United States Department of the Interior
BUREAU OF LAND MANAGEMENT
Colorado State Office
2850 Youngfield Street
Lakewood, Colorado 80215-7210
www.co.blm.gov

In Reply Refer To:
7250 (CO-932)

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

Dear Ms. Bassi:

The Bureau of Land Management (BLM) is writing this letter to formally communicate its recommendation for an instream flow water right on West Fork Turkey Creek, located in Water Division 2.

Location and Land Status. The West Fork Turkey Creek watershed originates on the east flank of Black Mountain, approximately 10 miles southwest of Colorado Springs. This reach begins at the headwaters and extends downstream to the confluence of East Fork Turkey Creek and West Fork Turkey Creek, a distance of approximately 3.0 miles. The BLM manages approximately 2.75 miles of this reach, while 0.25 miles are in private ownership.

Biological Summary. West Fork Turkey Creek is a cold-water, high gradient stream. The reach flows through a narrow canyon and is confined by bedrock in most locations. The stream generally has large-sized substrate, consisting of cobbles and small boulders. The stream has a good mix of pools, small riffles and runs.

Fisheries surveys have revealed a self-sustaining population of brook trout. Intensive macro-invertebrate surveys have not been conducted, but spot samples have revealed various species of mayfly, caddisfly and stonefly.

The riparian community is generally comprised of cottonwood, various willow species and alder. The riparian community is in very good condition, and provides abundant shading and cover for fish habitat.

R2Cross Analysis. The BLM collected the following R2Cross data from West Fork Turkey Creek:

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (meets 3 of 3 hydraulic criteria)
05/27/2014 #1	1.29 cfs	5.54 feet	0.73 cfs	2.12 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.

> 2.1 cubic feet per second is recommended during the warm weather period from May 1 to August 31. This recommendation is driven by the average velocity criteria. This creek is steep and has limited physical habitat, so it is important to protect a flow rate that provides usable habitat in riffles when fish are completing critical life history functions during the warm weather months.
>
> 0.75 cubic feet per second is recommended during the fall period, from September 1 to November 30. This recommendation is driven by limited water availability. This flow rate meets the average depth and wetted perimeter criteria.
>
> 0.5 cubic feet per second is recommended during the winter period from December 1 through March 31. This flow rate should prevent pools from freezing, allowing the fish population to successfully overwinter. Even though the base flow in this creek is small, it is extremely consistent, allowing the fishery to persist.
>
> 0.75 cubic feet per second is recommended during the early portion of the snowmelt runoff period, from the April 1 to April 30. This flow rate meets the average depth and wetted perimeter criteria.

Water Availability. The BLM recommends relying upon two sources of data for water availability analysis. United States Geological Survey (USGS) Gage 07105945 (Rock Creek above Fort Carson Reservation, CO) measures flow from a watershed immediately to the north of West Fork Turkey Creek with very similar watershed characteristics. In addition, this gage is located on Rock Creek immediately as it exits the mountains, which provides a better estimate of mountain-influenced runoff. A basin apportionment analysis could be performed to derive flow rates for West Fork Turkey Creek. The BLM does not recommend reliance upon USGS Gage 07099215 (Turkey Creek near Fountain, CO). This gage is located adjacent to State Highway 115, after the creek exits the mountains and loses a significant amount of flow to seepage. In addition, it appears that the gage may be influenced by diversions from the Strobel Ditch.

Streamstats should also be consulted. The Streamstats model produces similar estimates of baseflow as basin apportionment calculations of the Rock Creek gage.

BLM does not recommend relying upon diversion records from the Strobel Ditch. This ditch appears to divert fairly infrequently, likely because of its junior priority within the Arkansas River basin.

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

Relationship to Land Management Plans. The BLM's land use plan calls for West Fork Turkey Creek to be managed to maintain, restore or improve riparian conditions, such that proper functioning conditions are achieved. It also specifies that instream flow appropriations are pursued on fishery streams to ensure sufficient flows rates for fisheries protection. Appropriation of an instream flow water right would assist BLM in long-term management of outstanding riparian values and important fishery values.

Data sheets, R2Cross output, fishery survey information and photographs of the cross section were included with BLM's draft recommendation in February 2015. We thank both Colorado Parks and Wildlife and the Colorado Water Conservation Board for their cooperation in this effort.

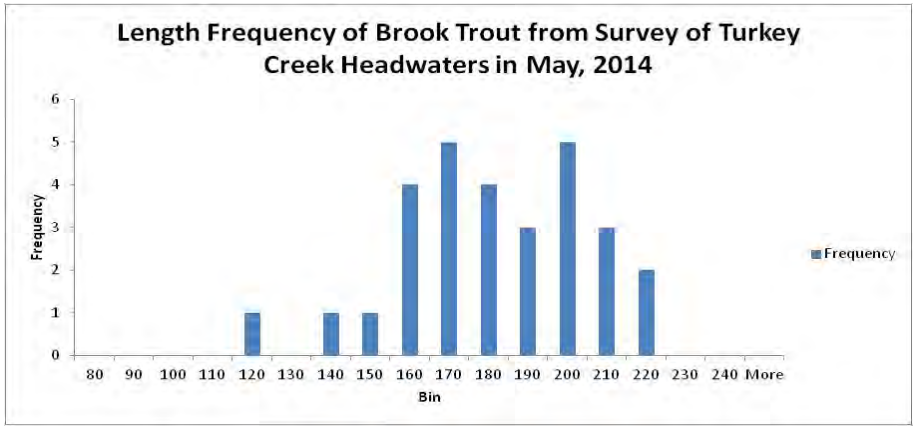
If you have any questions regarding our instream flow recommendation, please contact Roy Smith at 303-239-3940.

Sincerely,

Brian St. George
Deputy State Director
Resources and Fire

Cc: David Gilbert, Royal Gorge FO
Keith Berger, Royal Gorge FO

HUC12	Description	SampleDate	SiteName	Location	Protocol	TotalCatch	CommonName	TotalEffort	EffortMetric	LengthRange	CPUE
110200020701	Headwaters Turkey Cre	27-May-14	NULL	Upstream of Hwy 115 and gravel mine	TWO-PASS REMOVAL	29	BROOK TROUT	2	PASS	115 - 215	NULL
110200020702	Upper Turkey Creek	9-Nov-11	Fort Carson #50 in TA 38	Fort Carson #50 in TA 38	CPUE	97	CENTRAL STONEROLLER	2	NET	59 - 103	48.50 / NET
110200020702	Upper Turkey Creek	9-Nov-11	TA 38 North of Two Track intersect	TA 38 North of Two Track intersect	PRESENCE/ABSENCE	NULL	NULL	1	PASS	NULL	NULL
110200020704	Lower Turkey Creek	9-Nov-11	Downstream Dam Outlet Teller Reservoir	BLW Teller Reservoir Dam Outlet	PRESENCE/ABSENCE	NULL	NULL	1	PASS	NULL	NULL
110200020704	Lower Turkey Creek	9-Nov-11	AT CARRIZO SPRINGS	ABV W Carrizo Springs Ave	PRESENCE/ABSENCE	NULL	NULL	1	PASS	NULL	NULL



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

LOCATION INFORMATION

STREAM NAME:	West Fork Turkey Creek
XS LOCATION:	150' upst fr conf wth East Fork
XS NUMBER:	1
DATE:	27-May-14
OBSERVERS:	R. Smith, D. Gilbert
1/4 SEC:	SW
SECTION:	19
TWP:	16S
RANGE:	67W
PM:	Sixth
COUNTY:	El Paso
WATERSHED:	Arkansas River
DIVISION:	2
DOW CODE:	31617
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:	0.041

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

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

STREAM NAME: West Fork Turkey Creek
XS LOCATION: 150' upst fr conf wth East Fork
XS NUMBER: 1

DATA POINTS= 20

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	RS	0.00	5.00			0.00		0.00	0.00	0.0%
1	G	2.00	5.54			0.00		0.00	0.00	0.0%
		3.00	5.80			0.00		0.00	0.00	0.0%
	W	4.20	6.30	0.00	0.00	0.00		0.00	0.00	0.0%
		4.60	6.44	0.14	0.00	0.42	0.14	0.06	0.00	0.0%
		5.00	6.46	0.16	0.38	0.40	0.16	0.06	0.02	1.9%
		5.40	6.44	0.14	1.50	0.40	0.14	0.06	0.08	6.5%
		5.80	6.50	0.20	2.53	0.40	0.20	0.08	0.20	15.7%
		6.20	6.48	0.18	1.13	0.40	0.18	0.07	0.08	6.3%
		6.60	6.56	0.26	1.37	0.41	0.26	0.10	0.14	11.0%
		7.00	6.61	0.31	1.29	0.40	0.31	0.12	0.16	12.4%
		7.40	6.75	0.45	0.14	0.42	0.45	0.18	0.03	2.0%
		7.80	6.80	0.50	0.60	0.40	0.50	0.20	0.12	9.3%
		8.20	6.77	0.47	0.26	0.40	0.47	0.19	0.05	3.8%
		8.60	6.67	0.37	0.63	0.41	0.37	0.15	0.09	7.2%
		9.00	6.59	0.29	0.94	0.41	0.29	0.12	0.11	8.4%
		9.40	6.60	0.30	1.49	0.40	0.30	0.14	0.20	15.6%
	W	9.90	6.30	0.00	0.00	0.58		0.00	0.00	0.0%
1	G	11.70	5.50			0.00		0.00	0.00	0.0%
	LS	13.50	4.12			0.00		0.00	0.00	0.0%
	TOTALS ----------					5.87	0.5	1.52	1.29	100.0%
							(Max.)			

Manning's n = 0.1442
Hydraulic Radius= 0.25935403

STREAM NAME: West Fork Turkey Creek
XS LOCATION: 150' upst fr conf wth East Fork
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.52	1.52	0.0%
6.05	1.52	3.09	103.1%
6.07	1.52	2.96	94.2%
6.09	1.52	2.82	85.3%
6.11	1.52	2.69	76.6%
6.13	1.52	2.56	68.0%
6.15	1.52	2.43	59.6%
6.17	1.52	2.30	51.2%
6.19	1.52	2.18	43.0%
6.21	1.52	2.05	34.9%
6.23	1.52	1.93	26.9%
6.25	1.52	1.81	19.1%
6.26	1.52	1.75	15.2%
6.27	1.52	1.70	11.4%
6.28	1.52	1.64	7.5%
6.29	1.52	1.58	3.8%
6.30	1.52	1.52	0.0%
6.31	1.52	1.47	-3.7%
6.32	1.52	1.41	-7.4%
6.33	1.52	1.35	-11.1%
6.34	1.52	1.30	-14.7%
6.35	1.52	1.24	-18.3%
6.37	1.52	1.14	-25.5%
6.39	1.52	1.03	-32.5%
6.41	1.52	0.92	-39.4%
6.43	1.52	0.82	-46.1%
6.45	1.52	0.72	-52.7%
6.47	1.52	0.64	-58.2%
6.49	1.52	0.56	-63.3%
6.51	1.52	0.49	-67.6%
6.53	1.52	0.43	-71.7%
6.55	1.52	0.37	-75.7%

WATERLINE AT ZERO
AREA ERROR = 6.300

STREAM NAME: West Fork Turkey Creek
XS LOCATION: 150' upst fr conf wth East Fork
XS NUMBER: 1 Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.54	9.61	0.75	1.26	7.25	10.08	100.0%	0.72	12.13	1.67
	5.55	9.55	0.75	1.25	7.15	10.01	99.4%	0.71	11.92	1.67
	5.60	9.24	0.72	1.20	6.68	9.69	96.2%	0.69	10.88	1.63
	5.65	8.94	0.70	1.15	6.23	9.37	93.0%	0.66	9.89	1.59
	5.70	8.63	0.67	1.10	5.79	9.05	89.8%	0.64	8.96	1.55
	5.75	8.33	0.64	1.05	5.36	8.73	86.6%	0.61	8.09	1.51
	5.80	8.02	0.62	1.00	4.95	8.40	83.4%	0.59	7.27	1.47
	5.85	7.79	0.59	0.95	4.56	8.15	80.9%	0.56	6.46	1.42
	5.90	7.56	0.55	0.90	4.17	7.90	78.4%	0.53	5.69	1.36
	5.95	7.33	0.52	0.85	3.80	7.64	75.9%	0.50	4.98	1.31
	6.00	7.09	0.49	0.80	3.44	7.39	73.3%	0.47	4.31	1.25
	6.05	6.86	0.45	0.75	3.09	7.14	70.8%	0.43	3.70	1.19
	6.10	6.63	0.42	0.70	2.76	6.88	68.3%	0.40	3.12	1.13
	6.15	6.40	0.38	0.65	2.43	6.63	65.8%	0.37	2.60	1.07
	6.20	6.16	0.34	0.60	2.12	6.38	63.3%	0.33	2.12	1.00
	6.25	5.93	0.31	0.55	1.81	6.13	60.8%	0.30	1.68	0.93
WL	6.30	5.70	0.27	0.50	1.52	5.87	58.3%	0.26	1.29	0.85
	6.35	5.47	0.23	0.45	1.24	5.62	55.8%	0.22	0.95	0.76
	6.40	5.25	0.19	0.40	0.98	5.38	53.3%	0.18	0.65	0.67
	6.45	4.58	0.16	0.35	0.72	4.69	46.5%	0.15	0.43	0.60
	6.50	3.27	0.16	0.30	0.53	3.35	33.3%	0.16	0.32	0.61
	6.55	2.93	0.13	0.25	0.37	3.00	29.8%	0.12	0.19	0.52
	6.60	2.03	0.12	0.20	0.24	2.08	20.6%	0.11	0.12	0.49
	6.65	1.59	0.09	0.15	0.15	1.62	16.1%	0.09	0.06	0.42
	6.70	1.22	0.06	0.10	0.08	1.24	12.3%	0.06	0.03	0.33
	6.75	0.88	0.03	0.05	0.02	0.89	8.8%	0.03	0.00	0.19
	6.80	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: West Fork Turkey Creek
XS LOCATION: 150' upst fr conf wth East Fork
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.29	cfs
CALCULATED FLOW (Qc)=	1.29	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	6.30	ft
CALCULATED WATERLINE (WLc)=	6.30	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.50	ft
MAX CALCULATED DEPTH (Dc)=	0.50	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	0.85	ft/sec
MANNING'S N=	0.144	
SLOPE=	0.041	ft/ft
.4 * Qm =	0.5	cfs
2.5 * Qm=	3.2	cfs

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

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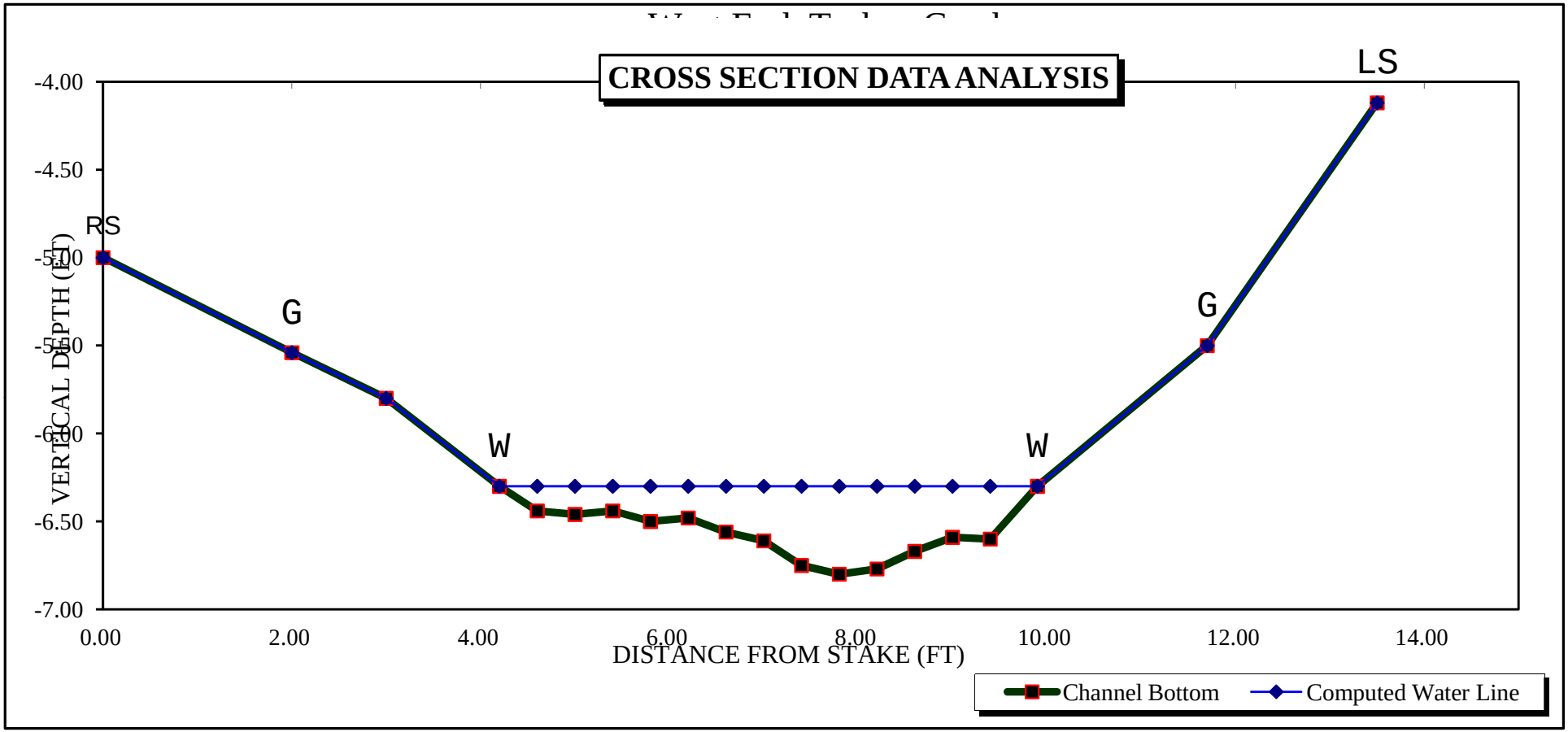
RECOMMENDATION BY: ………………………………………………… AGENCY……………………………………………… DATE:……………………………

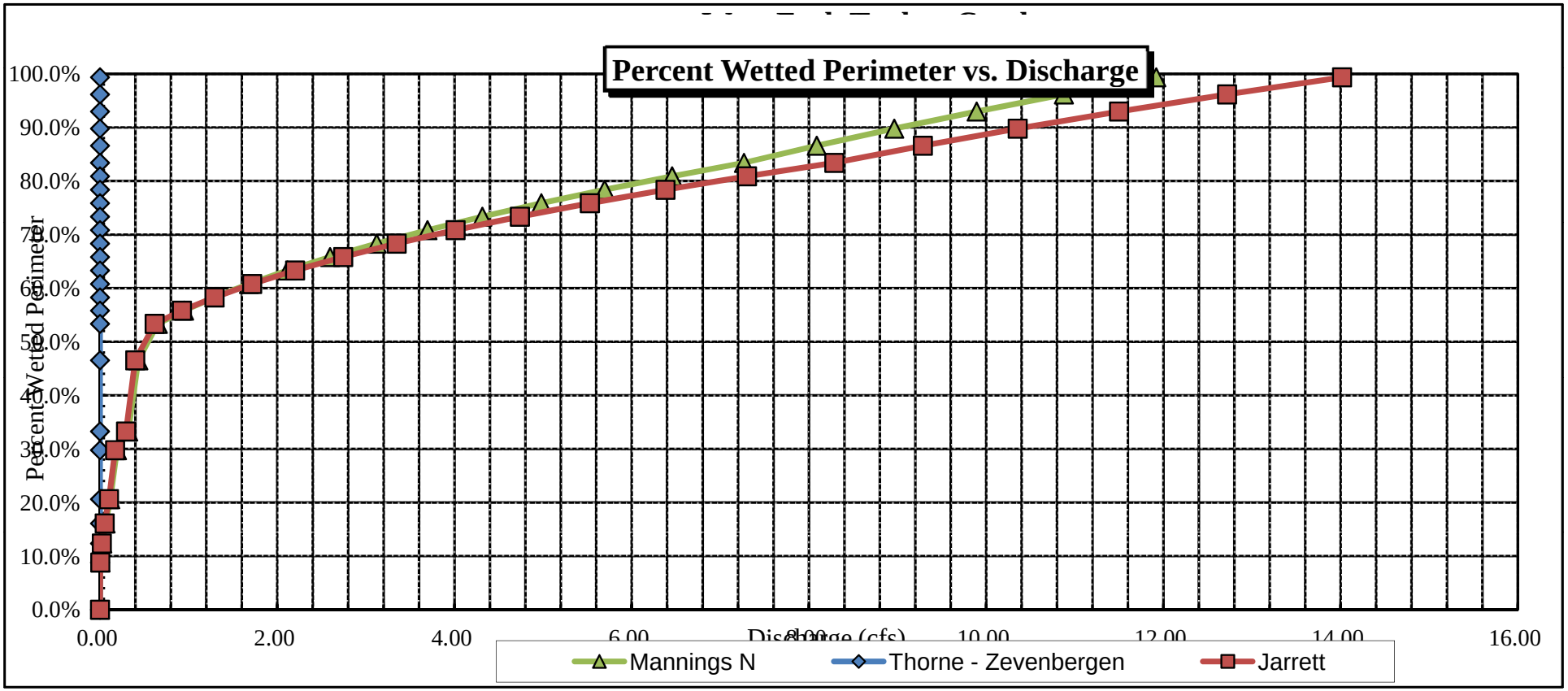
CWCB REVIEW BY: ……… DATE:……………………………

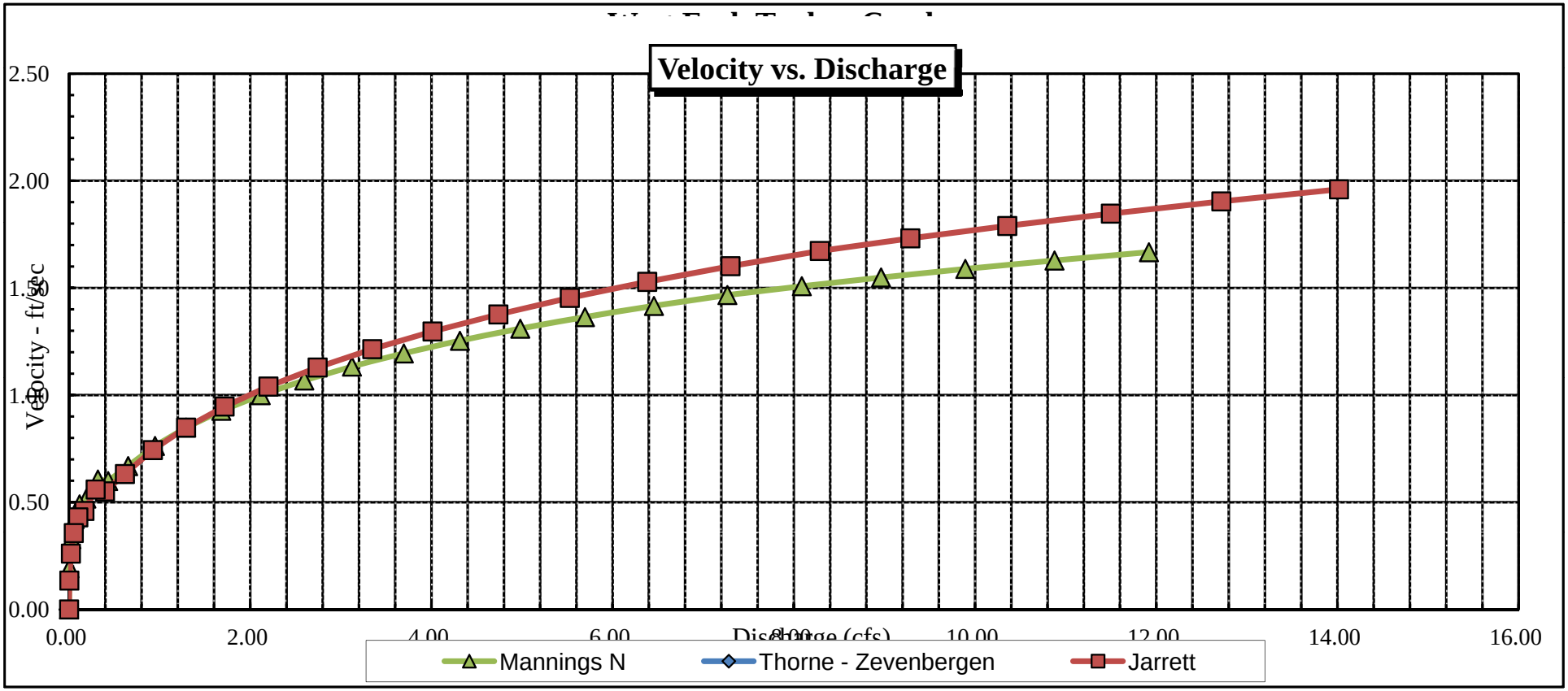
STREAM NAME: West Fork Turkey Creek
XS LOCATION: 150' upst fr conf wth East Fork
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

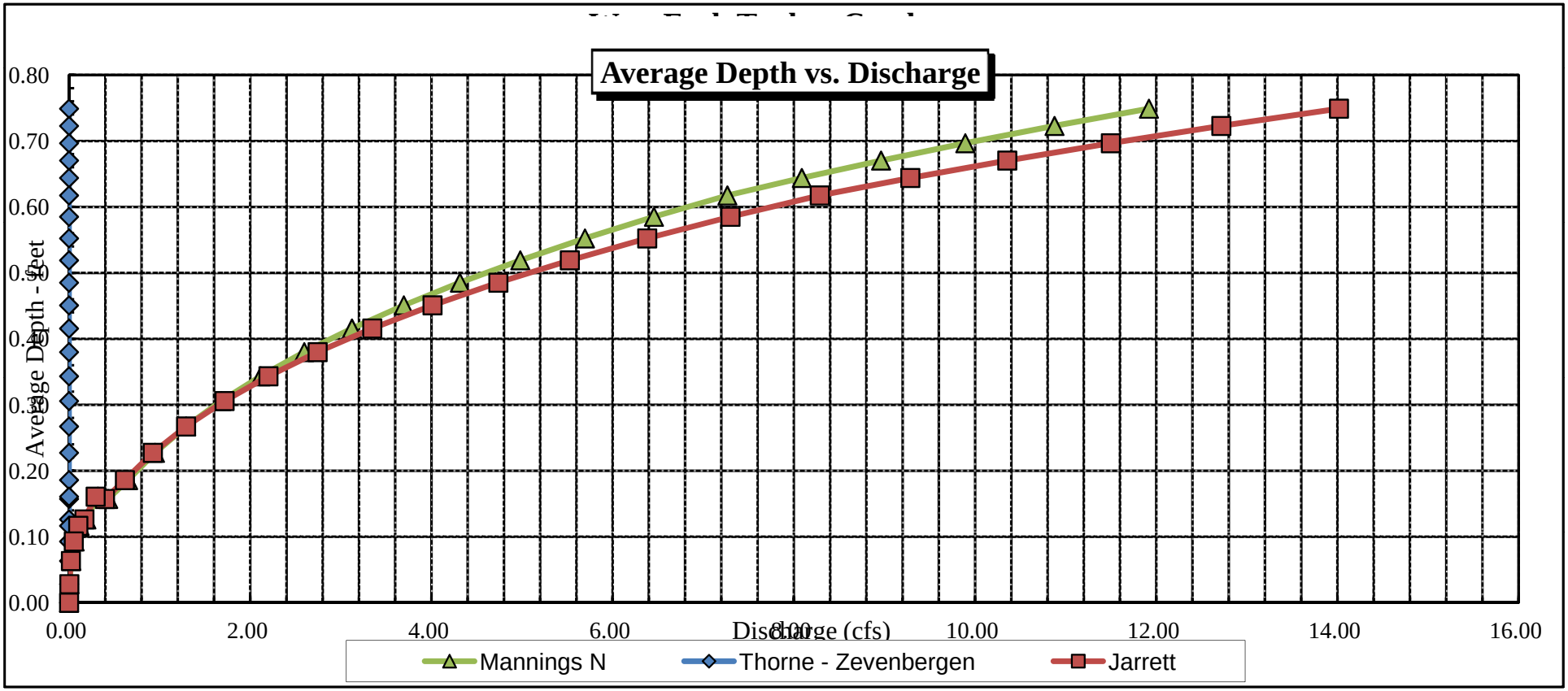
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

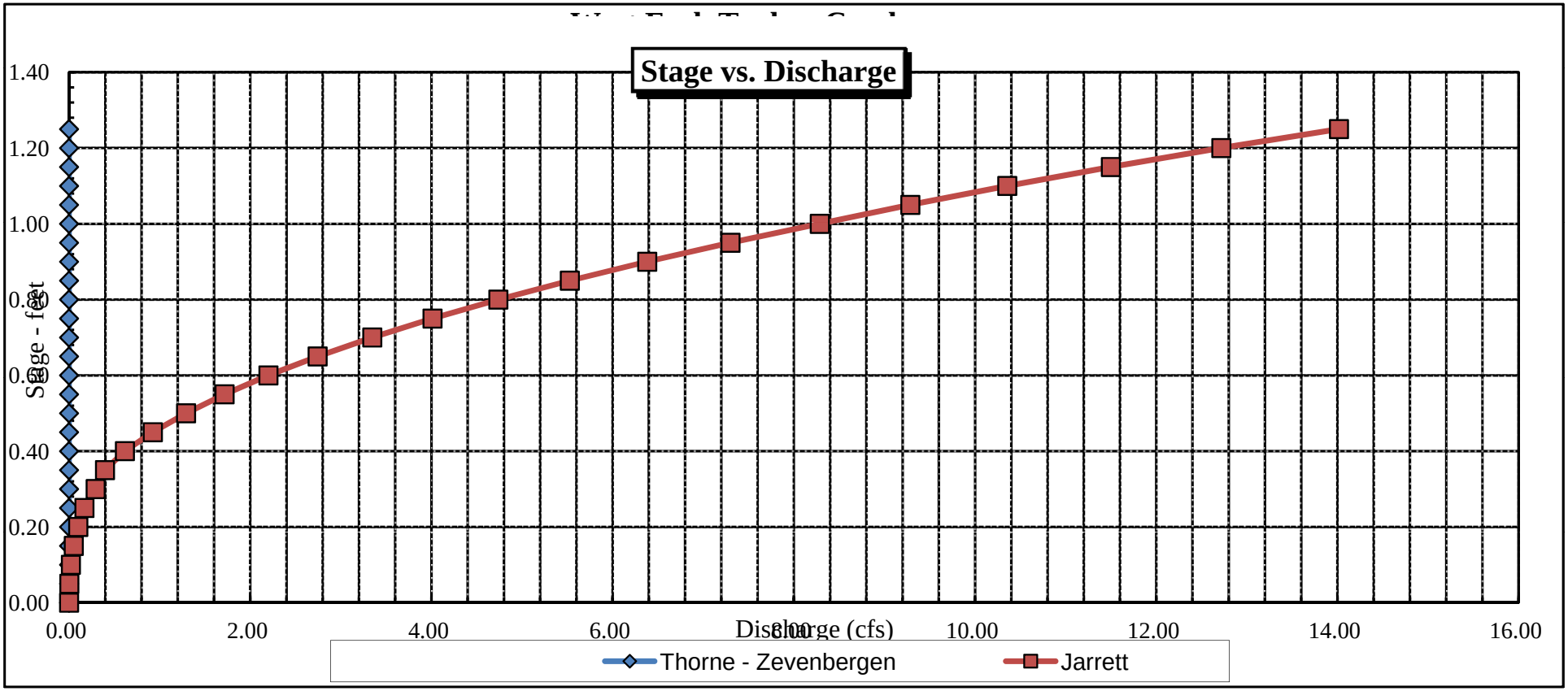
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.54	9.61	0.75	1.26	7.25	10.08	100.0%	0.72	14.29	1.97
	5.55	9.55	0.75	1.25	7.15	10.01	99.4%	0.71	14.02	1.96
	5.60	9.24	0.72	1.20	6.68	9.69	96.2%	0.69	12.72	1.90
	5.65	8.94	0.70	1.15	6.23	9.37	93.0%	0.66	11.50	1.85
	5.70	8.63	0.67	1.10	5.79	9.05	89.8%	0.64	10.36	1.79
	5.75	8.33	0.64	1.05	5.36	8.73	86.6%	0.61	9.29	1.73
	5.80	8.02	0.62	1.00	4.95	8.40	83.4%	0.59	8.29	1.67
	5.85	7.79	0.59	0.95	4.56	8.15	80.9%	0.56	7.30	1.60
	5.90	7.56	0.55	0.90	4.17	7.90	78.4%	0.53	6.38	1.53
	5.95	7.33	0.52	0.85	3.80	7.64	75.9%	0.50	5.53	1.45
	6.00	7.09	0.49	0.80	3.44	7.39	73.3%	0.47	4.74	1.38
	6.05	6.86	0.45	0.75	3.09	7.14	70.8%	0.43	4.01	1.30
	6.10	6.63	0.42	0.70	2.76	6.88	68.3%	0.40	3.35	1.21
	6.15	6.40	0.38	0.65	2.43	6.63	65.8%	0.37	2.74	1.13
	6.20	6.16	0.34	0.60	2.12	6.38	63.3%	0.33	2.20	1.04
	6.25	5.93	0.31	0.55	1.81	6.13	60.8%	0.30	1.72	0.95
WL	6.30	5.70	0.27	0.50	1.52	5.87	58.3%	0.26	1.29	0.85
	6.35	5.47	0.23	0.45	1.24	5.62	55.8%	0.22	0.92	0.74
	6.40	5.25	0.19	0.40	0.98	5.38	53.3%	0.18	0.62	0.63
	6.45	4.58	0.16	0.35	0.72	4.69	46.5%	0.15	0.40	0.55
	6.50	3.27	0.16	0.30	0.53	3.35	33.3%	0.16	0.29	0.56
	6.55	2.93	0.13	0.25	0.37	3.00	29.8%	0.12	0.17	0.46
	6.60	2.03	0.12	0.20	0.24	2.08	20.6%	0.11	0.10	0.43
	6.65	1.59	0.09	0.15	0.15	1.62	16.1%	0.09	0.05	0.36
	6.70	1.22	0.06	0.10	0.08	1.24	12.3%	0.06	0.02	0.26
	6.75	0.88	0.03	0.05	0.02	0.89	8.8%	0.03	0.00	0.13
	6.80	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


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


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


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


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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: West Fork Turkey Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: 150' upstream from confluence w/ East Fork						
DATE: 5-27-14	OBSERVERS: R. Smith, D. Gilbert					
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 19	TOWNSHIP: 16 N/S	RANGE: 67 E/W	PM: 6th	
COUNTY: El Paso	WATERSHED: Arkansas	WATER DIVISION: 2	DOW WATER CODE: 31617			
MAP(S): USGS:	GPS Zone 13 505655					
USFS:	4277168					

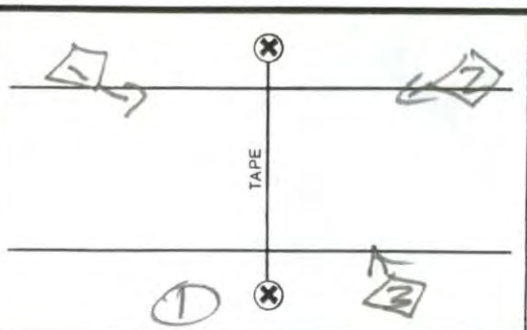
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: sand to 2-foot boulders limited cobbles + gravel	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	6.30/6.30
② WS Upstream	20.0'	4.84
③ WS Downstream	18.0'	6.38
SLOPE	1.54/38.0 = 0.041	

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, damselfly

COMMENTS

Extremely difficult to find riffles because of large substrate + steep gradient

Ph= 7.6 Cond= 120 Temp= 13°C

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: West Fork Turkey Creek	CROSS-SECTION NO: 1	DATE: 5-27-14	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 1:15 pm

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	0.0		5.0								
G	2.0		5.54								
	3.0		5.80								
W	4.2		6.30	0				0			
	4.6		6.44	.14				0			
	5.0		6.46	.16				0.38			
	5.4		6.44	.14				1.50			
	5.8		6.50	.20				2.53			
	6.2		6.48	.18				1.13			
	6.6		6.56	.26				1.37			
	7.0		6.61	.31				1.29			
	7.4		6.75	.45				0.14			
	7.8		6.80	.50				0.60			
	8.2		6.77	.47				0.26			
	8.6		6.67	.37				0.63			
	9.0		6.59	.29				0.94			
	9.4		6.60	.30				1.49			
W	9.9		6.30	0							
G	11.7		5.50								
LS	13.5		4.12								
TOTALS:											

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

COLORADO
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Department of Natural Resources

Discharge Measurement Summary

Date Generated: Wed Nov 18 2015

File Information

File Name	WFTURCNM.001.WAD
Start Date and Time	2015/09/22 14:37:22

Site Details

Site Name	W F TURKEY NR MOUTH
Operator(s)	BRIAN EPSTEIN

System Information

Sensor Type	FlowTracker
Serial #	P2354
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units (English Units)

Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.6%	5.4%
Velocity	2.2%	4.2%
Width	0.2%	0.2%
Method	3.2%	-
# Stations	6.6%	-
Overall	**7.8%**	**6.9%**

Summary

Averaging Int.	40	# Stations	8
Start Edge	REW	Total Width	1.700
Mean SNR	37.3 dB	Total Area	0.683
Mean Temp	54.43 °F	Mean Depth	0.402
Disch. Equation	Mid-Section	Mean Velocity	0.3996
		Total Discharge	**0.2730**

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	14:37	6.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	14:37	6.40	0.6	0.660	0.6	0.264	0.3953	1.00	0.3953	0.198	0.0783	28.7
2	14:38	6.60	0.6	0.400	0.6	0.160	0.4731	1.00	0.4731	0.080	0.0379	13.9
3	*14:39*	*6.80*	*0.6*	*0.450*	*0.6*	*0.180*	*0.4537*	*1.00*	*0.4537*	*0.090*	*0.0409*	*15.0*
4	14:41	7.00	0.6	0.450	0.6	0.180	0.4593	1.00	0.4593	0.090	0.0414	15.2
5	14:42	7.20	0.6	0.500	0.6	0.200	0.4327	1.00	0.4327	0.100	0.0433	15.9
6	14:43	7.40	0.6	0.500	0.6	0.200	0.2507	1.00	0.2507	0.125	0.0313	11.5
7	14:43	7.70	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

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

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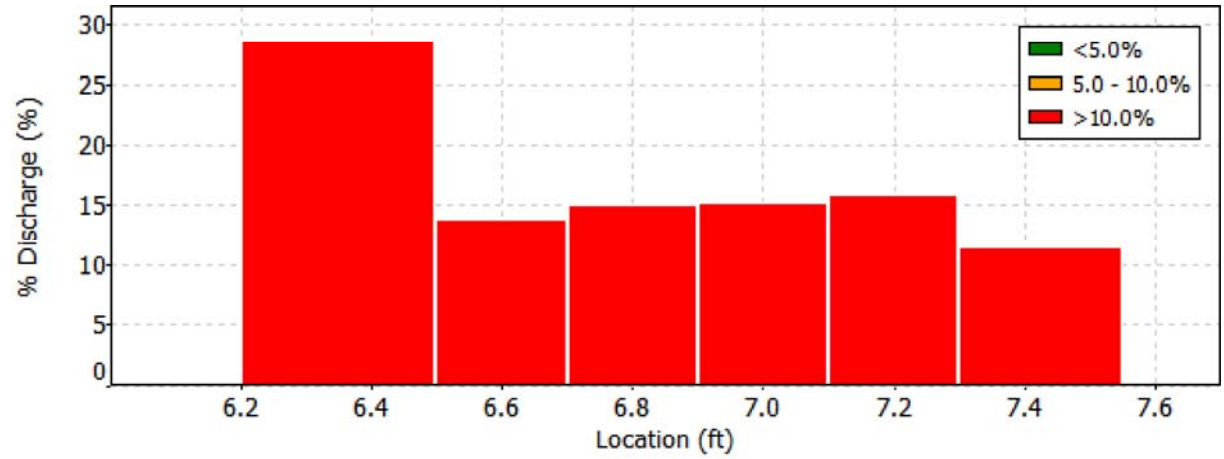
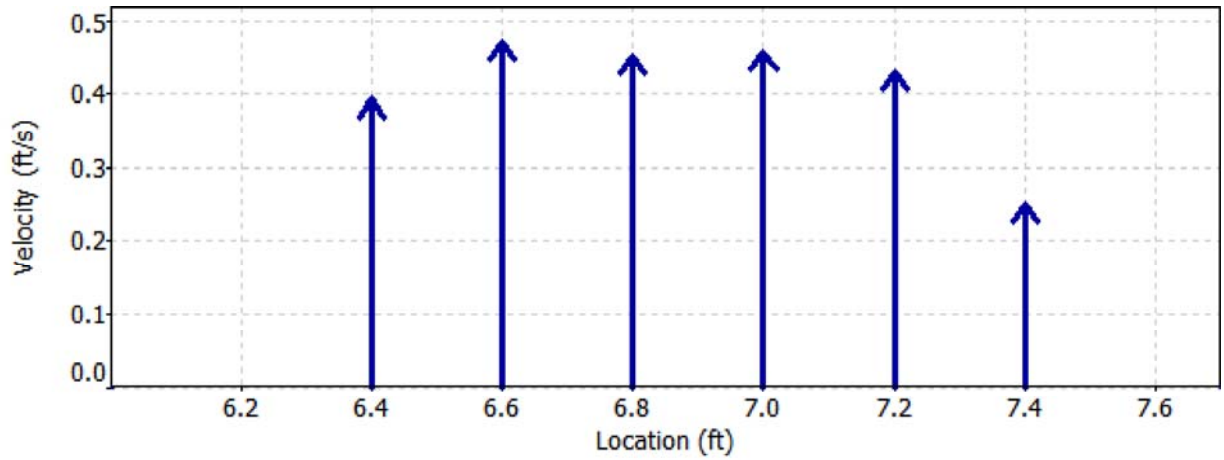
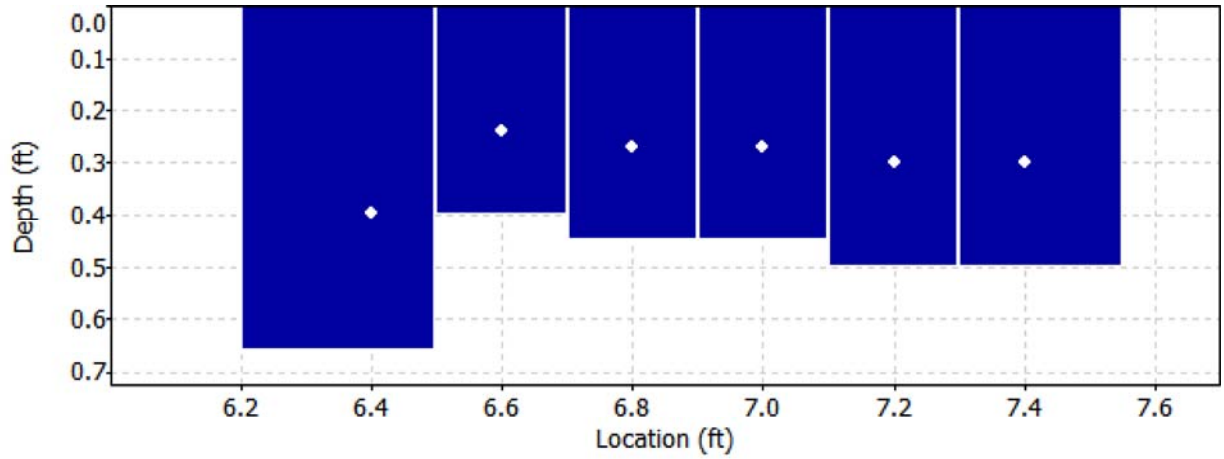
Discharge Measurement Summary

Date Generated: Wed Nov 18 2015

File Information		Site Details	
File Name	WFTURCNM.001.WAD	Site Name	W F TURKEY NR MOUTH
Start Date and Time	2015/09/22 14:37:22	Operator(s)	BRIAN EPSTEIN







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Discharge Measurement Summary

Date Generated: Wed Nov 18 2015

File Information

File Name	WFTURCNM.001.WAD
Start Date and Time	2015/09/22 14:37:22

Site Details

Site Name	W F TURKEY NR MOUTH
Operator(s)	BRIAN EPSTEIN

Quality Control

St	Loc	%Dep	Message
3	6.80	0.6	High standard error: 0.032

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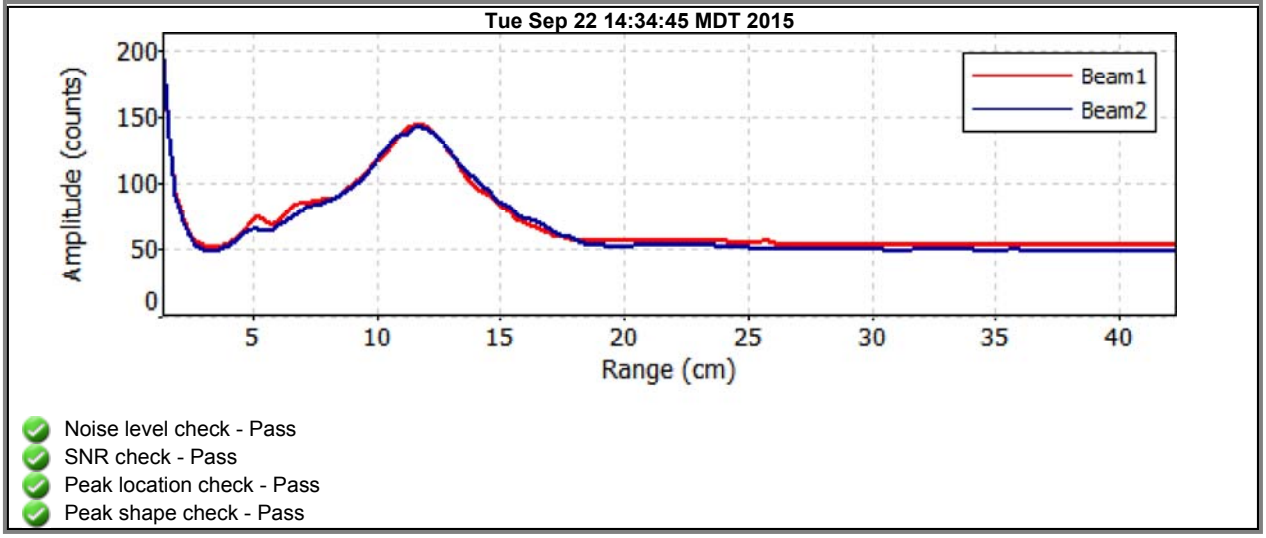
Discharge Measurement Summary

Date Generated: Wed Nov 18 2015

File Information		Site Details	
File Name	WFTURCNM.001.WAD	Site Name	W F TURKEY NR MOUTH
Start Date and Time	2015/09/22 14:37:22	Operator(s)	BRIAN EPSTEIN

Automatic Quality Control Test (BeamCheck)



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

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Discharge Measurement Summary

Date Generated: Wed Sep 2 2015

File Information

File Name	WTCNCETC.001.WAD
Start Date and Time	2015/08/10 11:24:59

Site Details

Site Name	W TURKEY NR CFL ETC
Operator(s)	BRIAN EPSTEIN

System Information

Sensor Type	FlowTracker
Serial #	P2354
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units (English Units)

Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.1%	1.6%
Velocity	1.6%	1.9%
Width	0.1%	0.1%
Method	1.4%	-
# Stations	1.4%	-
Overall	**2.8%**	**2.7%**

Summary

Averaging Int.	40	# Stations	37
Start Edge	REW	Total Width	9.600
Mean SNR	49.0 dB	Total Area	8.328
Mean Temp	56.09 °F	Mean Depth	0.868
Disch. Equation	Mid-Section	Mean Velocity	0.9632
		Total Discharge	**8.0213**

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	11:24	10.90	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	11:24	10.20	0.6	0.490	0.6	0.196	0.4121	1.00	0.4121	0.270	0.1111	1.4
2	11:26	9.80	0.6	0.540	0.6	0.216	0.3222	1.00	0.3222	0.216	0.0696	0.9
3	11:28	9.40	0.6	0.700	0.6	0.280	0.1811	1.00	0.1811	0.280	0.0508	0.6
4	11:30	9.00	0.6	0.600	0.6	0.240	0.2566	1.00	0.2566	0.240	0.0616	0.8
5	11:31	8.60	0.6	0.670	0.6	0.268	0.3419	1.00	0.3419	0.268	0.0917	1.1
6	11:33	8.20	0.6	0.720	0.6	0.288	0.5003	1.00	0.5003	0.288	0.1440	1.8
7	11:35	7.80	0.6	1.160	0.6	0.464	0.4117	1.00	0.4117	0.463	0.1906	2.4
8	11:37	7.40	0.6	1.100	0.6	0.440	0.5659	1.00	0.5659	0.439	0.2484	3.1
9	11:39	7.00	0.6	1.230	0.6	0.492	0.7927	1.00	0.7927	0.370	0.2930	3.7
10	11:42	6.80	0.6	0.890	0.6	0.356	0.9239	1.00	0.9239	0.178	0.1640	2.0
11	11:40	6.60	0.6	1.100	0.6	0.440	0.9196	1.00	0.9196	0.220	0.2023	2.5
12	11:44	6.40	0.6	1.120	0.6	0.448	0.7861	1.00	0.7861	0.227	0.1788	2.2
13	11:47	6.20	0.6	1.200	0.6	0.480	0.6867	1.00	0.6867	0.240	0.1648	2.1
14	11:49	6.00	0.6	1.150	0.6	0.460	1.0217	1.00	1.0217	0.226	0.2313	2.9
15	*11:50*	*5.80*	*0.6*	*1.200*	*0.6*	*0.480*	*1.1329*	*1.00*	*1.1329*	*0.240*	*0.2719*	*3.4*
16	11:52	5.60	0.6	1.120	0.6	0.448	1.2953	1.00	1.2953	0.227	0.2946	3.7
17	*11:53*	*5.40*	*0.6*	*1.150*	*0.6*	*0.460*	*1.4783*	*1.00*	*1.4783*	*0.230*	*0.3399*	*4.2*
18	*11:55*	*5.20*	*0.6*	*1.150*	*0.6*	*0.460*	*1.9045*	*1.00*	*1.9045*	*0.226*	*0.4311*	*5.4*
19	*11:56*	*5.00*	*0.6*	*1.180*	*0.6*	*0.472*	*1.7664*	*1.00*	*1.7664*	*0.236*	*0.4172*	*5.2*
20	*11:57*	*4.80*	*0.6*	*1.200*	*0.6*	*0.480*	*2.0955*	*1.00*	*2.0955*	*0.244*	*0.5115*	*6.4*
21	*11:59*	*4.60*	*0.6*	*1.000*	*0.6*	*0.400*	*2.0358*	*1.00*	*2.0358*	*0.200*	*0.4071*	*5.1*
22	*12:00*	*4.40*	*0.6*	*0.950*	*0.6*	*0.380*	*1.9846*	*1.00*	*1.9846*	*0.187*	*0.3706*	*4.6*
23	12:01	4.20	0.6	1.050	0.6	0.420	1.7192	1.00	1.7192	0.210	0.3609	4.5
24	*12:03*	*4.00*	*0.6*	*1.180*	*0.6*	*0.472*	*1.5361*	*1.00*	*1.5361*	*0.240*	*0.3687*	*4.6*
25	*12:04*	*3.80*	*0.6*	*1.200*	*0.6*	*0.480*	*1.1926*	*1.00*	*1.1926*	*0.240*	*0.2862*	*3.6*
26	*12:05*	*3.60*	*0.6*	*1.150*	*0.6*	*0.460*	*1.0466*	*1.00*	*1.0466*	*0.226*	*0.2365*	*2.9*
27	*12:07*	*3.40*	*0.6*	*1.130*	*0.6*	*0.452*	*1.3448*	*1.00*	*1.3448*	*0.226*	*0.3039*	*3.8*
28	*12:08*	*3.20*	*0.6*	*1.180*	*0.6*	*0.472*	*1.1365*	*1.00*	*1.1365*	*0.240*	*0.2728*	*3.4*
29	12:10	3.00	0.6	1.050	0.6	0.420	0.8881	1.00	0.8881	0.210	0.1866	2.3
30	12:11	2.80	0.6	0.990	0.6	0.396	0.7589	1.00	0.7589	0.195	0.1479	1.8
31	12:12	2.60	0.6	0.750	0.6	0.300	0.9114	1.00	0.9114	0.150	0.1367	1.7
32	*12:14*	*2.40*	*0.6*	*0.550*	*0.6*	*0.220*	*1.0640*	*1.00*	*1.0640*	*0.112*	*0.1188*	*1.5*
33	12:16	2.20	0.6	0.550	0.6	0.220	0.7838	1.00	0.7838	0.110	0.0862	1.1
34	12:17	2.00	0.6	0.830	0.6	0.332	0.6768	1.00	0.6768	0.163	0.1106	1.4
35	12:18	1.80	0.6	0.830	0.6	0.332	0.5492	1.00	0.5492	0.291	0.1596	2.0

36	12:18	1.30	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

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

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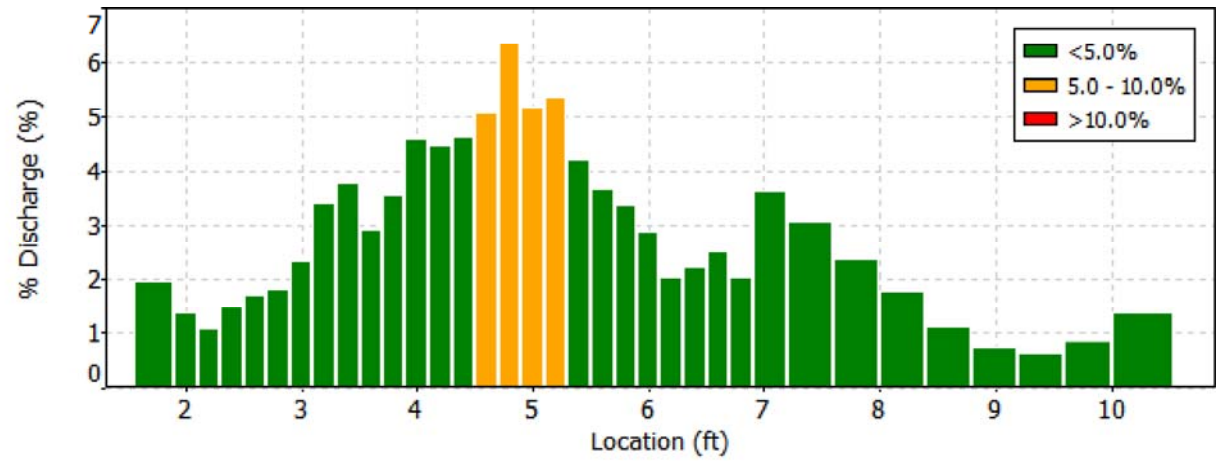
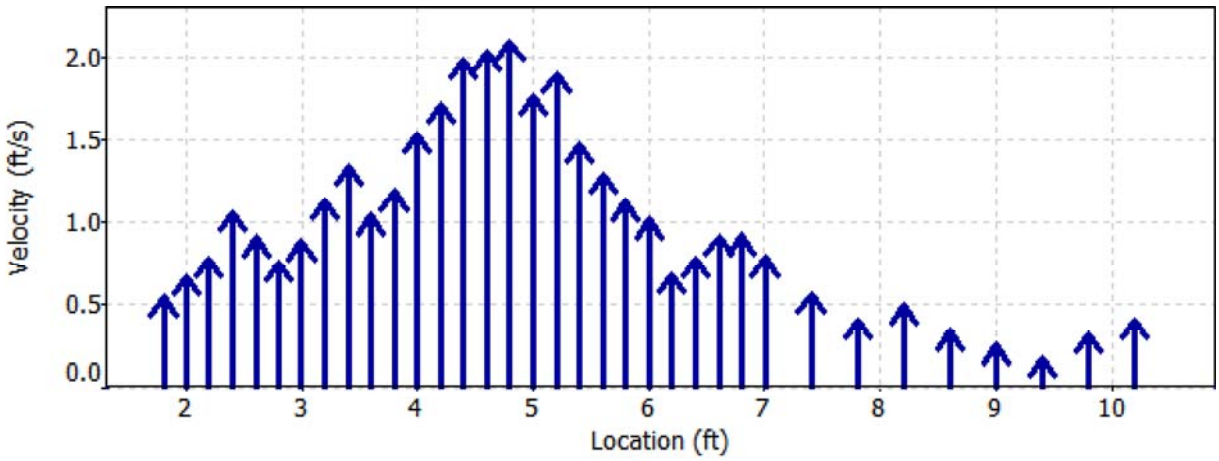
Colorado Water Conservation Board
Department of Natural Resources

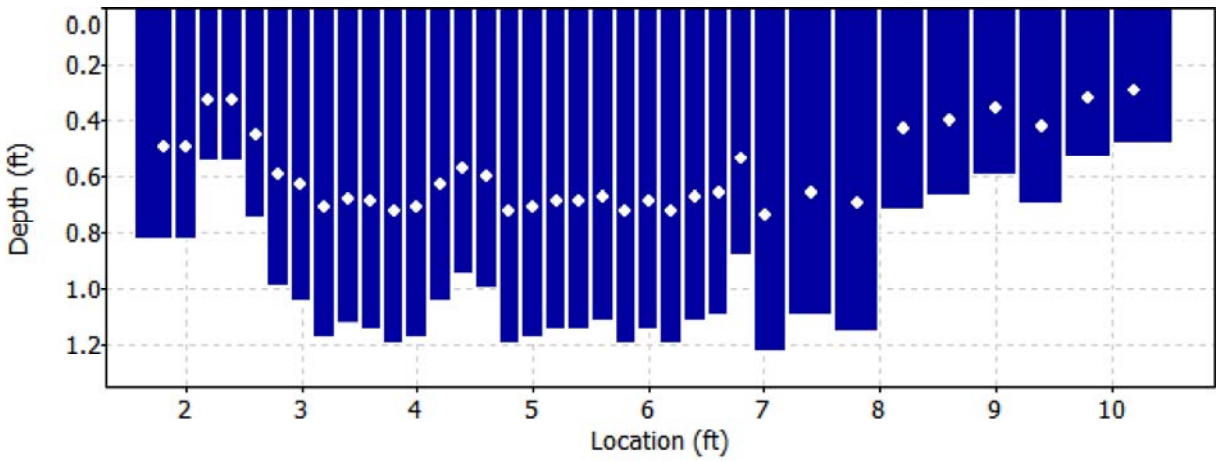
Discharge Measurement Summary

Date Generated: Wed Sep 2 2015

File Information		Site Details	
File Name	WTCNCETC.001.WAD	Site Name	W TURKEY NR CFL ETC
Start Date and Time	2015/08/10 11:24:59	Operator(s)	BRIAN EPSTEIN







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Discharge Measurement Summary

Date Generated: Wed Sep 2 2015

File Information		Site Details	
File Name	WTCNCETC.001.WAD	Site Name	W TURKEY NR CFL ETC
Start Date and Time	2015/08/10 11:24:59	Operator(s)	BRIAN EPSTEIN

Quality Control

St	Loc	%Dep	Message
15	5.80	0.6	High standard error: 0.134
17	5.40	0.6	High standard error: 0.130
18	5.20	0.6	High standard error: 0.121
19	5.00	0.6	High standard error: 0.126
20	4.80	0.6	High standard error: 0.148
21	4.60	0.6	High standard error: 0.145
22	4.40	0.6	High standard error: 0.131
24	4.00	0.6	High standard error: 0.156
25	3.80	0.6	High standard error: 0.137
26	3.60	0.6	High standard error: 0.147
27	3.40	0.6	High standard error: 0.145
28	3.20	0.6	High standard error: 0.148
32	2.40	0.6	High angle: 21
		0.6	High standard error: 0.119

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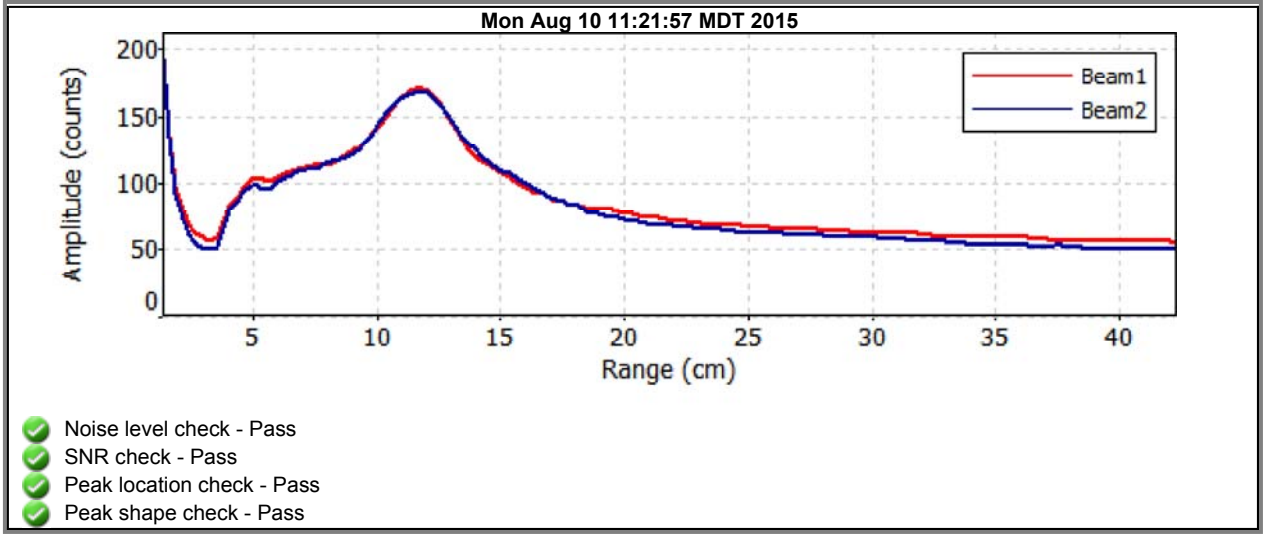
Discharge Measurement Summary

Date Generated: Wed Sep 2 2015

File Information		Site Details	
File Name	WTCNCETC.001.WAD	Site Name	W TURKEY NR CFL ETC
Start Date and Time	2015/08/10 11:24:59	Operator(s)	BRIAN EPSTEIN

Automatic Quality Control Test (BeamCheck)



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

STATE OF COLORADO

Epstein - DNR, Brian <brian.epstein@state.co.us>

20150922_TurkeyCreekAndTribs_FieldNotes

1 message

Brian Epstein - DNR <brian.epstein@state.co.us> Tue, Nov 10, 2015 at 12:09 PM
To: Brian Epstein <Brian.Epstein@state.co.us>

Turkey Creek and Tributaries East And West Forks Turkey Creeks Field Notes 20150922

•using Timble GPS Hunt, camera, and notes apps on iPhone

* East = East Fork Turkey Creek, West = West Fork Turkey Creek, and Turkey = Turkey Creek

11:24 Arrive confluence of East and West Forks Turkey Creek

20150922TurkeyCr001

- vids 12:14 and 12:16

- hiking up creek saw trout in a hole

20150922TurkeyCr002

- confluence of East and West Forks Turkey Creeks

- fish observed in confluence pool but sheltered before identified type

20150922TurkeyCr003

- 12:33 Picture of confluence: picture left is West and right is East, bottom is the beginning of Turkey Creek proper

- 12:42 video panning from Turkey Creek upstream to confluence, first coming into view East and then West

20150922EFTurkeyCr001

- FlowTracker s/n P2354

- discharge measurement location: East Fork Turkey Creek near Mouth

- 13:49 pic x-section, looking upstream

- File: EFTURCNM.001

- mostly cloudy, ~ 70F, no wind

- x-sec: pool in step pool environment, bed sand/cobble with some boulders
- flow conditions: mostly parallel flow paths
- measurement rated: poor
- start edge/time: REW 3.5'/ 13:56
- end edge/time: LEW 6.4'/ 14:11
- discharge: 0.18
- uncertainty (%): 5.5
- # stations: 12
- Vmean: 0.26
- Vmax: 0.41
- width: 2.9
- area: 0.7
- Dmean: 0.24
- Dmax: 0.42
- SNR: 31.1
- sigmaV: 0.016
- H2O temp (F): 56.4

20150922WFTurkeyCr001

- 13:15 video of trout

20150922WFTurkeyCr002

- FlowTracker s/n P2354
- discharge measurement location: West Fork Turkey Creek near Mouth
- 14:28 & 14:29 Pic discharge measurement section looking upstream
- File: WFTURCNM.001
- mostly cloudy, ~ 70F, no wind
- x-sec: pool in step pool environment, bed sand with some boulders
- flow conditions: mostly parallel flow paths
- measurement rated: poor
- start edge/time: REW 6.0' / 14:35

- end edge/time: LEW 7.7' / 14:47

- discharge: 0.27

- uncertainty: 7.8

- # stations: 8

- Vmean: 0.40

- Vmax: 0.47

- width: 1.7

- area: 0.68

- Dmean: 0.40

- Dmax: 0.66

- SNR: 37.2

- sigmaV: 0.022

- H2O temp: 54.4

- 14:56 pic taken 100' ds of x-section, looking downstream, consistent plunge pool environment, good bank stability because good riparian veg, boulders and woody debris

- 15:52 pic Turkey Creek at quarry, observed water truck pumping out of creek for dust suppression at quarry

20150922TurkeyCr004

- FlowTracker s/n P2354

- discharge measurement location: Turkey Creek at Henry Ride Road

- 16:11 & 16:16 Pic discharge measurement section looking upstream

- 16:16 fish

- File: TRKCBLCN.002

- mostly cloudy, ~ 70F, no wind

- x-sec: glide, in riffle-run-pool-glide environment, sand and cobble bed

- flow conditions: mostly parallel flow paths

- measurement rated: fair

- start edge/time: REW 2.2' / 16:26

- end edge/time: LEW 9.3' / 16:49

- discharge: 0.41

- uncertainty: 3.4

- # stations: 20

- Vmean: 0.22

- Vmax: 0.37

- width: 7.1

- area: 1.83

- Dmean: 0.26

- Dmax: 0.40

- SNR: 20.4

- sigmaV: 0.007

- H2O temp: 60.7

General Observation

- fish observed at every site in different life stages

- macro invertebrates observed at East and West

- pond skippers at all sites

- East, West, and Turkey up in the Canyon have similar geometry: high gradient, plunge-pool, plenty of bank stabilizing entities

- Turkey changes when it comes out of the canyon to a low gradient, riffle-run-pool-glide geometry, plenty of banks stability in area not altered by man from riparian vegetation

17:00 departing Turkey Creek

Brian Epstein
Hydrologist, Stream and Lake Protection Section
COLORADO
Colorado Water Conservation Board
Department of Natural Resources
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Page 1 of 2	State of Colorado	Meas. No.: 001
YYYY: 2015	**Colorado Water Conservation Board**	Division: 2
MM-DD: 08-10	ADV Discharge Measurement Notes	District: 10

Station Name: West Turkey

River, (Creek), Canal, Ditch

At, (Near), Above, Below Confluence w/ East Turkey Cr

Latitude: Longitude:

Party: Brian Epstein, Keith Cunningham, Jeff Bressler

Conditions

Weather: Cloudy ~75°F

Wind Spd / Dir: 0mph Water Temp:

X-Sec Desc: boulder bed

Flow Conds: slight turbulence, velocity concentrated left half

Control Desc.: N/A

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

Water Level Reading

Time	Staff Gage	Pressure Trans.	Time	Staff Gage	Pressure Trans.

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

Discharge Measurement

Manufacturer:	SonTek	Model:	FlowTracker	S/N:	(P2354) / P2355
Firmware:	3.9	Software:	2.20		
Diag Test File:	(Yes) or No	Raw Data File:	WTCNCETC.001		
Meas Type:	(Wading) / Boat / Bridge / Cableway			Method:	0.6
	N/A	ft. or mi / upstream or downstream of gage			
Start Edge:	LEW 10.9	End Edge:	LEW 1.3	Total Width:	9.6
Start Time:	11:24	End Time:	12:22		
Discharge:	8.0	Unsertainty:	2.8	# Stations:	37
Mean v:	0.96	Width	9.60	Mean d:	0.87
Max v:	2.10	Area:	8.33	Max d:	1.23
Mean SNR:	48.9	σv:	0.088	Mean Temp:	56.1

Meas. By:	BJE	Notes By:	BJE
Processed By:		Reviewed By:	

Remarks:

West Turkey Creek

- observed above confluence w/ East Turkey creek
- coniferous forest
- step pool environment
- abundant woody debris
- boulders dominate bed
- Jeff took pictures
- Keith took pictures