

DRAFT RECOMMENDATION– January 2015 Version

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

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 rates meets the average depth and wetted perimeter criteria.

0.5 cfs 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 cfs 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. 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 recommending 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 very 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. 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 will be 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.

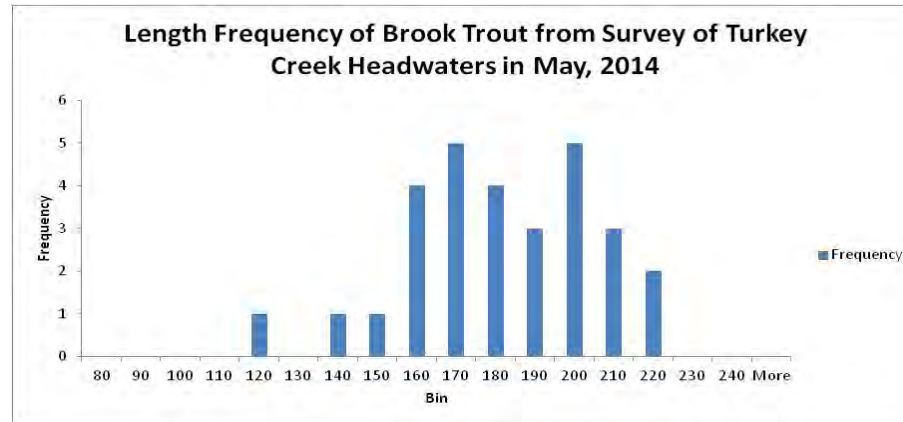
If you have any questions regarding our instream flow recommendation, please contact Roy Smith at 303-239-3940.

Sincerely,

Brian St. George
Deputy State Director
Resources and Fire

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

<u>HUC12</u>	<u>Description</u>	<u>SampleDate</u>	<u>SiteName</u>	<u>Location</u>	<u>Protocol</u>	<u>TotalCatch</u>	<u>CommonName</u>	<u>TotalEffort</u>	<u>EffortMetric</u>	<u>LengthRange</u>	<u>CPUE</u>
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

*** NOTE ***

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

TAPE WT: 0.0106
TENSION: 99999

CHANNEL PROFILE DATA

SLOPE: 0.041

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
1	RS	0.00	5.00		
	G	2.00	5.54		
		3.00	5.80		
W		4.20	6.30	0.00	0.00
		4.60	6.44	0.14	0.00
		5.00	6.46	0.16	0.38
		5.40	6.44	0.14	1.50
		5.80	6.50	0.20	2.53
		6.20	6.48	0.18	1.13
		6.60	6.56	0.26	1.37
		7.00	6.61	0.31	1.29
		7.40	6.75	0.45	0.14
		7.80	6.80	0.50	0.60
		8.20	6.77	0.47	0.26
		8.60	6.67	0.37	0.63
		9.00	6.59	0.29	0.94
		9.40	6.60	0.30	1.49
	W	9.90	6.30	0.00	0.00
1	G	11.70	5.50		
	LS	13.50	4.12		

TOTALS -----

WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.42	0.14	0.06	0.00	0.0%
0.40	0.16	0.06	0.02	1.9%
0.40	0.14	0.06	0.08	6.5%
0.40	0.20	0.08	0.20	15.7%
0.40	0.18	0.07	0.08	6.3%
0.41	0.26	0.10	0.14	11.0%
0.40	0.31	0.12	0.16	12.4%
0.42	0.45	0.18	0.03	2.0%
0.40	0.50	0.20	0.12	9.3%
0.40	0.47	0.19	0.05	3.8%
0.41	0.37	0.15	0.09	7.2%
0.41	0.29	0.12	0.11	8.4%
0.40	0.30	0.14	0.20	15.6%
0.58		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%

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:
=====

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

RATIONALE FOR RECOMMENDATION:
=====

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

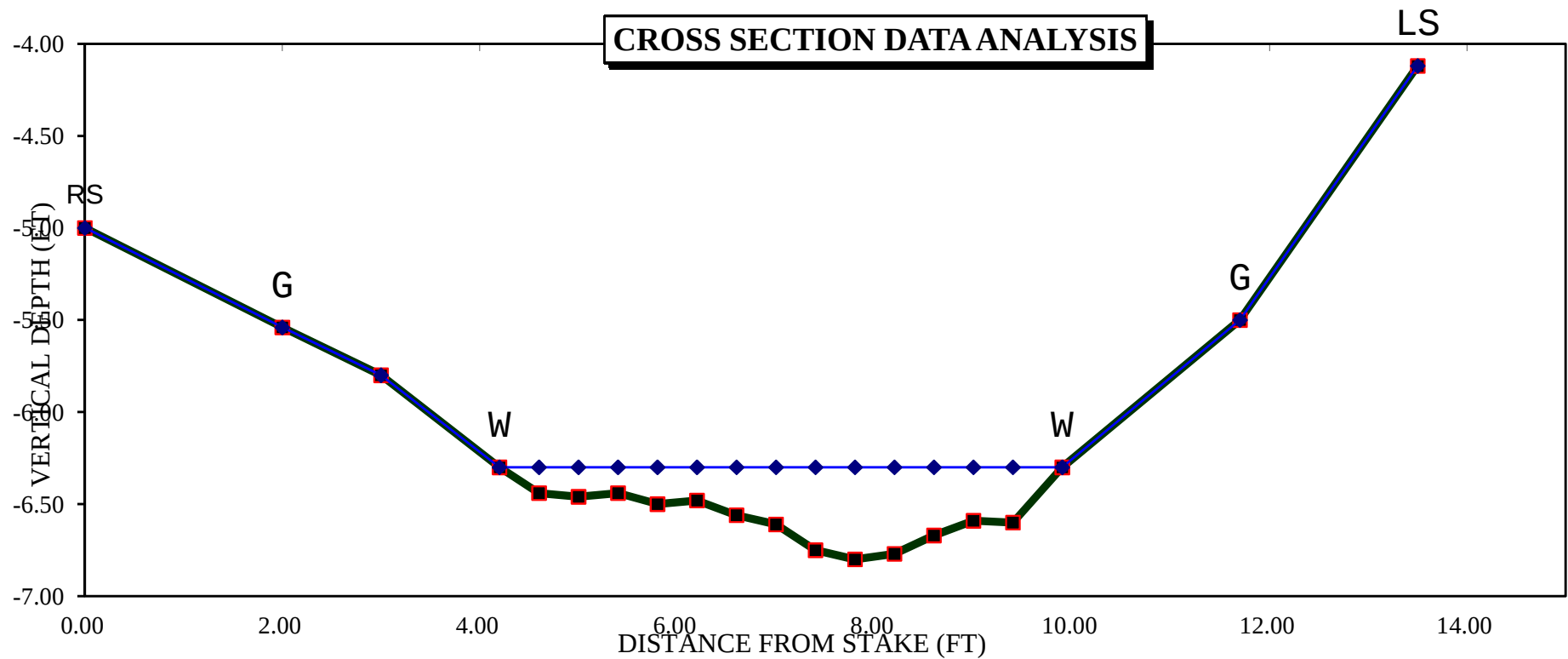
STAGING TABLE

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!

WATER FLOW ANALYSIS

CROSS SECTION DATA ANALYSIS



LS

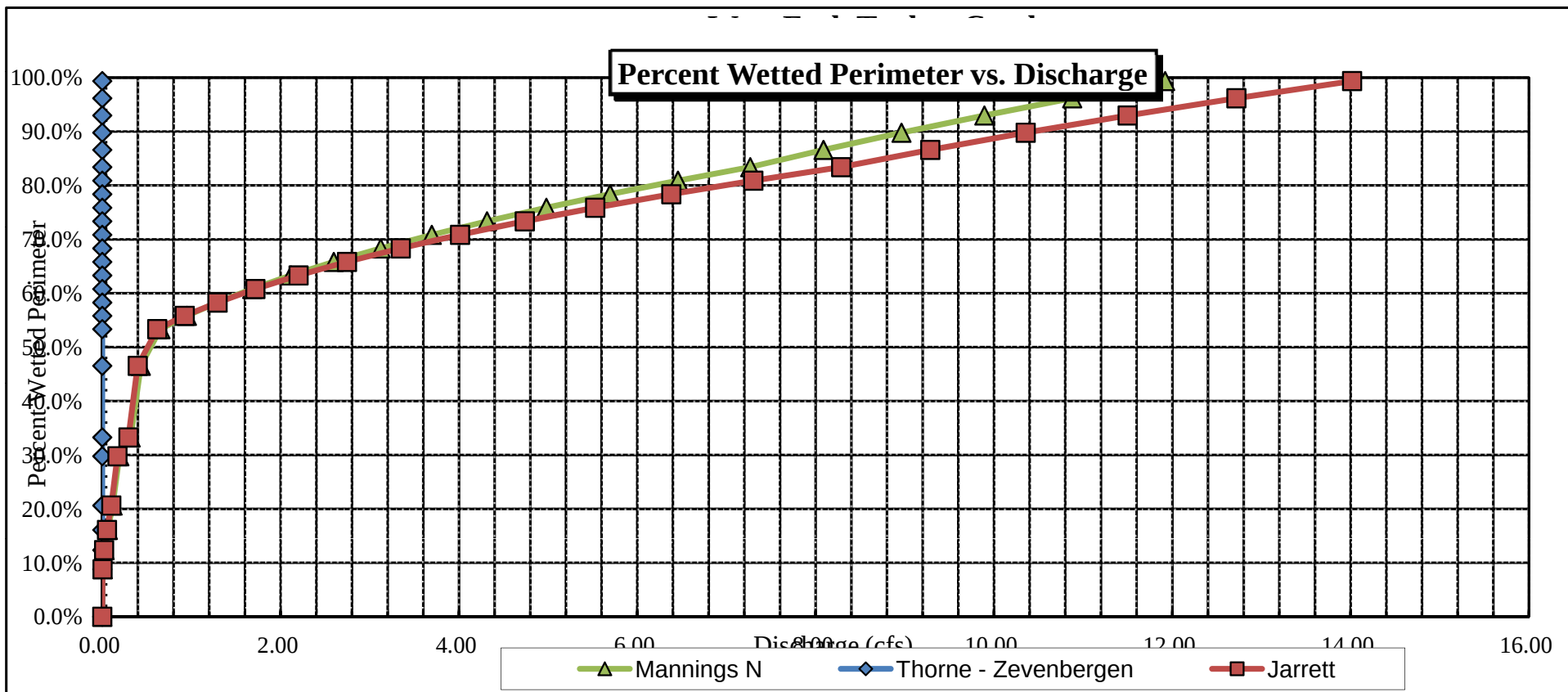
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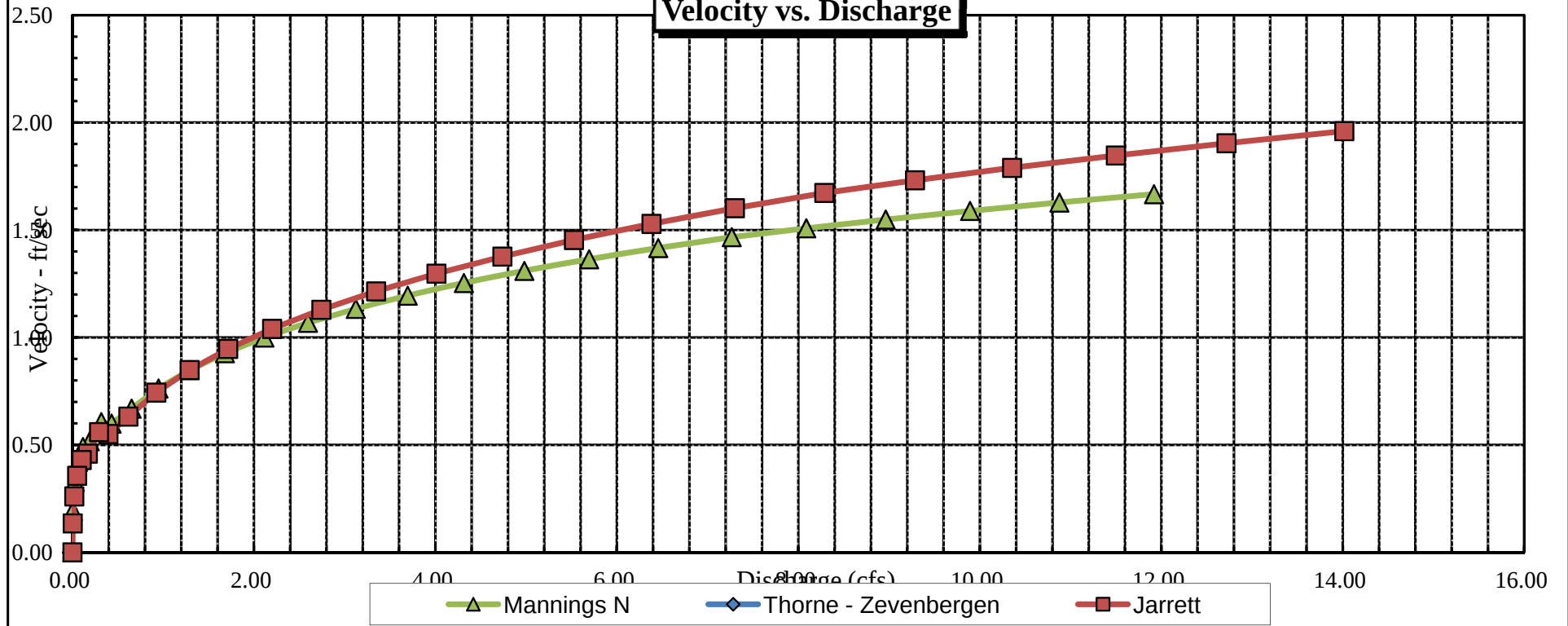
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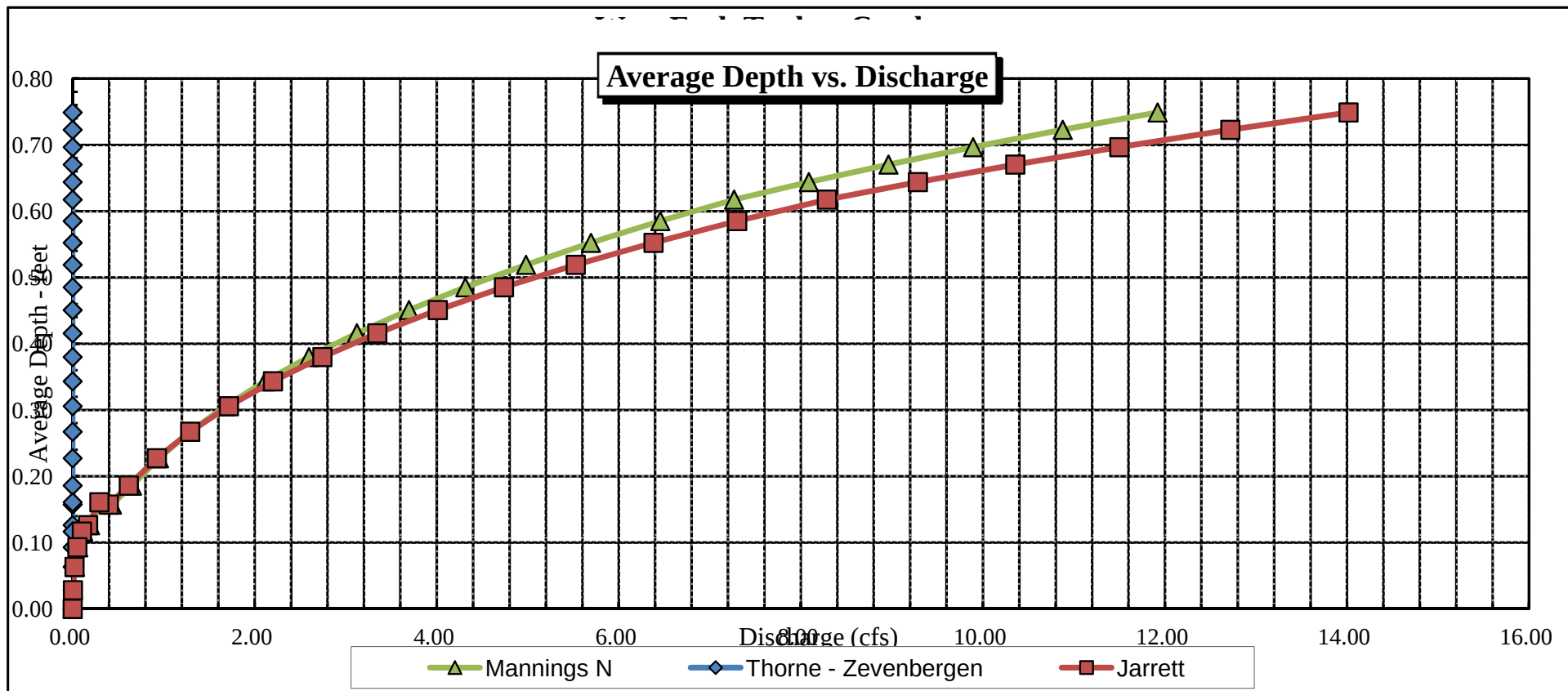
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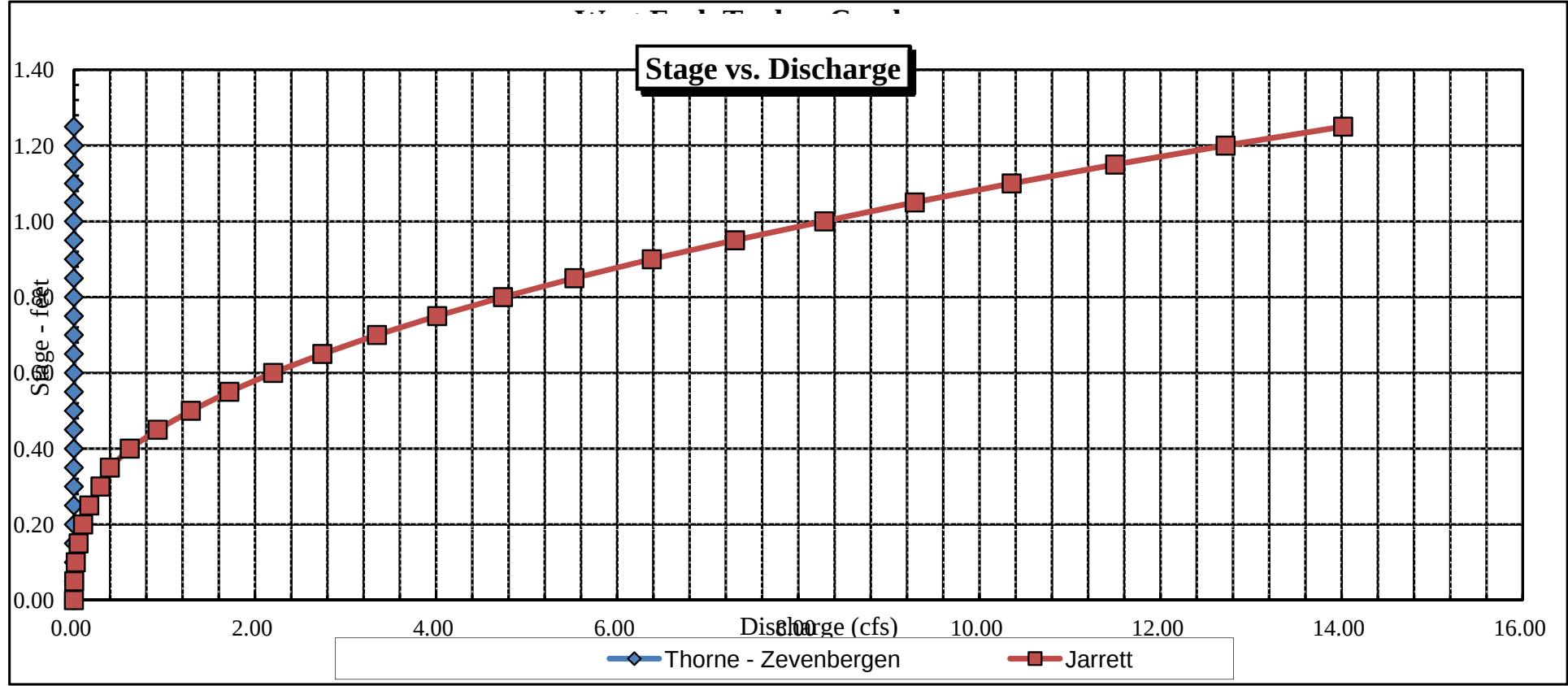
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Velocity vs. Discharge









FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



**COLORADO WATER
CONSERVATION BOARD**

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:		1/4 SECTION:		SECTION:		TOWNSHIP:		RANGE:	
		SW		19		16 N(S)		67 E(W)	
COUNTY:		WATERSHED:		WATER DIVISION:		DOW WATER CODE:			
El Paso		Arkansas		2		31617			
MAP(S):		USGS:		GPS Zone 13		SDSGSS			
		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: submerged lbs/foot	TAPE TENSION: submerged lbs
CHANNEL BED MATERIAL SIZE RANGE: sand to 2-foot boulders				PHOTOGRAPHS TAKEN: YES/NO		NUMBER OF PHOTOGRAPHS: 3

CHANNEL PROFILE DATA

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

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, damselfly

COMMENTS

Extremely difficult to find ripples because of large substrate
+ steep gradient.

pH = 7.6 Cond = 120 Temp = 130°C

DISCHARGE/CROSS SECTION NOTES

STREAM NAME:			CROSS-SECTION NO.:	DATE:	SHEET ____ OF ____						
BEGINNING OF MEASUREMENT		EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE)		LEFT / RIGHT	Gage Reading: _____ ft	TIME: _____					
Features Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec)		Area (ft ²)	Discharge (cfs)
								At Point	Mean in Vertical		
RS	0.0		5.0								
G	2.0		5.54								
	3.0		5.80								
W	4.2		6.30	φ							
	4.6		6.44	.14							
	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	φ							
G	11.7		5.50								
LS	13.5		4.12								
TOTALS:											

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















