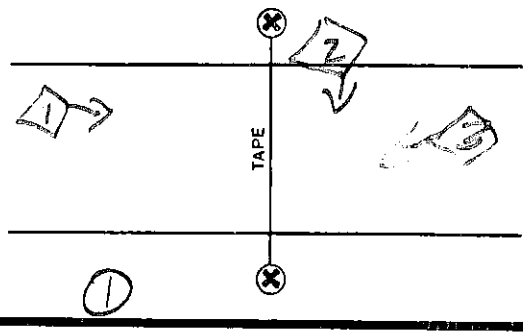
SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(X) Tape @ Stake LB	0.0	surveyed
(X) Tape @ Stake RB	0.0	surveyed
(1) WS @ Tape LB/RB	0.0	9.47/9.45
(2) WS Upstream	12.0'	9.40
(3) WS Downstream	13.5'	9.81
SLOPE	0.41/35.5 = 0.016	

SKETCH



AQUATIC SAMPLING SUMMARY

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

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

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

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

mayfly, caddisfly, stonefly

COMMENTS

pH: 7.8
Temp: 11.5° C
TDS: 110

alder - willow - sedge, riparian

CFD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Johnson Creek | CROSS-SECTION NO.: 5 | DATE: 9-17-10 | SHEET 1 OF 1

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 1:20 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+G	1.0		8.20								
W	2.0		9.47								
	2.5		9.75	0.3				0.30			
	3.0		9.75	0.3				0.59			
	3.5		9.70	0.25				0.44			
	4.0		9.75	0.3				0.64			
	4.5		9.80	0.35				0.53			
	5.0		9.75	0.3				0.61			
	5.5		9.75	0.3				0.98			
	6.0		9.75	0.3				1.31			
	6.5		9.85	0.4				1.26			
	7.0		9.80	0.35				1.47			
	7.5		9.75	0.3				1.83			
	8.0		9.75	0.3				1.94			
	8.5		9.70	0.25				1.05			
	9.0		9.70	0.25				1.48			
	9.5		9.70	0.25				0.77			
	10.0		9.70	0.25				—			
	11.0		9.60	0.15				0.35			
	12.0		9.55	0.1				0.62			
	13.0		9.55	0.1				0.14			
	14.0		9.55	0.1				0.24			
W	14.4		9.45								
	15.6		8.98								
G	16.8		8.20								
RS	18.8		10.61								
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:	Johnson Creek
XS LOCATION:	1/4 mi below conf w/ Pole Creek
XS NUMBER:	5
DATE:	17-Sep-10
OBSERVERS:	R. Smith, P. Belcher, J. Thompson
1/4 SEC:	SW SE
SECTION:	20
TWP:	12N
RANGE:	77W
PM:	Sixth
COUNTY:	Larimer
WATERSHED:	Laramie River
DIVISION:	1
DOW CODE:	11320
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:	0.016

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

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

STREAM NAME: Johnson Creek
XS LOCATION: 1/4 mi below conf w/ Pole Creek
XS NUMBER: 5

DATA POINTS= 26

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
1	LS & G	1.00	8.20			0.00		0.00	0.00	0.0%
	W	2.00	9.47	0.00	0.00	0.00		0.00	0.00	0.0%
		2.50	9.75	0.30	0.30	0.57	0.30	0.15	0.05	1.8%
		3.00	9.75	0.30	0.59	0.50	0.30	0.15	0.09	3.6%
		3.50	9.70	0.25	0.44	0.50	0.25	0.13	0.06	2.2%
		4.00	9.75	0.30	0.64	0.50	0.30	0.15	0.10	3.9%
		4.50	9.80	0.35	0.53	0.50	0.35	0.18	0.09	3.8%
		5.00	9.75	0.30	0.61	0.50	0.30	0.15	0.09	3.7%
		5.50	9.75	0.30	0.98	0.50	0.30	0.15	0.15	6.0%
		6.00	9.75	0.30	1.31	0.50	0.30	0.15	0.20	8.0%
		6.50	9.85	0.40	1.26	0.51	0.40	0.20	0.25	10.3%
		7.00	9.80	0.35	1.47	0.50	0.35	0.18	0.26	10.5%
		7.50	9.75	0.30	1.83	0.50	0.30	0.15	0.27	11.2%
		8.00	9.75	0.30	1.94	0.50	0.30	0.15	0.29	11.9%
		8.50	9.70	0.25	1.05	0.50	0.25	0.13	0.13	5.4%
		9.00	9.70	0.25	1.48	0.50	0.25	0.13	0.19	7.6%
		9.50	9.70	0.25	0.77	0.50	0.25	0.13	0.10	3.9%
		10.00	9.70	0.25	0.00	0.50	0.25	0.19	0.00	0.0%
		11.00	9.60	0.15	0.35	1.00	0.15	0.15	0.05	2.1%
		12.00	9.55	0.10	0.62	1.00	0.10	0.10	0.06	2.5%
		13.00	9.55	0.10	0.14	1.00	0.10	0.10	0.01	0.6%
		14.00	9.55	0.10	0.24	1.00	0.10	0.07	0.02	0.7%
	W	14.40	9.45	0.00	0.00	0.41		0.00	0.00	0.0%
		15.60	8.98			0.00		0.00	0.00	0.0%
1	G	16.80	8.20			0.00		0.00	0.00	0.0%
	RS	18.80	6.61			0.00		0.00	0.00	0.0%
	TOTALS ----------					12.52	0.4 (Max.)	2.86	2.44	100.0%

Manning's n = 0.0821
Hydraulic Radius= 0.22825364

STREAM NAME: Johnson Creek
XS LOCATION: 1/4 mi below conf w/ Pole Creek
XS NUMBER: 5

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	2.86	2.74	-4.2%
9.21	2.86	5.94	107.8%
9.23	2.86	5.67	98.6%
9.25	2.86	5.41	89.4%
9.27	2.86	5.15	80.3%
9.29	2.86	4.89	71.2%
9.31	2.86	4.63	62.2%
9.33	2.86	4.38	53.2%
9.35	2.86	4.12	44.2%
9.37	2.86	3.87	35.3%
9.39	2.86	3.61	26.5%
9.41	2.86	3.36	17.7%
9.42	2.86	3.24	13.3%
9.43	2.86	3.11	8.9%
9.44	2.86	2.99	4.5%
9.45	2.86	2.86	0.2%
9.46	2.86	2.74	-4.2%
9.47	2.86	2.62	-8.5%
9.48	2.86	2.49	-12.8%
9.49	2.86	2.37	-17.1%
9.50	2.86	2.25	-21.3%
9.51	2.86	2.13	-25.6%
9.53	2.86	1.89	-34.0%
9.55	2.86	1.65	-42.3%
9.57	2.86	1.46	-49.1%
9.59	2.86	1.27	-55.5%
9.61	2.86	1.10	-61.7%
9.63	2.86	0.92	-67.6%
9.65	2.86	0.76	-73.4%
9.67	2.86	0.60	-79.1%
9.69	2.86	0.44	-84.6%
9.71	2.86	0.31	-89.3%

WATERLINE AT ZERO
AREA ERROR = 9.450

STREAM NAME: Johnson Creek
XS LOCATION: 1/4 mi below conf w/ Pole Creek
XS NUMBER: 5

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	8.20	15.80	1.31	1.65	20.68	16.86	100.0%	1.23	54.31	2.63
	8.45	15.22	1.10	1.40	16.80	16.08	95.4%	1.04	39.63	2.36
	8.50	15.10	1.06	1.35	16.04	15.92	94.5%	1.01	36.93	2.30
	8.55	14.98	1.02	1.30	15.29	15.77	93.5%	0.97	34.32	2.24
	8.60	14.87	0.98	1.25	14.54	15.61	92.6%	0.93	31.78	2.19
	8.65	14.75	0.94	1.20	13.80	15.46	91.7%	0.89	29.32	2.12
	8.70	14.64	0.89	1.15	13.07	15.30	90.8%	0.85	26.95	2.06
	8.75	14.52	0.85	1.10	12.34	15.14	89.9%	0.81	24.66	2.00
	8.80	14.40	0.81	1.05	11.62	14.99	88.9%	0.77	22.45	1.93
	8.85	14.29	0.76	1.00	10.90	14.83	88.0%	0.73	20.33	1.87
	8.90	14.17	0.72	0.95	10.19	14.68	87.1%	0.69	18.29	1.80
	8.95	14.05	0.67	0.90	9.48	14.52	86.2%	0.65	16.35	1.72
	9.00	13.92	0.63	0.85	8.78	14.35	85.1%	0.61	14.50	1.65
	9.05	13.75	0.59	0.80	8.09	14.15	83.9%	0.57	12.77	1.58
	9.10	13.58	0.55	0.75	7.41	13.95	82.8%	0.53	11.13	1.50
	9.15	13.42	0.50	0.70	6.73	13.75	81.6%	0.49	9.58	1.42
	9.20	13.25	0.46	0.65	6.07	13.55	80.4%	0.45	8.13	1.34
	9.25	13.08	0.41	0.60	5.41	13.35	79.2%	0.41	6.78	1.25
	9.30	12.92	0.37	0.55	4.76	13.14	78.0%	0.36	5.53	1.16
	9.35	12.75	0.32	0.50	4.12	12.94	76.8%	0.32	4.39	1.07
	9.40	12.58	0.28	0.45	3.48	12.74	75.6%	0.27	3.36	0.96
WL	9.45	12.41	0.23	0.40	2.86	12.54	74.4%	0.23	2.44	0.85
	9.50	12.14	0.18	0.35	2.24	12.25	72.7%	0.18	1.66	0.74
	9.55	9.85	0.17	0.30	1.64	9.93	58.9%	0.17	1.14	0.69
	9.60	8.76	0.13	0.25	1.18	8.83	52.4%	0.13	0.71	0.60
	9.65	8.17	0.09	0.20	0.76	8.23	48.8%	0.09	0.35	0.47
	9.70	6.08	0.06	0.15	0.36	6.12	36.3%	0.06	0.13	0.35
	9.75	2.49	0.04	0.10	0.10	2.51	14.9%	0.04	0.03	0.27
	9.80	0.74	0.02	0.05	0.02	0.75	4.5%	0.02	0.00	0.19

STREAM NAME: Johnson Creek
XS LOCATION: 1/4 mi below conf w/ Pole Creek
XS NUMBER: 5

SUMMARY SHEET

MEASURED FLOW (Qm)=	2.44	cfs
CALCULATED FLOW (Qc)=	2.44	cfs
(Qm-Qc)/Qm * 100 =	0.1	%
MEASURED WATERLINE (WLm)=	9.46	ft
CALCULATED WATERLINE (WLc)=	9.45	ft
(WLm-WLc)/WLm * 100 =	0.1	%
MAX MEASURED DEPTH (Dm)=	0.40	ft
MAX CALCULATED DEPTH (Dc)=	0.40	ft
(Dm-Dc)/Dm * 100	0.1	%
MEAN VELOCITY=	0.85	ft/sec
MANNING'S N=	0.082	
SLOPE=	0.016	ft/ft
.4 * Qm =	1.0	cfs
2.5 * Qm=	6.1	cfs

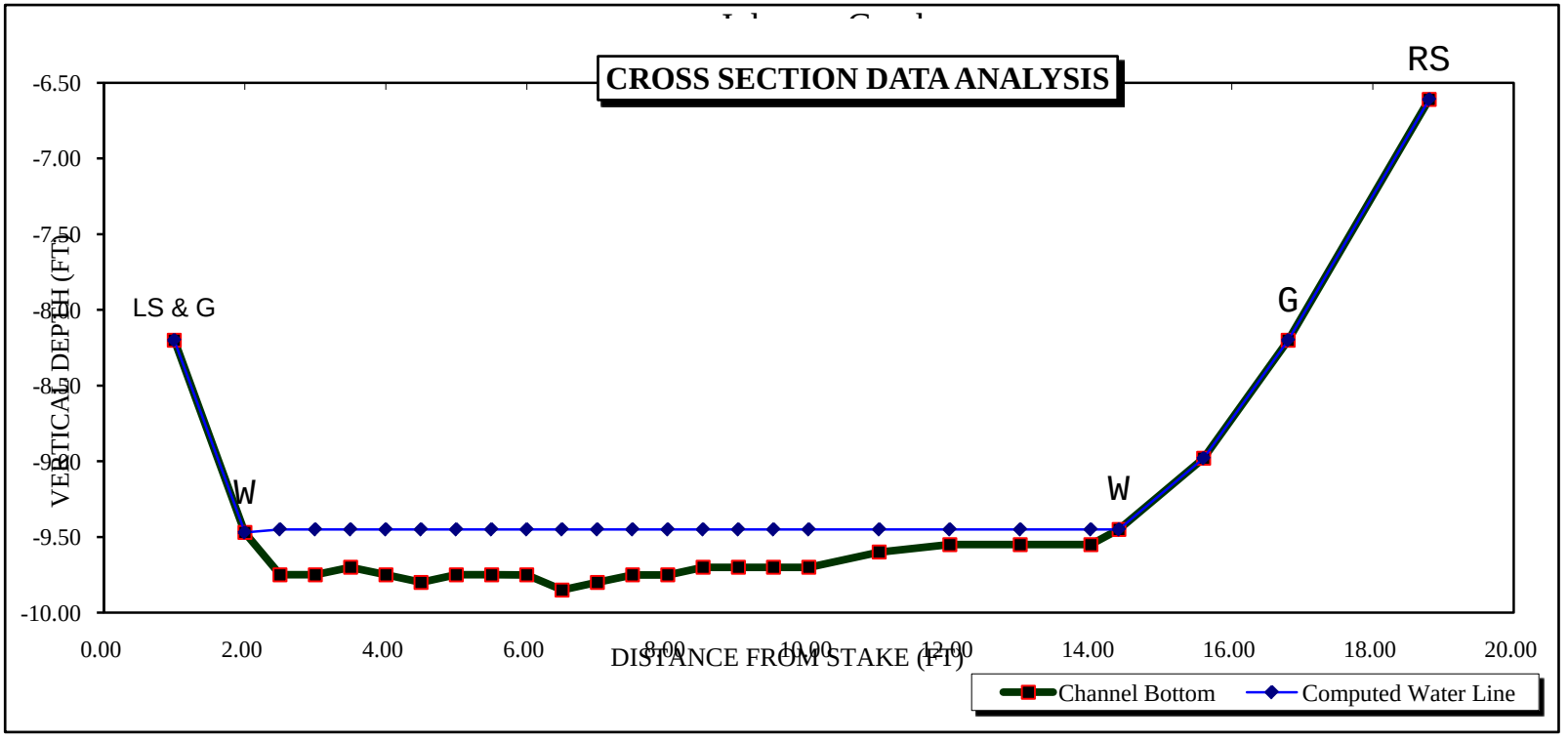
RECOMMENDED INSTREAM FLOW:
=============================

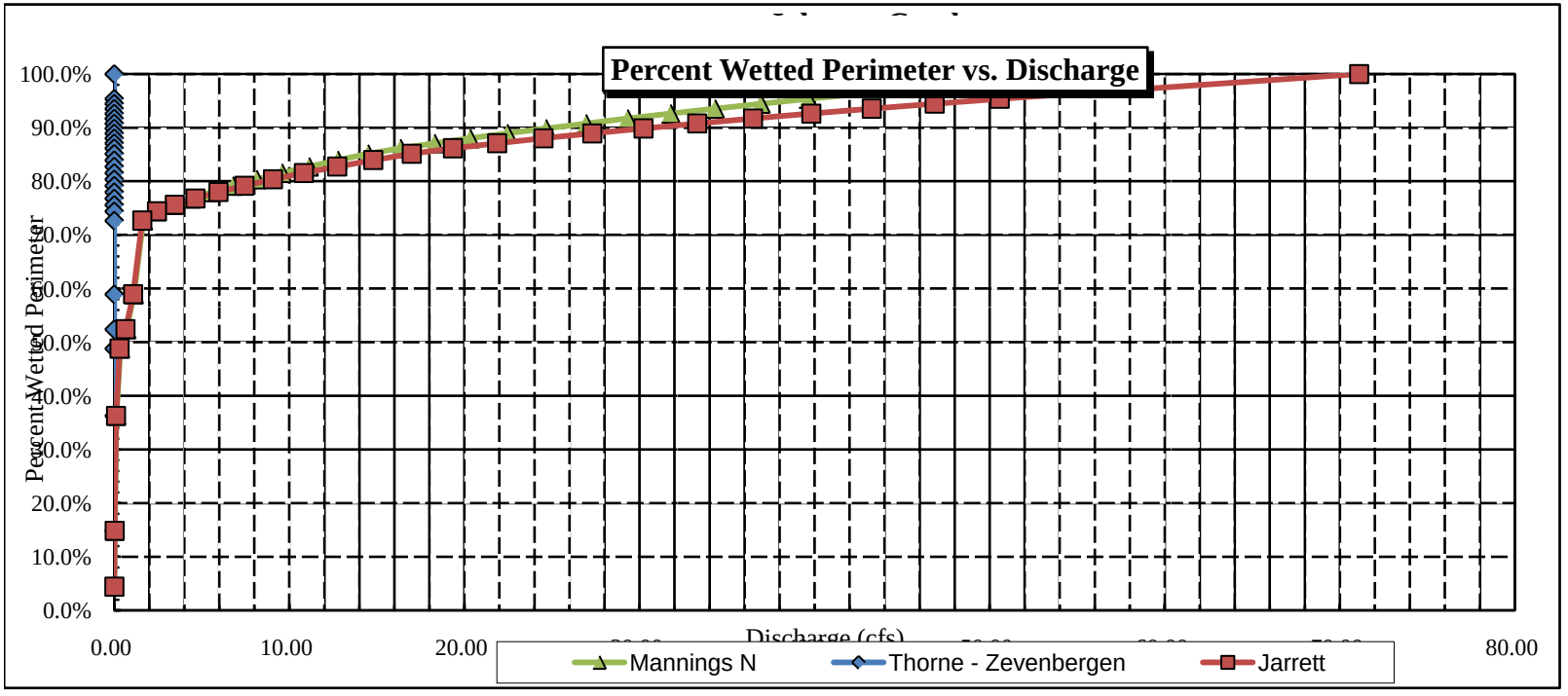
FLOW (CFS)	PERIOD
___________	___________
___________	___________
___________	___________
___________	___________

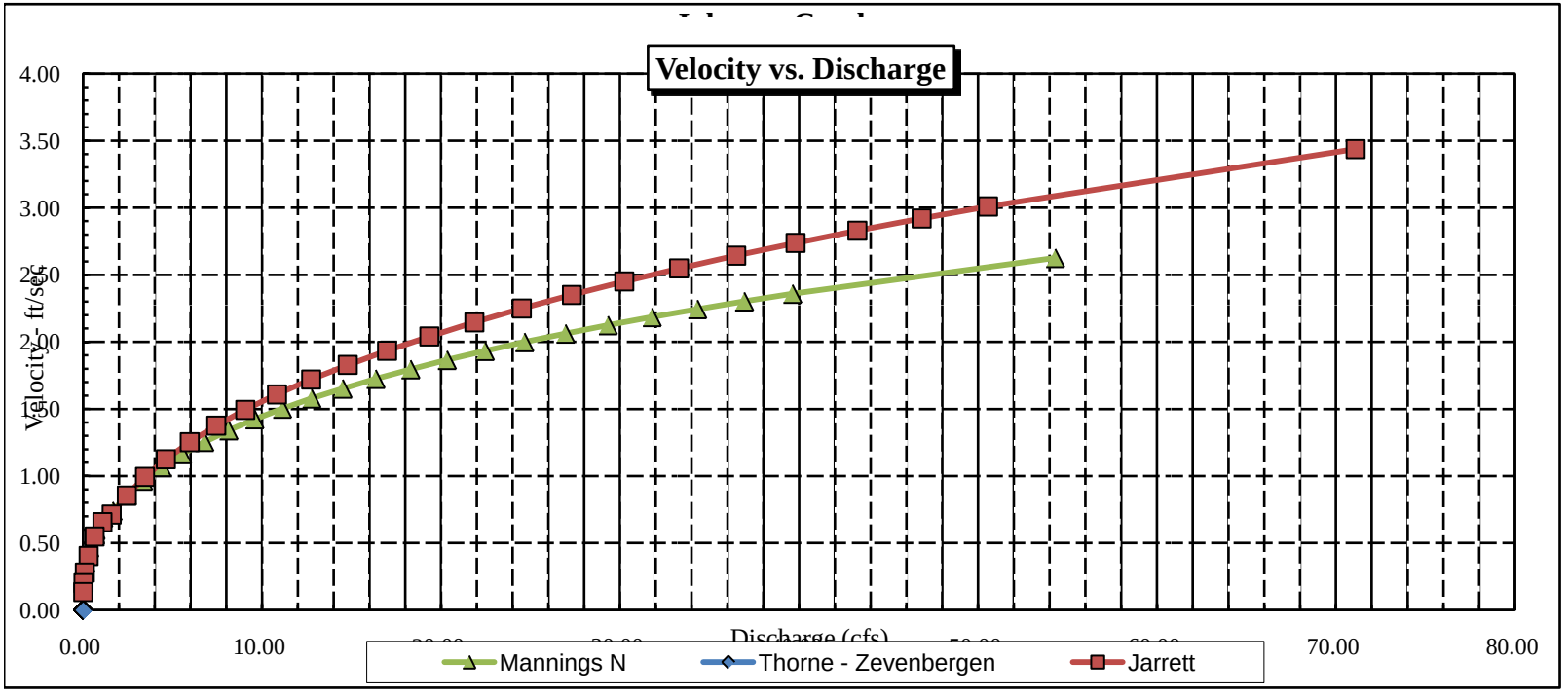
RATIONALE FOR RECOMMENDATION:
=============================

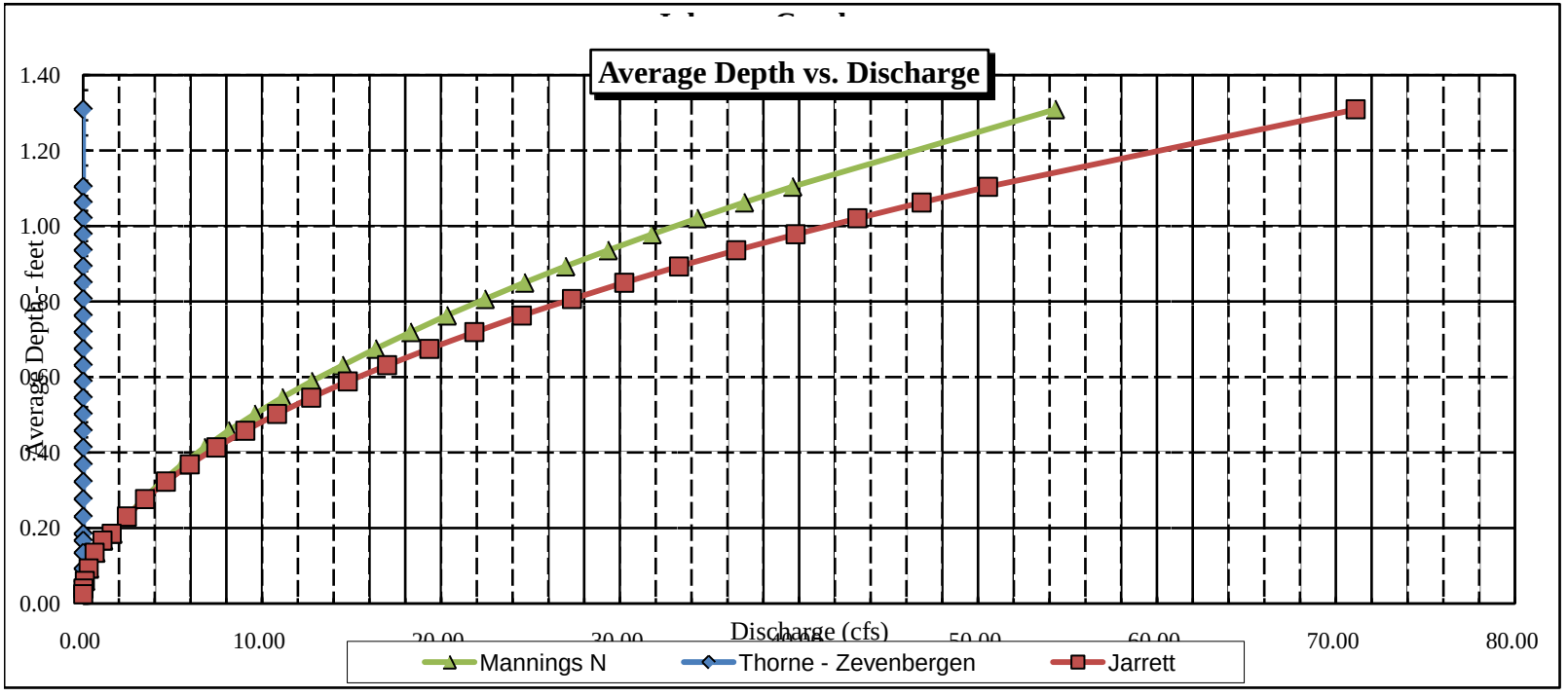
RECOMMENDATION BY: ……………………………………………… AGENCY……………………………………………… DATE:………………………

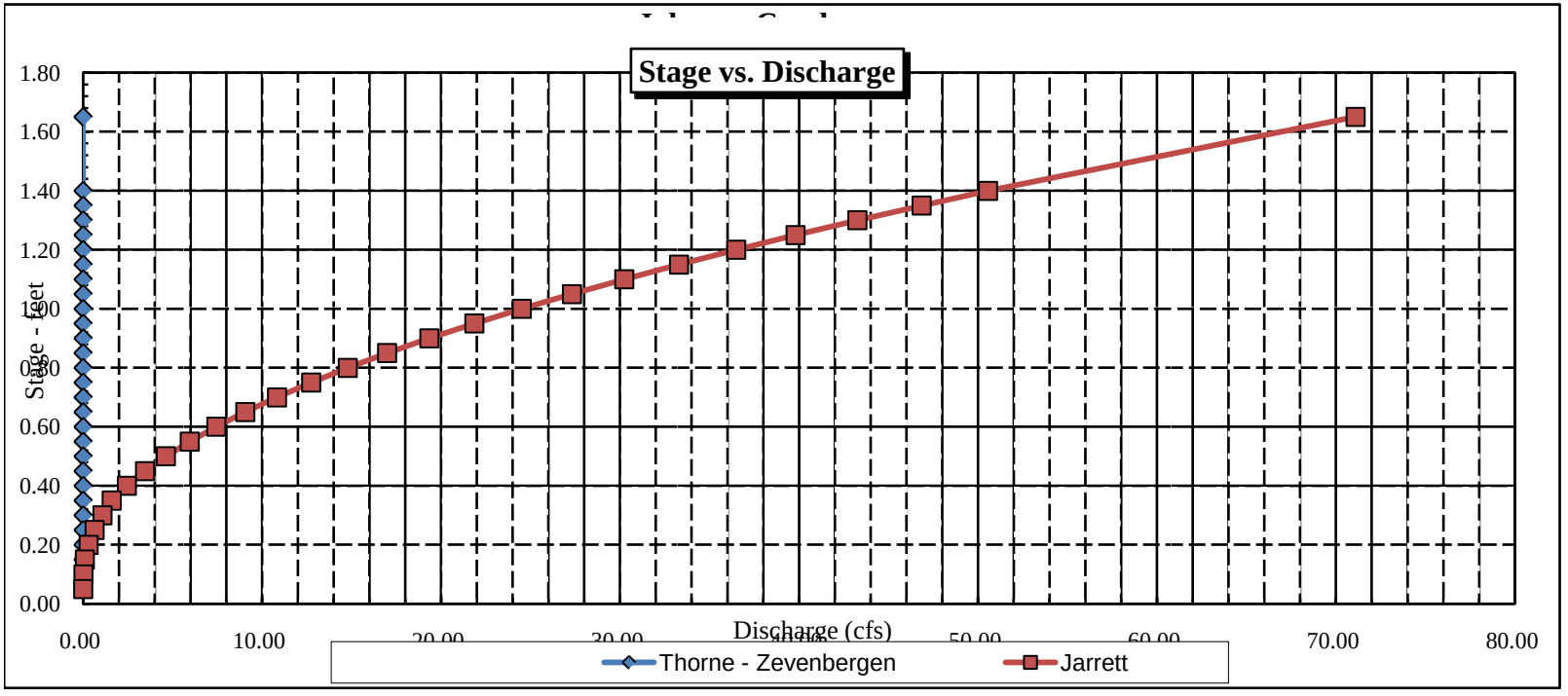
CWCB REVIEW BY: ……………………………………………………………………………………………………… DATE:………………………


CROSS SECTION DATA ANALYSIS
RS
G
LS & G
W
W
-6.50
-7.00
-7.50
-8.00
-8.50
-9.00
-9.50
-10.00
VERTICAL DEPTH (FT)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
10.00
20.00
80.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
10.00
70.00
80.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
10.00
70.00
80.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
Stage - feet
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
10.00
70.00
80.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Johnson Creek					CROSS-SECTION NO.: 6	
CROSS-SECTION LOCATION: 1/4 mile downstream from conf. w/ Pole Creek						
DATE: 9-17-10	OBSERVERS: R. Smith, P. Belcher, J. Thompson					
LEGAL DESCRIPTION	¼ SECTION: SW SE	SECTION: 20	TOWNSHIP: 12 (N) S	RANGE: 77 E (W)	PM: 6th	
COUNTY: Larimer	WATERSHED: Laramie	WATER DIVISION: 1	DOW WATER CODE: 11320			
MAP(S): USGS:						
USFS:						

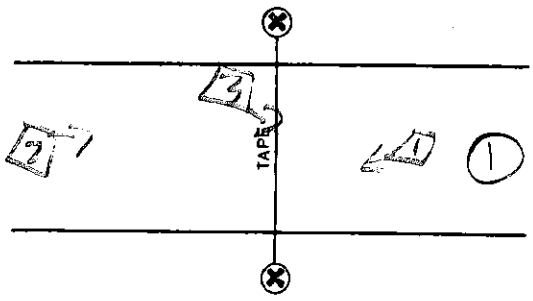
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/lobl	TAPE TENSION: ____ lbs
CHANNEL BED MATERIAL SIZE RANGE:	PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	5.00 / 5.00
② WS Upstream	15.7	4.91
③ WS Downstream	23.7	5.19
SLOPE	0.38 / 39.4 = .009	

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, stonefly

COMMENTS

pH - 7.8
Temp: 11.5°C
TDS: 110

FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Johnson Creek | CROSS-SECTION NO.: 6 | DATE: 9-17-10 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 2 pm

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		1.09								
G	0.6		4.10								
W	1.8		5.00	0	-						
	2.0		5.05	0.05				0.01			
	2.5		5.25	0.25				0.25			
	3.0		5.25	0.25				0.71			
	3.5		5.25	0.25				0.95			
	4.0		5.25	0.25				0.86			
	4.5		5.30	0.3				0.48			
	5.0		5.25	0.25				0.78			
	5.5		5.30	0.3				1.32			
	6.0		5.30	0.3				1.58			
	6.5		5.30	0.3				1.51			
	7.0		5.25	0.25				0.94			
	7.5		5.25	0.25				0.13			
	8.0		5.30	0.3				—			
	8.5		5.40	0.4				1.09			
	9.0		5.40	0.4				1.28			
	9.5		5.40	0.4				0.70			
	10.0		5.40	0.4				0.93			
	10.5		5.40	0.4				0.78			
	11.0		5.30	0.3				0.71			
	11.5		5.20	0.2				0.59			
	11.8		5.15	0.15				0.51			
W	12.0		5.00	0							
O	12.1		3.95								
RS	15.0		2.93								
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:	Johnson Creek
XS LOCATION:	1/4 mile d/s fr conf w/ Pole Creek
XS NUMBER:	6
DATE:	17-Sep-10
OBSERVERS:	R. Smith, P. Belcher, J. Thompson
1/4 SEC:	SW SE
SECTION:	20
TWP:	12N
RANGE:	77W
PM:	Sixth
COUNTY:	Larimer
WATERSHED:	Laramie River
DIVISION:	1
DOW CODE:	11320
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:	0.009

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

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

STREAM NAME: Johnson Creek
XS LOCATION: 1/4 mile d/s fr conf w/ Pole Creek
XS NUMBER: 6

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	1.09			0.00		0.00	0.00	0.0%
1	G	0.60	4.10			0.00		0.00	0.00	0.0%
	W	1.80	5.00	0.00	0.00	0.00		0.00	0.00	0.0%
		2.00	5.05	0.05	0.01	0.21	0.05	0.02	0.00	0.0%
		2.50	5.25	0.25	0.25	0.54	0.25	0.13	0.03	1.3%
		3.00	5.25	0.25	0.71	0.50	0.25	0.13	0.09	3.6%
		3.50	5.25	0.25	0.95	0.50	0.25	0.13	0.12	4.9%
		4.00	5.25	0.25	0.86	0.50	0.25	0.13	0.11	4.4%
		4.50	5.30	0.30	0.48	0.50	0.30	0.15	0.07	3.0%
		5.00	5.25	0.25	0.78	0.50	0.25	0.13	0.10	4.0%
		5.50	5.30	0.30	1.32	0.50	0.30	0.15	0.20	8.1%
		6.00	5.30	0.30	1.58	0.50	0.30	0.15	0.24	9.7%
		6.50	5.30	0.30	1.51	0.50	0.30	0.15	0.23	9.3%
		7.00	5.25	0.25	0.94	0.50	0.25	0.13	0.12	4.8%
		7.50	5.25	0.25	0.13	0.50	0.25	0.13	0.02	0.7%
		8.00	5.30	0.30	0.00	0.50	0.30	0.15	0.00	0.0%
		8.50	5.40	0.40	1.09	0.51	0.40	0.20	0.22	8.9%
		9.00	5.40	0.40	1.28	0.50	0.40	0.20	0.26	10.5%
		9.50	5.40	0.40	0.70	0.50	0.40	0.20	0.14	5.7%
		10.00	5.40	0.40	0.93	0.50	0.40	0.20	0.19	7.6%
		10.50	5.40	0.40	0.78	0.50	0.40	0.20	0.16	6.4%
		11.00	5.30	0.30	0.71	0.51	0.30	0.15	0.11	4.4%
		11.50	5.20	0.20	0.59	0.51	0.20	0.08	0.05	1.9%
		11.80	5.15	0.15	0.51	0.30	0.15	0.04	0.02	0.8%
	W	12.00	5.00	0.00	0.00	0.25		0.00	0.00	0.0%
1	G	12.10	3.95			0.00		0.00	0.00	0.0%
	RS	15.00	2.93			0.00		0.00	0.00	0.0%
	TOTALS ----------					10.34	0.4 (Max.)	2.91	2.44	100.0%

Manning's n = 0.0722
Hydraulic Radius= 0.28140454

STREAM NAME: Johnson Creek
XS LOCATION: 1/4 mile d/s fr conf w/ Pole Creek
XS NUMBER: 6

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	2.91	2.91	0.0%
4.75	2.91	5.50	89.2%
4.77	2.91	5.29	81.9%
4.79	2.91	5.08	74.7%
4.81	2.91	4.87	67.5%
4.83	2.91	4.66	60.3%
4.85	2.91	4.46	53.1%
4.87	2.91	4.25	46.0%
4.89	2.91	4.04	38.9%
4.91	2.91	3.83	31.7%
4.93	2.91	3.63	24.7%
4.95	2.91	3.42	17.6%
4.96	2.91	3.32	14.1%
4.97	2.91	3.22	10.5%
4.98	2.91	3.11	7.0%
4.99	2.91	3.01	3.5%
5.00	2.91	2.91	0.0%
5.01	2.91	2.81	-3.5%
5.02	2.91	2.71	-7.0%
5.03	2.91	2.61	-10.4%
5.04	2.91	2.51	-13.9%
5.05	2.91	2.41	-17.3%
5.07	2.91	2.21	-24.1%
5.09	2.91	2.01	-30.8%
5.11	2.91	1.82	-37.5%
5.13	2.91	1.62	-44.2%
5.15	2.91	1.43	-50.8%
5.17	2.91	1.24	-57.3%
5.19	2.91	1.06	-63.7%
5.21	2.91	0.87	-69.9%
5.23	2.91	0.70	-76.1%
5.25	2.91	0.52	-82.2%

WATERLINE AT ZERO
AREA ERROR = 5.000

STREAM NAME: Johnson Creek
XS LOCATION: 1/4 mile d/s fr conf w/ Pole Creek
XS NUMBER: 6

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.10	11.49	1.10	1.30	12.67	12.75	100.0%	0.99	24.64	1.94
	4.10	11.49	1.10	1.30	12.67	12.75	100.0%	0.99	24.64	1.94
	4.15	11.41	1.06	1.25	12.10	12.61	99.0%	0.96	22.97	1.90
	4.20	11.34	1.02	1.20	11.53	12.48	97.9%	0.92	21.35	1.85
	4.25	11.27	0.97	1.15	10.96	12.34	96.9%	0.89	19.77	1.80
	4.30	11.20	0.93	1.10	10.40	12.21	95.8%	0.85	18.25	1.75
	4.35	11.13	0.88	1.05	9.84	12.08	94.8%	0.81	16.77	1.70
	4.40	11.06	0.84	1.00	9.29	11.94	93.7%	0.78	15.33	1.65
	4.45	10.99	0.80	0.95	8.74	11.81	92.7%	0.74	13.95	1.60
	4.50	10.91	0.75	0.90	8.19	11.68	91.6%	0.70	12.62	1.54
	4.55	10.84	0.71	0.85	7.64	11.54	90.6%	0.66	11.34	1.48
	4.60	10.77	0.66	0.80	7.10	11.41	89.5%	0.62	10.12	1.42
	4.65	10.70	0.61	0.75	6.57	11.28	88.5%	0.58	8.94	1.36
	4.70	10.63	0.57	0.70	6.03	11.14	87.4%	0.54	7.83	1.30
	4.75	10.56	0.52	0.65	5.50	11.01	86.4%	0.50	6.77	1.23
	4.80	10.49	0.47	0.60	4.98	10.88	85.3%	0.46	5.77	1.16
	4.85	10.41	0.43	0.55	4.46	10.74	84.3%	0.41	4.84	1.09
	4.90	10.34	0.38	0.50	3.94	10.61	83.2%	0.37	3.97	1.01
	4.95	10.27	0.33	0.45	3.42	10.47	82.2%	0.33	3.17	0.93
WL	5.00	10.20	0.29	0.40	2.91	10.34	81.1%	0.28	2.44	0.84
	5.05	9.93	0.24	0.35	2.41	10.05	78.9%	0.24	1.81	0.75
	5.10	9.74	0.20	0.30	1.91	9.83	77.2%	0.19	1.26	0.66
	5.15	9.55	0.15	0.25	1.43	9.62	75.4%	0.15	0.79	0.55
	5.20	9.12	0.11	0.20	0.97	9.18	72.0%	0.11	0.42	0.44
	5.25	6.75	0.08	0.15	0.52	6.79	53.3%	0.08	0.18	0.35
	5.30	3.00	0.08	0.10	0.25	3.02	23.7%	0.08	0.09	0.37
	5.35	2.50	0.05	0.05	0.11	2.51	19.7%	0.04	0.03	0.25
	5.40	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Johnson Creek
XS LOCATION: 1/4 mile d/s fr conf w/ Pole Creek
XS NUMBER: 6

SUMMARY SHEET

MEASURED FLOW (Qm)=	2.44	cfs
CALCULATED FLOW (Qc)=	2.44	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	5.00	ft
CALCULATED WATERLINE (WLc)=	5.00	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.40	ft
MAX CALCULATED DEPTH (Dc)=	0.40	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	0.84	ft/sec
MANNING'S N=	0.072	
SLOPE=	0.009	ft/ft
.4 * Qm =	1.0	cfs
2.5 * Qm=	6.1	cfs

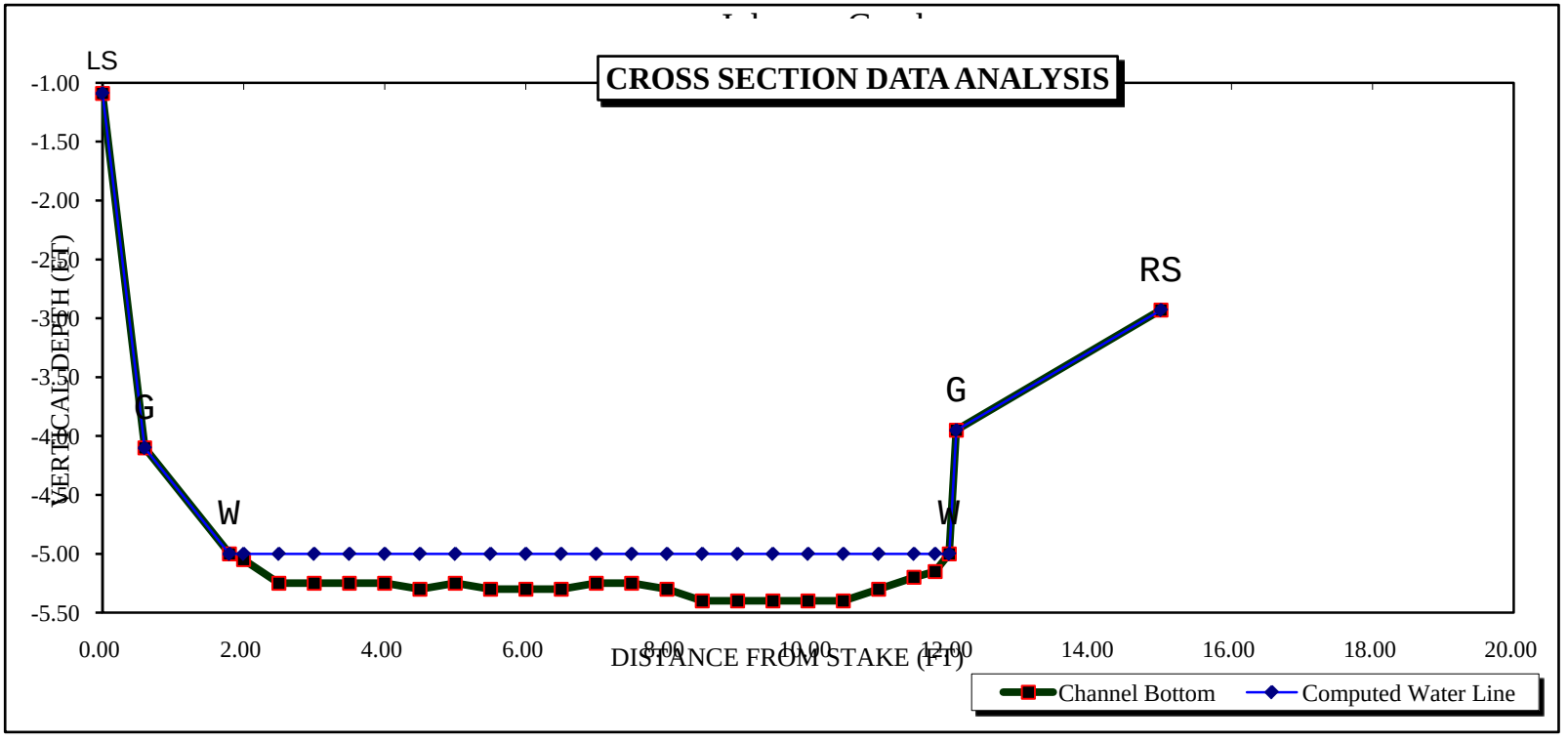
RECOMMENDED INSTREAM FLOW:
=============================

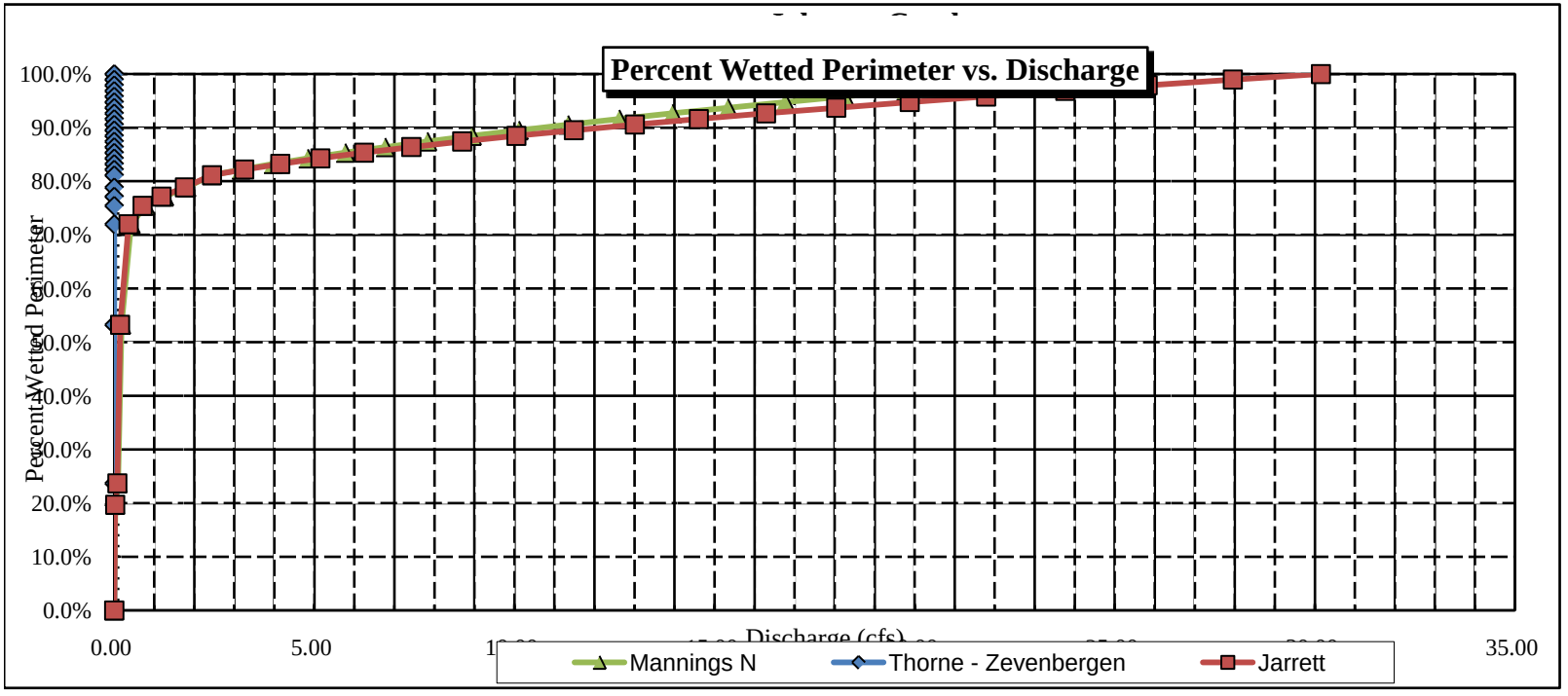
FLOW (CFS)	PERIOD
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

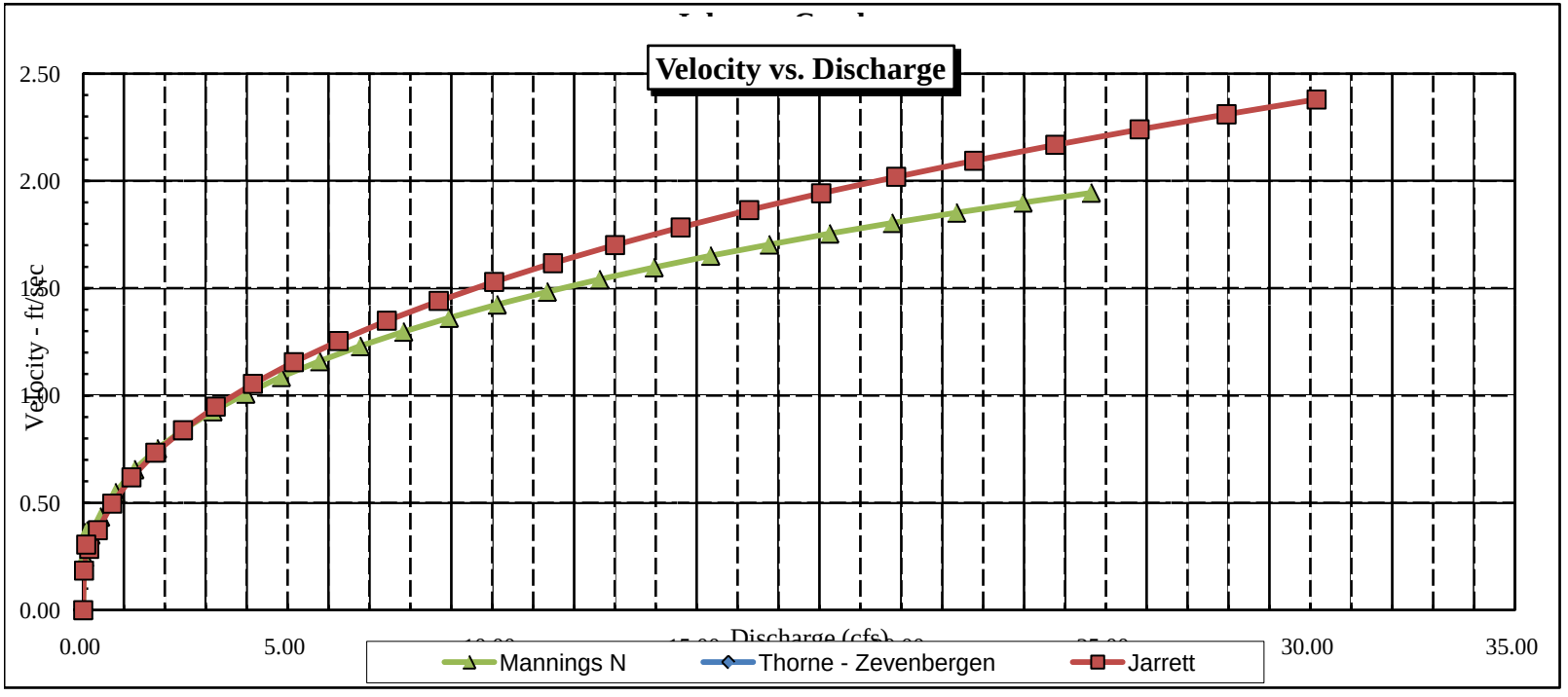
RATIONALE FOR RECOMMENDATION:
=============================

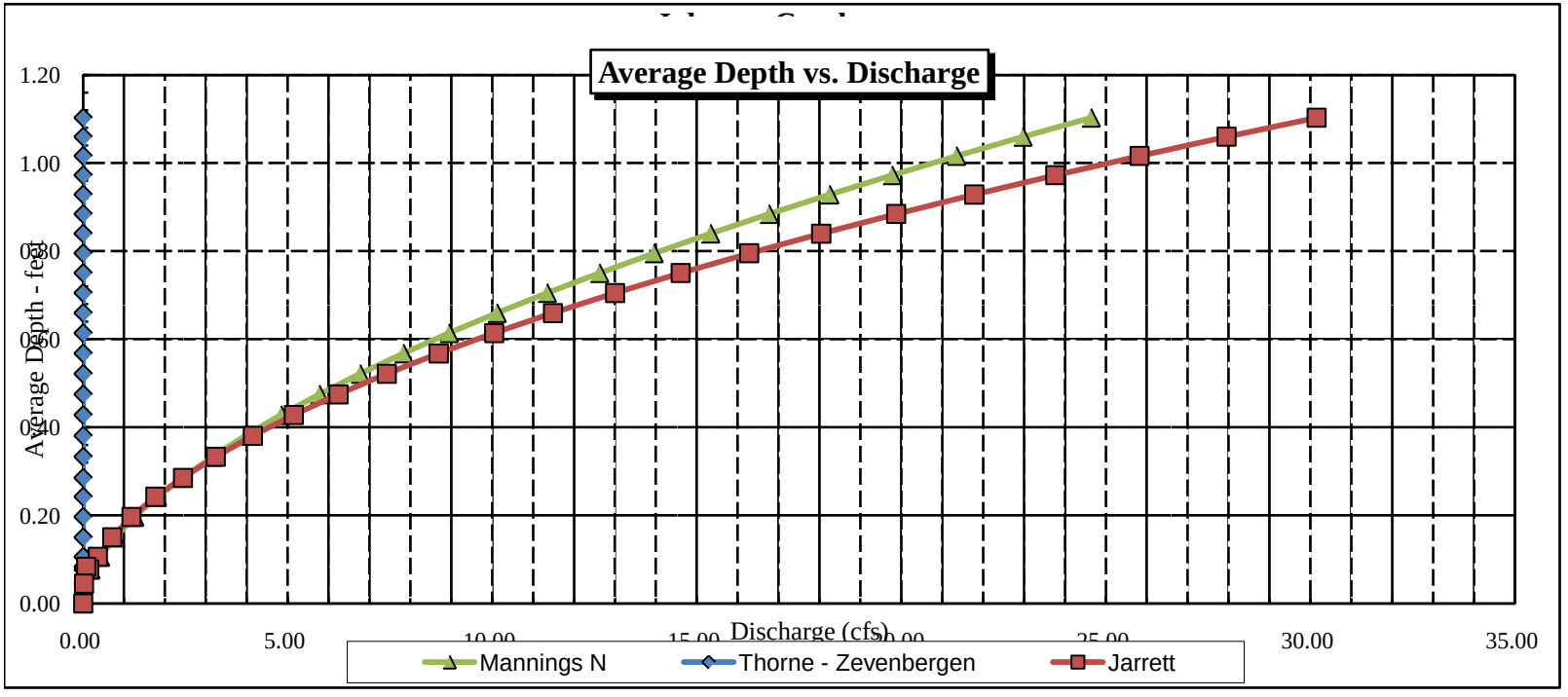
RECOMMENDATION BY: ………………………………………………………… AGENCY………………………………………………… DATE:……………………………

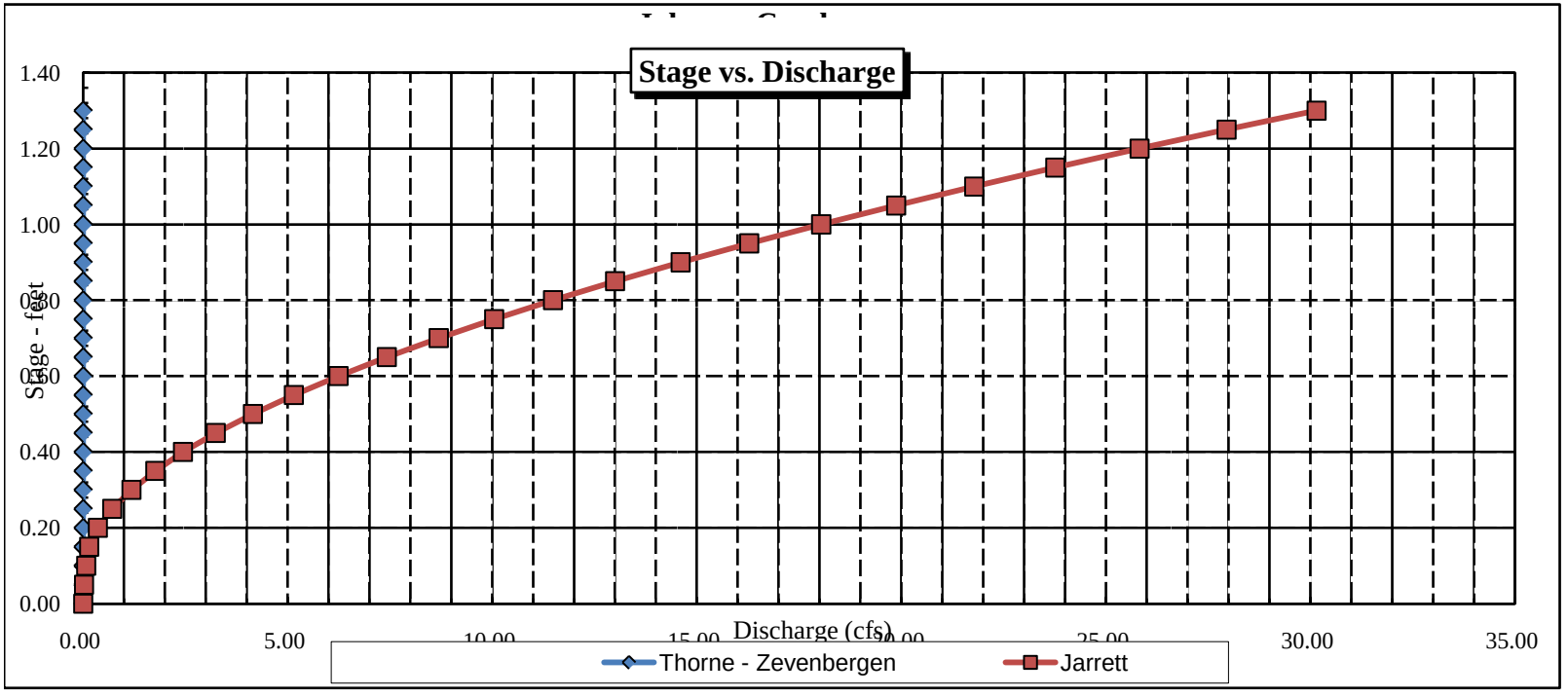
CWCB REVIEW BY: …… DATE:……………………………


CROSS SECTION DATA ANALYSIS
LS
G
W
G
W
RS
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00
-5.50
VERTICAL DEPTH (FT)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
5.00
35.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
2.50
2.00
1.50
1.00
0.50
0.00
0.00
5.00
30.00
35.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
Stage - feet
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Johnson Creek						CROSS-SECTION NO.: 7
CROSS-SECTION LOCATION: At BLM-private boundary above conf. w/ Ash Creek						
DATE: 9-17-10	OBSERVERS: R. Smith, P. Belcher, T. Thompson					
LEGAL DESCRIPTION	¼ SECTION: SE NW	SECTION: 30	TOWNSHIP: 12 (N)/S	RANGE: 77 E(W)	PM: 6th	
COUNTY: Larimer	WATERSHED: Laramie R.	WATER DIVISION: 1	DOW WATER CODE: 11320			
MAP(S): USGS:			GPS 409122			
USFS:			4537529			

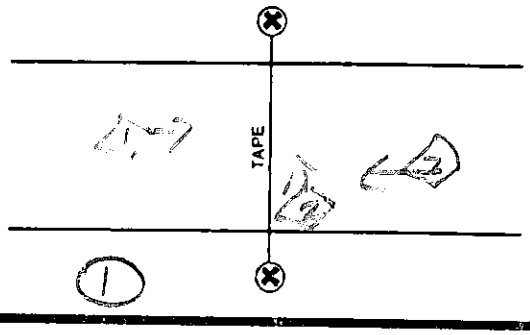
SUPPLEMENTAL DATA

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: ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: 2" - 6" cobbles	PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	7.20/7.20
② WS Upstream	9.5'	7.10
③ WS Downstream	24.2'	7.68
SLOPE	0.58/33.7 = .017	

SKETCH



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

AQUATIC SAMPLING SUMMARY

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

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

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

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

mayfly, caddisfly, stonefly

COMMENTS

pH = 7.8
TDS = 120
Temp: 13° C

FED 1-86

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Johnson Creek | CROSS-SECTION NO.: 7 | DATE: 9-17-10 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 3:25 pm

Features (Stake (S) Grassline (G) Waterline (W) Rock (R))	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	0.0		5.00								
	1.2		5.68								
G	2.3		6.19								
W	2.4	~~7.55~~	7.20		~~4.35~~		~~1.29~~				
2.5	3		7.55	0.35				1.15			
	3.5		7.55	0.35				0.99			
	4		7.40	0.2				0.82			
	4.5		7.45	0.25				0.91			
	5		7.45	0.25				0.96			
	5.5		7.40	0.2				0.67			
	6		7.40	0.2				1.26			
	6.5		7.35	0.15				0.89			
	7		7.35	0.15				0.90			
	7.5		7.45	0.25				1.05			
	8		7.20	0.2				0.80			
	8.5		7.30	0.1				0.82			
	9		7.35	0.15				1.18			
	9.5		7.50	0.3				0.90			
	10		7.30	0.1				0.30			
	10.5		7.40	0.2				1.21			
	11		7.35	0.15				0.35			
	11.5		7.35	0.15				—			
	12		7.30	0.1				—			
	12.5		7.25	0.05				0.07			
*	2.5		7.55	0.35				1.29			
W	12.9		7.21								
	13.5		6.57								
G	14.3		6.20								
S	16.5		5.76								
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:	Johnson Creek
XS LOCATION:	BLM-private boundary ab Fish Creek
XS NUMBER:	7
DATE:	17-Sep-10
OBSERVERS:	R. Smith, P. Belcher, J. Thompson
1/4 SEC:	SE NW
SECTION:	30
TWP:	12N
RANGE:	77W
PM:	Sixth
COUNTY:	Larimer
WATERSHED:	Laramie River
DIVISION:	1
DOW CODE:	11320
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: 0.017

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

ASSIGNED TO: ….....…….....DATE.....

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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
	RS	0.00	5.00			0.00		0.00	0.00	0.0%
		1.20	5.68			0.00		0.00	0.00	0.0%
1	G	2.30	6.19			0.00		0.00	0.00	0.0%
	W	2.40	7.20	0.00	0.00	0.00		0.00	0.00	0.0%
		2.50	7.55	0.35	1.29	0.36	0.35	0.11	0.14	7.6%
		3.00	7.55	0.35	1.15	0.50	0.35	0.18	0.20	11.2%
		3.50	7.55	0.35	0.99	0.50	0.35	0.18	0.17	9.7%
		4.00	7.40	0.20	0.82	0.52	0.20	0.10	0.08	4.6%
		4.50	7.45	0.25	0.91	0.50	0.25	0.13	0.11	6.3%
		5.00	7.45	0.25	0.96	0.50	0.25	0.13	0.12	6.7%
		5.50	7.40	0.20	0.67	0.50	0.20	0.10	0.07	3.7%
		6.00	7.40	0.20	1.26	0.50	0.20	0.10	0.13	7.0%
		6.50	7.35	0.15	0.89	0.50	0.15	0.08	0.07	3.7%
		7.00	7.35	0.15	0.90	0.50	0.15	0.08	0.07	3.8%
		7.50	7.45	0.25	1.05	0.51	0.25	0.13	0.13	7.3%
		8.00	7.40	0.20	0.80	0.50	0.20	0.10	0.08	4.5%
		8.50	7.30	0.10	0.82	0.51	0.10	0.05	0.04	2.3%
		9.00	7.35	0.15	1.18	0.50	0.15	0.08	0.09	4.9%
		9.50	7.50	0.30	0.90	0.52	0.30	0.15	0.14	7.5%
		10.00	7.30	0.10	0.30	0.54	0.10	0.05	0.02	0.8%
		10.50	7.40	0.20	1.21	0.51	0.20	0.10	0.12	6.8%
		11.00	7.35	0.15	0.35	0.50	0.15	0.08	0.03	1.5%
		11.50	7.35	0.15	0.00	0.50	0.15	0.08	0.00	0.0%
		12.00	7.30	0.10	0.00	0.50	0.10	0.05	0.00	0.0%
		12.50	7.25	0.05	0.07	0.50	0.05	0.02	0.00	0.1%
	W	12.90	7.21	0.00	0.00	0.40		0.00	0.00	0.0%
		13.50	6.57			0.00		0.00	0.00	0.0%
1	G	14.30	6.20			0.00		0.00	0.00	0.0%
	LS	16.50	5.76			0.00		0.00	0.00	0.0%
	TOTALS ----------					10.90	0.35 (Max.)	2.03	1.79	100.0%

Manning's n = 0.0714
Hydraulic Radius= 0.18603983

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WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	2.03	1.98	-2.5%
6.96	2.03	4.64	128.6%
6.98	2.03	4.42	118.0%
7.00	2.03	4.21	107.4%
7.02	2.03	3.99	96.9%
7.04	2.03	3.78	86.3%
7.06	2.03	3.56	75.8%
7.08	2.03	3.35	65.3%
7.10	2.03	3.14	54.8%
7.12	2.03	2.93	44.3%
7.14	2.03	2.71	33.9%
7.16	2.03	2.50	23.5%
7.17	2.03	2.40	18.3%
7.18	2.03	2.29	13.1%
7.19	2.03	2.19	7.9%
7.20	2.03	2.08	2.7%
7.21	2.03	1.98	-2.5%
7.22	2.03	1.87	-7.7%
7.23	2.03	1.77	-12.8%
7.24	2.03	1.67	-17.9%
7.25	2.03	1.56	-22.9%
7.26	2.03	1.46	-27.9%
7.28	2.03	1.26	-37.7%
7.30	2.03	1.07	-47.3%
7.32	2.03	0.88	-56.5%
7.34	2.03	0.71	-65.2%
7.36	2.03	0.55	-72.9%
7.38	2.03	0.42	-79.1%
7.40	2.03	0.31	-84.5%
7.42	2.03	0.23	-88.8%
7.44	2.03	0.16	-92.0%
7.46	2.03	0.12	-94.2%

WATERLINE AT ZERO
AREA ERROR = 7.200

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Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	6.20	12.00	1.10	1.35	13.14	13.66	100.0%	0.96	34.74	2.64
	6.20	12.00	1.10	1.35	13.14	13.66	100.0%	0.96	34.73	2.64
	6.25	11.89	1.06	1.30	12.54	13.49	98.8%	0.93	32.41	2.58
	6.30	11.77	1.02	1.25	11.95	13.32	97.5%	0.90	30.15	2.52
	6.35	11.66	0.97	1.20	11.36	13.15	96.3%	0.86	27.97	2.46
	6.40	11.55	0.93	1.15	10.78	12.98	95.0%	0.83	25.85	2.40
	6.45	11.43	0.89	1.10	10.21	12.81	93.8%	0.80	23.81	2.33
	6.50	11.32	0.85	1.05	9.64	12.64	92.6%	0.76	21.83	2.26
	6.55	11.21	0.81	1.00	9.08	12.48	91.3%	0.73	19.92	2.19
	6.60	11.13	0.77	0.95	8.52	12.34	90.3%	0.69	18.06	2.12
	6.65	11.08	0.72	0.90	7.96	12.22	89.4%	0.65	16.24	2.04
	6.70	11.03	0.67	0.85	7.41	12.10	88.6%	0.61	14.50	1.96
	6.75	10.98	0.63	0.80	6.86	11.98	87.7%	0.57	12.84	1.87
	6.80	10.92	0.58	0.75	6.31	11.86	86.8%	0.53	11.25	1.78
	6.85	10.87	0.53	0.70	5.77	11.74	86.0%	0.49	9.75	1.69
	6.90	10.82	0.48	0.65	5.23	11.62	85.1%	0.45	8.32	1.59
	6.95	10.77	0.44	0.60	4.69	11.51	84.2%	0.41	6.99	1.49
	7.00	10.72	0.39	0.55	4.15	11.39	83.3%	0.36	5.74	1.38
	7.05	10.66	0.34	0.50	3.62	11.27	82.5%	0.32	4.60	1.27
	7.10	10.61	0.29	0.45	3.08	11.15	81.6%	0.28	3.55	1.15
	7.15	10.56	0.24	0.40	2.55	11.03	80.7%	0.23	2.61	1.02
WL	7.20	10.51	0.19	0.35	2.03	10.91	79.9%	0.19	1.79	0.88
	7.25	10.08	0.15	0.30	1.51	10.44	76.4%	0.14	1.13	0.75
	7.30	9.57	0.11	0.25	1.02	9.88	72.3%	0.10	0.61	0.60
	7.35	6.92	0.08	0.20	0.58	7.18	52.6%	0.08	0.30	0.51
	7.40	4.37	0.07	0.15	0.29	4.55	33.3%	0.06	0.12	0.43
	7.45	1.65	0.08	0.10	0.13	1.76	12.9%	0.07	0.06	0.47
	7.50	1.18	0.05	0.05	0.05	1.23	9.0%	0.04	0.02	0.34

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SUMMARY SHEET

MEASURED FLOW (Qm)=	1.79	cfs
CALCULATED FLOW (Qc)=	1.79	cfs
(Qm-Qc)/Qm * 100 =	0.1	%
MEASURED WATERLINE (WLm)=	7.21	ft
CALCULATED WATERLINE (WLc)=	7.20	ft
(WLm-WLc)/WLm * 100 =	0.1	%
MAX MEASURED DEPTH (Dm)=	0.35	ft
MAX CALCULATED DEPTH (Dc)=	0.35	ft
(Dm-Dc)/Dm * 100	0.1	%
MEAN VELOCITY=	0.88	ft/sec
MANNING'S N=	0.071	
SLOPE=	0.017	ft/ft
.4 * Qm =	0.7	cfs
2.5 * Qm=	4.5	cfs

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

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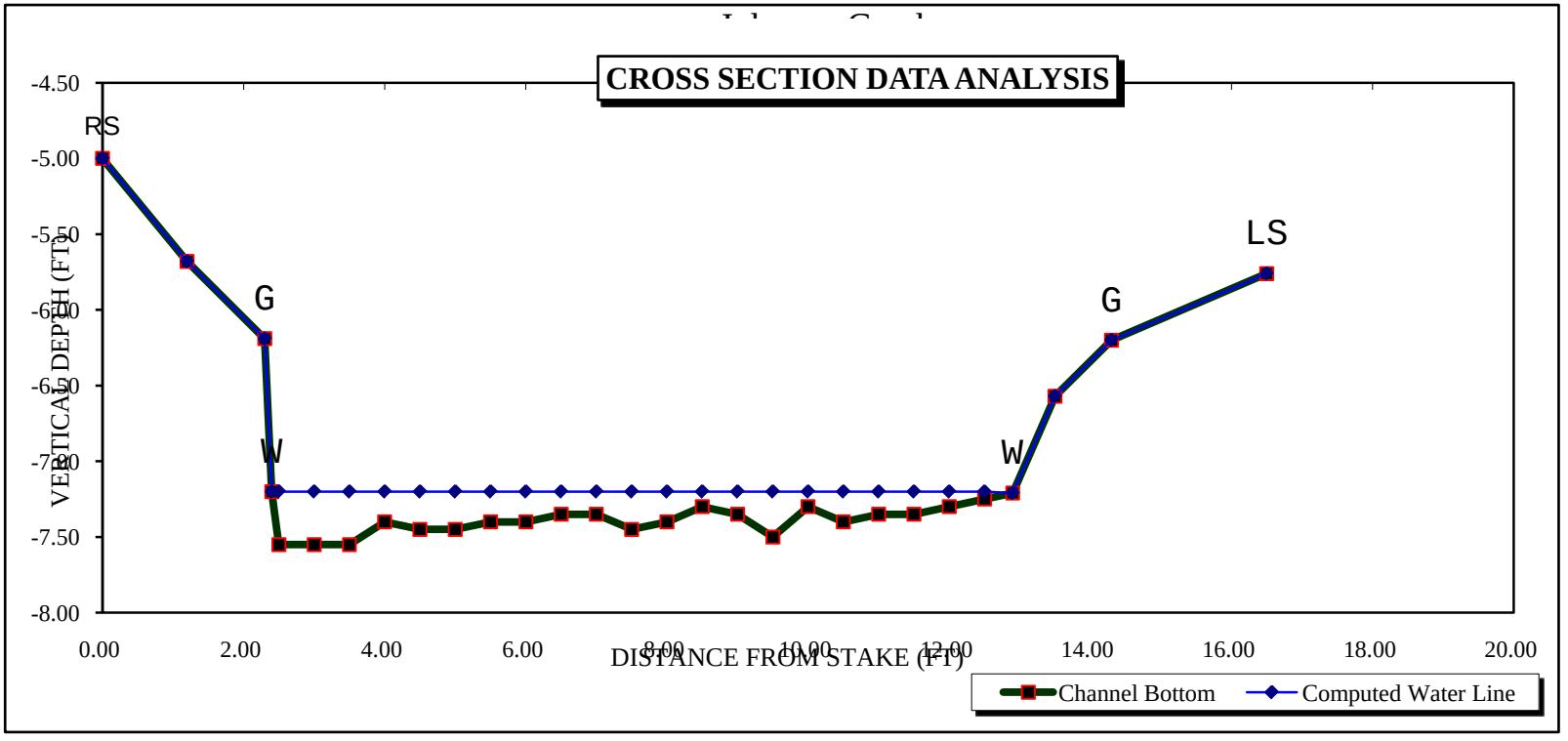
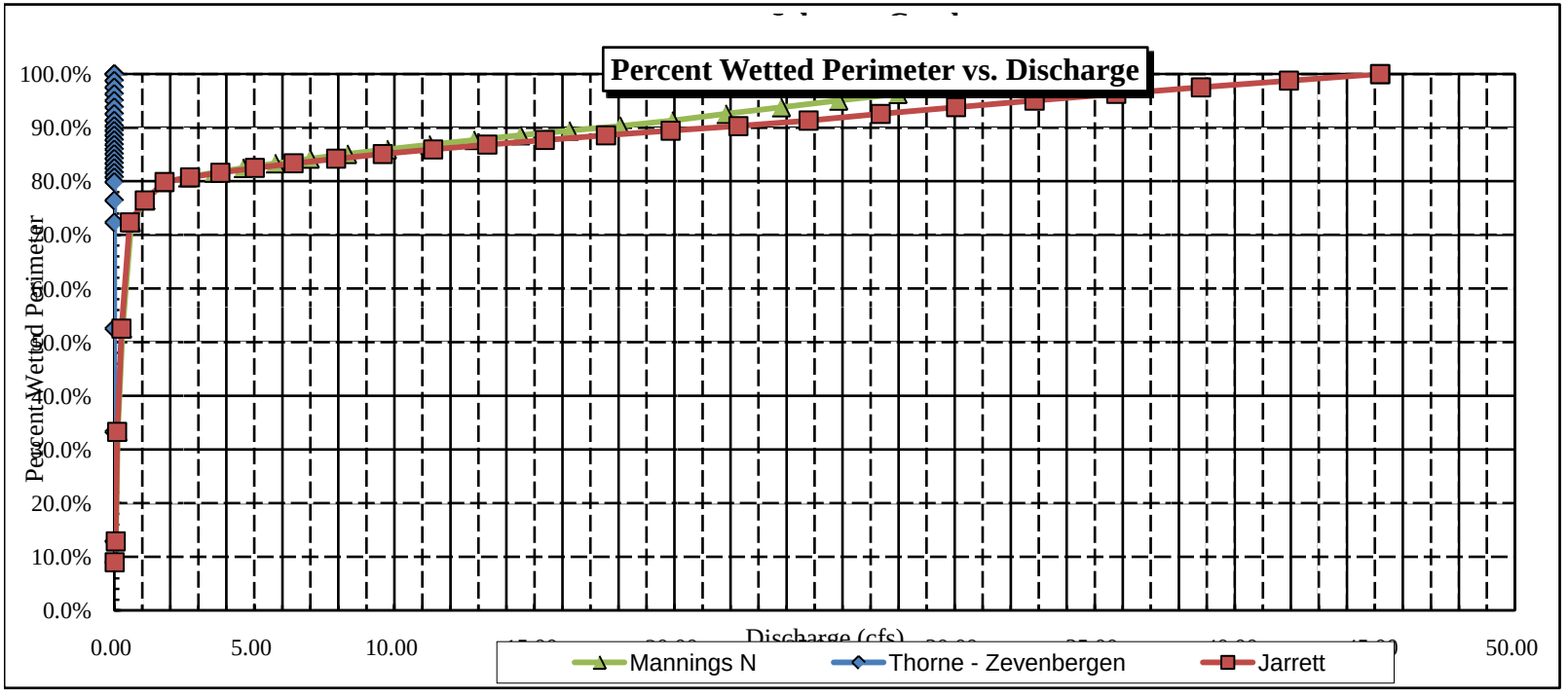
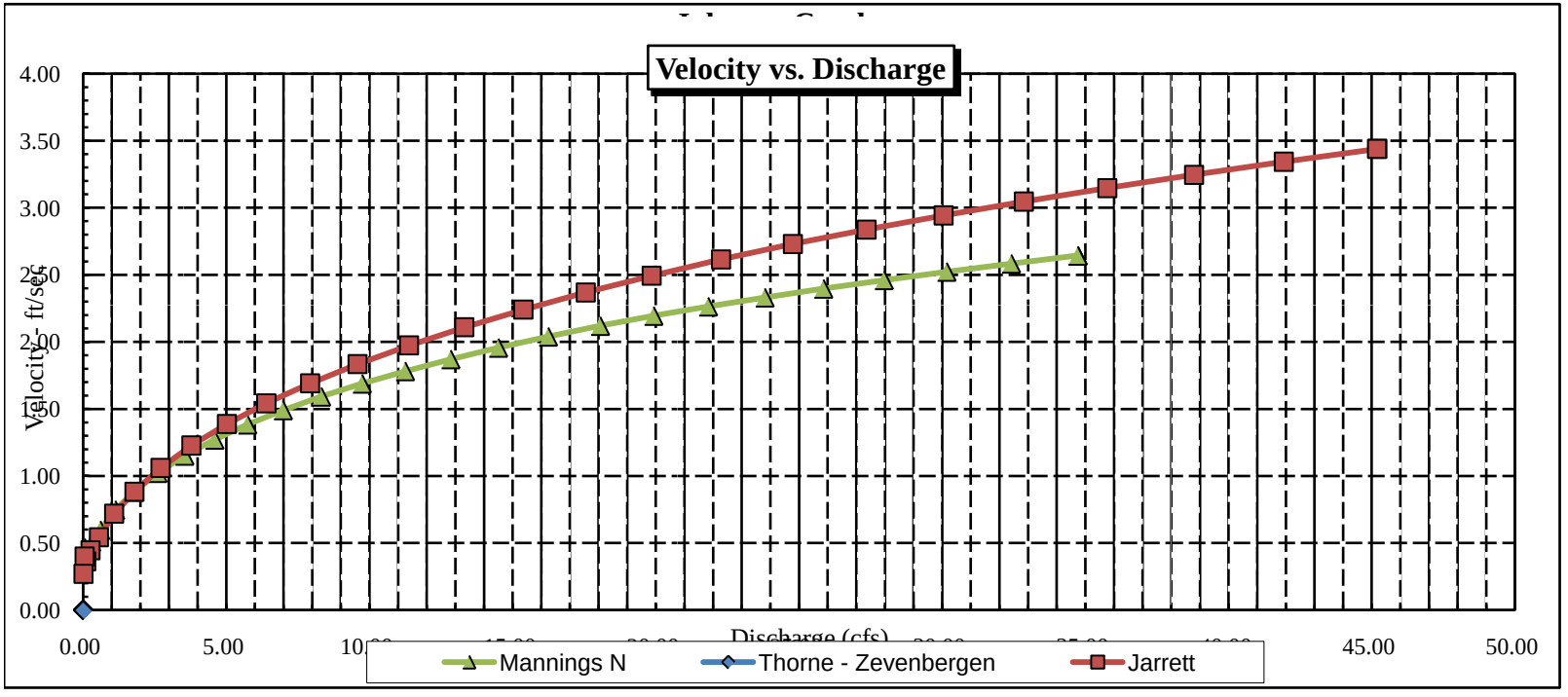
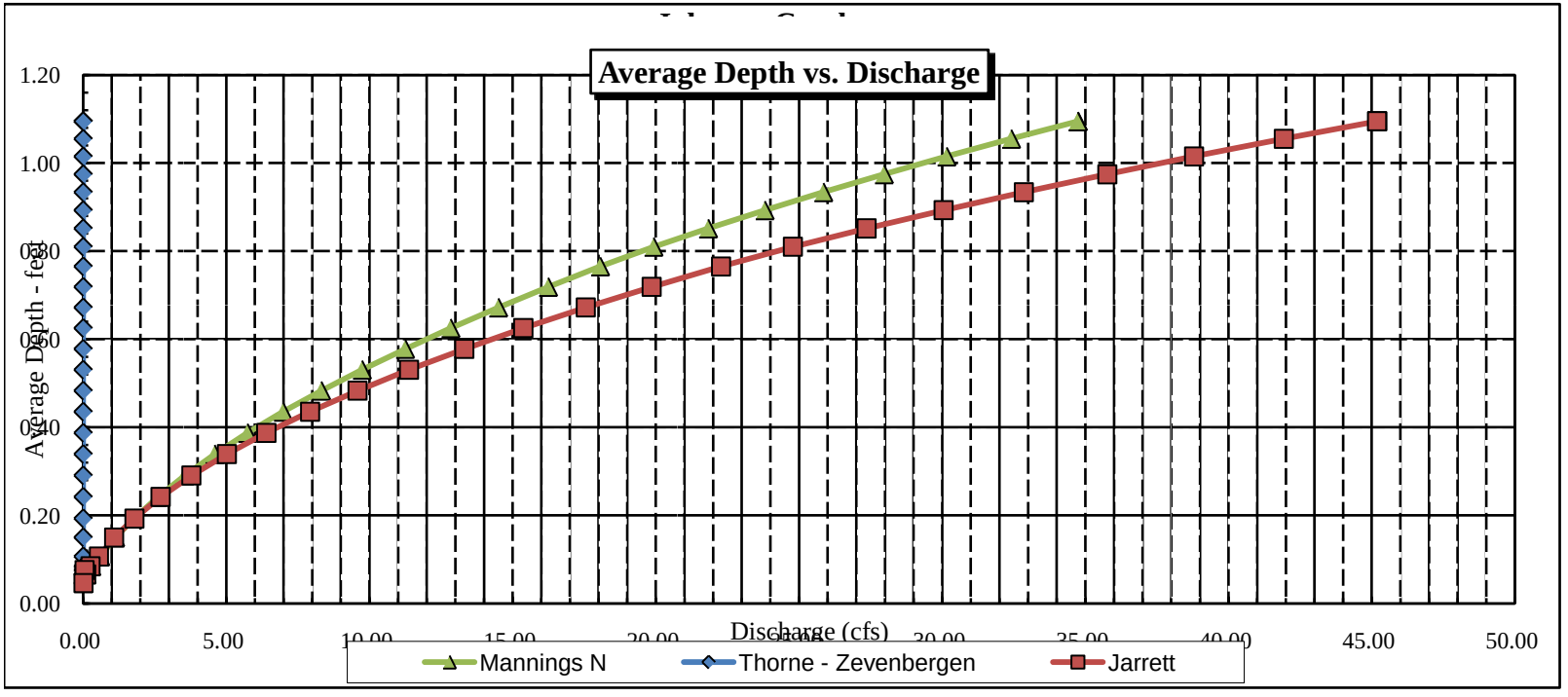
RECOMMENDATION BY: ……………………...………..……............................... AGENCY..……………………….....……...…...…….…....... DATE:......…...…......……………

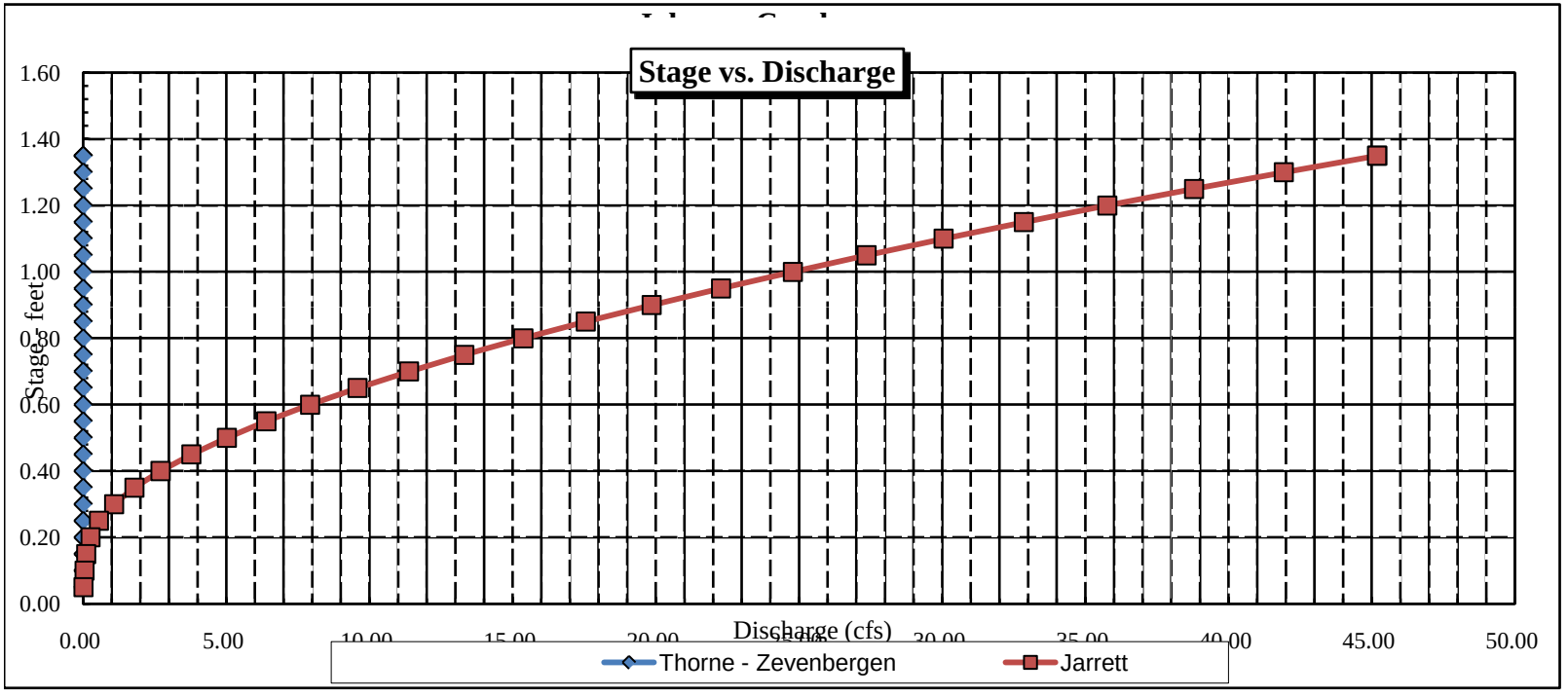
CWCB REVIEW BY: ..…………………………....………………………………………………...…............. DATE:.................…………….....


CROSS SECTION DATA ANALYSIS
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
-8.00
VERTICAL DEPTH (FT)
RS
G
W
W
G
LS
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
5.00
10.00
50.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Velocity - ft/sec
0.00
5.00
45.00
50.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
5.00
45.00
50.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
Stage - feet
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett