Water Resources Section 6060 Broadway Denver, CO 80216

January 14, 2019

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

Subject:

Instream Flow Recommendations for Streams in Water Division 2, Huerfano County; Baker and Bonnett Creeks, to be Presented at the January 28-29, 2019

**CWCB Meeting** 

Dear Ms. Bassi:

The information contained in and referred to in this letter forms the scientific and biological basis for instream flow (ISF) recommendations for Baker and Bonnett Creeks in Water Division 2. These flow recommendations will be presented for consideration by the Colorado Water Conservation Board (CWCB or Board) at their January 2019 regular meeting. The field investigations relating to these ISF recommendations were conducted by US Forest Service (USFS) personnel in 1992 and by Division of Wildlife (DOW) personnel in 2006. Supplementary information was collected by Colorado Parks and Wildlife (CPW) personnel in 2016. These stream reaches were first presented to the Board in 2009. At the January 2009 meeting, the Board declared its intent to appropriate on these streams, Cucharas Creek, Chaparral Creek, Dodgeton Creek, and two segments of the Huerfano River. Because of opposition from Huerfano County Water Conservancy District and other interests, the ISF appropriations were put on hold to allow the opposing parties to complete a study establishing their water needs and file for necessary additional water rights. A stipulation was signed by the parties that postponed a formal hearing of the appropriations. Per the terms of the stipulation, the Board took action to move forward the Huerfano River and Cucharas Creek appropriations in 2010 and the Dodgeton Creek and Chaparral Creek appropriations in 2011. The opposers requested the Baker Creek appropriation be made after January 2013. The postponement period has concluded, and it is now CPW staff's opinion that the information contained in this letter is sufficient to recommend ISF appropriations on Baker and Bonnett Creeks to the Board and to specifically address the findings required in Rule 5(i) of the Instream Flow Program Rules.



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

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

#### Recommended Segments

CPW is proposing ISF recommendations on Baker Creek from its headwaters to the USFS boundary and on Bonnett Creek from its headwaters to the confluence with the Cucharas River.

#### **Natural Environment**

As stated above, Baker and Bonnett Creeks were first proposed by DOW in 2009. DOW's interest was based on the fact that the streams contain suitable habitat for brook trout and observations by CPW staff indicate the stream supports brook trout. CPW is of the opinion that there are flow dependent natural environments in Baker and Bonnett Creeks that can be preserved to a reasonable degree by ISF appropriations.

#### Flows Necessary to Preserve the Natural Environment

In 2006 and 2016, CPW (DOW) personnel collected stream cross-section data to be used as input into the R2CROSS model. Initial biological instream flow recommendations were developed utilizing the standard application of the R2CROSS methodology (Espegren 1996). R2CROSS uses field data that has been collected in a riffle habitat types; riffles are typically the limiting habitat type in streams during low flow events. The field data includes a survey of stream channel geometry, a longitudinal slope of the water surface, and a streamflow measurement at the designated cross-section. After processing this data with R2CROSS, winter and summer flow recommendations were developed utilizing the standard R2CROSS criteria described in Nehring

(1979) and Espergren (1996); the R2CROSS hydraulic criteria of interest are average depth, average velocity, and wetted perimeter. Maintaining these hydraulic parameters at adequate levels across riffle habitat types will also maintain aquatic habitat in pools and runs for most life stages of fish and aquatic invertebrates (Nehring 1979).

Cross-section data sets were collected on the reaches identified above. The field data sheets and resulting R2CROSS outputs are attached. The results of the R2CROSS analysis are summarized on the attached recommendation summary reports. R2CROSS biological recommendations were further refined with a preliminary water availability analysis. CPW conducted a preliminary evaluation of the hydrology in these streams to determine if water is physically available for an ISF appropriation. Representative hydrographs for each of these reaches are based on USGS StreamStats, a software product that estimates mean monthly flow statistics. Winter water availability reduced the baseflow recommendations on both reaches. CPW determined that the reduced winter flow rates should be sufficient for overwintering fish. Final detailed water availability analyses will be performed by CWCB staff and presented in the Executive Summaries provided to the Board prior to the January 2019 meeting.

The proposed flow recommendations below should be sufficient to preserve the natural environment to a reasonable degree:

- Baker Creek
  - o 2.1 cfs is recommended from May 1 through June 30;
  - 1.4 cfs is recommended from July 1 through August 31;
  - o 0.5 cfs is recommended from September 1 through March 31;
  - o 1.0 cfs is recommended April 1 through April 30.
- Bonnett Creek
  - 1.0 cfs is recommended from April 1 through June 30;
  - o 0.6 cfs is recommended from July 1 through August 31;
  - o 0.4 cfs is recommended from September 1 through March 31.

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

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

Sincerely,

Katie Birch

**CPW Instream Flow Program Coordinator** 

Attachments (as stated)

### **Stream: Bonnett Creek**

## **Colorado Parks and Wildlife Recommendation Summary**

Water Division: 2 Water District: 16 CPW Watercode: 29202

#### **Segment:** Headwaters to the confluence with the Cucharas River

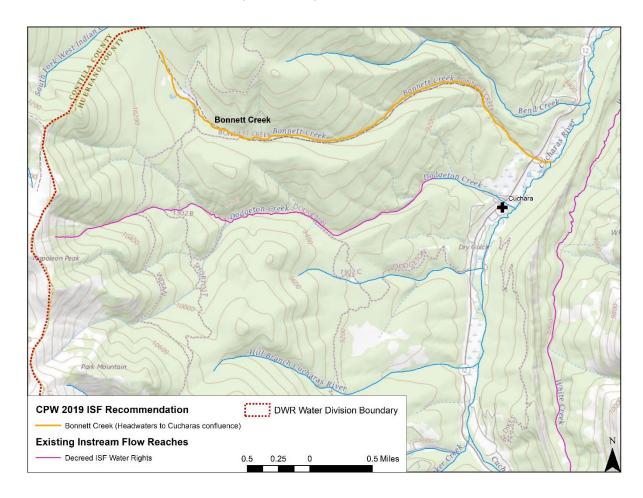
Upper Terminus: Headwaters 13S 486695.74 4138962.59 UTM

Lower Terminus: The confluence with the Cucharas River

13S 491728.78 4137528.63 UTM

ISF Recommendation: 1.0 cfs (4/1-6/30)

0.6 cfs (7/1 - 8/31)0.4 cfs (9/1 - 3/31)



#### Introduction

The information contained in this report and the associated supporting documents form the basis for the instream flow recommendation to be considered by the Colorado Water Conservation Board (Board). It is Colorado Parks and Wildlife (CPW) staff's opinion that the information contained in this report is sufficient for the Board's staff to begin the investigations required to support the findings required in Rule 5(i) of the Instream Flow Rules.

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

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

#### **Instream Flow Recommendation**

The subject of this report is a segment of Bonnett Creek beginning at its headwaters and extending downstream to the confluence with the Cucharas River. The proposed segment is located southwest of the Town of Cuchara. The majority of the reach is located on public lands managed by the US Forest Service (USFS) in the Pike and San Isabel National Forests.

		Total Length	Land Ow	nership
Upper Terminus	Lower Terminus	(miles)	% Private	% Public
Headwaters	Confluence with the Cucharas River	4.05	18%	82%

#### **Natural Environment**

Bonnett Creek is a first order, high-gradient stream with a somewhat confined channel. Substrate ranges from boulder to cobble. Observations by CPW staff indicate the stream environment of

Bonnett Creek supports brook trout (Salvelinus fontinalis).

### Biological Flow Quantification Methodology

CPW staff used the R2CROSS methodology to quantify the amount of water required to preserve the natural environment to a reasonable degree. The R2CROSS method requires that stream discharge and channel profile data be collected in a riffle stream habitat type. Riffles are most easily visualized, as the stream habitat types that would dry up first should streamflow cease. This type of hydraulic data collection consists of setting up a transect, surveying the stream channel geometry, and measuring the stream discharge. Copies of field data collected for this proposed segment are included as an attachment.

Field data is processed in the R2CROSS model to develop these initial recommendations. The recommendations are designed to address the unique biologic requirements of each stream without regard to water availability. The R2CROSS method utilizes three hydraulic parameters, average depth, percent wetted perimeter, and average velocity to develop biologic instream flow recommendations. CPW has determined that maintaining these three hydraulic parameters at adequate levels across riffle habitat types, aquatic habitat in pools and runs will also be maintained for most life stages of fish and aquatic invertebrates (Nehring 1979; Espegren 1996).

#### Results

The USFS, in July of 1992, collected stream cross-section information, flow data, and natural environment observations to quantify the instream flow needs for this reach of the Bonnett Creek using R2CROSS. In 2016, CPW collected additional cross-section and flow data.

For this segment of stream, three data sets were collected with the results shown in Table 1 above. Table 1 shows who collected the data (Party), the date the data was collected, the measured discharge at the time of the survey (Q), the accuracy range of the predicted flows based on Manning's equation (240% and 40% of Q), the hydraulic equation that was used, and the corresponding summer flow recommendation meeting all 3 hydraulic criteria and the winter flow recommendation meeting 2 of 3 hydraulic criteria.

Table 1. Results of R2CROSS transect measurements and the resulting flow recommendations.

	Party	Date Measured	Q measured	40%-250%	Hydraulic Equation	Flow Meeting Two Criteria	Flow Meeting Three Criteria
1	USFS	7/15/1992	0.42 cfs	0.2 – 1.1 cfs	Manning's	0.48 cfs	Out of confidence interval
2	CPW	6/16/2016	1.1 cfs	0.4 – 2.8 cfs	Manning's	0.66 cfs	1.22 cfs
3	CPW	6/16/2016	0.84 cfs	0.3 – 2.1 cfs	Manning's	0.58 cfs	0.69 cfs
				Mean		0.6 cfs	1.0 cfs

the Manning's modeled range for this cross-section, **1.1 cfs**.

Based on these results, CPW's initial recommendation is 1.0 cfs, summer, and 0.6 cfs, winter, based on USFS and CPW data collection efforts. This recommendation is based on the physical and

biological data collected to date and does not incorporate any water availability constraints.

#### **Hydrologic Data**

CPW staff conducted a preliminary evaluation of the stream hydrology to determine if water was physically available for an instream flow appropriation. The hydrograph is based on USGS StreamStats, a software product that estimates mean monthly flow statistics for the contributing basin. Figure 1 below displays the StreamStats hydrograph, the initial R2CROSS recommendations, and the proposed ISF recommendations refined by preliminary water availability.

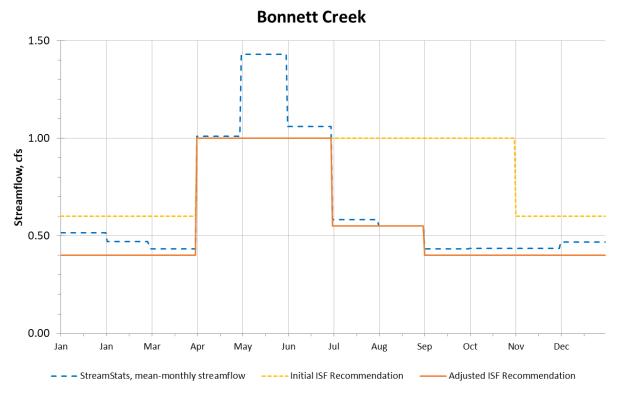


Figure 1. Hydrograph showing the USGS StreamStats monthly mean flow estimates for Bonnett Creek, and initial and adjusted, final CPW winter and summer seasonal recommended flows.

#### **Recommended Flow Rates**

After incorporating the preliminary water availability information, the original instream flow recommendation was modified. During the baseflow period, the proposed winter flow recommendation was reduced from 0.6 cfs to 0.4 cfs. This reduced base flow rate is needed for fish overwintering; it will achieve the percent wetted perimeter criteria across the reach and velocities and depths that are suitable at microhabitats within the reach. The proposed summer flow recommendation will preserve the natural environment by achieving all three instream flow criteria during the snowmelt runoff period between April and the end of June. CPW recommends protection of the receding limb of the hydrograph in order to achieve suitable velocities and wetted perimeter during the late summer. This combination will support fish spawning, development, and rearing. The proposed flows below are sufficient to preserve the natural environment to a reasonable degree in this reach of Bonnett Creek:

1.0 cfs is recommended from April 1 through June 30;

- 0.6 cfs is recommended from July 1 through August 31;
- 0.4 cfs is recommended from September 1 through March 31.

If additional water is determined to be available in further investigations, CPW would recommend appropriating the additional water up to the initial, biological recommended flow amounts to preserve the natural environment to a reasonable degree.

#### **Existing Water Right Information**

CPW staff has analyzed the water rights tabulation and consulted with the Division of Water Resources (DWR) Water Commissioner to identify any potential water availability problems due to existing diversions. Records indicate that there are no surface water diversions located within this reach of Bonnett Creek.

CPW and CWCB staff have met with the Cucharas Collaborative and Huerfano County Water Conservancy District water users; they have been made aware of these proposed ISF recommendations and have expressed no major issues or concerns.



# **INSTREAM FLOW DETERMINATIONS**



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

#### LOCATION INFORMATION

STREAM NAME: Bonnett Creek, 93C

XS LOCATION: XS NUMBER:	1 Mile u/s of l	JSFS Boundary
DATE: OBSERVERS:	15-Jul-92 Lewin, Murph	у
1/4 SEC: SECTION: TWP: RANGE: PM:	SE 33 30 S 69 W	
COUNTY: WATERSHED: DIVISION: DOW CODE:	HUERFANO CUCHARAS 2 29202	RIVER
USGS MAP: USFS MAP:	0	
SUPPLEMENTAL DATA		*** NOTE *** Leave TAPE WT and TENSION at defaults for data collected
TAPE WT: TENSION:	0.0106 99999	with a survey level and rod
CHANNEL PROFILE DATA	<u>.</u>	
SLOPE:	0.05575	
INPUT DATA CHECKED BY	Y:	DATE
ASSIGNED TO:		DATE

FEATURE

S

1 G

W

W

G

S

Bonnett Creek, 93C

# DATA POINTS=

VERT

5.01

5.44

5.92

6.11

6.43

6.63

6.63

6.64

6.73

6.78

6.74

6.73

6.63

6.63

6.59

6.41

6.29

6.08

5.92

5.83

**DEPTH** 

XS LOCATION:

1 Mile u/s of USFS Boundary

WATER

DEPTH

0.00

0.20

0.20

0.20

0.30

0.35

0.30

0.30

0.20

0.20

0.15

0.00

XS NUMBER:

DIST

0.70

1.50

2.50

3.00

3.40

3.60

3.90

4.30

4.60

4.90

5.20

5.50

5.80

6.10

6.50

6.90

7.50

8.50

9.60

10.00

20

VEL

0.00

0.30

0.30

0.40

0.30

0.60

0.40

1.10

0.80

0.50

0.80

0.00

#### VALUES COMPUTED FROM RAW FIELD DATA

1.0.100.0000.00				
WETTED	WATER	AREA	Q	% Q
PERIM.	DEPTH	(Am)	(Qm)	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%
0.00		0.00	0.00	0.0%
0.28	0,20	0.05	0.02	3.6%
0.30	0.20	0.07	0.02	5.0%
0.40	0.20	0.07	0.03	6.7%
0.31	0.30	0.09	0.03	6.4%
0.30	0.35	0,11	0.06	15.0%
0.30	0.30	0.09	0.04	8.6%
0.30	0.30	0.09	0.10	23.6%
0.32	0.20	0.06	0.05	11.4%
0.30	0.20	0.07	0.04	8.3%
0.40	0.15	0.06	0.05	11.4%
0.44		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%
0.00		0.00	0.00	0.0%
		W21 - 2	0.00	
3.66	0.35	0.76	0.42	100.0%
	(Max.)			

Manning's n = Hydraulic Radius=

0.2202 0.20628451

TOTALS -----

Bonnett Creek, 93C

XS LOCATION:

1 Mile u/s of USFS Boundary

XS NUMBER:

\_\_1

#### WATER LINE COMPARISON TABLE

WATER	MEAS	COMP	AREA
LINE	AREA	AREA	ERROR
	0.76	0.80	5.5%
6.17	0.76	1.86	145.8%
6.19	0.76	1.76	132.8%
6,21	0.76	1.66	120.0%
6,23	0.76	1.57	107.6%
6.25	0.76	1,48	95.4%
6.27	0.76	1.39	83.6%
6.29	0.76	1.30	72.2%
6.31	0.76	1,22	61.0%
6,33	0.76	1,13	50.2%
6,35	0.76	1.05	39.7%
6.37	0.76	0.98	29.5%
6.38	0.76	0.94	24.5%
6.39	0.76	0.90	19.7%
6.40	0.76	0.87	14.9%
6,41	0.76	0.83	10.2%
6.42	0.76	0.80	5.5%
6.43	0.76	0.76	0.9%
6.44	0.76	0.73	-3.6%
6.45	0.76	0.69	-8.1%
6.46	0.76	0.66	-12.6%
6.47	0.76	0.63	-17.0%
6.49	0.76	0.56	-25.8%
6.51	0.76	0.50	-34.3%
6.53	0.76	0.43	-42.7%
6.55	0.76	0.37	-50.9%
6.57	0.76	0.31	-59.0%
6.59	0.76	0.25	-66.8%
6.61	0.76	0.19	-74.3%
6.63	0.76	0.14	-81.3%
6.65	0.76	0.11	-85.4%
6.67	0.76	0.08	-89.0%

WATERLINE AT ZERO AREA ERROR =

6.432

STREAM NAME; XS LOCATION:

Bonnett Creek, 93C

1 Mile u/s of USFS Boundary

XS NUMBER:

Constant Manning's n

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

	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)
-	5.00	7.40	0.47	0.00	0.05	7.45	400.00	0.45		
GL.	5.92	7.10	0.47	0.86	3:35	7.45	100.0%	0.45	3.12	0.93
	5.93	6.99	0.47	0.85	3.26	7.34	98.4%	0.44	3.03	0.93
	5.98	6.51	0.45	0.80	2.92	6.85	91.9%	0.43	2.64	0.90
	6.03	6.04	0.43	0.75	2.61	6.36	85.3%	0.41	2.30	0.88
	6.08	5.56	0.42	0.70	2.32	5.87	78.8%	0,39	1,99	0.86
	6,13	5.22	0.39	0.65	2.05	5.52	74.0%	0.37	1.69	0.82
	6.18	4.92	0.36	0.80	1.80	5.19	69.7%	0.35	1.41	0.79
	6.23	4.62	0.34	0.55	1.56	4.87	65.4%	0.32	1,16	0.75
	6.28	4,32	0.31	0.50	1.33	4.55	61.0%	0.29	10.94	0.70
	6.33	4.01	0.28	0.45	1.13	4.21	56.6%	0.27	0.74	0.66
	6.38	3.70	0.25	0.40	0.93	3.68	52.1%	0.24	0.57	0.62
WL.	6.43	3.45	0.22	0.35	0.75	3.60	48.4%	0.21	0.42	0.56
	6,48	3.29	0.18	0.30	0.59	3,41	45.8%	0.17	0.29	0.49
	6.53	3_13	0.14	0.25	0.43	3.22	43.2%	0.13	0.18	0.41
	5.58	2.97	0.09	0.20	0.27	3.03	40.6%	0.09	0.09	0.32
	6.63	1.81	0.08	0.15	0.14	1.85	24.8%	0.07	0.04	0.28
	6.68	1.20	0.06	0.10	0.07	1.23	16.4%	0.06	0.02	0.23
	6.73	0.83	0.02	0.05	0.02	0.63	11.2%	0.02	0.00	0.12

3/3 = ? 2/3 = 0.5



### FIELD DATA FOR **INSTREAM FLOW DETERMINATIONS**



CONSERVATION BOARI	D				LOC	AIIU	N IN	IFOI	KMA	JIOI	N							and some	_N
STREAM NAME: BEARING STORES SECTION NO.:																			
CROSS-SECTION LOCATION:			NWC																
60' Eas	t of				12	; C	n a	qu	ch	01	wat	2 1	- A I	~~(	4.4				
	EDVEDS:	ay Ski	LMNS	<u></u>	L	Cas	sky	Ti	12	1	0	-10	14-14	1	1)				
LEGAL % SEC	TION:		ECTION	v:		TO	OWNSH	IP:		N.	/S	RANGE	Ē:	-	Е	/W	PM:		
COUNTY:	11/2 1	WATERSHE				0.			TER DI	IVISION				T	DOW W			1,27	
Huerfenn Usgs:		1.4		100			J. E. F		11	- 49	6	0	8		^	7 ~	0 6		
MAP(S):	at a ?	51.20	570	977		40	19,	= ( )	US	,01	30	75		- 3				7	
	SUPPLEMENTAL DATA  SAG TAPE SECTION SAME AS SECTION SAME SECTION SAME AS SECTION SAME SECTION SAME SECTION SAME SECTION SAME S																		
SAG TAPE SECTION SAME AS	DISCHARGE SECTION: Plarsh 11215																		
METER NUMBER:	14	DATE RATE	ED:		ars	ıl.			1/			Tieur	-			T	====		
CHANNEL BED MATERIAL SIZ	E RANGE:					CALIE	B/SPIN:	2007/		sec	-	VEIGHT		NUMBE	ER OF F	-	GRAPH:		lbs
	1000		-			5.0		PHOTO	)GHAP1	HS TAK	EN: (E	S/NO			-0.0	5			
		gallio.			СНА	NNI	EL P	ROF	ILE	DAT	A						-		
STATION			t)		ROD	READ	ING (ft)			1	Ĭ,	~	(				J.	L	LEGEND:
Tape @ Stake LB 0.0 Stake &																			
X Tape @ Stake RB 0.0 Station (1)																			
1) WS @ Tape LB/RB 0.0 11.34/11.36 E T C Photo 1																			
2 WS Upstream	2) WS Upstream 8-78 10.71																		
3 WS Downstream	7	8		T	11.	68	7							<del>()</del>	6			Direct.	ction of Flow
SLOPE 9	7/	18 =	= C	0.00	54	92	9			-200			·	<i>y</i>					
				AQ	UAT	IC S	AMP	LIN	G SI	JMM	IARY					6.			
STREAM ELECTROFISHED: Y	res(NO)	DISTANCE	E ELEC	TROFIS	HED:	ft		F	ISH CA	NUGHT:	YES/N	0	11	WATER	RCHEM	HSTRY	SAMPL	.ED: YES	NO)
		LENGTH	· FREC	NENC	DISTR	IBUTIC	ON BY C	)NE-IN	CH SIZ	£ GRO	UPS (1.	0-1.9, 2	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	A SECTION B	Y COMMON	OR SCI	ENTIFIC	ORDE	R NAM	E:				1								
101	a. East-Substituti	3,240																	
						CC	ММ	ENT	'S						775				
Chear w	arter	; h	)ar	m	4	CI	rea	51	NP	att	me s		N	0 C	ECNE	~t	DIT	FFE	5
		1															9	MILE	
																			2/
									17.00										

#### **DISCHARGE/CROSS SECTION NOTES**

STREAM NAME:	·						CROS	S-SECTION	! NO.:	DATE:	1 SHEE	т О
EGINNING OF M	MEASUREMENT	EDGE OF V	VATER LOOKING D .KE)	OWNSTREAM:	LEFT / RIG	нт	Gage Re	ading:	ft	тіме:	1636	
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)	Revo	lutions	Time (sec)	Velo At Point	Mean in Vertical	Area (ft <sup>2</sup> )	Discharge (cfs)
SBF	0		10.75									
WL	0.15		11.05	1		production was					- 31	
VVL	15		11.55	0.2				Carry Mr.		118	50	The state of the s
-	.8		11.60	0.25	-		<del></del>			.91		
	1.1		11.65	0.25	n-1					• 53		-
	.4		11.60	0.25						1.12		
	2		11.60	0.30						1.06		
	2.3		11.60	0.25						1,25		
	.6		11.55	0.25						1.85		
	,9		11.60	0.25						2,14	4	
	3.2		11.55	0.15	×					2.34		
12,000	15		11.55	0.10						1.02		
	4.1	20.1	11.50	0.15	1 1					0.71	,	
a) intras	4	5	11,50	0.10						1,09		
11 11-4	17		11.55	0,10						0.84		
20	5		11.55	0.10	K ENT					0.58		
11	5,3		11.15	U	Lipping Both 1	Selenter .	( )	The second				to protection and the second
BE	.4		10.75									
3	9.8		10.60			,						
							-				,	
	1.2									· · · · · ·		
							_	,,,				
								1/				
,				*				1				
											+	
						231	· ·					1
							*		#	1	-	-
11 - 12/4								36				
		3									-	
TOTALS:	197											// b
			Gage Reading		CALCULAT				l		S CHECKED BY	-

					VERT	WATER				Tape to
	Data Input & Proofing	GL=1	FEATURE	DIST	<b>DEPTH</b>	DEPTH	VEL	Α	Q	Water
					Total Da	ta Points = 23				
STREAM NAME:	Bonnett Creek	1	GL	0.00	10.75			0.00	0.00	0.00
XS LOCATION:	60' East of highway downstream			0.15	11.05			0.00	0.00	0.00
XS NUMBER:	Lat.= 37.384699 ; Long.= 105.095095		WL	0.20	11.34	0.00	0.00	0.00	0.00	0.00
DATE:	6/16/2016			0.50	11.55	0.20	0.18	0.06	0.01	11.35
OBSERVERS:	Cody Tyler and Jay Skinner (CPW)			0.80	11.60	0.25	0.91	0.08	0.07	11.35
				1.10	11.65	0.25	0.55	0.08	0.04	11.40
1/4 SEC:				1.40	11.60	0.25	1.12	0.08	0.08	11.35
SECTION:				1.70	11.70	0.30	1.28	0.09	0.12	11.40
TWP:				2.00	11.60	0.30	1.06	0.09	0.10	11.30
RANGE:				2.30	11.60	0.25	1.25	0.08	0.09	11.35
PM:				2.60	11.55	0.25	1.85	0.08	0.14	11.30
				2.90	11.60	0.25	2.14	0.08	0.16	11.35
COUNTY:				3.20	11.55	0.15	2.34	0.05	0.11	11.40
	Cucharas			3.50	11.55	0.10	1.02	0.03	0.03	11.45
DIVISION:				3.80	11.55	0.15	1.78	0.05	0.08	11.40
DOW CODE:	29202			4.10	11.50	0.10	0.71	0.03	0.02	11.40
USGS MAP:				4.40	11.50	0.10	1.09	0.03	0.03	11.40
USFS MAP:	Pike- San Isabel			4.70	11.55	0.10	0.84	0.03	0.03	11.45
T455.45	Level and Rod Survey		140	5.00	11.55	0.10	0.58	0.02	0.01	11.45
TAPE WT:			WL	5.00	11.36	0.00	0.00	0.00	0.00	0.00
TENSION:	99999 lbs	- 2	01	5.30	11.15			0.00	0.00	0.00
OL ODE:	0.651.0.10	3.	GL	8.40	10.75			0.00	0.00	0.00
SLOPE:	0.054 ft / ft		S	9.80	10.60			0.00	0.00	0.00
CHECKED BY	DATE									
CHECKED BT.	DATE									
ASSIGNED TO	):DATE									
ACCIONED TO	/υ/\   ⊑									

Totals | 0.92 | 1.11

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

#### LOCATION INFORMATION

STREAM NAME: XS LOCATION:

XS LOCATION: XS NUMBER:		ghway downstream 99 ; Long.= 105.095095
DATE: OBSERVERS:	16-Jun-16 Cody Tyler ar	nd Jay Skinner
1/4 SEC: SECTION: TWP: RANGE: PM:	0 0 0 0	
COUNTY: WATERSHED: DIVISION: DOW CODE:	Huerfano Cucharas 2 29202	
USGS MAP: USFS MAP:	0 Pike- San Isa	bel
SUPPLEMENTAL DATA		*** NOTE *** Leave TAPE WT and TENSION at defaults for data collected
TAPE WT: TENSION:	0.0106 99999	with a survey level and rod
CHANNEL PROFILE DATA		
SLOPE:	0.054	
INPUT DATA CHECKED BY	/:	DATE
ASSIGNED TO:	• • • • • • • • • • • • • • • • • • • •	DATE

Bonnett Creek

Bonnett Creek

XS LOCATION:

60" East of highway downstream Lat.= 37.384699 ; Long.= 105.095095

XS NUMBER:

# DATA POINTS=

VALUES COMPUTED FROM RAW FIELD DATA

00 15 20 50 80 10 40	10.75 11.05 11.34 11.55 11.60 11.65 11.60	0.00 0.20 0.25	0.00 0.18 0.91	9ERIM. 0.00 0.00 0.00 0.37	DEPTH	0.00 0.00 0.00	0.00 0.00 0.00	0.0% 0.0% 0.0%
15 20 50 80 10 40	11.05 11.34 11.55 11.60 11.65	0.20 0.25	0.18	0.00 0.00		0.00	0.00	0.09
20 50 80 10 40	11.34 11.55 11.60 11.65	0.20 0.25	0.18	0.00				
50 80 10 40 70	11.55 11.60 11.65	0.20 0.25	0.18			0.00	0.00	0.00
80 10 40 70	11.60 11.65	0.25		0.37	0.00			0.0
10 40 70	11.65		0.91	-101	0.20	0.06	0.01	1.0
40 70		0.05	0.01	0.30	0.25	0.08	0.07	6.19
70	11.60	0.25	0.55	0.30	0.25	0.08	0.04	3.79
		0.25	1.12	0.30	0.25	0.08	0.08	7.6
	11.70	0.30	1.28	0.32	0.30	0.09	0.12	10.4
00	11.60	0.30	1.06	0.32	0.30	0.09	0.10	8.6
30	11.60	0.25	1.25	0.30	0.25	0.08	0.09	8.4
60	11.55	0.25	1.85	0.30	0.25	0.08	0.14	12.5
90	11.60	0.25	2.14	0.30	0.25	0.08	0.16	14.4
20	11.55	0.15	2.34	0.30	0.15	0.05	0.11	9.5
50	11.55	0.10	1.02	0.30	0.10	0.03	0.03	2.8
80	11.55	0.15	1.78	0.30	0.15	0.05	0.08	7.2
10	11.50	0.10	0.71	0.30	0.10	0.03	0.02	1.9
40	11.50	0.10	1.09	0.30	0.10	0.03	0.03	2.9
70	11.55	0.10	0.84	0.30	0.10	0.03	0.03	2.3
00	11.55	0.10	0.58	0.30	0.10	0.02	0.01	0.8
00	11.36	0.00	0.00	0.19		0.00	0.00	0.0
30	11.15			0.00		0.00	0.00	0.0
40	10.75			0.00		0.00	0.00	0.0
80	10.60			0.00		0.00	0.00	0.0
	np. que ma vez enp ma chi ma del			5.12	0.3	0.92	1,11	100.0
	70 00 00 30 40 80	70 11.55 00 11.55 00 11.36 .30 11.15 40 10.75	.70 11.55 0.10 .00 11.55 0.10 .00 11.36 0.00 .30 11.15 .40 10.75 .80 10.60	.70	.70     11.55     0.10     0.84     0.30       .00     11.55     0.10     0.58     0.30       .00     11.36     0.00     0.00     0.19       .30     11.15     0.00       .40     10.75     0.00       .80     10.60     0.00	.70     11.55     0.10     0.84     0.30     0.10       .00     11.55     0.10     0.58     0.30     0.10       .00     11.36     0.00     0.00     0.19       .30     11.15     0.00       .40     10.75     0.00       .80     10.60     0.00	.70     11.55     0.10     0.84     0.30     0.10     0.03       .00     11.55     0.10     0.58     0.30     0.10     0.02       .00     11.36     0.00     0.00     0.19     0.00       .30     11.15     0.00     0.00     0.00       .40     10.75     0.00     0.00     0.00       .80     10.60     0.00     0.00     0.00       5.12     0.3     0.92	.70     11.55     0.10     0.84     0.30     0.10     0.03     0.03       .00     11.55     0.10     0.58     0.30     0.10     0.02     0.01       .00     11.36     0.00     0.00     0.19     0.00     0.00       .30     11.15     0.00     0.00     0.00     0.00       .40     10.75     0.00     0.00     0.00     0.00       .80     10.60     0.00     0.00     0.00     0.00       5.12     0.3     0.92     1.11

23

Manning's n = Hydraulic Radius= 0.0901 0.17864962

Bonnett Creek

XS LOCATION:

XS NUMBER:

60" East of highway downstream Lat.= 37.384699 ; Long.= 105.095095

#### WATER LINE COMPARISON TABLE

1414.750	14510	20115	ADEA
WATER	MEAS	COMP	AREA
LINE	AREA	AREA	ERROR
	0.00	4.05	44.00/
44.40	0.92	1.05	14.6%
11.10	0.92	2.31	152.4%
11.12	0.92	2.20	140.5%
11.14	0.92	2.09	128.9%
11.16	0.92	1.99	117.7%
11.18	0.92	1.89	106.5%
11.20	0.92	1.79	95.5%
11.22	0.92	1.69	84.5%
11.24	0.92	1.59	73.5%
11.26	0.92	1.49	62.6%
11.28	0.92	1.39	51.8%
11.30	0.92	1.29	41.1%
11.31	0.92	1.24	35.8%
11.32	0.92	1.19	30.5%
11.33	0.92	1.15	25.2%
11.34	0.92	1.10	19.9%
11.35	0.92	1.05	14.6%
11.36	0.92	1.00	9.4%
11.37	0.92	0.95	4.2%
11.38	0.92	0.91	-1.0%
11.39	0.92	0.86	-6.2%
11.40	0.92	0.81	-11.4%
11.42	0.92	0.72	-21.6%
11.44	0.92	0.62	-31.8%
11.46	0.92	0.53	-42.0%
11.48	0.92	0.44	-52.1%
11.50	0.92	0.35	-62.1%
11.52	0.92	0.26	-71.1%
11.54	0.92	0.19	-79.6%
11.56	0.92	0.12	-86.4%
11.58	0.92	0.08	-91.3%
11.60	0.92	0.04	-95.1%

WATERLINE AT ZERO AREA ERROR =

11.378

Bonnett Creek

XS LOCATION:

30" west of highway 12

XS NUMBER:

Lat.= 37.385091, Long.= 105.096198

Constant Manning's n

STAGING TABLE

\*GL\* = lowest Grassline elevation corrected for sag

\*WL\* = Waterline corrected for variations in field measured water surface elevations and sag

-										
	DIST TO	TOP	AVG.	MAX.		WETTED	PERCENT	HYDR		AVG.
	WATER	WIDTH	DEPTH	DEPTH	AREA	PERIM.	WET PERIM	RADIUS	FLOW	VELOCITY
-	(FT)	(FT)	(FT)	(FT)	(SQ FT)	(FT)	(%)	(FT)	(CFS)	(FT/SEC)
*GL*	9.70	4.16	1.36	1.90	5.67	6.97	100.0%	0.81	15.93	2.81
GL	10.06	3.79	1.12	1.54	4.23	6.15	88.2%	0.69	10.64	2.52
		3.79		1.54	4.23	6.04	86.6%	0.69	9.99	2.52
	10.11	3.73	1.08 1.05	1.49	3.86	5.93	85.0%	0.65	9.35	2.47
	10.16			1.39	3.67	5.82	83.5%	0.63	8.73	2.38
	10.21	3.65	1.01	1.39		5.72	82.0%	0.61	8.12	2.32
	10.26	3.61	0.97	1.29	3.49	5.72	80.4%	0.59	7.53	2.32
	10.31	3.58	0.93		3.31			0.57	6.96	2.27
	10.36	3.54	0.88	1.24	3.14	5.50 5.40	78.9% 77.4%	0.55	6.40	2.22
	10.41	3.51 3.49	0.84 0.80	1.19 1.14	2.96 2.78	5.40	77.4% 75.9%	0.53	5.86	2.10
	10.46			1.14	2.76	5.29	74.4%	0.50	5.33	2.10
	10.51	3.46	0.75	1.09	2.44	5.19	73.0%	0.48	4.82	1.98
	10.56	3.44	0.71			4.99	73.0%	0.45	4.33	1.91
	10.61	3.41	0.66	0.99	2.27		70.0%	0.43	3.85	1.84
	10.66	3.39	0.62	0.94	2.10	4.88	68.5%		3.40	1.76
	10.71	3.36	0.57	0.89	1.93	4.78		0.40	2.96	1.78
	10.76	3.34	0.53	0.84	1.76	4.68	67.0% 65.6%	0.38 0.35	2.55	1.60
	10.81	3.32	0.48	0.79	1.59	4.57	64.1%	0.33	2.16	1.51
	10.86	3.29	0.43	0.74	1.43	4.47		0.32	1.79	1.41
	10.91	3.27	0.39	0.69	1.26	4.37	62.6%		1.79	1.41
	10.96	3.24	0.34	0.64	1.10	4.26	61.1%	0.26		
	11.01	3.22	0.29	0.59	0.94	4.16	59.6%	0.23	1.13	1.20
*WL*	11.06	3.20	0.24	0.54	0.78	4.06	58.2%	0.19	0.84	
	11.11	3.17	0.20	0.49	0.62	3.94	56.6%	0.16		0.94
	11.16	2.99	0.15	0.44	0.46	3.70	53.0%	0.13	0.38	0.81
	11.21	2.39	0.14	0.39	0.33	3.01	43.1%	0.11	0.24	0.74
	11.26	1.63	0.14	0.34	0.23	2.16	31.0%	0.10	0.16	0.72
	11.31	1.30	0.12	0.29	0.15	1.74	25.0%	0.09	0.10	0.64
	11.36	1.01	0.09	0.24	0.09	1.36	19.5%	0.07	0.05	0.55
	11.41	0.73	0.07	0.19	0.05	0.98	14.0%	0.05	0.02	0.45
	11.46	0.43	0.05	0.14	0.02	0.60	8.6%	0.04	0.01	0.36
	11.51	0.18	0.04	0.09	0.01	0.29	4.1%	0.03	0.00	0.29
	11.56	0.08	0.02	0.04	0.00	0.13	1.8%	0.01	0.00	0.17

$$\frac{2/3}{3} = 0.58 \text{ of }$$

$$\frac{3/3}{3} = 0.70 \text{ of }$$

$$\frac{1.08}{0.84} = \frac{1.00}{1.08} = \frac{1.00}{0.58} = \frac{1.00}{0.58}$$

$$\frac{1.08x}{1.08} = \frac{0.84}{1.08} = \frac{0.62}{0.58}$$

$$\frac{1.08x}{1.08} = 0.70 \text{ c.67}$$

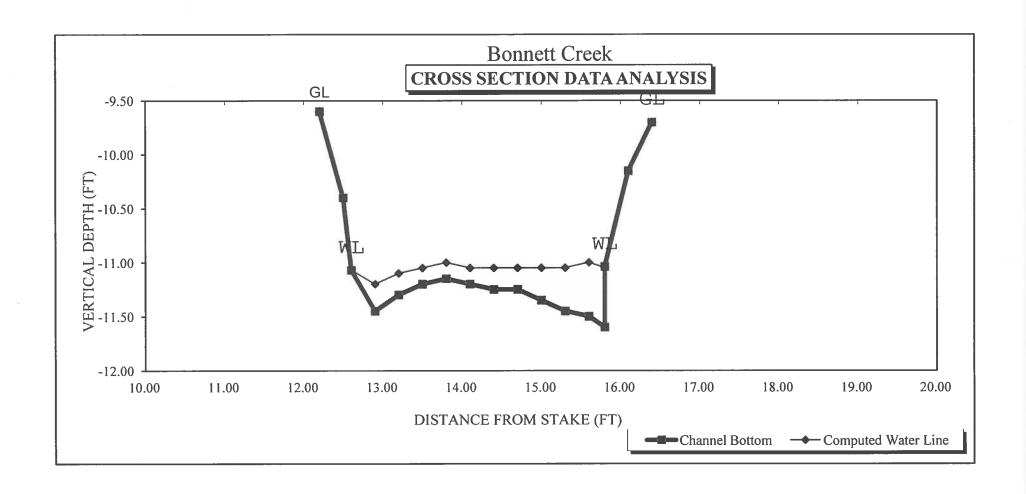
Bonnett Creek

XS LOCATION: XS NUMBER:

30" west of highway 12 Lat.= 37.385091, Long.= 105.096198

#### SUMMARY SHEET

MEASURED FLOW (Qm)= CALCULATED FLOW (Qc)≍	0.84 cfs 0.84 cfs	RECOMMENDED INS	
(Qm-Qc)/Qm * 100 =	-0.2 %	FLOW (CFS)	PERIOD
MEASURED WATERLINE (WLm)=	11.06 ft	========	
CALCULATED WATERLINE (WLc)=	11.06 ft		
(WLm-WLc)/WLm * 100 =	-0.1 %		
MAX MEASURED DEPTH (Dm)=	0.55 ft		
MAX CALCULATED DEPTH (Dc)=	0.54 ft		
(Dm-Dc)/Dm * 100	2.0 %		
MEAN VELOCITY=	1.08 ft/sec		
MANNING'S N=	0.021		
SLOPE=	0.002 ft/ft		
.4 * Qm =	0.3 cfs		
2.5 * Qm=	2.1 cfs		
RATIONALE FOR RECOMMENDATION:			
=======================================			
		Coc West Co.	40000
		92.15 W.OFRE	
W 1 1100000 - 10110	122[23]		
RECOMMENDATION BY:	AGENCY		DATE:
CWCB REVIEW BY:			DATE





# FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



COLORADO WATER CONSERVATION BOARD	)				LOC	ATIO	NIN	1FO	RMA	TION	1								OF	
STREAM NAME: BONK	na +1	d	The same	1,000	2		- f	hu	· las	and the						C	ROSS-	SECTIO	N NO.:	
CROSS-SECTION LOCATION:		U	P			30			1	F H		W or		17	10.00	-f-4-6	Ca was			
			9					د د ندل			7	000	1		LEY	5 6				
	RVERS:			+	Ja	in ey S	s les	in h	er											
LEGAL % SECT DESCRIPTION	TION:		ECTION	4:		TC	WNSH			N/		RANGE				/W	PM:			
Hwerfan			cha.			ورس				NOISIN						VATER (				
MAP(S): USGS: USFS:	MAP(S): Lat. = 57, 585 091; Long. = 105, 696 148																			
	SUPPLEMENTAL DATA  AG TAPE SECTION SAME AS YES/NO METER TYPE: Mass No. 18																			
AG TAPE SECTION SAME AS YES NO METER TYPE: Marsh Mc B																				
DATE RATED:  CALIB/SPIN:sec TAPE WEIGHT:Ibs/foot TAPE TENSION:Ibs  CHANNEL RED MATERIAL SIZE RANGE:																				
CHANNEL PROFILE DATA																				
STATION DISTANCE (ft) ROD READING (ft)  LEGEND:																				
STATION FROM TAPE (II) HOU READING (III)  Tape @ Stake LB 0.0 Stake &																				
Tape @ Stake RB		0.0				-	e		S K	9	Λ		9	D		\ <u>\</u>	Ka		ation (1)	
1 WS @ Tape LB/RB		0.0			1.07	/	1.04		K E T C		$\langle \rangle$		TAPE			(2)	>	Pt	noto 🗘	+
2 WS Upstream:		5,5				1-06			н					(h					900	í.
3 WS Downstream		3.3		1		1.69	<u> </u>	_					6	0				Direc	ction of FI	)
SLOPE	2.03	/13.8	3 =	0.0	200						_		_	y				13		
				AC	<b>TAU</b>	ric s	AMF	PLIN	G SI	JMM	ARY									
STREAM ELECTROFISHED: YI	ES/NO	DISTANCI	E ELEC	TROFIS	HED: _	ft		F	ISH CA	UGHT:	YES/NO	)		WATE	RCHEN	MISTRY	SAMPL	ED: YE	INO)	
		LENGTH	- FREQ	UENC	Y DIST	RIBUTIC	ON BY (	ONE-IN	CHSIZ	E GRO	UPS (1.	0-1.9, 2	.0-2.9	ETC.)	,					
SPECIES (FILL IN)		<del> </del>	1	2	3	-4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL	-
																	-		-	+
																	$\vdash$			
			ŧ											-						
AQUATIC INSECTS IN STREAM	SECTION B	Y COMMON	OR SCI	ENTIFIC	ORDI	ER NAM	E:													-
							- 1000		- Maria - San				7 3500			ermoto	H-1000	and w		_
			200		_	CC	) M M	ENT	S								1000	- S		-
1	- qualifyren		5 A				20 6				8.1									-
Clope 8	WE LAY	A and a	to de co	" from	1	h	LA	Carried States	in	18 p	f.4	Burn.								-1

#### **DISCHARGE/CROSS SECTION NOTES**

STREAM NAME:	·				CROSS-SECTION NO.:					SHEET	OF
BEGINNING OF MEASUREMEN	T EDGE OF WATER LOOKING D	OWNSTREAM:	LEFT / RIGH	T Ga	ge Readi	ing:	ft	TIME:	54	5	
Stake (S) Grassline (G) Waterline (W) Rock (R)  Distance From Initial Point (ft)	Width Total (ft) Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Obser- vation (ft)	Revolution		Time (sec)	Velocity At Point	Mean i	in (	rea ft <sup>2</sup> )	Discharge (cfs)
Stake (S) Grassline (G) Waterline (W) Rock (R) Initial Point (ft)  SBF 12.2  12.5  WL 17.6  12.9  13.2  15.8  14.1  5.8  14.1  5.8  14.1	(ft) Vertical Depth From Tape/Inst	Depth	of Obser- vation (ft)	Revolution of the second of th	1		At	Mean i Vertica  1.5  1.1  , 9  .9  1.0  1.1  1.1  0.9	7 5 5 8 9 2 3	rea ft <sup>2</sup> )	
TOTALS:	me: IGO Tage Reading		CALCULATIO	DNS PERF	ORMED B	JY:		ALCULATION	ONS CHEC	KED BY:	

				VERT	WATER				Tape to
Data Input & Proofing	GL=1	FEATURE	DIST	DEPTH	DEPTH	VEL	. A	Q	Water
				Total Da	ta Points = 17				
STREAM NAME: Bonnett Creek	1	GL	12.20	9.60			0.00	0.00	0.00
XS LOCATION: 30' west of highway 12			12.50	10.40			0.00	0.00	0.00
XS NUMBER: Lat.= 37.385091, Long.= 105.096198		WL	12.60	11.07	0.00	0.00	0.00	0.00	0.00
DATE: 6/16/2016			12.90	11.45	0.25	1.50	0.08	0.11	11.20
OBSERVERS: Cody Tyler and Jay Skinner (CPW)			13.20	11.30	0.20	1.17	0.06	0.07	11.10
444.050			13.50	11.20	0.15	0.95	0.05	0.04	11.05
1/4 SEC:			13.80	11.15 11.20	0.15	0.95 0.98	0.05 0.05	0.04	11.00 11.05
SECTION: TWP:			14.10 14.40	11.20	0.15 0.20	1.09	0.05	0.04	11.05
RANGE:			14.70	11.25	0.20	1.12	0.06	0.07	11.05
PM:			15.00	11.35	0.30	1.13	0.09	0.10	11.05
			15.30	11.45	0.40	1.13	0.12	0.14	11.05
COUNTY: Huerfano			15.60	11.50	0.50	0.91	0.13	0.11	11.00
WATERSHED: Cucharas			15.80	11.60	0.55	0.75	0.06	0.04	11.05
DIVISION: 2		WL	15.80	11.04	0.00	0.00	0.00	0.00	0.00
DOW CODE: 29202	- 5		16.10	10.15			0.00	0.00	0.00
USGS MAP:	1	GL	16.40	9.70			0.00	0.00	0.00
USFS MAP: Pike- San Isabel									
TAPE WT: 0.0106 Level and Rod Survey									
TENSION: 99999 lbs									
ILITOION. USSSS									
SLOPE: 0.002 ft / ft									
CHECKED BY:DATEDATE									
ACCIONED TO: DATE									
ASSIGNED TO:DATEDATE									

Totals 0.78 0.84

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

#### LOCATION INFORMATION

STREAM NAME:

XS LOCATION: XS NUMBER:	30" west of highway 12 Lat.= 37.385091, Long.= 105.096198						
DATE: OBSERVERS:	16-Jun-16 Cody Tyler an	id Jay Skinner					
1/4 SEC: SECTION: TWP: RANGE: PM:	0 0 0 0						
COUNTY: WATERSHED: DIVISION: DOW CODE:	Huerfano Cucharas 2 29202						
USGS MAP: USFS MAP:	0 Pike- San Isabel						
SUPPLEMENTAL DATA		*** NOTE *** Leave TAPE WT and TENSION					
TAPE WT: TENSION:	0.0106 99999	at defaults for data collected with a survey level and rod					
CHANNEL PROFILE DATA							
SLOPE:	0.002						
INPUT DATA CHECKED BY	r:	DATE					
ASSIGNED TO:		DATE					

Bonnett Creek

Bonnett Creek

XS LOCATION:

FEATURE

1 GL

WL

WL

1 GL

30" west of highway 12

XS NUMBER:

Lat.= 37.385091, Long.= 105.096198

WATER

DEPTH

0.00

0.25

0.20

0.15

0.15

0.15

0.20

0.20

0.30

0.40

0.50

0.55

0.00

# DATA POINTS=

VERT

DEPTH

9.60

10.40

11.07

11.45

11.30

11.20

11.15

11.20

11.25

11.25

11.35

11.45

11.50

11.60

11.04

10.15 9.70 17

VEL

0.00

1.50

1.17

0.95

0.95

0.98

1.09

1.12

1.13

1.13

0.91

0.75

0.00

#### VALUES COMPUTED FROM RAW FIELD DATA

WETTED	WATER	AREA	Q	% Q
PERIM.	DEPTH	(Am)	(Qm)	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%
0.48	0.25	0.08	0.11	13.4%
0.34	0.20	0.06	0.07	8.4%
0.32	0.15	0.05	0.04	5.1%
0.30	0.15	0.05	0.04	5.1%
0.30	0.15	0.05	0.04	5.3%
0.30	0.20	0.06	0.07	7.8%
0.30	0.20	0.06	0.07	8.0%
0.32	0.30	0.09	0.10	12.1%
0.32	0.40	0.12	0.14	16.2%
0.30	0.50	0.13	0.11	13.6%
0.22	0.55	0.06	0.04	4.9%
0.56		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
4.07	0.55	0.78	0.84	100.0%
	(Max.)			

Manning's n = Hydraulic Radius= 0.0206 0.19172149

TOTALS -----

DIST

12.20

12.50

12.60

12.90

13.20

13.50

13.80

14.10

14.40

14.70

15.00

15.30

15.60

15.80

15.80

16.10

16.40

Bonnett Creek

XS LOCATION:

XS NUMBER:

30" west of highway 12 Lat.= 37.385091, Long.= 105.096198

#### WATER LINE COMPARISON TABLE

NA/ATED	MEAC	COMP	ADEA
WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
LINE	AREA	AREA	ERROR
	0.78	0.80	2.5%
10.81	0.78	1.61	106.9%
10.83	0.78	1.55	98.4%
10.85	0.78	1.48	90.4%
10.87	0.78	1.42	81.5%
10.89	0.78	1.42	73.1%
10.91	0.78	1.28	64.7%
10.93	0.78	1.22	56.3%
10.95	0.78	1.15	48.0%
10.97	0.78	1.09	39.7%
10.99	0.78	1.02	31.4%
11.01	0.78	0.96	23.1%
11.02	0.78	0.93	19.0%
11.03	0.78	0.90	14.8%
11.04	0.78	0.86	10.7%
11.05	0.78	0.83	6.6%
11.06	0.78	0.80	2.5%
11.07	0.78	0.77	-1.6%
11.08	0.78	0.74	-5.7%
11.09	0.78	0.70	-9.8%
11.10	0.78	0.67	-13.9%
11.11	0.78	0.64	-18.0%
11.13	0.78	0.58	-26.1%
11.15	0.78	0.51	-34.1%
11.17	0.78	0.45	-42.0%
11.19	0.78	0.40	-49.2%
11.21	0.78	0.34	-55.8%
11.23	0.78	0.30	-61.8%
11.25	0.78	0.25	-67.3%
11.27	0.78	0.22	-71.8%
11.29	0.78	0.19	-75.8%
11.31	0.78	0.16	-79.4%

WATERLINE AT ZERO AREA ERROR =

11.061

Bonnett Creek

XS LOCATION:

60" East of highway downstream

XS NUMBER:

Lat.= 37.384699 ; Long.= 105.095095

Constant Manning's n

STAGING TABLE

\*GL\* = lowest Grassline elevation corrected for sag

\*WL\* = Waterline corrected for variations in field measured water surface elevations and sag

-	DIST TO	TOP	AVG.	MAX.		WETTED	PERCENT	HYDR		AVG.
	WATER	WIDTH	DEPTH	DEPTH	AREA	PERIM.	WET PERIM	RADIUS	FLOW	VELOCITY
_	(FT)	(FT)	(FT)	(FT)	(SQ FT)	(FT)	(%)	(FT)	(CFS)	(FT/SEC)
3L°	10.75	<u>(8.40</u> )	0.56	0.95	4.74	9.24	100.0%	0.51	11.65	2.46
	10.78	8.17	0.55	0.92	4.51	8.99	97.3%	0.50	10.92	2.42
	10.83	7.76	0.53	0.87	4.11	8.55	92.5%	0.48	9.68	2.35
	10.88	7.34	0.51	0.82	3.74	8.10	87.6%	0.46	8.55	2.29
	10.93	6.93	0.49	0.77	3.38	7.65	82.8%	0.44	7.51	2.22
	10.98	6.52	0.47	0.72	3.04	7.21	78.0%	0.42	6.56	2.16
	11.03	6.11	0.45	0.67	2.73	6.76	73.1%	0.40	5.71	2.09
	11.08	5.70	0.43	0.62	2.43	6.32	68.3%	0.39	4.93	2.03
	11.13	5.31	0.41	0.57	2.16	5.87	63.6%	0.37	4.24	1.96
	11.18	5.09	0.37	0.52	1.90	5.60	60.6%	0.34	3.54	1.86
	11.23	5.01	0.33	0.47	1.65	5.47	59.1%	0.30	2.84	1.72
	11.28	4.93	0.28	0.42	1.40	5.33	57.6%	0.26	2.20	1.57
	11.33	4.85	0.24	0.37	1.15	5.19	56.1%	0.22	1.62	1.41
WL*	11.38	4.75	0.19	0.32	0.91	5.04	54.5%	0.18	1.12	1.23
	11.43	4.67	0.15	0.27	0.68	4.90	53.0%	0.14	0.70	(1.03
	11.48	4.60	0.10	0.22	0.45	4.76	51.5%	0.09	0.35	0.79
	11.53	3.90	0.06	0.17	0.23	3.98	43.1%	0.06	0.13	0.58
	11.58	2.03	0.04	0.12	0.08	2.08	22.5%	0.04	0.04	0.45
	11.63	0.70	0.03	0.07	0.02	0.72	7.8%	0.03	0.01	0.33
	11.68	0.13	0.01	0.02	0.00	0.14	1.5%	0.01	0.00	0.18

$$\frac{1.03}{0.7} = \frac{1.00}{X} = \frac{0.79}{0.35} = \frac{1.00}{X}$$

$$1.03X = 0.7$$

$$X = 0.68$$

$$X = 0.68$$

$$X = 0.56$$

$$2/3 = 0.56$$

$$\frac{119}{1.12} = \frac{0.2}{1.62}$$

$$\frac{124}{1.62} = \frac{0.2}{1}$$

$$\frac{1.62}{1.62} = \frac{0.2}{1}$$

$$\frac{0.2(1.62)}{0.2(1.62)} = 0.24$$

$$\frac{0.2(1.62)}{0.24} = \frac{0.24}{1.24}$$

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$$\frac{0.2}{0.2} = \frac{0.2}{1.24}$$

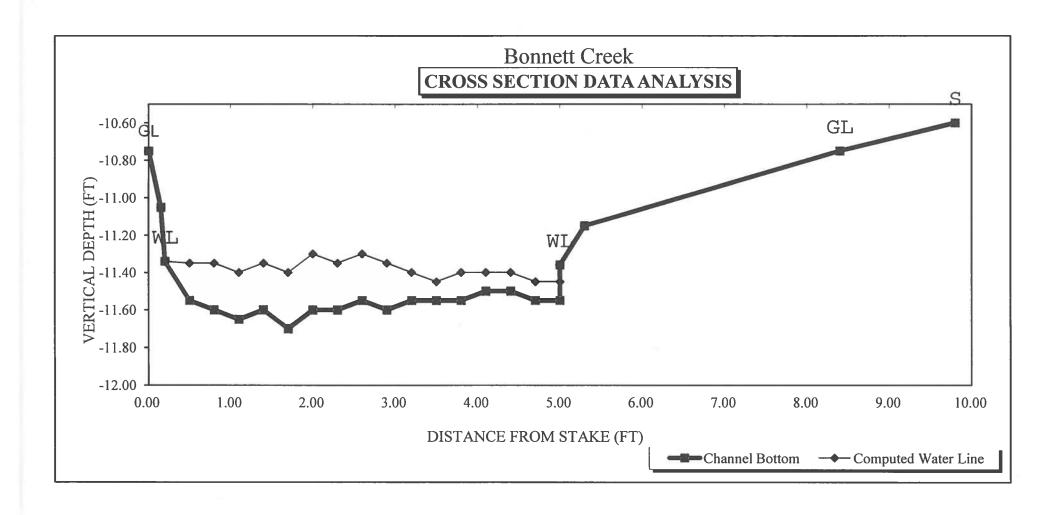
STREAM NAME: XS LOCATION:

XS NUMBER:

Bonnett Creek 60" East of highway downstream Lat.= 37.384699; Long.= 105.095095

#### SUMMARY SHEET

MEASURED FLOW (Qm)= CALCULATED FLOW (Qc)=	1.11 1.12			RECOMMENDED INSTREAM FLOW:		
(Qm-Qc)/Qm * 100 =	-1.1		FLOW (CFS)	PERIOD		
MEASURED WATERLINE (WLm)=	11.35	ft	=======================================	======		
CALCULATED WATERLINE (WLc)=	11.38	ft				
(WLm-WLc)/WLm * 100 =	-0.2	%				
MAX MEASURED DEPTH (Dm)=	0.30	ft				
MAX CALCULATED DEPTH (Dc)=	0.32	ft				
(Dm-Dc)/Dm * 100	-7.3	%				
MEAN VELOCITY=	1.23	ft/sec	···			
MANNING'S N=	0.090					
SLOPE=	0.054	ft/ft				
.4 * Qm =	0.4					
2.5 * Qm=	2.8	cfs				
200 000 000 000 000 000 000 000 000 000				190 - 190 -		
- Constitution of the Cons						
RECOMMENDATION BY:	11 -11 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	AGENCY		DATE:		
CWCB REVIEW BY:		# 40#4# # 40#3# # 1 # 10# 10#4000000		DATE:		





Abandoned Measurement because rapid change in weather conditions resulted in hypothermia concerns. -Brian Epstein

### Discharge Measurement Summary

Date Generated: Wed Jul 24 2013

**File Information** 

20101025\_BNT001.WAD File Name Start Date and Time 2010/10/25 15:43:37

**Site Details** Site Name Operator(s)

ΒE

**System Information** FlowTracker Sensor Type P2354 Serial # **CPU Firmware Version** 3.7 Software Ver 2.30 **Mounting Correction** 0.0%

**Units** (English Units) Distance ft Velocity ft/s ft^2 Area Discharge cfs

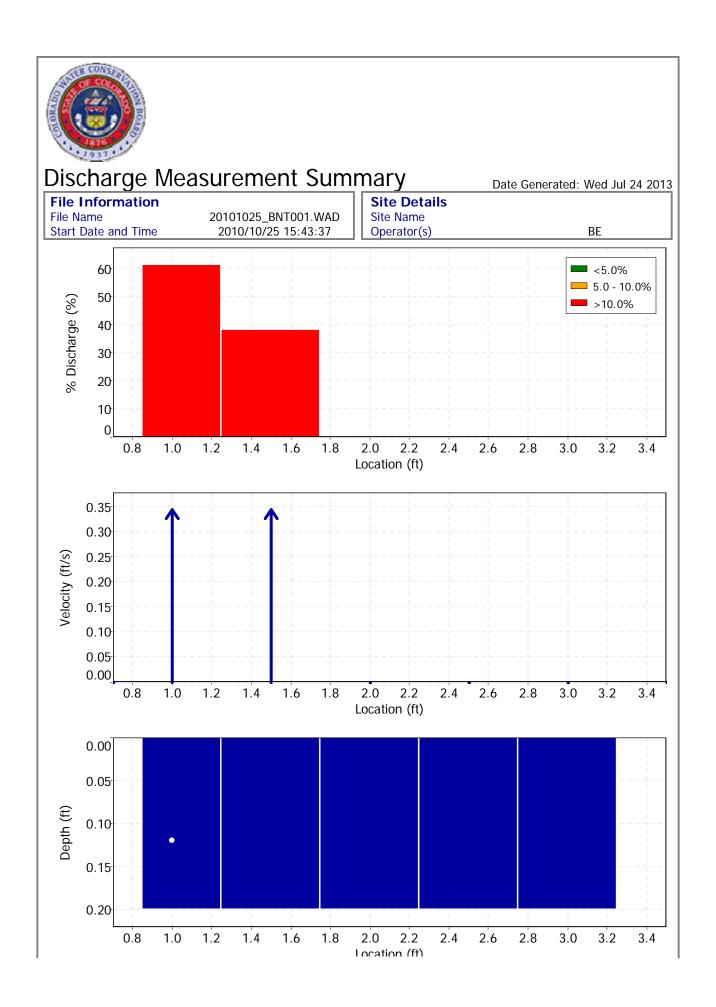
Discharge Uncertainty						
Category	ISO	Stats				
Accuracy	1.0%	1.0%				
Depth	1.1%	0.0%				
Velocity	8.3%	24.2%				
Width	0.4%	0.4%				
Method	5.4%	-				
# Stations	32.0%	-				
Overall	33.5%	24.2%				

Summary			
Averaging Int.	40	# Stations	7
Start Edge	LEW	Total Width	1.550
Mean SNR	38.2 dB	Total Area	0.230
Mean Temp	35.02 °F	Mean Depth	0.148
Disch. Equation	Mid-Section	Mean Velocity	0.1947
		Total Discharge	0.0448

M	Measurement Results											
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	15:43	0.70	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	15:43	1.00	0.6	0.200	0.6	0.080	0.3445	1.00	0.3445	0.080	0.0276	61.5
2	15:43	1.50	None	0.200	0.0	0.0	0.0000	1.00	0.3445	0.050	0.0172	38.5
3	15:43	2.00	None	0.200	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
4	15:43	2.50	None	0.200	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
5	15:43	3.00	None	0.200	0.0	0.0	0.0000	1.00	0.0000	0.100	0.0000	0.0
6	15:43	3.50	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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Page 2 of 5 7/24/2013



Date Generated: Wed Jul 24 2013

File Information

File Name 2016 Start Date and Time 20

20101025\_BNT001.WAD 2010/10/25 15:43:37 Site Details
Site Name
Operator(s)

BE

No Quality Control warnings

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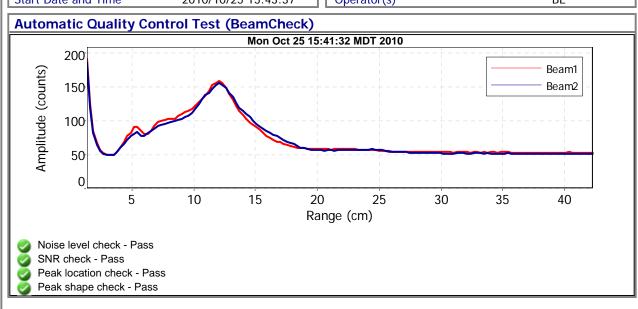
Date Generated: Wed Jul 24 2013

File Information

File Name Start Date and Time 20101025\_BNT001.WAD 2010/10/25 15:43:37

Site Details
Site Name
Operator(s)

BE



Page 5 of 5 7/24/2013

Station Num. 00ス Meas. No.: State of Colorado **Colorado Water Conservation Board** Comp. By: SJE **ADV Discharge Measurement Notes** Checked By: Station Name: Bonnett River (Creek, Canal, Ditch At, Near, Above Below Terminus Lover Longitude: W 1056 11.5H Latitude: Date: Brian Party: Weather: 48.6°F Wind Spd / Dir. Water Temp: X-Sec Desc: Flow Conds: Control Desc.: Measurement Rate: Excelent (2%) / Good (5%) / Fair (8%) / Poor (>8%) [based on the above conditions] **Gage Reading** Time Outside Inside Encoder Recorder Other 10.30 èn 10:26 10:46 Weighted MGH 3H Con. **CORRECT MGH** SonTek Model: FlowTracker (P2354) P2355 3.7 Software: 2.20 154 DONTABLT.001 lag Test File: Wadingy Boat / Bridge / Cableway Method: or downstream of gage 🐰 it. br mi /(up REW Start Edge: Total Width: # Sections: 16:23 Start Time: End Time: 10:45 0.099 Unsertainty: Discharge: £060.0 Mean v: Width Mean d: 0.19 0,24 Max v: ०,२२२ Area: Max d: Зσ. Mean SNR: σV: 001 Mean Temp: Remarks: or was a

Remarks (continued):	H-D	
Location (4)	H <sub>2</sub> 0 Leoth (4)	Const
0.80	ඛුහ	REW
0.95	0.22	
0.95	0.23	
1,10	0.24 0.24	
1.20	0.27	tan katalan kanasanada medilan selata salam kanasan menengan kanasan kanasan kanasan kanasan kanasan kanasan k
1.30	0.46	
1.40 1.50	0.26	
	0.23	
1.60	0.20 0.20	
1, 30	0.70	
1.90	0.20	vangana manakani dani danang/wana kanana manama manama iki mana ka ki inama manama gi dangan mangi a
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Date Generated: Wed Jul 24 2013

**File Information** 

File Name 20110908\_BONTABLT002.WAD Start Date and Time 2011/09/08 10:28:36

Site Details
Site Name
Operator(s)

BONNETT ABV LOW TERM BJE

System Information
Sensor Type FlowTracker
Serial # P2354
CPU Firmware Version 3.7
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%	1.4%				
Velocity	1.5%	6.0%				
Width	0.2%	0.2%				
Method	3.1%	-				
# Stations	5.8%	-				
Overall	6.8%	6.3%				

Summary
Averaging Int. 40 # Stations
Start Edge REW Total Widtle

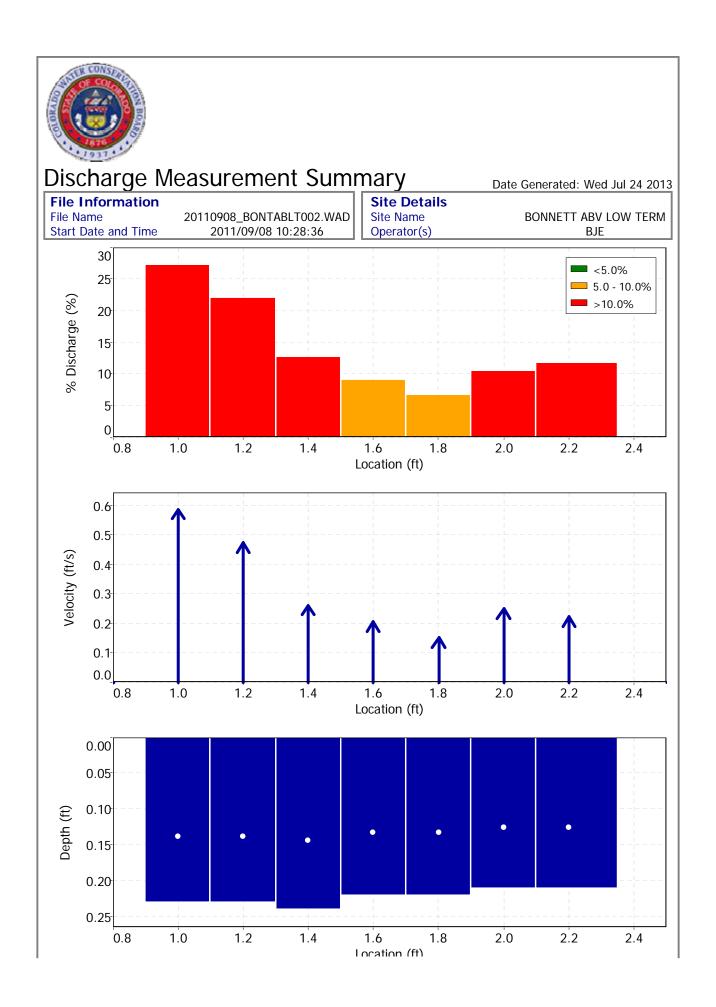
Start Edge REW **Total Width** 1.700 Mean SNR 30.2 dB **Total Area** 0.323 Mean Temp 48.38 °F Mean Depth 0.190 Disch. Equation Mid-Section Mean Velocity 0.3068 **Total Discharge** 0.0990

	Supplemental Data (Gauge Height Change = 0.000ft)						
#	Time	Location	Gauge Height	Rated Flow	Comments		
1	Thu Sep 8 10:24:30 MDT 2011	0.000	0.350		TEMP STAFF		
2	Thu Sep 8 10:32:14 MDT 2011	1.400	0.350				
3	Thu Sep 8 10:46:22 MDT 2011	2.500	0.350				

Me	Measurement Results											
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	10:28	0.80	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	10:28	1.00	0.6	0.230	0.6	0.092	0.5866	1.00	0.5866	0.046	0.0270	27.3
2	10:29	1.20	0.6	0.230	0.6	0.092	0.4724	1.00	0.4724	0.046	0.0217	22.0
3	10:32	1.40	0.6	0.240	0.6	0.096	0.2612	1.00	0.2612	0.048	0.0126	12.7
4	10:34	1.60	0.6	0.220	0.6	0.088	0.2044	1.00	0.2044	0.044	0.0090	9.1
5	10:35	1.80	0.6	0.220	0.6	0.088	0.1506	1.00	0.1506	0.044	0.0066	6.7
6	10:43	2.00	0.6	0.210	0.6	0.084	-0.2480	-1.00	0.2480	0.042	0.0104	10.5
7	10:39	2.20	0.6	0.210	0.6	0.084	-0.2218	-1.00	0.2218	0.052	0.0116	11.8
8	10:39	2.50	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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Date Generated: Wed Jul 24 2013

File Information

File Name 20110908\_BONTABLT002.WAD Start Date and Time 2011/09/08 10:28:36

Site Details
Site Name
Operator(s)

BONNETT ABV LOW TERM

BJE

Quality Control							
St	Loc	%Dep	Message				
6	2.00	0.6	High angle: -177				
7	2.20	0.6	High angle: -172				

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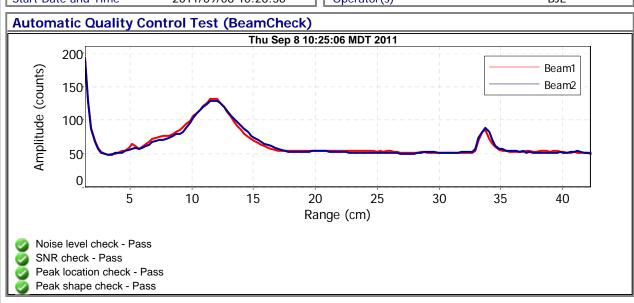
Date Generated: Wed Jul 24 2013

File Information

File Name Start Date and Time 20110908\_BONTABLT002.WAD 2011/09/08 10:28:36

Site Details
Site Name
Operator(s)

BONNETT ABV LOW TERM BJE



Page 5 of 5 7/24/2013

ſ	Page of	State of Colorado			Meas. No.:	001
N	MYY:2012	Colorado '	Water Conservati	on Board	Division:	2
	им-DD:06-29	ADV Disc	harge Measureme	nt Notes	District:	16
	Station Name:	nal.	nett		_	
		gyppysourspyrryspyspility obholigh, abdolighe ir <b>degr</b> abholishille ist	nnoomis maggiosing a businessian statics evenus.	entransferent i 2. vorsidalistik kilopiteriya en entrefir visitigisa (kilopiteriya sakik) (c.)	River (Creek) Can	al, Ditch
	At, Near, Above, 🤅	Selow	(0-12	near C	uchara	elje - (190-a), benje e (190-a) andeleto i 190-a) andere i englet e galencji pojekolikoj.
	Latitude: N	37°23'5.0	7"	Longitude: レ	105°05′43	71" NAU83
	Party:	Brian	Lastevi			
Ī			Cond	itions		
	Weather:	JUNAU 1	195°F 9	Few 5	cattered	Claud
	Wind Spd / Dir:	Ompl / C	)	Water Temp:		
	X-Sec Desc:	boulder	, cobble	5 4/50	in sand	
	Flow Conds:	Slightly	Fuldruf		V	
	Control Desc.:	NA '				
	Meas	surement Rated: Excelen	(2%) / Good (5%) / Fa	air (8%) / Poor (>8%)	based on the above con	ditions]
1			Water Lev	el Reading		
	Time	Staff Gage	Pressure Trans.	Time	Staff Gage	Pressure Trans.
	4/1/4	The state of the s	in the second control of the second control of	magnific to morning and republication of paper the paper.	conservation and property in production of the	The property contract to the contract to
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	and the second s	Contraction may be a personal	waterway to the wind of the case of an expension where	Er ans de see additional harborist satisfication of the contract of the contra	nancist accompany provides in a proc patholic	The second second second second
	ernangan indigeran din Law on termina	ago ago a so a e o a e a abrombo mendodes mondos so	Managaran and analysis and a substitute of the s	to the entrance of the second of School Are		Andrews are amounted in the first of the first
	Press	sure Transducer Do	wnload	Weighted MGH	Assembly ( ) (September) is the position of the	property out in the con-
	File Name:	ganagasan kada sa waka uka saka	in agramma in a consideration of the constant	GH Corr.	The state of the s	
	Time:			Correct MGH		
			Discharge I	<b>Veasurement</b>		$\triangle$
	Manufacturer:	SonTek	Model:	FlowTracker	S/N:	P2354/1 P2355
	Firmware:	3.7	Software:	2.20	part of material interests and explanation for	continuation in the first of the contribution of the
e) )	Diag Test File:	Yes or No	Raw Data File:	BONTCA	100, 63	anter (18 e) e e e e e e e e e e e e e e e e e e
15/4	Meas Type:	(Wading) Boat / B	ridge / Cableway	Der is v 1	Method:	6.6
37. 4	er de sam r	NA		ft. or mi / upstream	n or downstream o	of gage
14.1	Start Edge:	KEW	Total Width:	1.6	# Stations:	<b>T</b>
۲.,	Start Time:	73:	a Tarre a	End Time:	13:14	garang ang penggangan banapagan di sebagai ang panggan ang di sebagai ang panggan ang panggan ang panggan ang
	Discharge:	0.220	Unsertainty:	B.5%	7	
	Mean v:	0.950	Width	00ها، ا	Mean d:	0.14
	Max v:	1.570	Area:	0.232	Max d:	0.31
	Mean SNR:	3-1.9	σv:	0.069	Mean Temp:	65.1
	Meas. By:	BUE	some manes of the contract contract of	Notes By:	の万	ensy der ind removere d'avec en ai
and the second	Processed By:	S. A. of Harmon Code 1	量。 上水流	Reviewed By:	San	J. 1984.

Remarks:
· Got fermission from woman at Lodge to take requirement on her land  > she said later in the season the creck will go dry then be running and then go dry God asked if sozione was danny it up. (I said, I didn't Know)
GRS Point: Bont ( Q3
15:18 Pic Bonnett Cr at Cross Section 13:18 Vid Ponnett Cr at Cross Section



**File Information** 

Disch. Equation

File Name Start Date and Time 20120629\_BONTCRQ3001.WAD 2012/06/29 13:05:33

**Site Details** Site Name Operator(s)

0.9498

BONNETT CR AT RD BRIAN EPSTEIN

Date Generated: Wed Jul 24 2013

**System Information** FlowTracker Sensor Type Serial # P2354 **CPU Firmware Version** 3.7 Software Ver 2.30 **Mounting Correction** 0.0%

**Units** (English Units) Distance ft Velocity ft/s ft^2 Area Discharge cfs

Discharge Uncertainty						
Category	ISO	Stats				
Accuracy	1.0%	1.0%				
Depth	0.8%	14.2%				
Velocity	3.9%	25.9%				
Width	0.3%	0.3%				
Method	4.1%	-				
# Stations	12.2%	-				
Overall	13.5%	29.6%				

**Summary** Averaging Int. # Stations 7 40 Start Edge REW **Total Width** 1.600 Mean SNR 37.9 dB **Total Area** 0.232 Mean Temp 65.08 °F Mean Depth 0.145

Mid-Section

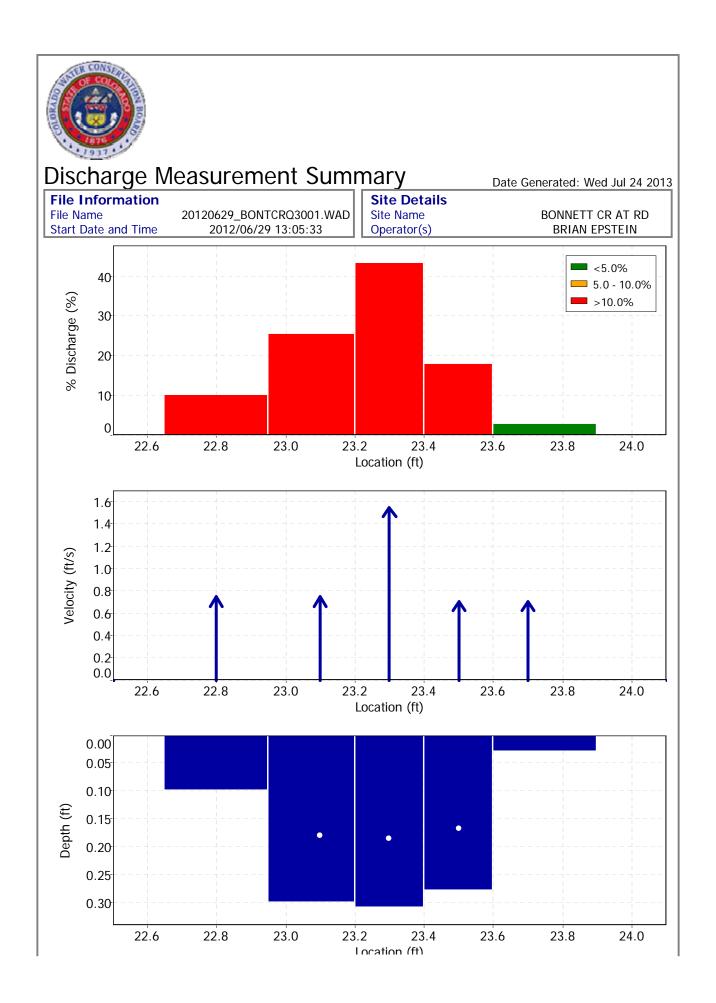
**Total Discharge** 0.2202

M	Measurement Results											
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	13:05	22.50	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	13:05	22.80	None	0.100	0.0	0.0	0.0000	1.00	0.7480	0.030	0.0225	10.2
2	13:06	23.10	0.6	0.300	0.6	0.120	0.7480	1.00	0.7480	0.075	0.0561	25.5
3	13:08	23.30	0.6	0.310	0.6	0.124	1.5476	1.00	1.5476	0.062	0.0959	43.5
4	13:10	23.50	0.6	0.280	0.6	0.112	-0.7057	-1.00	0.7057	0.056	0.0395	17.9
5	13:10	23.70	None	0.030	0.0	0.0	0.0000	1.00	0.7057	0.009	0.0063	2.9
6	13:10	24.10	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.

Mean Velocity

7/24/2013 Page 1 of 5



Page 2 of 5 7/24/2013



Date Generated: Wed Jul 24 2013

**File Information** 

File Name 20120629\_BONTCRQ3001.WAD Start Date and Time 2012/06/29 13:05:33

Site Details
Site Name
Operator(s)

BONNETT CR AT RD BRIAN EPSTEIN

Quality	Quality Control								
St	Loc	%Dep	Message						
4	23.50	0.6	High angle: 178						

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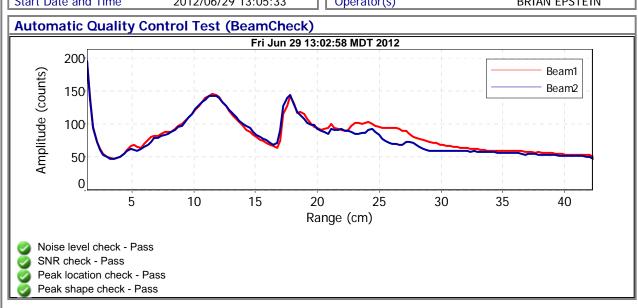
Date Generated: Wed Jul 24 2013

**File Information** 

File Name Start Date and Time 20120629\_BONTCRQ3001.WAD 2012/06/29 13:05:33

Site Details
Site Name
Operator(s)

BONNETT CR AT RD BRIAN EPSTEIN



Page 5 of 5 7/24/2013

Page 1_ of Z		State of Colorado	Meas. No.: 002									
4447.2014	Colorado	Division: 2										
мм-оо:06-07	ADV Dis	charge Measureme	ent Notes	District:								
Station Name:	Station Name: GPS Point: BONTCR Q3											
River , Creek, Canal, Ditch												
At)Near, Above, Below												
Latitude: Longitude:												
Party: Brian Epikin												
Conditions												
Weather: Partly (lou)y ~ 69°=												
Wind Spd / Dir:	and the base of the constitution of the consti											
X-Sec Desc:												
Flow Conds:	Steady,		miner	Sike te demonstration of the control	ancombined, at written I to file to the committee in protein an application of the committee in the committe							
Control Desc.:	MA	a to the transfer of the state of	e plantifikke och Bythophopia på ropporter angelenner i ersellen		on increases a president proportion of the service							
Measurement Rated: Excelent (2%) / Good (5%) / Fair (8%) (Poor (>8%)) [based on the above conditions]												
		Water Lev	el Reading									
Time	Staff Gage	Pressure Trans.	Time	Staff Gage	Pressure Trans.							
NA			-									
en e	no crea visios de emissor se a creativa dia estada	cate de visitate e acusto de la completación de establicación de establicación de de de de la completación de establicación de de de de la completación de establicación de esta	all tribulation of restor of the state of th	eternetra entre e resta com entretra e presenta eternetra e entre en								
ette (vietali terio S. Arbento et eksimologia (1907) (1905 et mentek	enter entrend en l'entre ( l'entre de l'entre	Control and All Annual of Marie Marie (Marie Annual Annual Annual Annual Annual Annual Annual Annual Annual An	ga i terdeninka ili sene neri senio, o a controlis si societo colo	aliakus ja aku mugi ilangka kanak malukuk manana (kalah uk instr	and the section of the contract of the contrac							
etabaku yettariak Silalamah balandalaha, puna (silal-15-i	an file ann a a a airean de a ann a dean dheach dheach ann a deirean ann a	e Addition is there is no blester that there are not returned in the	ti tituta kenar bisu ci ampanteriorian arrindis iniati, i ambal	interpretario, magri planti gila però procedenti di antici di distributi di socio e con perio, si di	a partiral a communicación de communicac							
gage view ramanda ambar sprawi i si pragrama ramas na sinkipi s	in which continues we still that the less section is continued as in a	COSSIN-ARRIVAL PICTRO I LO SIRRO E PRINCIPIO CO	anaman pamarahan ji pindapi pinga marji panari garan (pamari - / rita, n.). sirata	adeus angloweg ad shell of allholind which I down the draft victoria habe	and provided the contract of the state of th							
Pressu	ure Transducer Do	wnload	Weighted MGH									
File Name:	NA		GH Corr.	en van vannster i van den en verden van den en	e galantine commune manusche vonerzen von							
Time:	tigarangan periodografia periodo de la produce de la p	indiana direktaka kilaka kilaka kiloka di kilaka angina kiloka di kiloka kiloka kiloka kiloka kiloka kiloka ki Kiloka kiloka kilok	Correct MGH	a antoni estra e (ne prosto Envolvento), por es-	Commission delegacionalmente de control de la control de l							
	·	Discharge N	leasurement									
Manufacturer:	SonTek	Model:	FlowTracker	S/N:	P2354 / P2355							
Firmware:	3.9	Software:	2.20	und neuer un nache dass draftes des die des des des des des des des des des de	atam com tone services or combining himselve							
Diag Test File:	(res)or No	Raw Data File:	BONTCRQ3.002									
Meas Type:	(Vading / Boat / Bi	ridge / Cableway	ance an entered method of the control of the contro	Method:	0.6							
Made of the project of contract at the additional and provide a set of contract and the action on		NA	ft. or mi / upstream	or downstream o	f gage							
Start Edge:	FU 0.9	End Edge: 4	EW 3.6	Total Width:	2.7							
Start Time:	14:32	End Time:	14.46	as gal <sub>i</sub> na, ak majal yai gili menan gilandira (gili halida yainin nai nainin ke halindira cikida) i n	ad at an Marina di Anazaria. (Albert al-Andréane) ana-del (Contention (Contention (Contention (Contention (Con							
Discharge:	0-363	Unsertainty:	6.6	# Stations:	10							
Mean v:	0.429	Width	2.701	Mean d:	0.31							
Max v:	0.720	Area:	0.847	Max d:	0,40							
Mean SNR:	40.2	σv:	0.031	Mean Temp:	57.8							
Meas. By:		ŊŇ	Notes By:	BOE	- papping papping and the second decrease and decrease of the second							
Processed By:			Reviewed By:									

Remarks.
Bonnett Crak
- reusure) of Vellau Pine O. L. chill.
- owner pursission granted (year)
- owner purnission granted V(YR)
The state of the s
- used to be on spring water from unit
across (0-12, Now on Cucharas
water (YPR)
- our Said Bornett drug up in 7007
and almost original 2012
- 1424 Bi 444 Bornett Cr at X-Sicher
- 1424 By 445 Bonny Cr at X-Section
from REW
Man and Olil Pro har all not enough
Mensioned Parked Rose because: not enough flow for stations, dopth very stratedly, not uniform above and below
Not uniform also and helped
MIND TO TO THE MENT OF THE MEN



**File Information** BONTCRQ3.002.WAD File Name 2014/08/07 14:34:21 Start Date and Time

**Site Details** Site Name Operator(s)

BONNETT CR AT CO12

BJE

Date Generated: Fri Nov 21 2014

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

(English Units) Units Distance ft Velocity ft/s ft^2 Area Discharge cfs

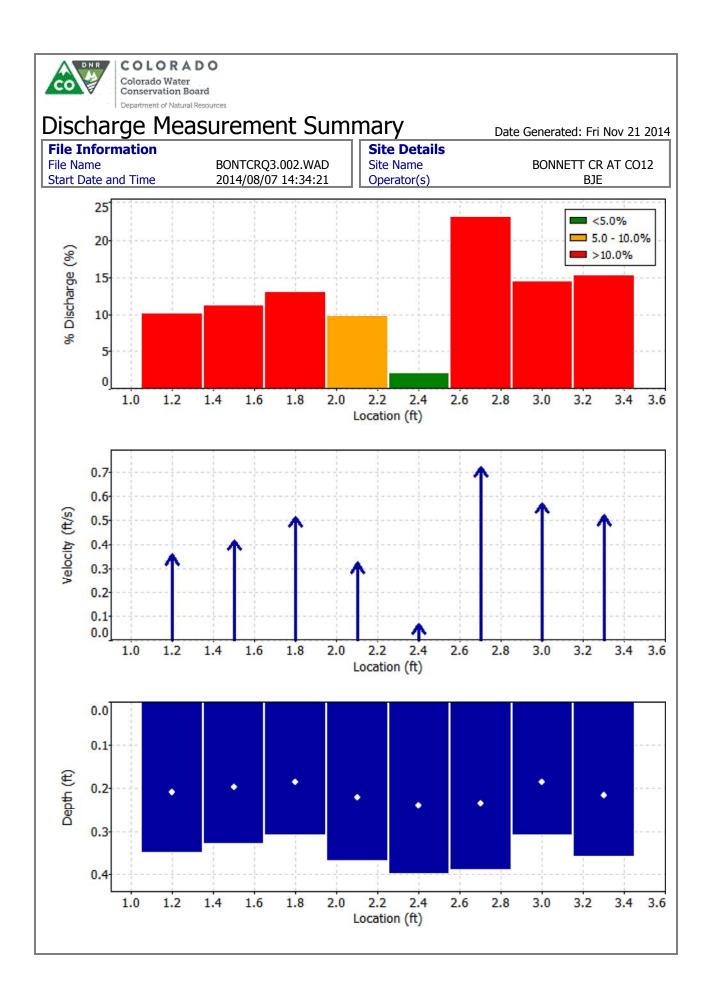
Discharge Uncertainty								
Category	ISO	Stats						
Accuracy	1.0%	1.0%						
Depth	0.6%	3.2%						
Velocity	2.7%	17.3%						
Width	0.2%	0.2%						
Method	2.9%	-						
# Stations	5.1%	-						
Overall	6.6%	17.6%						

**Summary** 40 # Stations 10 Averaging Int. Start Edge REW **Total Width** 2.702 Mean SNR 40.2 dB **Total Area** 0.847 Mean Temp 57.80 °F Mean Depth 0.313 Disch. Equation Mid-Section Mean Velocity 0.4289 **Total Discharge** 0.3631

Measurement Results												
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	14:34	0.90	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	14:34	1.20	0.6	0.350	0.6	0.140	0.3543	1.00	0.3543	0.105	0.0372	10.3
2	14:35	1.50	0.6	0.330	0.6	0.132	0.4163	1.00	0.4163	0.099	0.0413	11.4
3	14:36	1.80	0.6	0.310	0.6	0.124	0.5118	1.00	0.5118	0.093	0.0476	13.1
4	14:38	2.10	0.6	0.370	0.6	0.148	0.3212	1.00	0.3212	0.111	0.0357	9.8
5	14:41	2.40	0.6	0.400	0.6	0.160	0.0656	1.00	0.0656	0.120	0.0079	2.2
6	14:42	2.70	0.6	0.390	0.6	0.156	0.7198	1.00	0.7198	0.117	0.0843	23.2
7	14:43	3.00	0.6	0.310	0.6	0.124	0.5705	1.00	0.5705	0.093	0.0531	14.6
8	14:44	3.30	0.6	0.360	0.6	0.144	0.5187	1.00	0.5187	0.108	0.0560	15.4
9	14:44	3.60	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.

Page 1 of 4 11/21/2014



Page 2 of 4 11/21/2014



Date Generated: Fri Nov 21 2014

**File Information** 

File Name BONTCRQ3.002.WAD Start Date and Time BONTCRQ3.002.WAD 2014/08/07 14:34:21

Site Details
Site Name BONNETT CR AT CO12
Operator(s) BJE

**Quality Control** 

No Quality Control warnings

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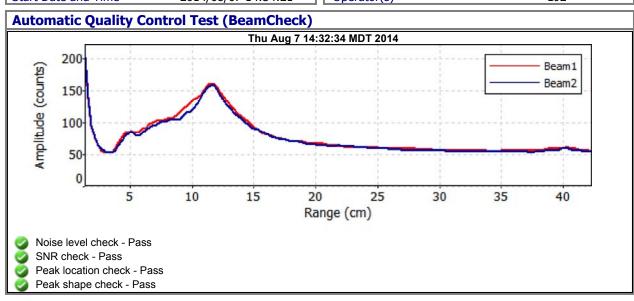
Date Generated: Fri Nov 21 2014

**File Information** 

File Name BONTCRQ3.002.WAD Start Date and Time 2014/08/07 14:34:21

Site Details
Site Name

Site Name BONNETT CR AT CO12 Operator(s) BJE



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#### 20150911\_BonnettCreek\_FieldNotes

1 message

**Brian Epstein - DNR** <br/>
Strian.epstein@state.co.us>
To: Brian Epstein <Brian.Epstein@state.co.us>

Tue, Nov 10, 2015 at 12:07 PM

Bonnett Creek Field Notes 20150911

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

BonnettCr150911Pic01

BonnettCr150911Vid01

BonnettCr150911Pic02

BonnettCr150911Pic03

BonnettCr150911Pic04

BonnettCr150911Pic05

Discharge Measurement

- File name: BNTCAR12.021

- Location Bonnett Creek below Road 12

- Conditions:

• 65 deg F, light variable breeze, scattered clouds

· x-section bed fines/sand dominated

• flow lines mostly parallel and normal to tag line

• FlowTracker meter s/n p2354

• start edge/time: REW 3.7 / 14:31

• end edge/time: LEW 5.2 / 14:42

• W =

- Q = 0.10
- Uncertainty = 9.0%
- Stations 7
- V mean = 0.36
- $V \max = 0.62$
- W = 1.5
- A = 0.27
- D mean = 0.18
- D max = 0.25
- SNR mean = 33.5
- V mean std error = 0.017
- Temp 59.3 deg F
- Measurement Rating: poor (narrow, shallow, flow lines direction shifted left to right)

#### Brian Epstein

Hydrologist, Stream and Lake Protection Section



Office: 303-866-3441x3253 | Cell: 720-545-6027 1313 Sherman Street, Room 721, Denver, CO 80203 brian.epstein@state.co.us | www.cwcb.state.co.us

























