Stream: Apishapa River

Executive Summary

Water Division: 2
Water District: 18
CDOW#: 28945

Segment: Headwaters to Herlick Canyon Creek

Upper Terminus: Headwaters in the vicinity of
Latitude: 37º 21’ 12.8”N Longitude: 105º 01’ 00.7"W

Lower Terminus: Herlick Canyon Creek
Latitude: 37º 19’ 34.4”N Longitude: 104º 57’ 04.6"W

ISF Recommendation: 2.85 cfs (04/15 – 06/30)
2.00 cfs (07/01 – 07/31)
1.10 cfs (08/01 – 10/31)
0.75 cfs (11/01 – 04/14)

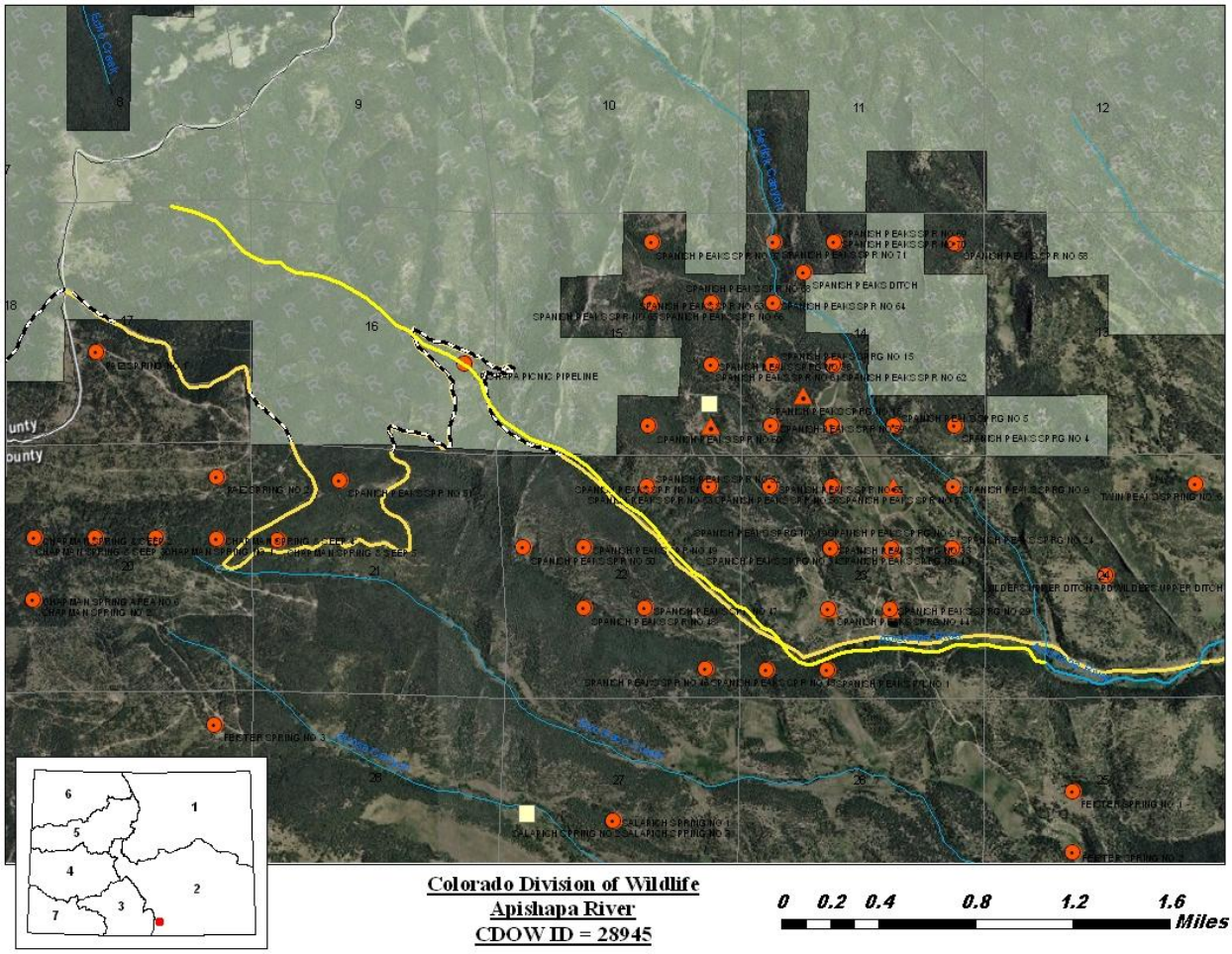


Figure 1. Map of the Apishapa River ISF segment and existing water rights in the vicinity.

The information contained in this report and the associated instream flow file folder forms the basis for the instream flow recommendation to be considered by the Colorado Water Conservation Board (Board). The investigations related to this instream flow recommendation were initiated prior to the statutory merging of two divisions within the Colorado Department of Natural Resources; in 2011, the Division of Wildlife and the Division of Parks and Outdoor Recreation merged to form Colorado Parks and Wildlife (CPW). It is CPW staff's opinion that the information contained in this report is sufficient for the Board's staff to initiate an instream flow appropriation and address the findings required in this ISF statutes and Rule 5(i) of the Instream Flow Rules.

The State of Colorado's Instream Flow Program and Natural Lake Level Program (ISF/NLL Program) was created in 1973 when the Colorado State Legislature recognized "the need to correlate the activities of mankind with some reasonable preservation of the natural environment" (see 37-92-102 (3) C.R.S.). The statute vests the Board with the exclusive authority to appropriate and acquire instream flow and natural lake level water rights. In order to encourage other entities to participate in Colorado's ISF/NLL Program, the statute directs the Board to request instream flow recommendations from other state and federal agencies. CPW is recommending this segment of the Apishapa River to the Board for inclusion into the ISF/NLL

Program. The Apishapa River should be considered for inclusion into the ISF/NLL Program, because it has a natural environment that can be preserved to a reasonable degree with an instream flow water right.

CPW is forwarding this stream flow recommendation to the Board in order to meet our statutory charge "… 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.). CPW's Strategic Plan states "[h]ealthy aquatic environments are essential to maintain healthy and viable fisheries, and critical for self-sustaining populations… by protecting and enhancing the quality and quantity of aquatic habitats."

The subject of this report is a segment of the Apishapa River beginning at its headwaters and extending downstream to Herlick Canyon Creek. The proposed segment is located southwest of the Town of Aguilar. The proposed segment is on a mixture of public and private lands (see Land Status Review table, below). The recommendation for this segment is also discussed below.

Land Status Review

Upper Terminus	Lower Terminus	Approximate Total Length (miles)	Approximate Land Ownership	
			% Private	% Public
Headwaters	Herlick Canyon Creek	4.2	50%	50%+

+ = 100% of the public lands are managed by the USFS.

Instream Flow Recommendations

CPW is recommending 2.85 cfs, summer, and 2.0 cfs, winter, based on data collection efforts. This recommendation is based on the physical and biological data collected to date and does not incorporate any water availability constraints.

- 2.85 cubic feet per second is required to maintain the three principal hydraulic criteria of average depth, average velocity, and percent wetted perimeter.
- 2.00 cubic feet per second is required to maintain two of the three principal hydraulic criteria.

The numeric flow recommendations resulting from this modeling effort are within the confidence interval produced by the R2CROSS model (see Table 1).

Biological and Field Survey Data

In August of 2010, CDOW personnel collected stream cross section information and all other data needed to quantify the instream flow needs for this reach of Apishapa River. The Apishapa River is classified as a small stream (between 10 to 19 feet wide). From a natural environment standpoint, the Apishapa River basin as a whole supports a very diverse fishery - the lower reaches of the stream (downstream of this ISF segment) supports populations of black

bullhead*(*Ameiurus melas*), common carp (*Cyprinus carpio*), flathead chub** (*Platygobio gracilis*), fathead minnow (*Pimephales promelas*), longnose dace (*Rhinichthys cataractae*), plains killifish* (*Fundulus zebrinus*), red shiner (*Cyprinella lutrensis*), sand shiner* (*Notropis stramineus*), green sunfish* (*Lepomis cyanellus*), central stoneroller* (*Campostoma anomalum*), white sucker* (*Catostomus comersonii*) (*= native fish, **= species of concern). At the time of the 2010 field survey, it was CDOW's intent to collect fisheries information for the headwaters of Apishapa River because we do not currently have fisheries data within the ISF segment. Unfortunately, an equipment malfunction prevented this from occurring but personal communication with Mark Uppendahl (2016) confirmed that at the time of the 2010 field visit, brook trout (*Salvelinus fontinalis*) were observed in the creek. To further substantiate this visual data, we have examined data from similar nearby streams, and it is our professional opinion that even if we did not have this observational information, there is sufficient information to suggest that this stream segment would likely support populations of both brook trout and brown trout (*Salmo trutta*).

Field Survey Data

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 selecting a site based on a reconnaissance of the area, surveying the stream channel geometry and slope of the water surface, and measuring the stream discharge. Appendix B contains copies of field data collected for this proposed segment.

Biological Flow Recommendation

The Board staff relies upon the biological expertise of the cooperating agencies to interpret output from the R2CROSS model data collected to develop the initial, biologic instream flow recommendation. This initial recommendation is designed to address the unique biologic requirements of each stream without regard to water availability. Three hydraulic variables-average depth, percent wetted perimeter, and average velocity are used 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).

For this segment of stream, two data sets were collected and the results are shown in Table 1 below. 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 summer flow recommendation based on meeting all three hydraulic criteria, and the winter flow recommendation based upon only two of three hydraulic criteria.

Table 1: Data

Party	Date	Q	250%-40%	Summer (3/3)	Winter (2/3)
CDOW	8/04/2010	3.79	9.5 – 1.5	2.90	1.10^{R}

CDOW	8/04/2010	4.89	12.2 – 2.0	2.80	2.00

CDOW = Division of Wildlife (now Colorado Parks and Wildlife) R = Outside of R2X Accuracy Range

Biologic Flow Recommendation

The summer flow recommendation is the flow that meets all three hydraulic criteria provided that this flow is within the accuracy range of the model; from this data collected on the Apishapa River, the summer flow recommendations range from 2.8 cfs to 2.9 cfs. Similarly, the winter flow recommendation is the flow that meets two of three hydraulic criteria. Only one of the R2CROSS runs had a winter flow recommendation within the accuracy range of the model; the flow that meets the two criteria is 2.0 cfs. Averaging the summer flow recommendations that fell within the accuracy range of the model resulted in a summer flow recommendation of 2.85 cfs (See Table 1); since only one value for winter was in-range, the winter flow recommendation is 2.0 cfs.

Hydrologic Data

The CPW staff conducted a preliminary evaluation of the stream hydrology to determine if water was physically available for an instream flow appropriation. The hydrograph below was derived from data collected by the USGS stream gage for Cucharas River at Boyd Ranch, near La Veta, CO (#07114000), which has a drainage area of 56 square miles and 47 years of data (1934 – 1981) (See Figure 2 below and Gage Summary in Appendix C) and by the USGS StreamStats Water Resources Web Application Program (see http://water.usgs.gov/osw/streamstats/index.html). The total drainage area of this ISF segment of Apishapa River is 6.0 square miles (Figure 2); the USGS gage data was adjusted for this reduction in drainage basin area. Table 2 (below) displays the estimated flow of the Apishapa River at the lower terminus of the instream flow reach in terms of a percentage of exceedence. Figure 3 (below) shows the median flow data from the Cucharas River Gage, the StreamStats results, and the ISF recommendations as modified based on initial water availability considerations.

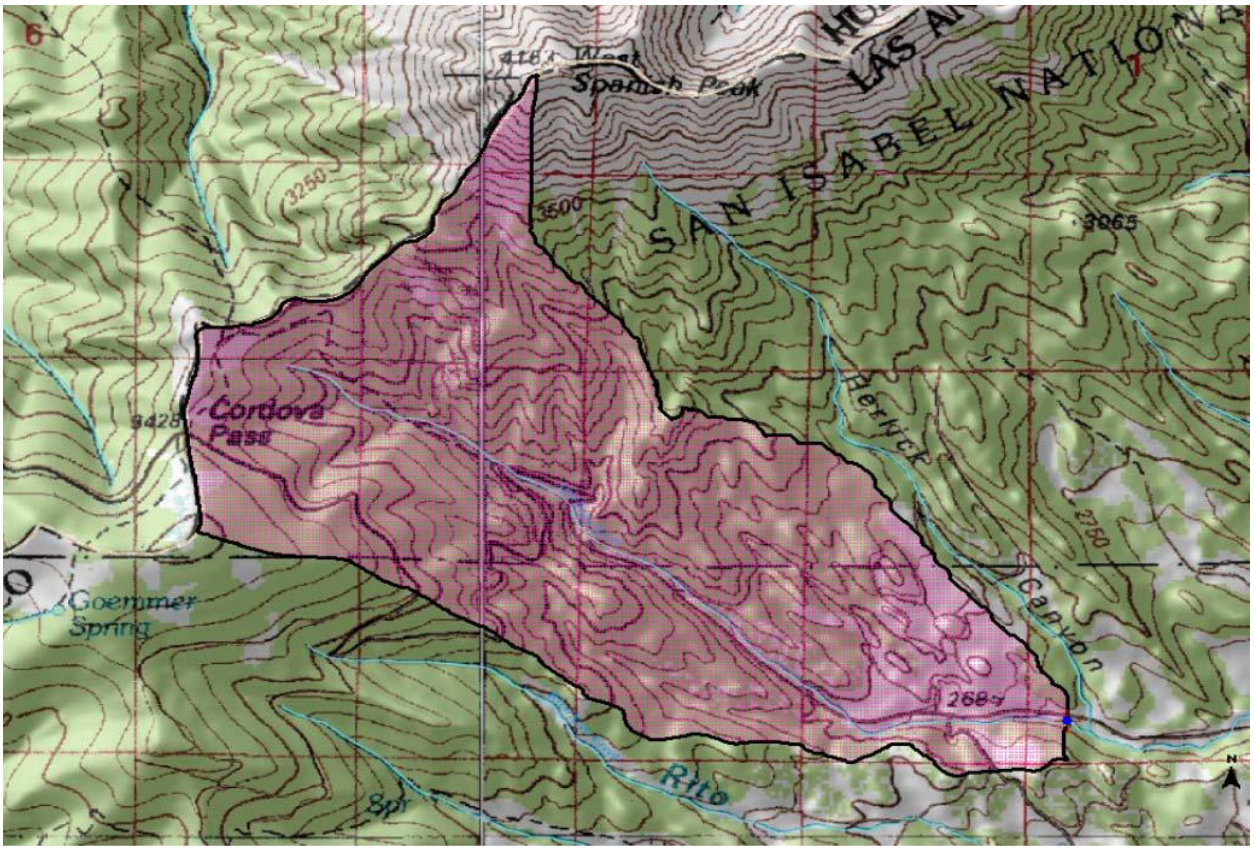


Figure 2. Map from StreamStats input page showing drainage basin area used to generate StreamStats hydrograph

Table 2: Estimated streamflow for Apishapa River

Apishapa River		Drainage Area = 56 miles										
	January	February	March	April	May	June	July	August	September	October	November	December
1%	1.33	1.71	2.36	12.86	30.01	28.40	12.04	5.14	2.89	2.46	2.14	1.61
5%	1.18	1.18	1.71	7.18	22.14	19.93	6.96	3.64	2.14	1.82	1.61	1.29
10%	1.02	0.99	1.39	4.82	18.25	15.86	5.79	3.00	1.71	1.39	1.29	1.18
20%	0.91	0.90	1.18	3.11	12.11	11.57	4.29	2.46	1.50	1.18	1.07	0.96
50%	0.74	0.75	0.86	1.71	5.14	5.89	2.46	1.50	1.02	0.96	0.87	0.75
80%	0.59	0.59	0.69	0.98	2.14	2.46	1.39	0.94	0.75	0.66	0.68	0.62
90%	0.51	0.57	0.60	0.83	1.29	1.82	1.07	0.75	0.56	0.55	0.60	0.51
95%	0.47	0.54	0.56	0.70	0.91	1.39	0.83	0.60	0.44	0.49	0.54	0.47
99%	0.35	0.41	0.47	0.59	0.75	0.75	0.35	0.40	0.34	0.41	0.41	0.33

Apishapa River - Streamstats Mean Flow				Drainage Area = 122								
	January	February	March	April	May	June	July	August	September	October	November	December
	1.1	1.0	1.0	2.6	4.9	4.0	1.9	1.6	1.2	1.1	1.0	1.0

Green indicates flow greater than summer flow recommendation and Yellow indicates flow greater than winter flow recommendation

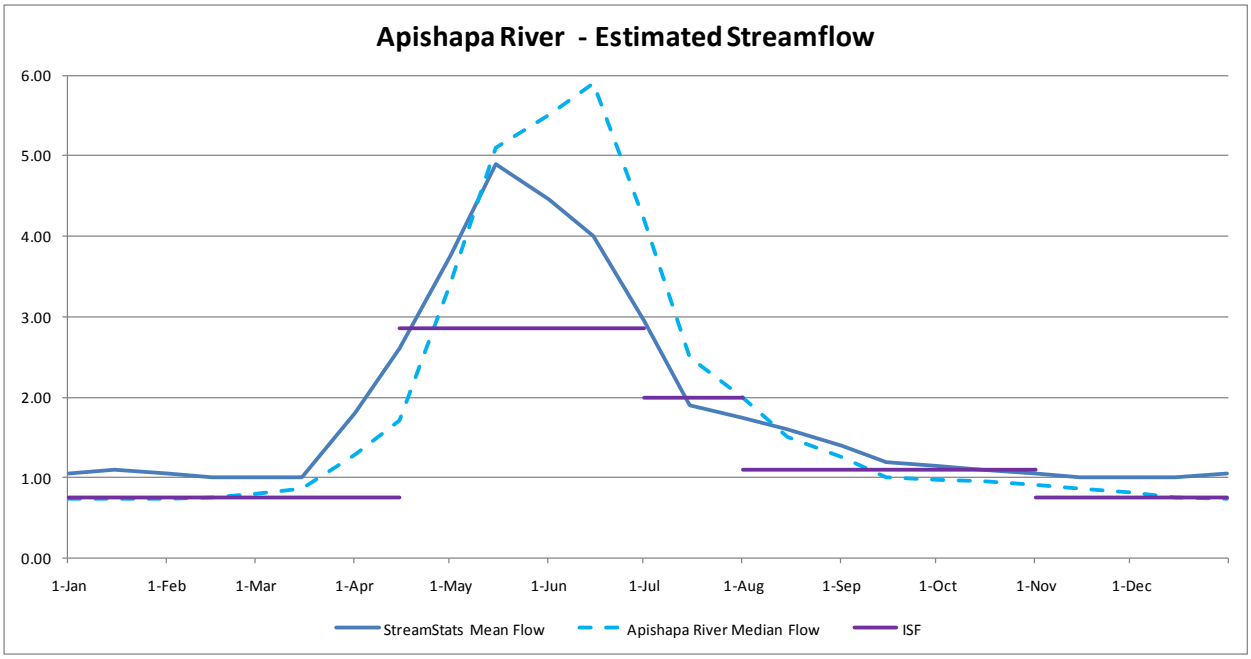


Figure 3. StreamStats hydrograph with median flow hydrograph from Cucharas River gage and ISF recommendations as modified based on water availability.

Table 2 shows that the summer flow recommendation of 2.85 cfs is available at least 50% of the time for the months of May through June. The winter flow recommendation of 2.0 cfs is not available for any of the winter months. Based on CPW's preliminary water availability analysis, the summer recommendation was reduced to 2.0 cfs for July and 1.1 cfs for August, September and October. The winter recommendation had to be reduced to 0.75 cfs for the entire low flow season (November through mid-April). In summary, after incorporating the above water availability constraints, the original instream flow recommendation was modified as follows:

- 2.85 cubic feet per second is recommended from April 15 through June 30;
- 2.00 cubic feet per second is recommended from July 1 through July 31;
- 1.10 cubic feet per second is recommended from August 1 through October 31;
- 0.75 cubic feet per second is recommended from November 1 through April 14.

However, if additional water is determined to be available in the future, CPW would recommend appropriating the additional water up to the recommended flow amounts to preserve the natural environment to a reasonable degree. Otherwise, the above modified flow regime should be adequate to preserve the natural environment in the Apishapa River to a reasonable degree.

Existing Water Right Information

CPW staff has analyzed the water rights tabulation and will consult with CWCB staff and the Division Engineer's Office (DEO) to identify any potential water availability problems due to existing diversions. Preliminary review of Division of Water Resources records indicate that there are not any existing surface water diversions located within this reach of Apishapa River.

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

LOCATION INFORMATION

STREAM NAME:	Apishapa River - #2
XS LOCATION:	37 20' 26.0" 104 59' 29.2"
XS NUMBER:	080410_X2
DATE:	4-Aug-10
OBSERVERS:	UPPENDAHL
1/4 SEC:	0
SECTION:	0
TWP:	0
RANGE:	0
PM:	0
COUNTY:	0
WATERSHED:	0
DIVISION:	0
DOW CODE:	0
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

SLOPE:	0.03382353

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

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

STREAM NAME: Apishapa River - #2
XS LOCATION: 37 20' 26.0" 104 59' 29.2"
XS NUMBER: 080410_X2

DATA POINTS= 37

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
TS	0.00	6.40			0.00		0.00	0.00	0.0%
BS	0.01	6.57			0.00		0.00	0.00	0.0%
	1.00	6.73			0.00		0.00	0.00	0.0%
	2.00	6.82			0.00		0.00	0.00	0.0%
1 GL	3.00	7.01			0.00		0.00	0.00	0.0%
SWL	3.30	7.72	0.00	0.00	0.00		0.00	0.00	0.0%
	4.00	8.06	0.30	0.00	0.78	0.30	0.18	0.00	0.0%
	4.50	8.16	0.40	0.67	0.51	0.40	0.20	0.13	2.7%
	5.00	8.11	0.35	2.02	0.50	0.35	0.18	0.35	7.2%
	5.50	8.16	0.40	1.92	0.50	0.40	0.20	0.38	7.9%
	6.00	8.06	0.30	2.30	0.51	0.30	0.15	0.35	7.1%
	6.50	8.16	0.40	1.85	0.51	0.40	0.20	0.37	7.6%
	7.00	8.16	0.40	2.01	0.50	0.40	0.20	0.40	8.2%
	7.50	8.16	0.40	2.87	0.50	0.40	0.20	0.57	11.8%
	8.00	8.16	0.40	2.70	0.50	0.40	0.20	0.54	11.1%
	8.50	7.96	0.20	2.78	0.54	0.20	0.10	0.28	5.7%
	9.00	8.01	0.25	2.08	0.50	0.25	0.13	0.26	5.3%
	9.50	7.91	0.15	1.93	0.51	0.15	0.08	0.14	3.0%
	10.00	8.01	0.25	1.16	0.51	0.25	0.13	0.15	3.0%
	10.50	8.16	0.40	0.42	0.52	0.40	0.20	0.08	1.7%
	11.00	8.26	0.50	1.17	0.51	0.50	0.25	0.29	6.0%
	11.50	8.36	0.60	0.60	0.51	0.60	0.30	0.18	3.7%
	12.00	8.16	0.40	0.40	0.54	0.40	0.20	0.08	1.6%
	12.50	8.21	0.45	0.45	0.50	0.45	0.23	0.10	2.1%
	13.00	8.06	0.30	0.30	0.52	0.30	0.15	0.05	0.9%
	13.50	8.16	0.40	0.40	0.51	0.40	0.20	0.08	1.6%
	14.00	8.11	0.35	0.35	0.50	0.35	0.18	0.06	1.3%
	14.50	7.96	0.20	0.20	0.52	0.20	0.10	0.02	0.4%
	15.00	7.86	0.10	0.10	0.51	0.10	0.05	0.01	0.1%
	15.50	7.86	0.10	0.10	0.50	0.10	0.04	0.00	0.1%
SWL	15.80	7.80	0.00	0.00	0.31		0.00	0.00	0.0%
	16.00	7.67			0.00		0.00	0.00	0.0%
	16.70	7.18			0.00		0.00	0.00	0.0%
1 GL	17.50	7.07			0.00		0.00	0.00	0.0%
	18.50	6.82			0.00		0.00	0.00	0.0%
BS	22.00	6.60			0.00		0.00	0.00	0.0%
TS	22.01	6.41			0.00		0.00	0.00	0.0%
TOTALS ----------					12.83	0.6 (Max.)	4.02	4.88	100.0%

Manning's n = 0.1038
Hydraulic Radius= 0.31335721

STREAM NAME: Apishapa River - #2
XS LOCATION: 37 20' 26.0" 104 59' 29.2"
XS NUMBER: 080410_X2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	4.02	4.01	-0.1%
7.51	4.02	7.21	79.3%
7.53	4.02	6.95	72.9%
7.55	4.02	6.69	66.4%
7.57	4.02	6.43	60.0%
7.59	4.02	6.17	53.6%
7.61	4.02	5.92	47.2%
7.63	4.02	5.66	40.8%
7.65	4.02	5.41	34.5%
7.67	4.02	5.15	28.1%
7.69	4.02	4.90	21.8%
7.71	4.02	4.64	15.5%
7.72	4.02	4.52	12.4%
7.73	4.02	4.39	9.2%
7.74	4.02	4.27	6.1%
7.75	4.02	4.14	3.0%
7.76	4.02	4.01	-0.1%
7.77	4.02	3.89	-3.2%
7.78	4.02	3.77	-6.3%
7.79	4.02	3.64	-9.4%
7.80	4.02	3.52	-12.5%
7.81	4.02	3.40	-15.5%
7.83	4.02	3.15	-21.6%
7.85	4.02	2.91	-27.6%
7.87	4.02	2.68	-33.4%
7.89	4.02	2.45	-39.0%
7.91	4.02	2.23	-44.5%
7.93	4.02	2.01	-50.0%
7.95	4.02	1.80	-55.2%
7.97	4.02	1.60	-60.3%
7.99	4.02	1.40	-65.1%
8.01	4.02	1.22	-69.6%

WATERLINE AT ZERO
AREA ERROR = 7.760

STREAM NAME: Apishapa River - #2
XS LOCATION: 37 20' 26.0" 104 59' 29.2"
XS NUMBER: 080410_X2

Constant Manning's n

STAGING TABLE

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	7.07	14.47	0.91	1.29	13.15	15.43	100.0%	0.85	31.12	2.37
	7.11	14.17	0.89	1.25	12.58	15.10	97.8%	0.83	29.34	2.33
	7.16	13.79	0.86	1.20	11.89	14.68	95.1%	0.81	27.19	2.29
	7.21	13.57	0.83	1.15	11.20	14.42	93.5%	0.78	24.93	2.22
	7.26	13.48	0.78	1.10	10.53	14.28	92.5%	0.74	22.62	2.15
	7.31	13.39	0.74	1.05	9.86	14.14	91.6%	0.70	20.40	2.07
	7.36	13.30	0.69	1.00	9.19	14.00	90.7%	0.66	18.27	1.99
	7.41	13.20	0.65	0.95	8.53	13.86	89.8%	0.62	16.24	1.90
	7.46	13.11	0.60	0.90	7.87	13.72	88.9%	0.57	14.30	1.82
	7.51	13.02	0.55	0.85	7.21	13.58	88.0%	0.53	12.46	1.73
	7.56	12.93	0.51	0.80	6.57	13.43	87.0%	0.49	10.73	1.63
	7.61	12.83	0.46	0.75	5.92	13.29	86.1%	0.45	9.10	1.54
	7.66	12.74	0.41	0.70	5.28	13.15	85.2%	0.40	7.57	1.43
	7.71	12.64	0.37	0.65	4.65	13.01	84.3%	0.36	6.16	1.33
WL	7.76	12.48	0.32	0.60	4.02	12.81	83.0%	0.31	4.89	1.22
	7.81	12.27	0.28	0.55	3.40	12.57	81.5%	0.27	3.74	1.10
	7.86	11.41	0.24	0.50	2.80	11.71	75.6%	0.24	2.83	1.01
	7.91	11.07	0.20	0.45	2.23	11.34	73.5%	0.20	1.99	0.89
	7.96	10.22	0.17	0.40	1.70	10.47	67.8%	0.16	1.34	0.78
	8.01	8.82	0.14	0.35	1.23	9.02	58.5%	0.14	0.85	0.70
	8.06	8.26	0.10	0.30	0.80	8.43	54.6%	0.09	0.44	0.55
	8.11	6.65	0.06	0.25	0.43	6.77	43.9%	0.06	0.18	0.42
	8.16	2.18	0.08	0.20	0.17	2.24	14.5%	0.07	0.08	0.47
	8.21	1.13	0.08	0.15	0.08	1.17	7.6%	0.07	0.04	0.46
	8.26	0.75	0.05	0.10	0.04	0.78	5.1%	0.05	0.01	0.35
	8.31	0.38	0.03	0.05	0.01	0.39	2.5%	0.02	0.00	0.22
	8.36	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

3/3 = 2.75

2/3 = 1.99

STREAM NAME: Apishapa River - #2
XS LOCATION: 37 20' 26.0" 104 59' 29.2"
XS NUMBER: 080410_X2

SUMMARY SHEET

MEASURED FLOW (Qm)=	4.88	cfs
CALCULATED FLOW (Qc)=	4.89	cfs
(Qm-Qc)/Qm * 100 =	-0.1	%
MEASURED WATERLINE (WLm)=	7.76	ft
CALCULATED WATERLINE (WLc)=	7.76	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.60	ft
MAX CALCULATED DEPTH (Dc)=	0.60	ft
(Dm-Dc)/Dm * 100	-0.1	%
MEAN VELOCITY=	1.22	ft/sec
MANNING'S N=	0.104	
SLOPE=	0.03382353	ft/ft
.4 * Qm =	2.0	cfs
2.5 * Qm=	12.2	cfs

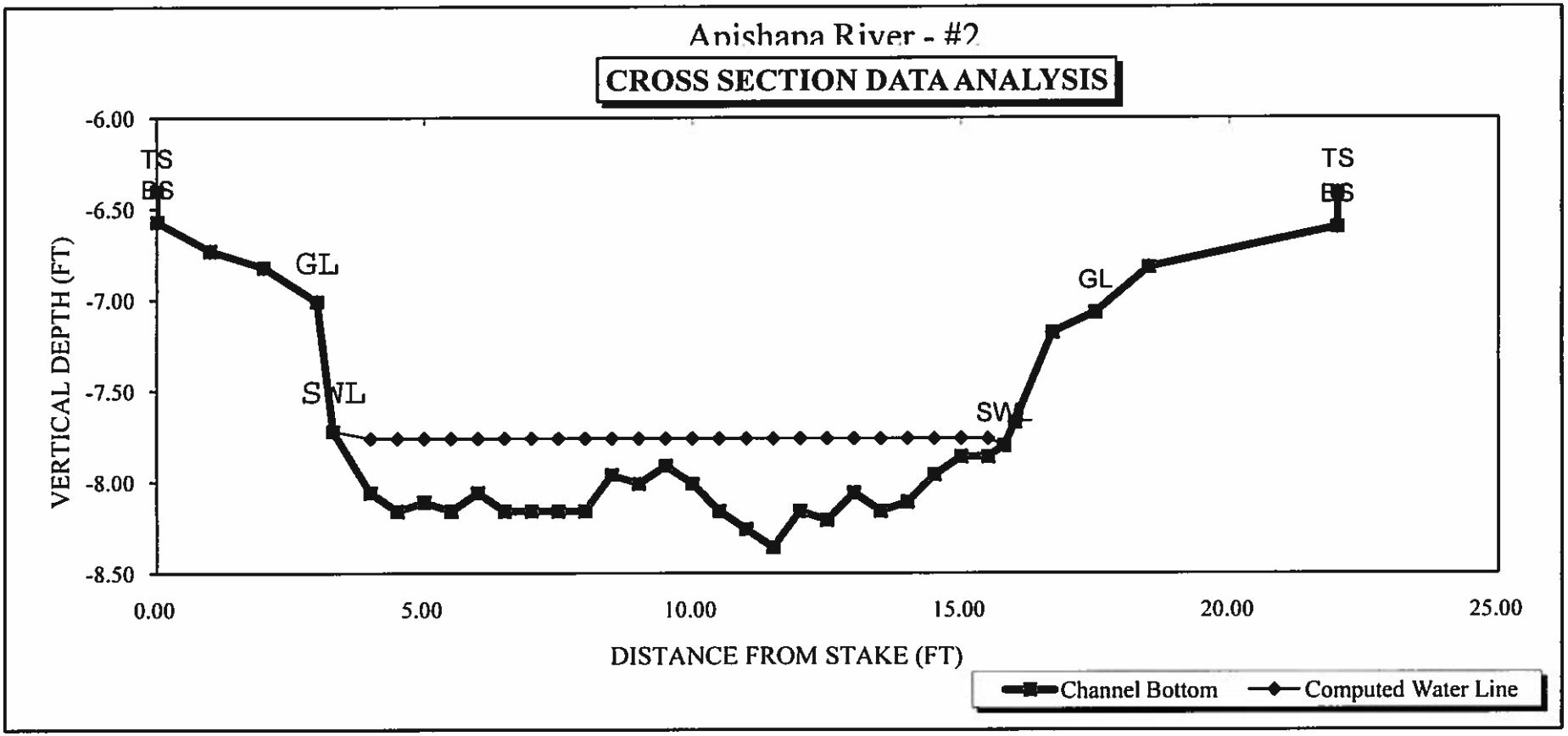
RECOMMENDED INSTREAM FLOW:

FLOW (CFS)	PERIOD

RATIONALE FOR RECOMMENDATION:

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

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


Anishana River - #2
CROSS SECTION DATA ANALYSIS
-6.00
-6.50
-7.00
-7.50
-8.00
-8.50
VERTICAL DEPTH (FT)
TS
BS
GL
SWL
GL
SWL
TS
BS
0.00
5.00
10.00
15.00
20.00
25.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line

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

LOCATION INFORMATION

STREAM NAME:	Apishapa River - #1
XS LOCATION:	37 20' 33.7" 104 59' 46.1"
XS NUMBER:	080410_X1
DATE:	4-Aug-10
OBSERVERS:	UPPENDAHL
1/4 SEC:	0
SECTION:	0
TWP:	0
RANGE:	0
PM:	0
COUNTY:	0
WATERSHED:	0
DIVISION:	0
DOW CODE:	0 28945
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

TAPE WT:	0.0106
TENSION:	99999

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

CHANNEL PROFILE DATA

SLOPE:	0.03195266

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

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

STREAM NAME: Apishapa River - #1
XS LOCATION: 37 20' 33.7" 104 59' 46.1"
XS NUMBER: 080410_X1

DATA POINTS= 27

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL
TS	0.00	5.95		
BS	0.01	6.26		
	0.50	6.21		
1 GL	1.00	6.51		
	2.00	6.80		
SWL	3.10	7.05	0.00	0.00
	3.50	7.10	0.05	0.00
	4.00	7.15	0.10	0.61
	4.50	7.20	0.15	1.64
	5.00	7.15	0.10	1.28
	5.50	7.25	0.20	1.81
	6.00	7.25	0.20	2.35
	6.50	7.30	0.25	2.57
	7.00	7.25	0.20	2.24
	7.50	7.15	0.10	2.89
	8.00	7.35	0.30	2.57
	8.50	7.35	0.30	1.92
	9.00	7.45	0.40	2.48
	9.50	7.45	0.40	2.15
	10.00	7.45	0.40	1.96
	10.50	7.40	0.35	1.89
	11.00	7.35	0.30	0.93
SWL	11.50	7.05	0.00	0.00
	11.70	6.60		
1 GL	12.00	6.45		
	12.50	6.30		
PIN	13.00	6.21		

TOTALS ----------

VALUES COMPUTED FROM RAW FIELD DATA

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%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.40	0.05	0.02	0.00	0.0%
0.50	0.10	0.05	0.03	0.8%
0.50	0.15	0.08	0.12	3.2%
0.50	0.10	0.05	0.06	1.7%
0.51	0.20	0.10	0.18	4.8%
0.50	0.20	0.10	0.24	6.2%
0.50	0.25	0.13	0.32	8.5%
0.50	0.20	0.10	0.22	5.9%
0.51	0.10	0.05	0.14	3.8%
0.54	0.30	0.15	0.39	10.2%
0.50	0.30	0.15	0.29	7.6%
0.51	0.40	0.20	0.50	13.1%
0.50	0.40	0.20	0.43	11.4%
0.50	0.40	0.20	0.39	10.4%
0.50	0.35	0.18	0.33	8.7%
0.50	0.30	0.15	0.14	3.7%
0.58		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%
8.57	0.4 (Max.)	1.90	3.79	100.0%

Manning's n = 0.0487
Hydraulic Radius= 0.22136316

STREAM NAME: Apishapa River - #1
XS LOCATION: 37 20' 33.7" 104 59' 46.1"
XS NUMBER: 080410_X1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.90	1.90	0.0%
6.80	1.90	4.15	118.7%
6.82	1.90	3.96	108.6%
6.84	1.90	3.77	98.6%
6.86	1.90	3.58	88.7%
6.88	1.90	3.40	78.9%
6.90	1.90	3.21	69.3%
6.92	1.90	3.03	59.7%
6.94	1.90	2.85	50.2%
6.96	1.90	2.67	40.9%
6.98	1.90	2.50	31.6%
7.00	1.90	2.32	22.5%
7.01	1.90	2.24	17.9%
7.02	1.90	2.15	13.4%
7.03	1.90	2.07	8.9%
7.04	1.90	1.98	4.4%
7.05	1.90	1.90	0.0%
7.06	1.90	1.81	-4.4%
7.07	1.90	1.73	-8.8%
7.08	1.90	1.65	-13.1%
7.09	1.90	1.57	-17.3%
7.10	1.90	1.49	-21.5%
7.12	1.90	1.33	-29.7%
7.14	1.90	1.18	-37.7%
7.16	1.90	1.04	-45.4%
7.18	1.90	0.90	-52.4%
7.20	1.90	0.78	-58.7%
7.22	1.90	0.67	-64.4%
7.24	1.90	0.57	-69.9%
7.26	1.90	0.48	-74.8%
7.28	1.90	0.40	-79.0%
7.30	1.90	0.33	-82.6%

WATERLINE AT ZERO
AREA ERROR = 7.050

STREAM NAME: Apishapa River - #1
XS LOCATION: 37 20' 33.7" 104 59' 46.1"
XS NUMBER: 080410_X1

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	6.51	10.88	0.65	0.94	7.11	11.43	100.0%	0.62	28.21	3.97
	6.55	10.66	0.63	0.90	6.68	11.20	98.0%	0.60	25.77	3.86
	6.60	10.39	0.59	0.85	6.15	10.91	95.4%	0.56	22.87	3.72
	6.65	10.20	0.55	0.80	5.63	10.68	93.4%	0.53	20.06	3.56
	6.70	10.00	0.51	0.75	5.13	10.44	91.3%	0.49	17.41	3.39
	6.75	9.81	0.47	0.70	4.63	10.21	89.3%	0.45	14.92	3.22
	6.80	9.61	0.43	0.65	4.15	9.97	87.2%	0.42	12.60	3.04
	6.85	9.37	0.39	0.60	3.67	9.69	84.8%	0.38	10.49	2.86
	6.90	9.13	0.35	0.55	3.21	9.41	82.3%	0.34	8.55	2.66
	6.95	8.88	0.31	0.50	2.76	9.13	79.9%	0.30	6.78	2.46
	7.00	8.64	0.27	0.45	2.32	8.85	77.4%	0.26	5.19	2.23
WL	7.05	8.40	0.23	0.40	1.90	8.57	75.0%	0.22	3.79	1.99
	7.10	7.92	0.19	0.35	1.49	8.07	70.6%	0.18	2.63	1.77
	7.15	7.33	0.15	0.30	1.11	7.47	65.3%	0.15	1.69	1.53
	7.20	5.63	0.14	0.25	0.78	5.73	50.1%	0.14	1.14	1.45
	7.25	4.42	0.12	0.20	0.52	4.48	39.2%	0.12	0.68	1.30
	7.30	3.21	0.10	0.15	0.33	3.25	28.4%	0.10	0.39	1.19
	7.35	2.50	0.07	0.10	0.17	2.51	22.0%	0.07	0.16	0.92
	7.40	1.75	0.04	0.05	0.07	1.76	15.4%	0.04	0.04	0.63
	7.45	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

3/3 = 2.9
2/3 = 1.1

STREAM NAME: Apishapa River - #1
XS LOCATION: 37 20' 33.7" 104 59' 46.1"
XS NUMBER: 080410_X1

SUMMARY SHEET

MEASURED FLOW (Qm)=	3.79	cfs
CALCULATED FLOW (Qc)=	3.79	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	7.05	ft
CALCULATED WATERLINE (WLc)=	7.05	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.40	ft
MAX CALCULATED DEPTH (Dc)=	0.40	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.99	ft/sec
MANNING'S N=	0.049	
SLOPE=	0.03195266	ft/ft
.4 * Qm =	1.5	cfs
2.5 * Qm=	9.5	cfs

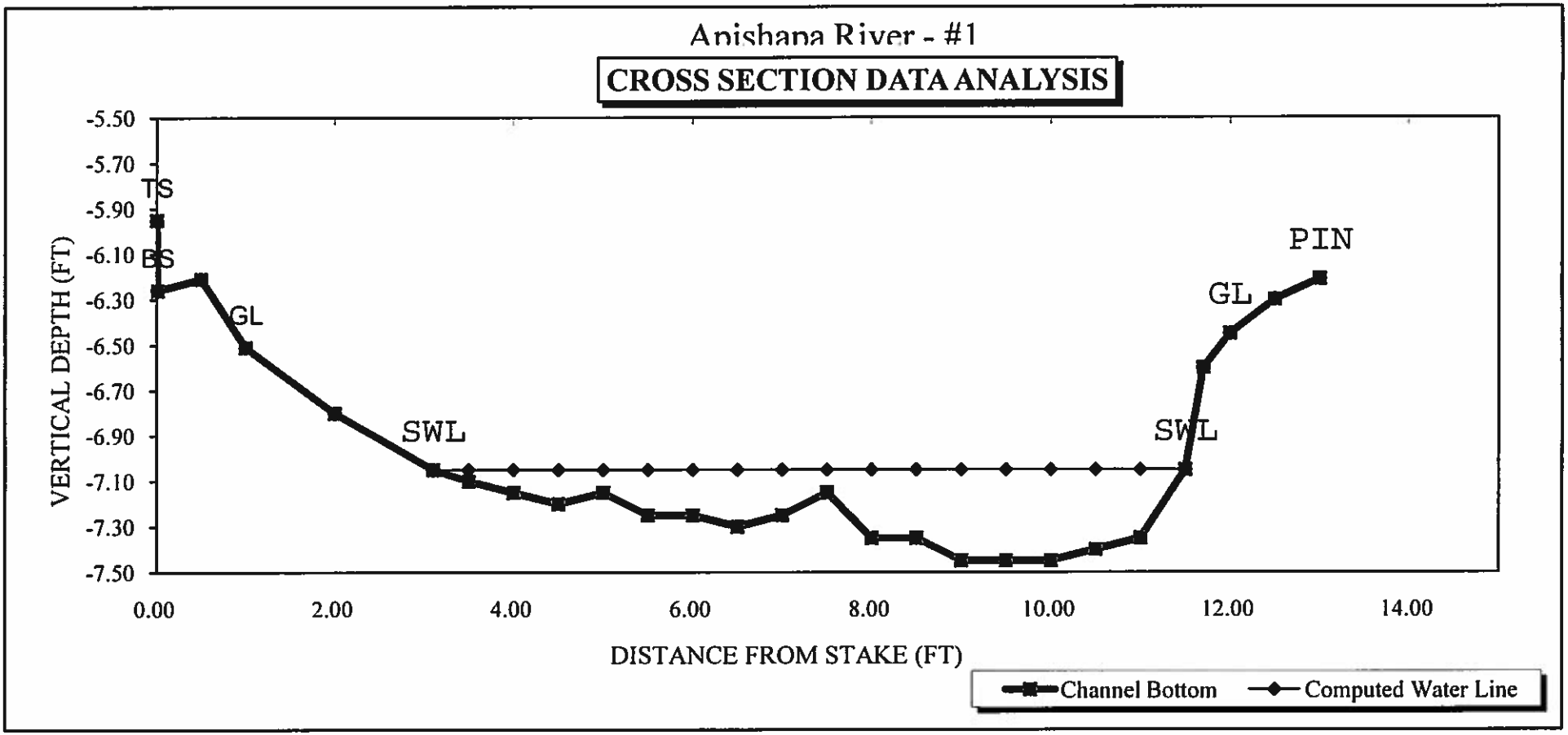
RECOMMENDED INSTREAM FLOW:
==========

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

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

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

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


Anishana River - #1
CROSS SECTION DATA ANALYSIS
VERTICAL DEPTH (FT)
-5.50
-5.70
-5.90
-6.10
-6.30
-6.50
-6.70
-6.90
-7.10
-7.30
-7.50
TS
BS
GL
SWL
SWL
GL
PIN
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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: APISHAPA RIVER | CROSS-SECTION NO.: #2

CROSS-SECTION LOCATION: D/S OF TRIBUTARY ON USPS LANDS

37° 20' 26.0" 104° 59' 29.2" WP # 44 Cordova Pass Rd.

DATE: 8/4/10 | OBSERVERS: UPPENDAHL

LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP:		RANGE:		PM:
	SW	15	31	N/S	68	E/W	6

COUNTY: | WATERSHED: Apishapa | WATER DIVISION: 2 | DOW WATER CODE: 28945

MAP(S): USGS: | USFS:

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO | METER TYPE: MARSH - McBIRNEY

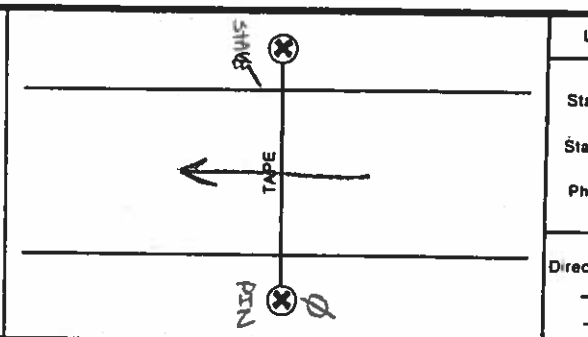
METER NUMBER: | DATE RATED: | CALIB/SPIN: _____ sec | TAPE WEIGHT: _____ lbs/foot | TAPE TENSION: _____ lbs

CHANNEL BED MATERIAL SIZE RANGE: | PHOTOGRAPHS TAKEN: YES/NO | NUMBER OF PHOTOGRAPHS:

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	
⊗ Tape @ Stake RB	0.0	
① WS @ Tape LB/RB	0.0	
② WS Upstream	11.0'	7.40
③ WS Downstream	2.60'	7.86
SLOPE	.46 / 13.6	

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:

COMMENTS

Rain night before / Heavy rain after work Complete on 8/4/10

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: APISHAPA RIVER	CROSS-SECTION NO: #2	DATE: 080410	SHEET 1 OF __
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (LEFT) RIGHT (0.0 AT STAKE)	Gage Reading: ____ ft	TIME: 14:30

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)
TS	0		6.40								
BS	0		6.57								
	1.0		6.73								
	2.0		6.82								
GL	3.0		7.01								
SWL	3.3		7.72	0				0			
	4.0		8.06	.30				0			
	4.5		8.16	.40				.67			
	5.0		8.11	.35				2.02			
	5.5		8.16	.40				1.92			
	6.0		8.06	.30				2.30			
	6.5		8.16	.40				1.85			
	7.0		8.16	.40				2.01			
	7.5		8.16	.40				2.87			
	8.0		8.16	.40				2.70			
	8.5		7.96	.20				2.78			
	9.0		8.01	.25				2.08			
	9.5		7.91	.15				1.93			
	10.0		8.01	.25				1.16			
	10.5		8.16	.40				0.42			
	11.0		8.26	.50				1.17			
	11.5		8.36	.60				2.02			
	12.0		8.16	.40				2.70			
	12.5		8.21	.45				1.94			
	13.0		8.06	.30				3.11			
	13.5		8.16	.40				2.08			
	14.0		8.11	.35				.93			
	14.5		7.96	.20				.88			
	15.0		7.86	.10				.52			
	15.5		7.86	.10				.14			
SWL	15.8		7.80	0				0			
	16.0		7.67								
	16.7		7.18								
GL	17.5		7.07								
	18.5		6.82								
BS	22.0		6.60								
TS	22.01		6.41								
TOTALS:										402	4.88

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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: APISHAPA RIVER						CROSS-SECTION NO.: # 1	
CROSS-SECTION LOCATION: USFS LANDS U/S OF TRIB							
37° 20' 33.7" 104° 59' 46.1"							
DATE: 8/4/10	OBSERVERS: UPPENDAHL						
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 15	TOWNSHIP: 31 N/S	RANGE: 68 E/W	PM: 6		
COUNTY:	WATERSHED: Apishapa	WATER DIVISION: 2	DOW WATER CODE: 28945				
MAP(S):	USGS:						
	USFS:						

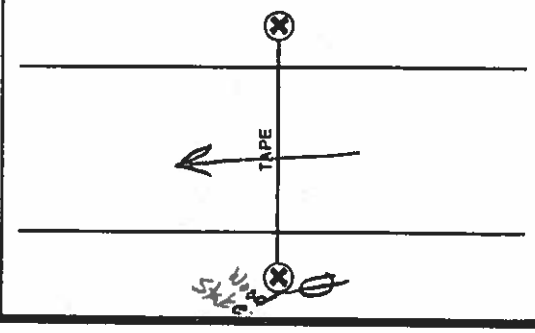
SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
Tape @ Stake LB	0.0	
Tape @ Stake RB	0.0	
WS @ Tape LB/RB	0.0	
WS Upstream	9.50	6.91
WS Downstream	7.40	7.45
SLOPE	.54 / 16.9	

SKETCH



LEGEND: Stake, Station, Photo, Direction of Flow

AQUATIC SAMPLING SUMMARY

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

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

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

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

COMMENTS

Rain night befor - Stream brown w/ sediment -

FORM #ISF FD 1-85

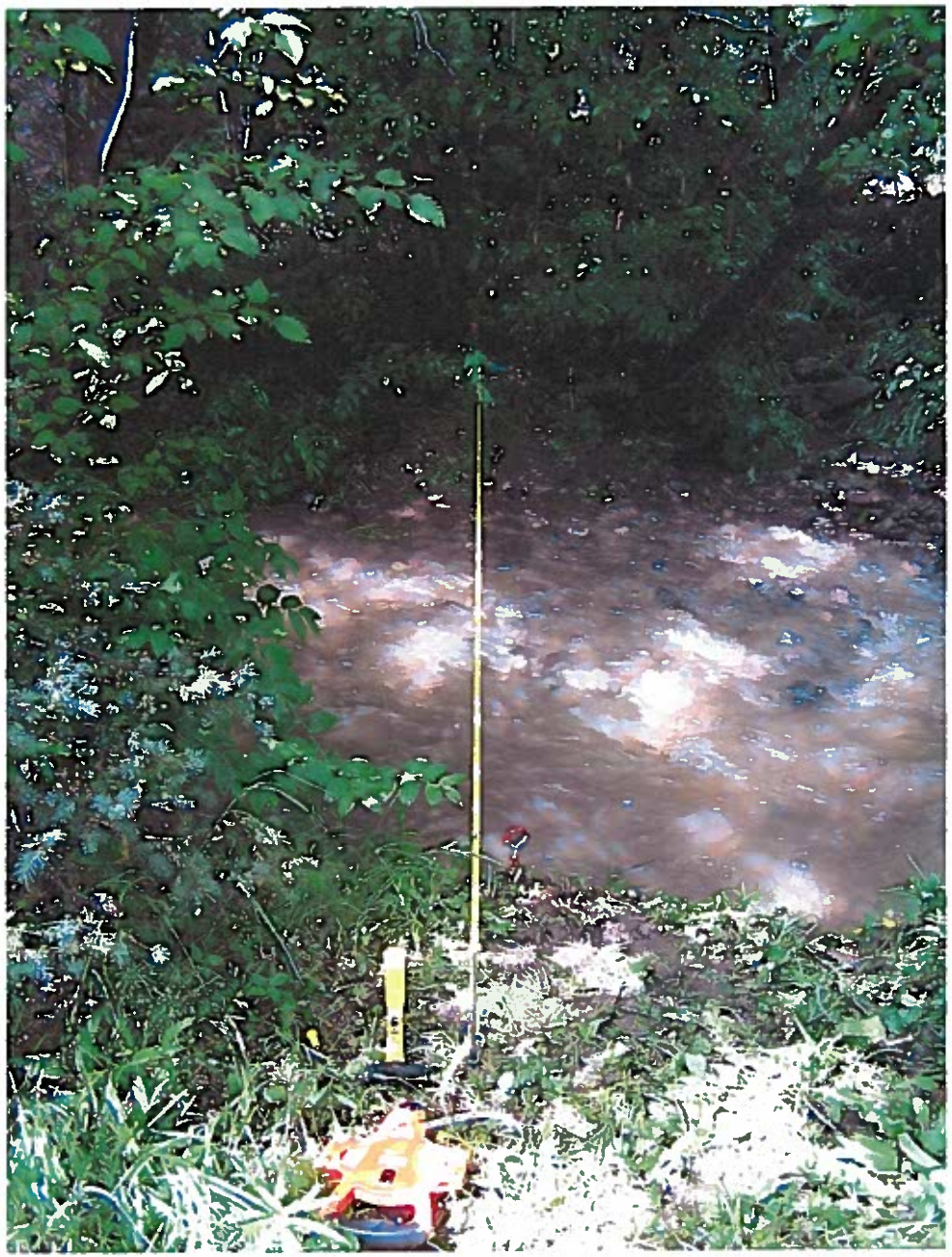
DISCHARGE/CROSS SECTION NOTES

STREAM NAME: APISHAPA RIVER	CROSS-SECTION NO.: 080410-1	DATE: 8/4/10	SHEET 1 OF __
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (LEFT) RIGHT (0.0 AT STAKE)	Gage Reading: ____ ft	TIME: 12:30

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)
TS	Ø		5.95								
BS	Ø		6.26								
	0.5		6.21								
GL	1.0		6.51								
	2.0		6.80								
SWL	3.1		7.05	Ø				Ø			
	3.5		7.10	.05				Ø			
	4.0		7.15	.10				.61			
	4.5		7.20	.15				1.64			
	5.0		7.15	.10				1.28			
	5.5		7.25	.20				1.81			
	6.0		7.25	.20				2.35			
	6.5		7.30	.25				2.57			
	7.0		7.25	.20				2.24			
	7.5		7.15	.10				2.89			
	8.0		7.35	.30				2.57			
	8.5		7.35	.30				1.92			
	9.0		7.45	.40				2.48			
	9.5		7.45	.40				2.15			
	10.0		7.45	.40				1.96			
	10.5		7.40	.35				1.89			
	11.0		7.35	.30				.93			
SWL	11.5		7.05	Ø				Ø			
	11.7		6.60								
GL	12.0		6.45								
	12.5		6.30								
PIN	13.0		6.21								
TOTALS:										1.90	3.79

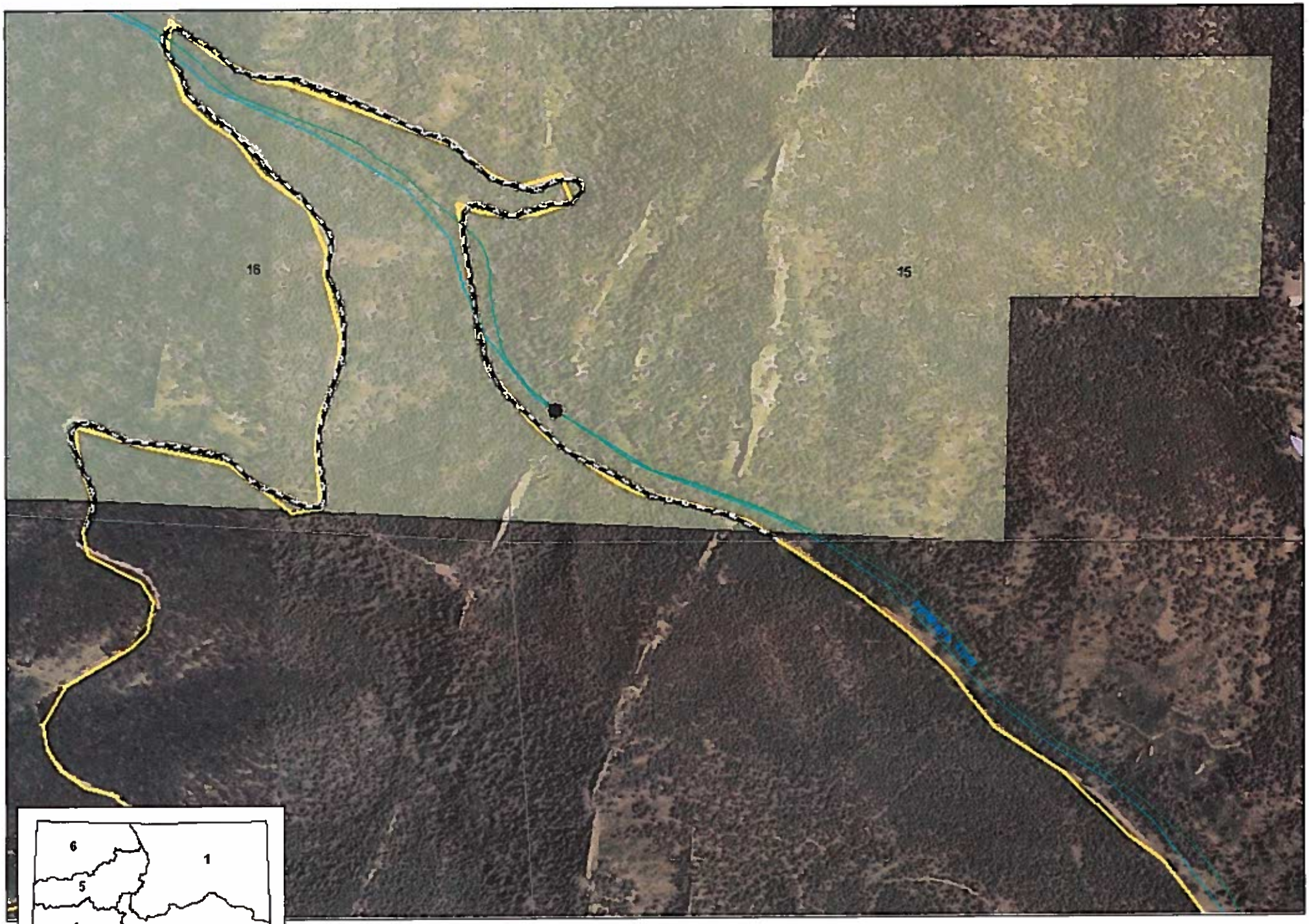
End of Measurement	Time: 13:15	Gage Reading ____ ft	CALCULATIONS PERFORMED BY	CALCULATIONS CHECKED BY

Apishapa River – Upper Site



Apishapa River – Lower Site

Apishapa River – Unnamed Tributary



Colorado Division of Wildlife
Apishapa River

0 0.05 0.1 0.2 0.3 Miles

Discharge Measurment Field Visit Data Report *(Filters: Name begins with Apishapa;)*

Div	Name	CWCB Case Number	Segment ID	Meas. Date	UTM	Location	Flow Amount (cfs)	Meas #	Rating	Station ID
2	Apishapa River		12/2/A-001	09/01/2011	UTMx: 502479 UTMy: 4131276	above Oliver Canyon	0.2	1	Fair	
2	Apishapa River		12/2/A-001	09/08/2011	UTMx: 500097 UTMy: 4133269	CR 46 Upper Crossing	0.23	3	Poor	2
2	Apishapa River		12/2/A-001	04/10/2012	UTMx: 502485 UTMy: 4131266	Abv Lower Terminus	5.18	1	Fair	
2	Apishapa River		12/2/A-001	05/22/2012	UTMx: 502467 UTMy: 4131292	~ 12 feet below Pressure Transducer	2.48			
2	Apishapa River		12/2/A-001	06/28/2012	UTMx: 502479 UTMy: 4131276	Station 1	0.2	3		1
2	Apishapa River		12/2/A-001	08/01/2012	UTMx: 502485 UTMy: 4131266	~ 17 feet DS of pressure transducer	0.41	4		
2	Apishapa River		12/2/A-001	11/01/2012	UTMx: 502484 UTMy: 4131267	~ 7 feet US of pressure transducer	0.23	5	Poor	
2	Apishapa River		12/2/A-001	04/29/2013	UTMx: 502479 UTMy: 413276	Station 1	0.79			1
2	Apishapa River		12/2/A-001	05/30/2013	UTMx: 502479 UTMy: 4131276	Station 1	0.63	7	Good	1
2	Apishapa River		12/2/A-001	07/08/2013	UTMx: 502479 UTMy: 4131276	Station 1	0.14	8	Fair	1
2	Apishapa River		12/2/A-001	10/30/2013	UTMx: 502479 UTMy: 4131276	station 1	0.59	9	fair	
2	Apishapa River		12/2/A-001	05/13/2015	UTMx: 500925 UTMy: 4132552	37 20 22.7546; 104 59 22.3764	4.47	1		

Discharge Measurement Summary

Date Generated: Wed May 29 2013

File Information

File Name	APISRVQ1.006.WAD
Start Date and Time	2013/04/29 18:46:06

Site Details

Site Name	APISHAPA RV ABV LT
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	0.8%	2.4%
Velocity	1.0%	7.9%
Width	0.3%	0.3%
Method	3.8%	-
# Stations	9.4%	-
Overall	**10.3%**	**8.3%**

Summary

Averaging Int.	40	# Stations	6
Start Edge	REW	Total Width	1.400
Mean SNR	38.4 dB	Total Area	0.446
Mean Temp	46.06 °F	Mean Depth	0.318
Disch. Equation	Mid-Section	Mean Velocity	1.7726
		Total Discharge	**0.7900**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Mon Apr 29 18:51:58 MDT 2013	3.001			REVERSE METER

Measurement Results

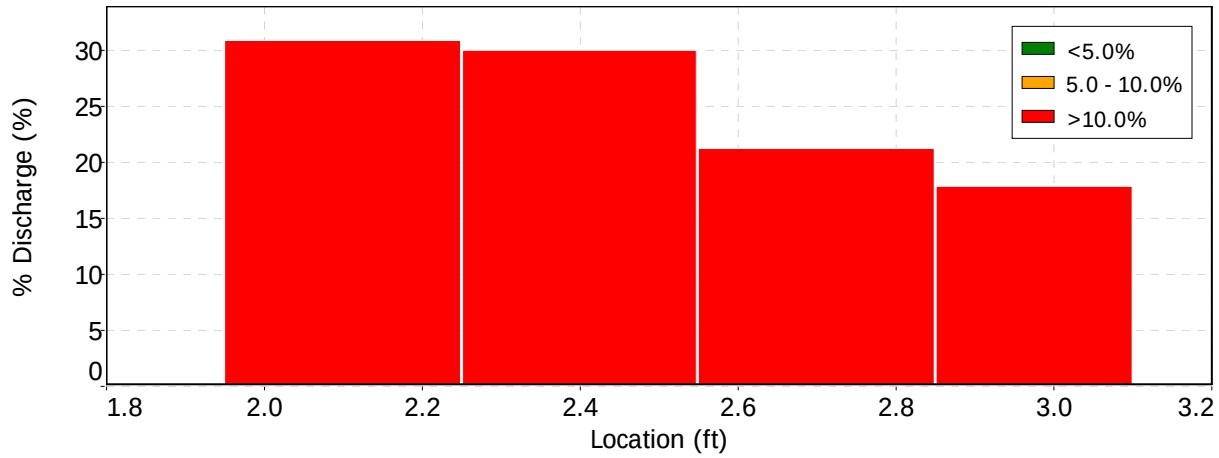
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	18:46	1.80	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	18:46	2.10	0.6	0.400	0.6	0.160	2.0354	1.00	2.0354	0.120	0.2444	30.9
2	18:47	2.40	0.6	0.410	0.6	0.164	1.9288	1.00	1.9288	0.123	0.2375	30.1
3	18:49	2.70	0.6	0.400	0.6	0.160	1.3927	1.00	1.3927	0.120	0.1672	21.2
4	*18:52*	*3.00*	*0.6*	*0.330*	*0.6*	*0.132*	*-1.7096*	*-1.00*	*1.7096*	*0.082*	*0.1410*	*17.8*
5	18:52	3.20	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

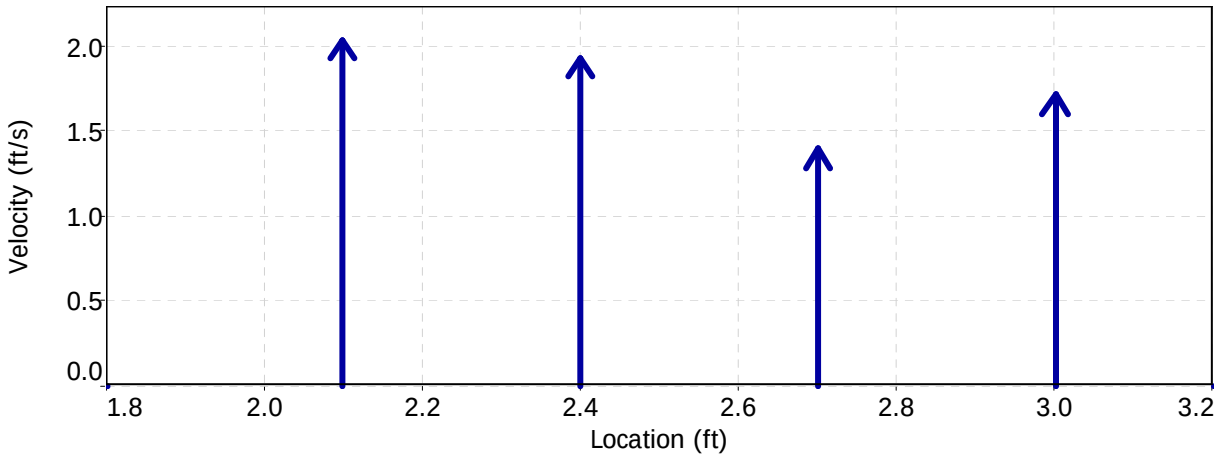
Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

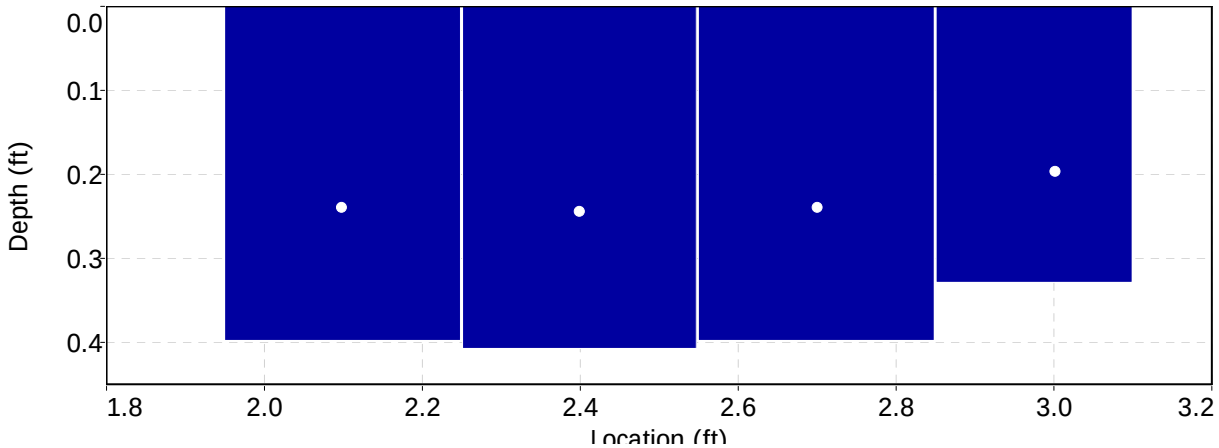
Discharge Measurement Summary

Date Generated: Wed May 29 2013

File Information		Site Details	
File Name	APISRVQ1.006.WAD	Site Name	APISHAPA RV ABV LT
Start Date and Time	2013/04/29 18:46:06	Operator(s)	BRIAN EPSTEIN







Discharge Measurement Summary

Date Generated: Wed May 29 2013

File Information		Site Details	
File Name	APISRVQ1.006.WAD	Site Name	APISHAPA RV ABV LT
Start Date and Time	2013/04/29 18:46:06	Operator(s)	BRIAN EPSTEIN

Quality Control

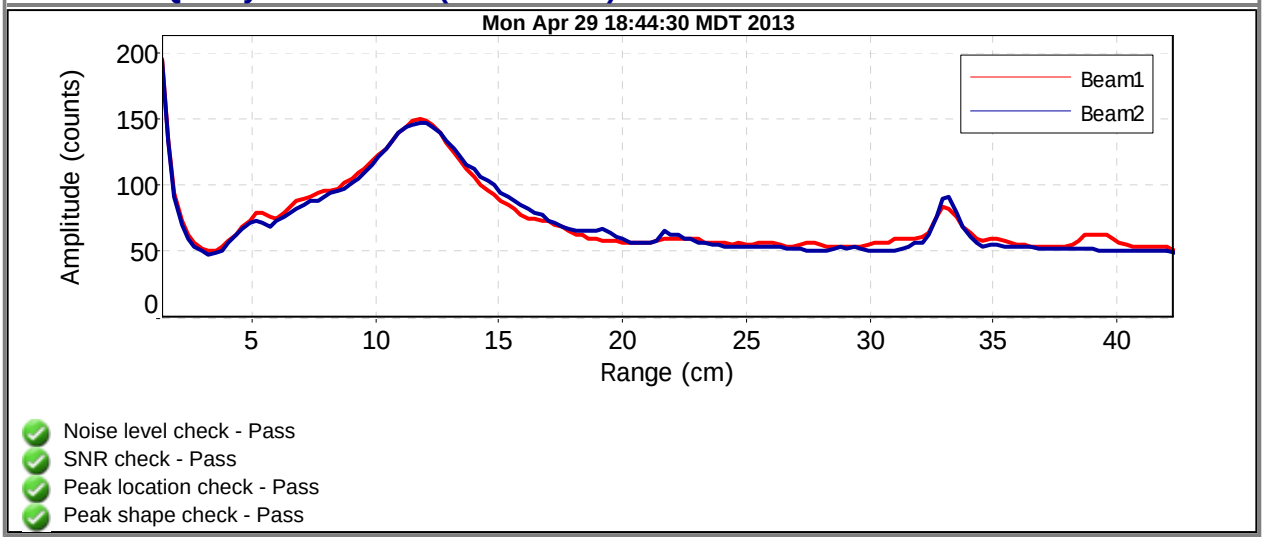
St	Loc	%Dep	Message
4	3.00	0.6	High angle: -170

Discharge Measurement Summary

Date Generated: Wed May 29 2013

File Information		Site Details	
File Name	APISRVQ1.006.WAD	Site Name	APISHAPA RV ABV LT
Start Date and Time	2013/04/29 18:46:06	Operator(s)	BRIAN EPSTEIN

Automatic Quality Control Test (BeamCheck)



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

Discharge Measurement Summary

Date Generated: Wed Nov 14 2012

File Information

File Name	APISRVQ1.005.WAD
Start Date and Time	2012/11/01 13:05:16

Site Details

Site Name	APISHAPA RV TEMP GGE
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	0.7%	4.2%
Velocity	5.1%	12.6%
Width	0.2%	0.2%
Method	3.5%	-
# Stations	7.8%	-
Overall	**10.0%**	**13.3%**

Summary

Averaging Int.	40	# Stations	8
Start Edge	REW	Total Width	1.400
Mean SNR	27.3 dB	Total Area	0.286
Mean Temp	39.60 °F	Mean Depth	0.204
Disch. Equation	Mid-Section	Mean Velocity	0.8193
		Total Discharge	**0.2344**

Supplemental Data (Gauge Height Change = 0.000ft)

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Thu Nov 1 13:02:05 MDT 2012	0.000	0.490		
2	Thu Nov 1 13:18:10 MDT 2012	3.300	0.490		

Measurement Results

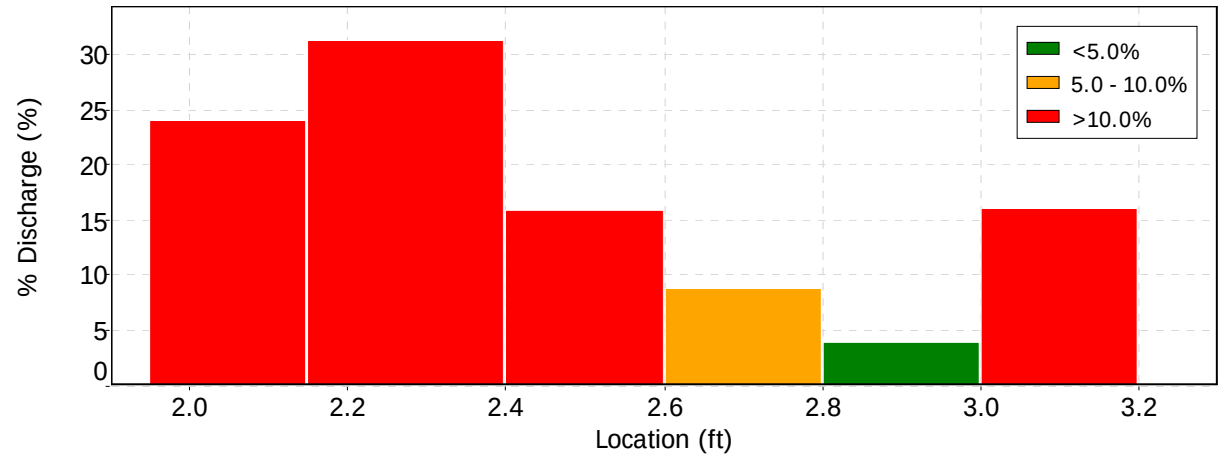
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	13:05	1.90	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	13:05	2.00	None	0.230	0.0	0.0	0.0000	1.00	1.2241	0.046	0.0563	24.0
2	13:05	2.30	0.6	0.240	0.6	0.096	1.2241	1.00	1.2241	0.060	0.0735	31.4
3	13:06	2.50	0.6	0.280	0.6	0.112	0.6663	1.00	0.6663	0.056	0.0373	15.9
4	13:08	2.70	0.6	0.230	0.6	0.092	0.4446	1.00	0.4446	0.046	0.0205	8.7
5	13:10	2.90	0.6	0.200	0.6	0.080	0.2333	1.00	0.2333	0.040	0.0093	4.0
6	*13:16*	*3.10*	*0.6*	*0.190*	*0.6*	*0.076*	*-0.9869*	*-1.00*	*0.9869*	*0.038*	*0.0375*	*16.0*
7	13:16	3.30	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

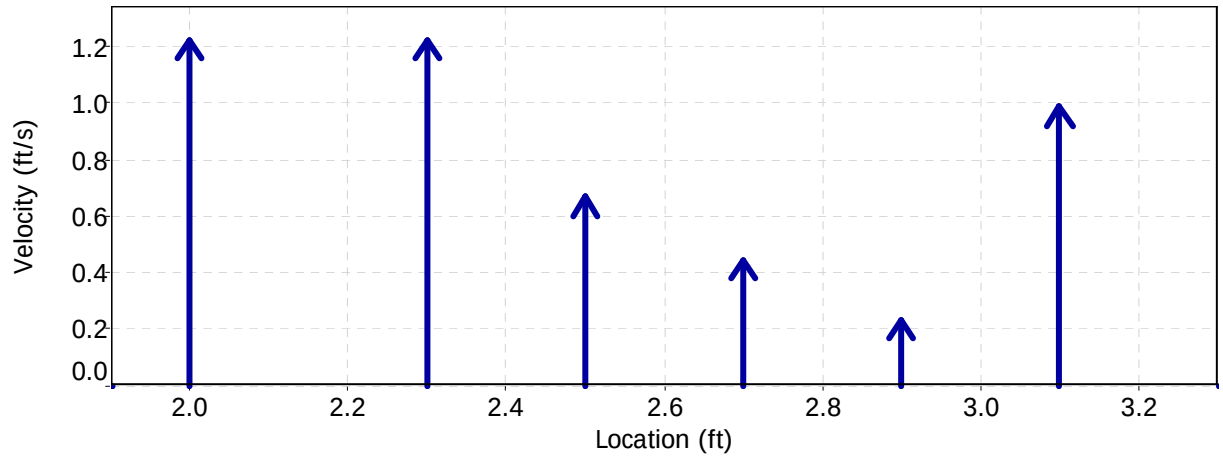
Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

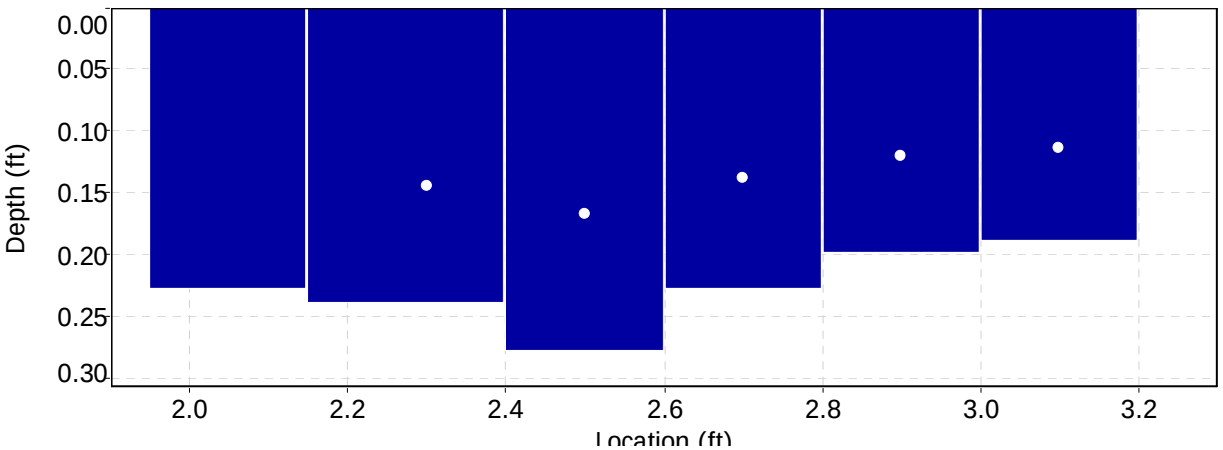
Discharge Measurement Summary

Date Generated: Wed Nov 14 2012

File Information		Site Details	
File Name	APISRVQ1.005.WAD	Site Name	APISHAPA RV TEMP GGE
Start Date and Time	2012/11/01 13:05:16	Operator(s)	BRIAN EPSTEIN







Discharge Measurement Summary

Date Generated: Wed Nov 14 2012

File Information		Site Details	
File Name	APISRVQ1.005.WAD	Site Name	APISHAPA RV TEMP GGE
Start Date and Time	2012/11/01 13:05:16	Operator(s)	BRIAN EPSTEIN

Quality Control

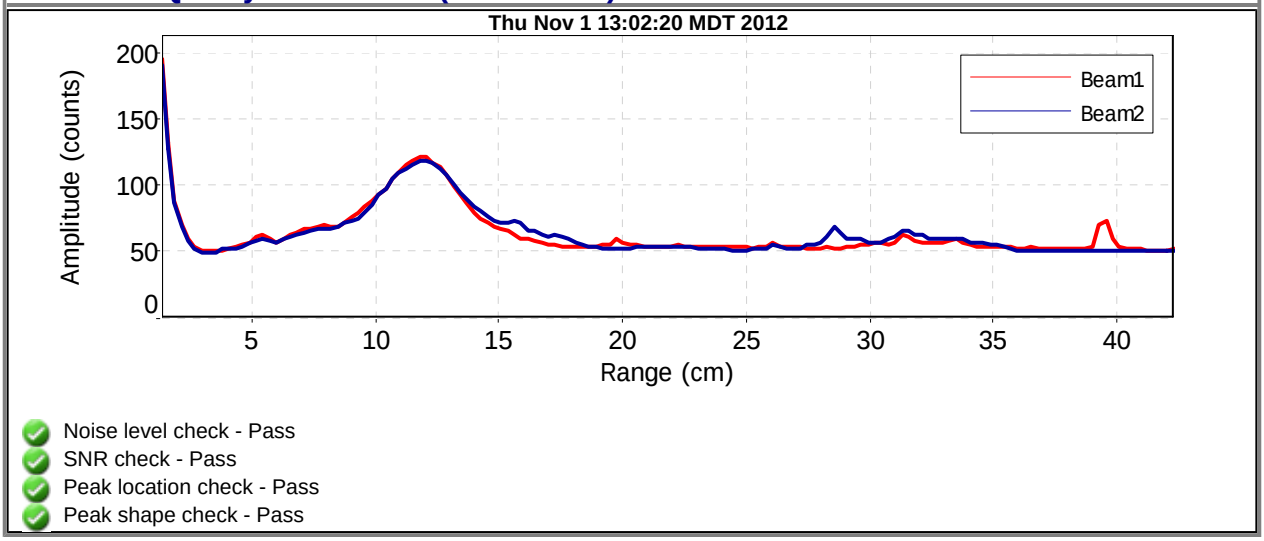
St	Loc	%Dep	Message
6	3.10	0.6	High angle: -170

Discharge Measurement Summary

Date Generated: Wed Nov 14 2012

File Information		Site Details	
File Name	APISRVQ1.005.WAD	Site Name	APISHAPA RV TEMP GGE
Start Date and Time	2012/11/01 13:05:16	Operator(s)	BRIAN EPSTEIN

Automatic Quality Control Test (BeamCheck)



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

Discharge Measurement Summary

Date Generated: Wed Nov 14 2012

File Information

File Name	APISRVQ1.004.WAD
Start Date and Time	2012/08/01 12:01:01

Site Details

Site Name	APISHAPA RV ABV LT
Operator(s)	BRIAN EPSTEIN

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	0.7%	7.7%
Velocity	1.3%	4.9%
Width	0.2%	0.2%
Method	3.5%	-
# Stations	7.8%	-
Overall	**8.7%**	**9.2%**

Summary

Averaging Int.	40	# Stations	7
Start Edge	LEW	Total Width	4.400
Mean SNR	36.3 dB	Total Area	0.765
Mean Temp	55.90 °F	Mean Depth	0.174
Disch. Equation	Mid-Section	Mean Velocity	0.5377
		Total Discharge	**0.4114**

Supplemental Data (Gauge Height Change = 0.000ft)

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Wed Aug 1 11:58:02 MDT 2012	8.100	0.550		
2	Wed Aug 1 12:09:01 MDT 2012	23.500	0.550		

Measurement Results

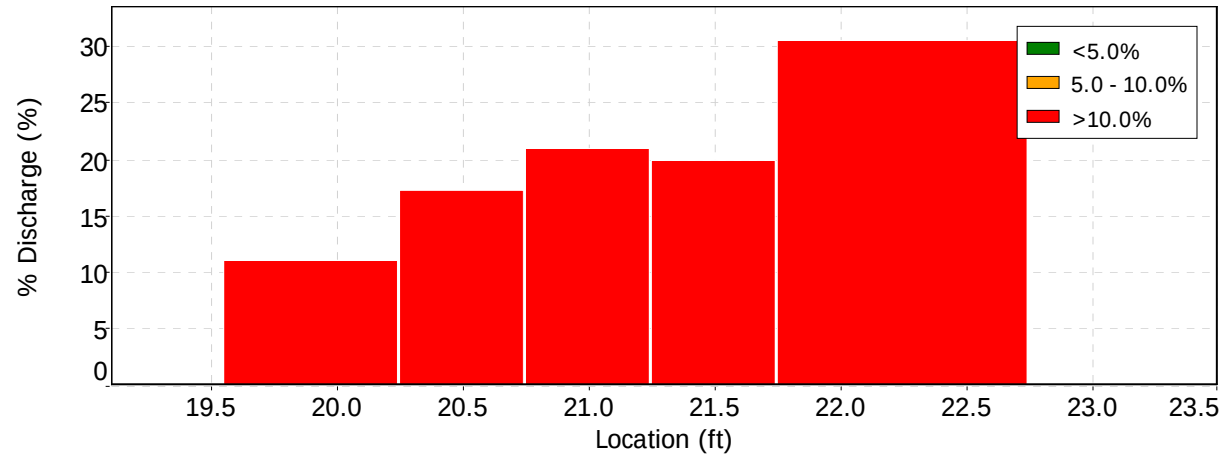
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	12:01	19.10	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	12:01	20.00	0.6	0.200	0.6	0.080	0.3271	1.00	0.3271	0.140	0.0458	11.1
2	12:03	20.50	0.6	0.300	0.6	0.120	0.4757	1.00	0.4757	0.150	0.0713	17.3
3	12:04	21.00	0.6	0.270	0.6	0.108	0.6411	1.00	0.6411	0.135	0.0865	21.0
4	12:06	21.50	0.6	0.280	0.6	0.112	0.5840	1.00	0.5840	0.140	0.0817	19.9
5	12:07	22.00	0.6	0.200	0.6	0.080	0.6293	1.00	0.6293	0.200	0.1259	30.6
6	12:07	23.50	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

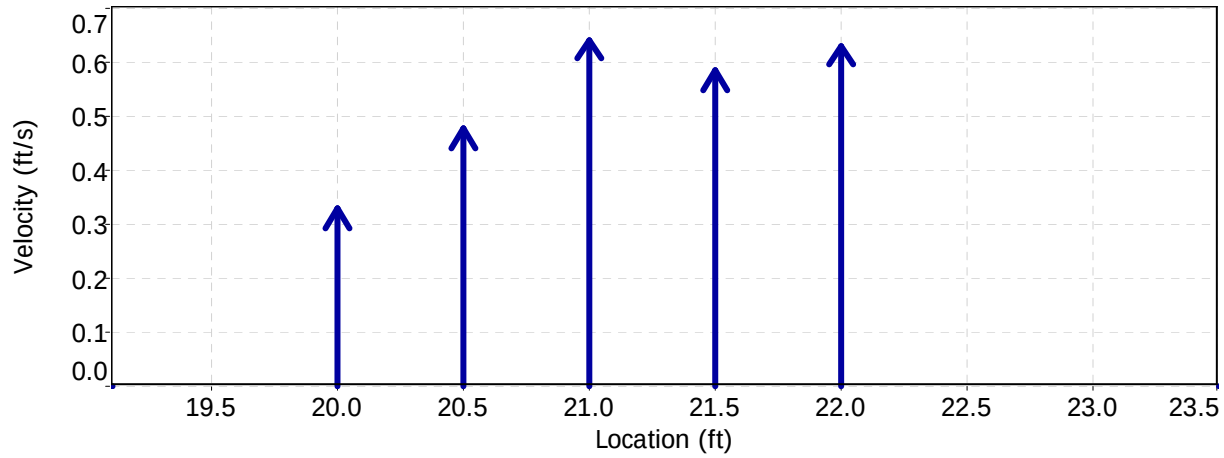
Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

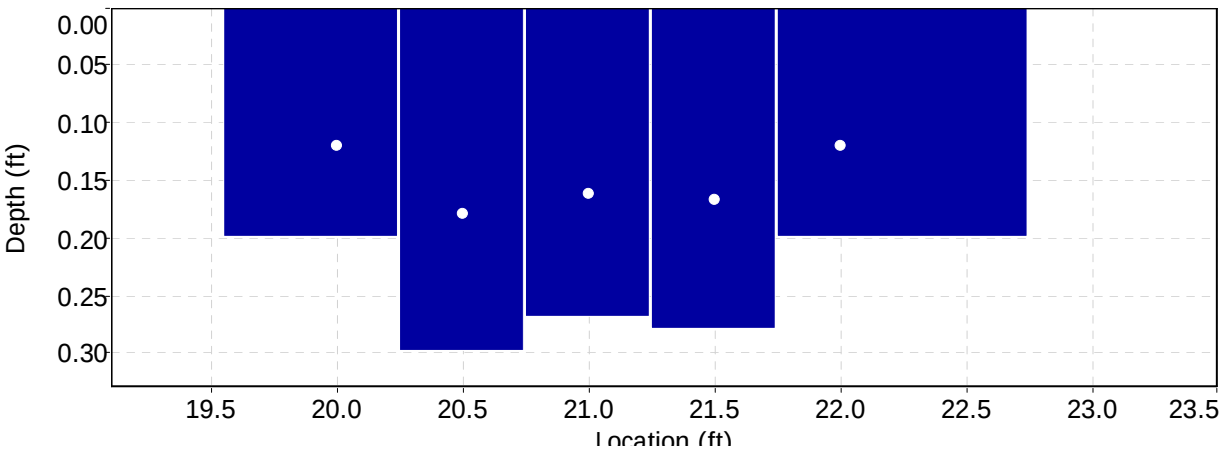
Discharge Measurement Summary

Date Generated: Wed Nov 14 2012

File Information		Site Details	
File Name	APISRVQ1.004.WAD	Site Name	APISHAPA RV ABV LT
Start Date and Time	2012/08/01 12:01:01	Operator(s)	BRIAN EPSTEIN







Discharge Measurement Summary

Date Generated: Wed Nov 14 2012

File Information		Site Details	
File Name	APISRVQ1.004.WAD	Site Name	APISHAPA RV ABV LT
Start Date and Time	2012/08/01 12:01:01	Operator(s)	BRIAN EPSTEIN

Quality Control

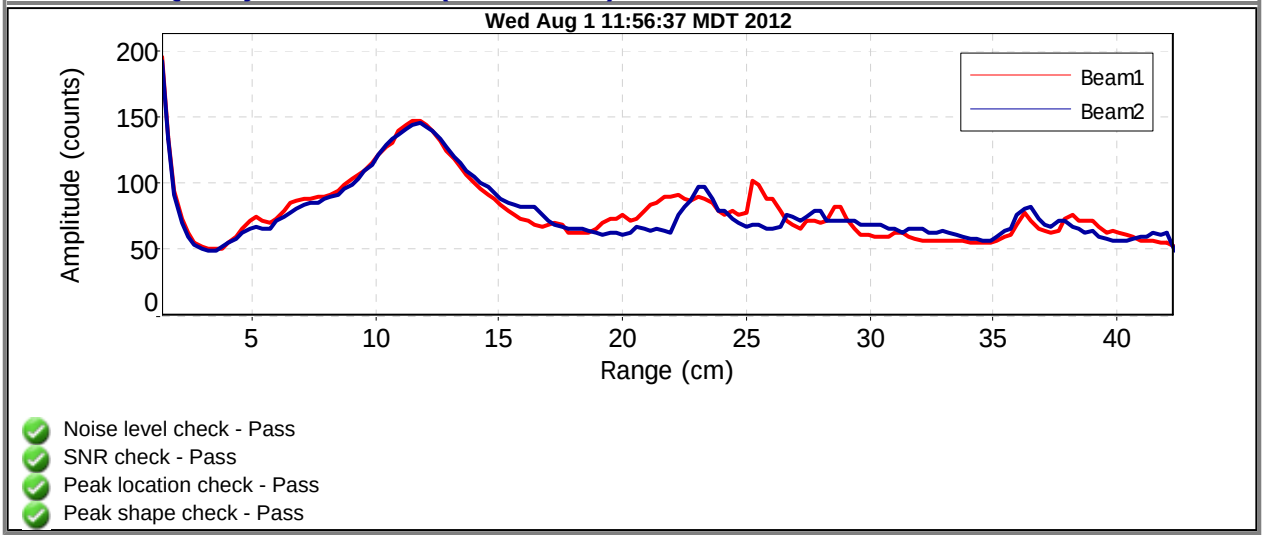
No Quality Control warnings

Discharge Measurement Summary

Date Generated: Wed Nov 14 2012

File Information		Site Details	
File Name	APISRVQ1.004.WAD	Site Name	APISHAPA RV ABV LT
Start Date and Time	2012/08/01 12:01:01	Operator(s)	BRIAN EPSTEIN

Automatic Quality Control Test (BeamCheck)



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

Discharge Measurement Summary

Date Generated: Wed Nov 14 2012

File Information

File Name	APISRVQ1.003.WAD
Start Date and Time	2012/06/28 13:43:07

Site Details

Site Name	APISHAPA RV AT Q1
Operator(s)	BRIAN EPSTEIN

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	0.7%	4.6%
Velocity	2.7%	9.5%
Width	0.2%	0.2%
Method	3.6%	-
# Stations	7.8%	-
Overall	**9.1%**	**10.6%**

Summary

Averaging Int.	40	# Stations	8
Start Edge	REW	Total Width	3.800
Mean SNR	32.3 dB	Total Area	1.018
Mean Temp	60.67 °F	Mean Depth	0.268
Disch. Equation	Mid-Section	Mean Velocity	0.1994
		Total Discharge	**0.2029**

Supplemental Data (Gauge Height Change = 0.000ft)

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Thu Jun 28 13:37:35 MDT 2012	0.000	0.470		
2	Thu Jun 28 13:45:26 MDT 2012	2.500	0.470		
3	Thu Jun 28 13:51:07 MDT 2012	4.400	0.470		

Measurement Results

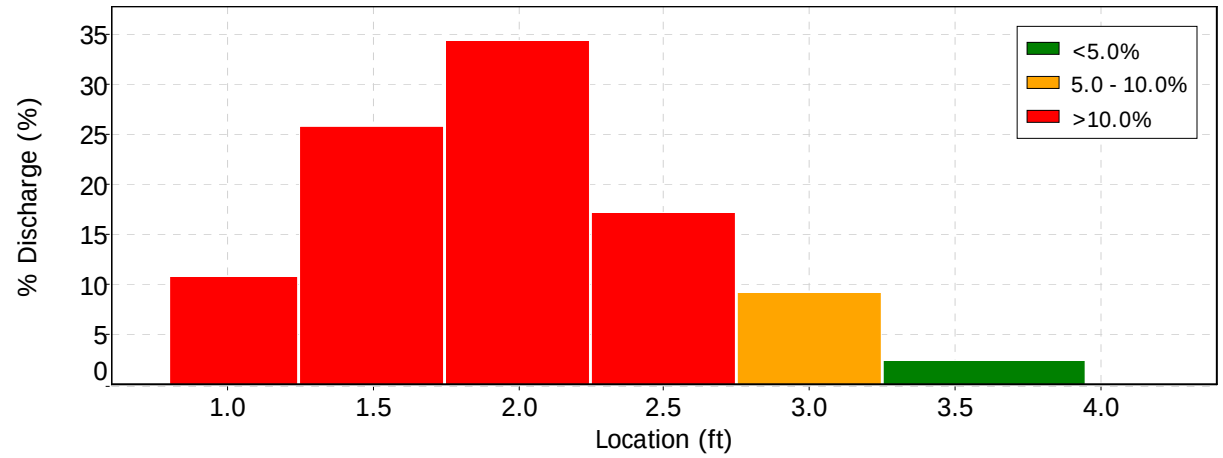
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	13:43	0.60	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	13:43	1.00	None	0.140	0.0	0.0	0.0000	1.00	0.3478	0.063	0.0219	10.8
2	13:43	1.50	0.6	0.300	0.6	0.120	0.3478	1.00	0.3478	0.150	0.0521	25.7
3	13:44	2.00	0.6	0.390	0.6	0.156	0.3576	1.00	0.3576	0.195	0.0698	34.4
4	13:46	2.50	0.6	0.400	0.6	0.160	0.1752	1.00	0.1752	0.200	0.0350	17.3
5	13:47	3.00	0.6	0.400	0.6	0.160	0.0945	1.00	0.0945	0.200	0.0189	9.3
6	13:48	3.50	0.6	0.300	0.6	0.120	0.0246	1.00	0.0246	0.210	0.0052	2.5
7	13:48	4.40	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

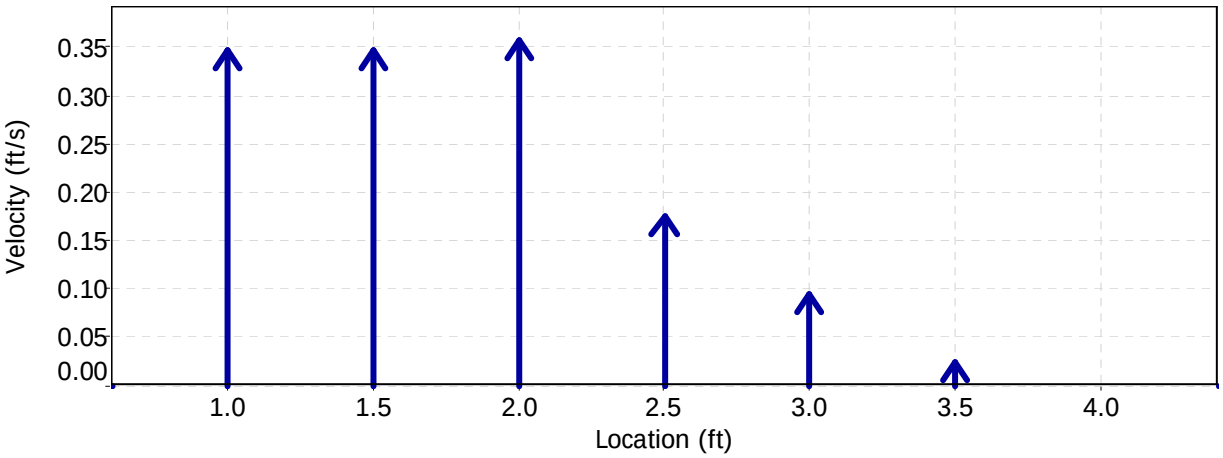
Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

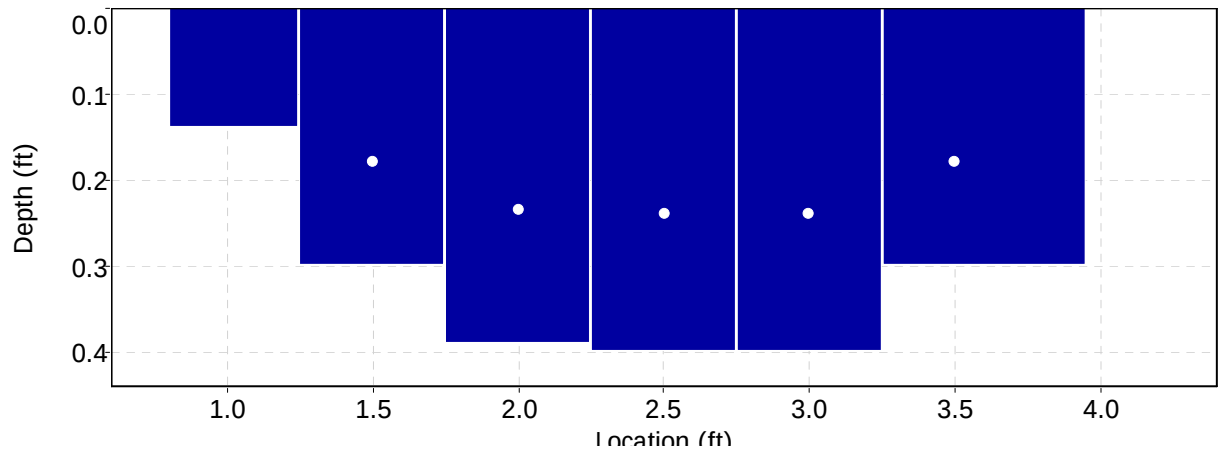
Discharge Measurement Summary

Date Generated: Wed Nov 14 2012

File Information		Site Details	
File Name	APISRVQ1.003.WAD	Site Name	APISHAPA RV AT Q1
Start Date and Time	2012/06/28 13:43:07	Operator(s)	BRIAN EPSTEIN







Discharge Measurement Summary

Date Generated: Wed Nov 14 2012

File Information		Site Details	
File Name	APISRVQ1.003.WAD	Site Name	APISHAPA RV AT Q1
Start Date and Time	2012/06/28 13:43:07	Operator(s)	BRIAN EPSTEIN

Quality Control

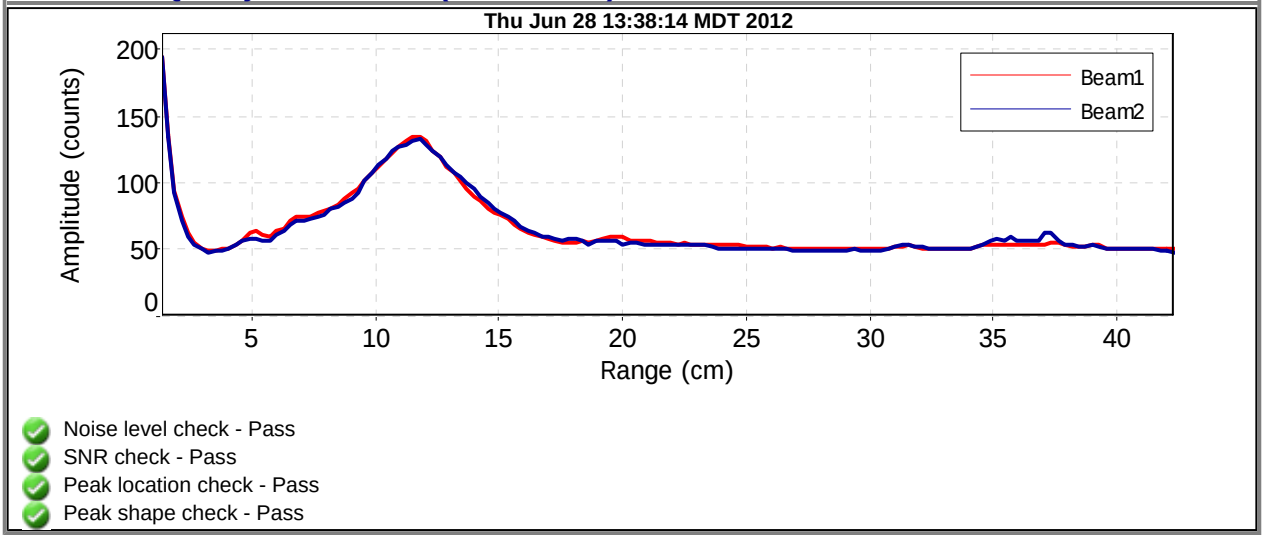
No Quality Control warnings

Discharge Measurement Summary

Date Generated: Wed Nov 14 2012

File Information		Site Details	
File Name	APISRVQ1.003.WAD	Site Name	APISHAPA RV AT Q1
Start Date and Time	2012/06/28 13:43:07	Operator(s)	BRIAN EPSTEIN

Automatic Quality Control Test (BeamCheck)



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

Discharge Measurement Summary

Date Generated: Wed Nov 14 2012

File Information

File Name	APISRVQ1.002.WAD
Start Date and Time	2012/05/22 12:57:06

Site Details

Site Name	APISHAPA RV Q1
Operator(s)	BRIAN EPSTEIN

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%	3.4%
Velocity	2.0%	7.7%
Width	0.2%	0.2%
Method	3.1%	-
# Stations	4.6%	-
Overall	**6.0%**	**8.5%**

Summary

Averaging Int.	40	# Stations	12
Start Edge	REW	Total Width	5.700
Mean SNR	42.6 dB	Total Area	3.015
Mean Temp	51.72 °F	Mean Depth	0.529
Disch. Equation	Mid-Section	Mean Velocity	0.8210
		Total Discharge	**2.4755**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue May 22 13:16:02 MDT 2012	21.000	0.830		
2	Tue May 22 13:20:47 MDT 2012	22.000			REV MTR W COR FAC

Measurement Results

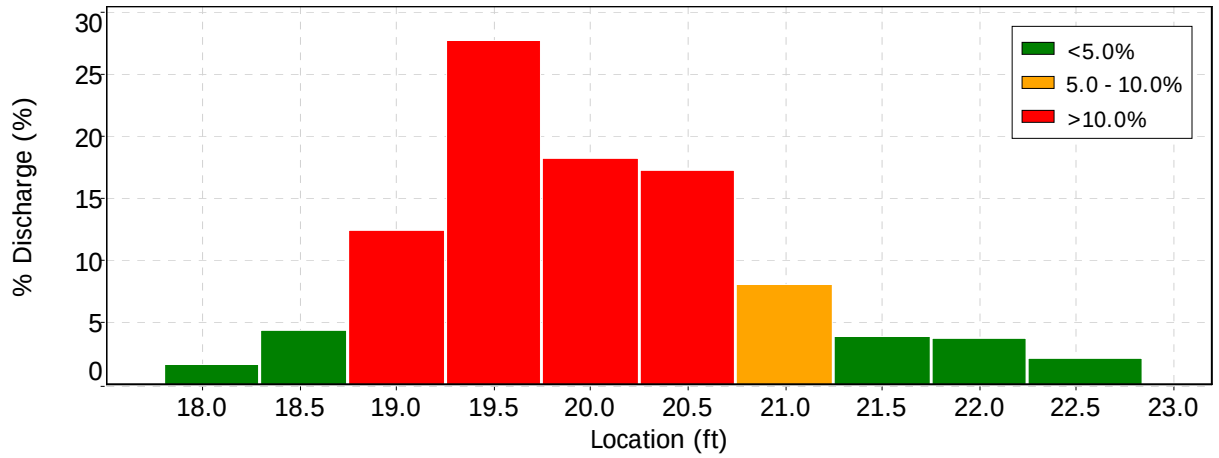
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	12:57	17.50	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	12:57	18.10	0.6	0.600	0.6	0.240	0.1342	1.00	0.1342	0.300	0.0403	1.6
2	13:05	18.50	0.6	0.720	0.6	0.288	0.3353	1.00	0.3353	0.324	0.1087	4.4
3	13:09	19.00	0.6	0.790	0.6	0.316	0.7831	1.00	0.7831	0.395	0.3093	12.5
4	13:11	19.50	0.6	0.900	0.6	0.360	1.5292	1.00	1.5292	0.450	0.6881	27.8
5	13:12	20.00	0.6	0.690	0.6	0.276	1.3100	1.00	1.3100	0.345	0.4519	18.3
6	13:13	20.50	0.6	0.700	0.6	0.280	1.2218	1.00	1.2218	0.350	0.4277	17.3
7	13:16	21.00	0.6	0.680	0.6	0.272	0.5863	1.00	0.5863	0.340	0.1994	8.1
8	13:17	21.50	0.6	0.500	0.6	0.200	0.3970	1.00	0.3970	0.250	0.0992	4.0
9	*13:21*	*22.00*	*0.6*	*0.330*	*0.6*	*0.132*	*-0.5781*	*-1.00*	*0.5781*	*0.165*	*0.0954*	*3.9*
10	13:21	22.50	None	0.160	0.0	0.0	0.0000	1.00	0.5781	0.096	0.0555	2.2
11	13:21	23.20	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

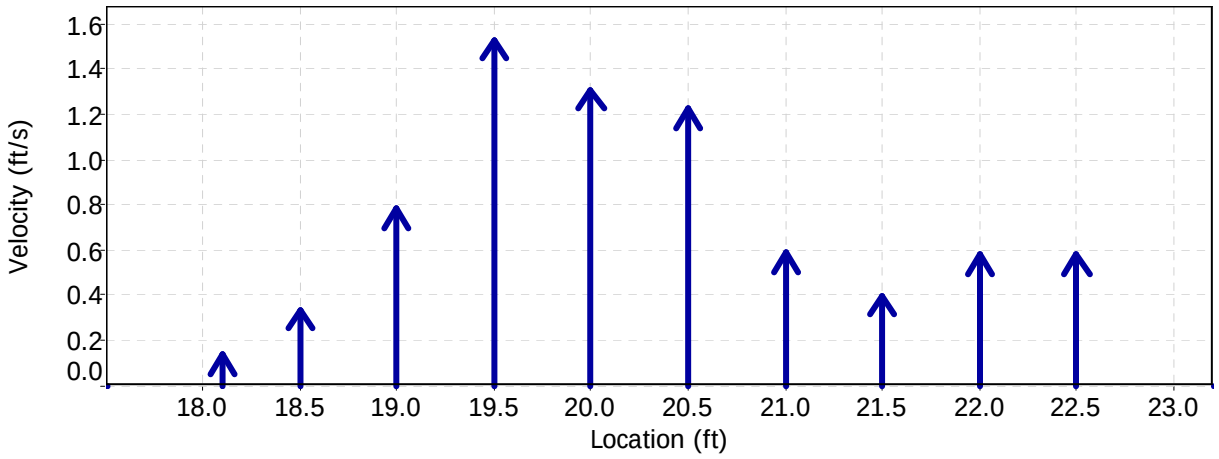
Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

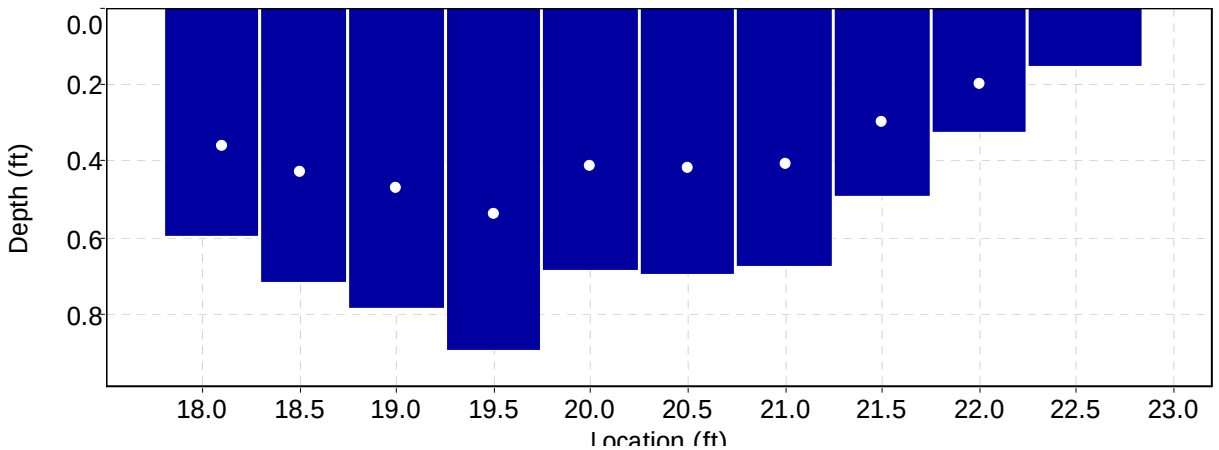
Discharge Measurement Summary

Date Generated: Wed Nov 14 2012

File Information		Site Details	
File Name	APISRVQ1.002.WAD	Site Name	APISHAPA RV Q1
Start Date and Time	2012/05/22 12:57:06	Operator(s)	BRIAN EPSTEIN







Discharge Measurement Summary

Date Generated: Wed Nov 14 2012

File Information		Site Details	
File Name	APISRVQ1.002.WAD	Site Name	APISHAPA RV Q1
Start Date and Time	2012/05/22 12:57:06	Operator(s)	BRIAN EPSTEIN

Quality Control

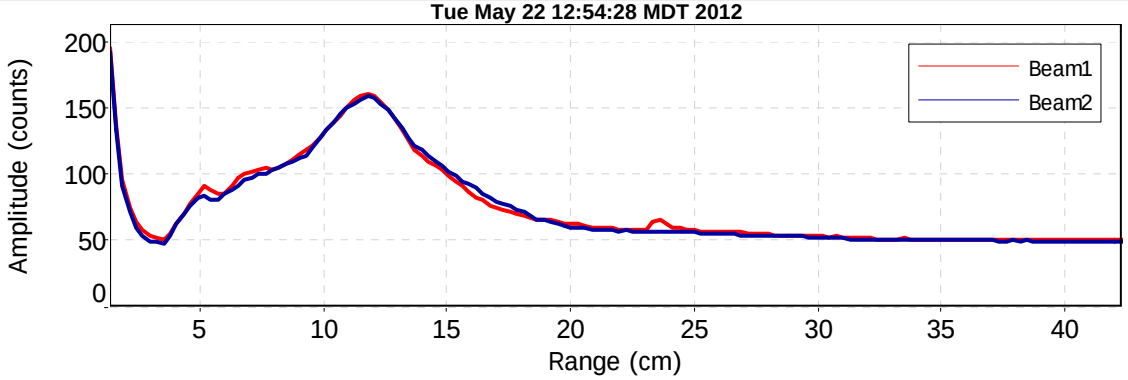
St	Loc	%Dep	Message
9	22.00	0.6	High angle: -167

Discharge Measurement Summary

Date Generated: Wed Nov 14 2012

File Information		Site Details	
File Name	APISRVQ1.002.WAD	Site Name	APISHAPA RV Q1
Start Date and Time	2012/05/22 12:57:06	Operator(s)	BRIAN EPSTEIN

Automatic Quality Control Test (BeamCheck)



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

Discharge Measurement Summary

Date Generated: Wed Apr 11 2012

File Information

File Name	APSABVLT.001.WAD
Start Date and Time	2012/04/10 08:53:15

Site Details

Site Name	APISHAPA ABV LT
Operator(s)	BRIAN EPSTEIN

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	0.5%	3.9%
Velocity	1.3%	6.4%
Width	0.2%	0.2%
Method	2.7%	-
# Stations	3.9%	-
Overall	**5.0%**	**7.6%**

Summary

Averaging Int.	40	# Stations	13
Start Edge	REW	Total Width	6.500
Mean SNR	47.3 dB	Total Area	2.832
Mean Temp	34.37 °F	Mean Depth	0.436
Disch. Equation	Mid-Section	Mean Velocity	1.8290
		Total Discharge	**5.1793**

Supplemental Data (Gauge Height Change = 0.000ft)

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Tue Apr 10 08:50:23 MDT 2012	0.000	0.950		
2	Tue Apr 10 09:01:16 MDT 2012	21.000	0.950		
3	Tue Apr 10 09:10:19 MDT 2012	18.400	0.950		

Measurement Results

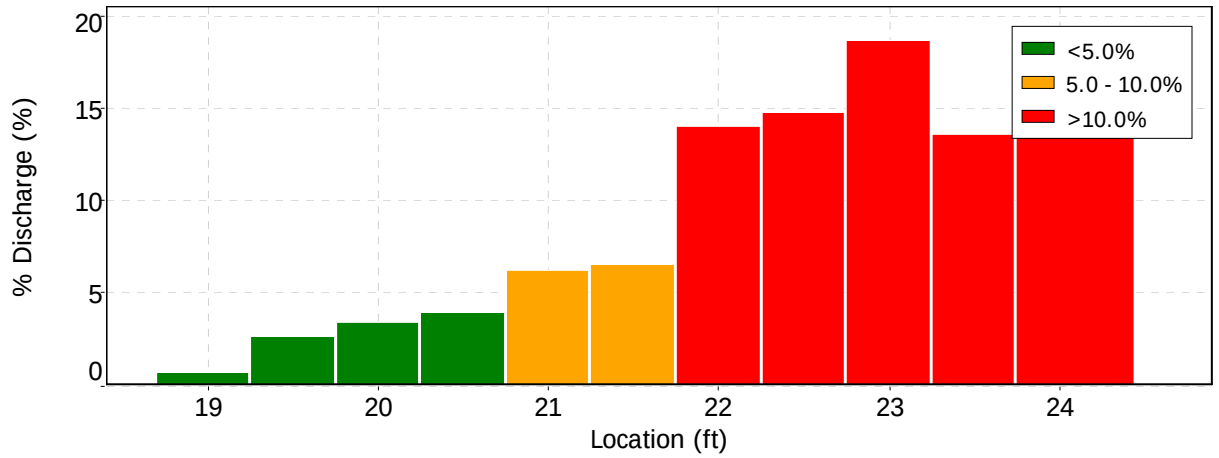
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	08:53	24.90	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	08:53	24.00	0.6	0.600	0.6	0.240	1.8842	1.00	1.8842	0.420	0.7914	15.3
2	08:55	23.50	0.6	0.510	0.6	0.204	2.7589	1.00	2.7589	0.255	0.7033	13.6
3	08:56	23.00	0.6	0.690	0.6	0.276	2.8169	1.00	2.8169	0.345	0.9718	18.8
4	08:57	22.50	0.6	0.650	0.6	0.260	2.3612	1.00	2.3612	0.325	0.7673	14.8
5	08:58	22.00	0.6	0.610	0.6	0.244	2.3868	1.00	2.3868	0.305	0.7279	14.1
6	*09:00*	*21.50*	*0.6*	*0.650*	*0.6*	*0.260*	*1.0459*	*1.00*	*1.0459*	*0.325*	*0.3399*	*6.6*
7	09:02	21.00	0.6	0.580	0.6	0.232	1.1112	1.00	1.1112	0.290	0.3223	6.2
8	09:04	20.50	0.6	0.400	0.6	0.160	1.0390	1.00	1.0390	0.200	0.2078	4.0
9	09:05	20.00	0.6	0.210	0.6	0.084	1.6818	1.00	1.6818	0.105	0.1766	3.4
10	09:07	19.50	0.6	0.260	0.6	0.104	1.0545	1.00	1.0545	0.130	0.1370	2.6
11	09:08	19.00	0.6	0.240	0.6	0.096	0.2585	1.00	0.2585	0.132	0.0342	0.7
12	09:08	18.40	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

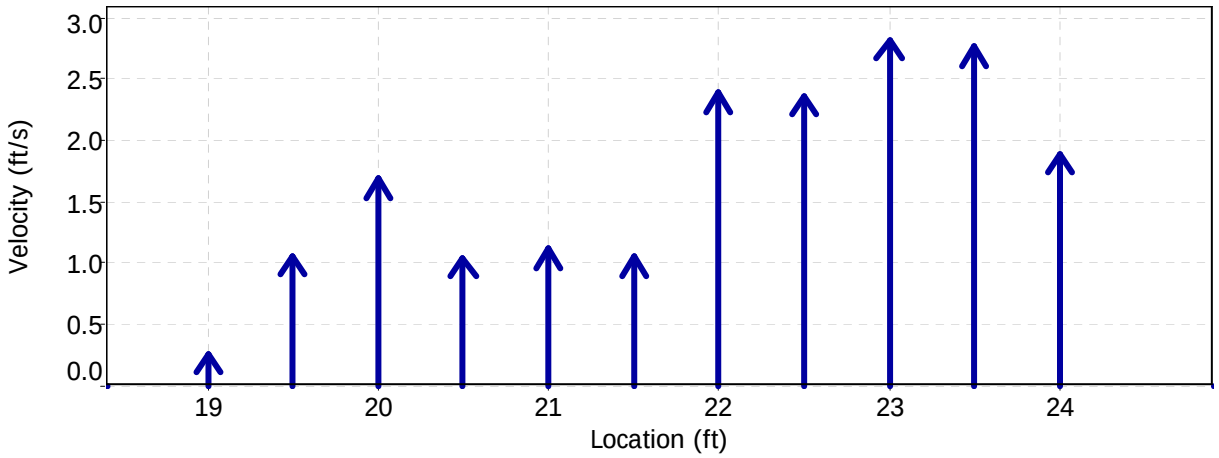
Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

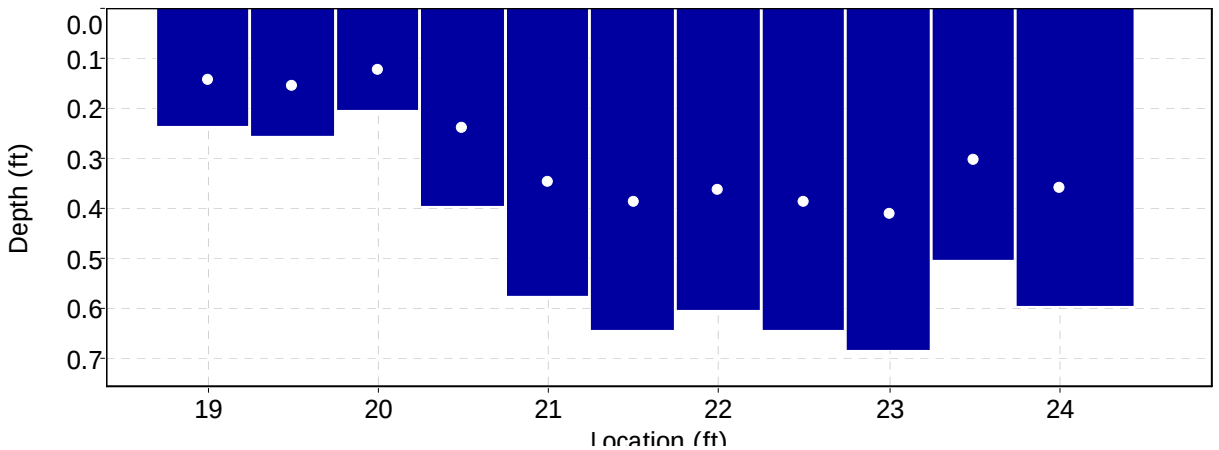
Discharge Measurement Summary

Date Generated: Wed Apr 11 2012

File Information		Site Details	
File Name	APSABVLT.001.WAD	Site Name	APISHAPA ABV LT
Start Date and Time	2012/04/10 08:53:15	Operator(s)	BRIAN EPSTEIN







Discharge Measurement Summary

Date Generated: Wed Apr 11 2012

File Information		Site Details	
File Name	APSABVLT.001.WAD	Site Name	APISHAPA ABV LT
Start Date and Time	2012/04/10 08:53:15	Operator(s)	BRIAN EPSTEIN

Quality Control

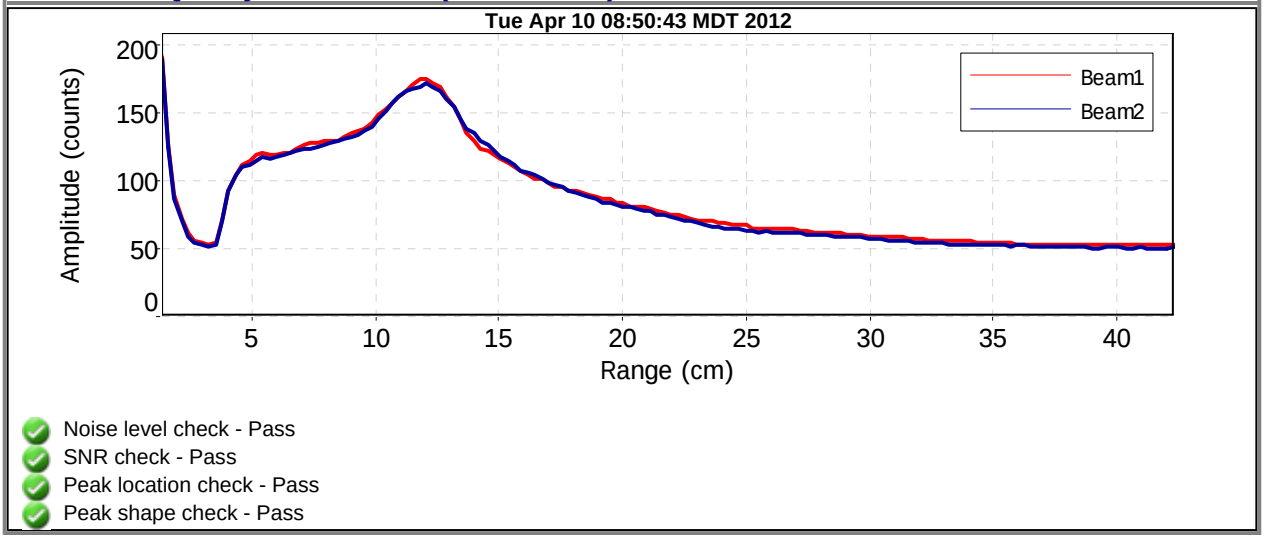
St	Loc	%Dep	Message
6	21.50	0.6	High standard error: 0.089

Discharge Measurement Summary

Date Generated: Wed Apr 11 2012

File Information		Site Details	
File Name	APSABVLT.001.WAD	Site Name	APISHAPA ABV LT
Start Date and Time	2012/04/10 08:53:15	Operator(s)	BRIAN EPSTEIN

Automatic Quality Control Test (BeamCheck)



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

Discharge Measurement Summary

Date Generated: Mon Sep 12 2011

File Information

File Name	APISRVQ2.003.WAD
Start Date and Time	2011/09/08 15:01:58

Site Details

Site Name	APISHAPA RV A U CR46
Operator(s)	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	0.7%	1.7%
Velocity	2.5%	11.8%
Width	0.2%	0.2%
Method	3.3%	-
# Stations	6.6%	-
Overall	**7.9%**	**12.0%**

Summary

Averaging Int.	40	# Stations	8
Start Edge	LEW	Total Width	1.601
Mean SNR	35.6 dB	Total Area	0.522
Mean Temp	45.83 °F	Mean Depth	0.326
Disch. Equation	Mid-Section	Mean Velocity	0.4330
		Total Discharge	**0.2261**

Supplemental Data (Gauge Height Change = 0.000ft)

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Thu Sep 8 14:54:05 MDT 2011	0.000	0.300		TEMP STAFF
2	Thu Sep 8 15:10:13 MDT 2011	2.200	0.300		
3	Thu Sep 8 15:14:52 MDT 2011	2.601	0.300		

Measurement Results

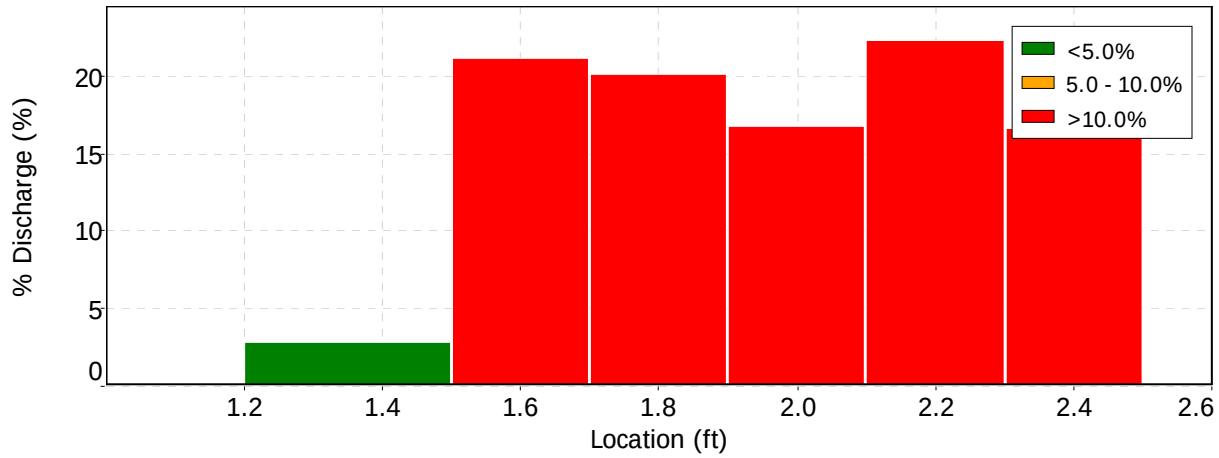
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	15:01	1.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*15:01*	*1.40*	*0.6*	*0.420*	*0.6*	*0.168*	*-0.0489*	*-1.00*	*0.0489*	*0.126*	*0.0062*	*2.7*
2	*15:04*	*1.60*	*0.6*	*0.440*	*0.6*	*0.176*	*-0.5449*	*-1.00*	*0.5449*	*0.088*	*0.0480*	*21.2*
3	*15:07*	*1.80*	*0.6*	*0.400*	*0.6*	*0.160*	*-0.5686*	*-1.00*	*0.5686*	*0.080*	*0.0455*	*20.1*
4	*15:09*	*2.00*	*0.6*	*0.380*	*0.6*	*0.152*	*0.5007*	*1.00*	*0.5007*	*0.076*	*0.0381*	*16.8*
5	15:12	2.20	0.6	0.390	0.6	0.156	0.6483	1.00	0.6483	0.078	0.0506	22.4
6	15:13	2.40	0.6	0.370	0.6	0.148	0.5102	1.00	0.5102	0.074	0.0378	16.7
7	15:13	2.60	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

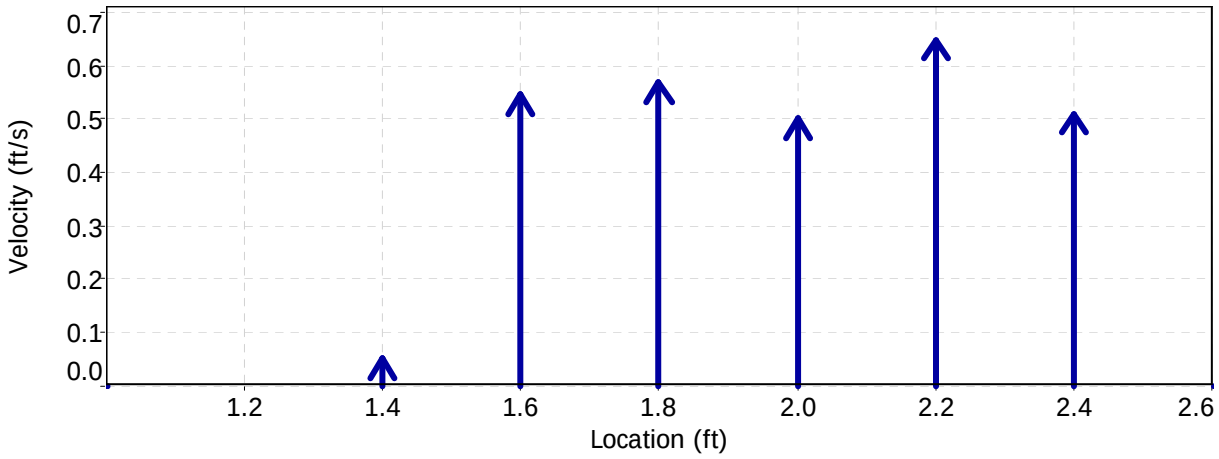
Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

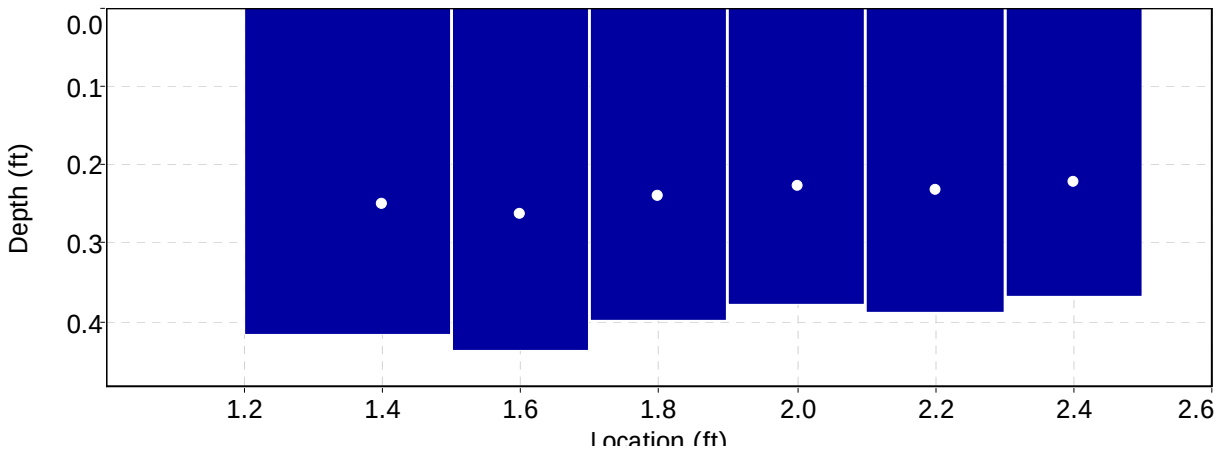
Discharge Measurement Summary

Date Generated: Mon Sep 12 2011

File Information		Site Details	
File Name	APISRVQ2.003.WAD	Site Name	APISHAPA RV A U CR46
Start Date and Time	2011/09/08 15:01:58	Operator(s)	BJE







Discharge Measurement Summary

Date Generated: Mon Sep 12 2011

File Information		Site Details	
File Name	APISRVQ2.003.WAD	Site Name	APISHAPA RV A U CR46
Start Date and Time	2011/09/08 15:01:58	Operator(s)	BJE

Quality Control

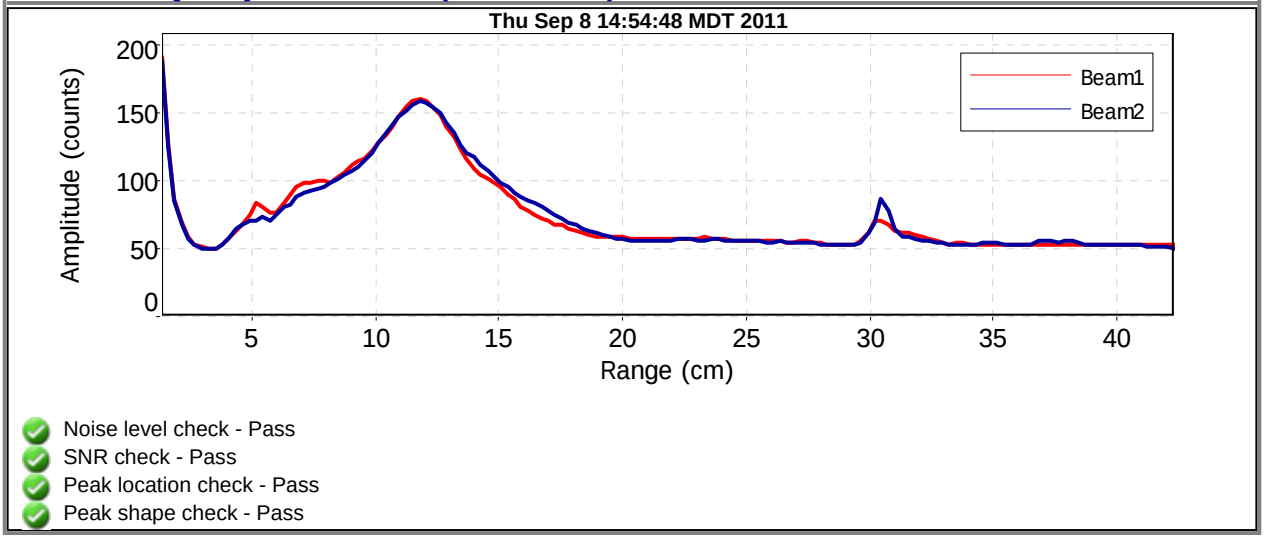
St	Loc	% Dep	Message
1	1.40	0.6	High angle: 163
2	1.60	0.6	High angle: -179
		0.6	High standard error: 0.031
3	1.80	0.6	High angle: 172
4	2.00	0.6	High standard error: 0.031

Discharge Measurement Summary

Date Generated: Mon Sep 12 2011

File Information		Site Details	
File Name	APISRVQ2.003.WAD	Site Name	APISHAPA RV A U CR46
Start Date and Time	2011/09/08 15:01:58	Operator(s)	BJE

Automatic Quality Control Test (BeamCheck)



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

The measurement was aborted because the selected cross section had an eddy on the right side.

Discharge Measurement Summary

Date Generated: Mon Sep 12 2011

File Information

File Name	APISRVQ2.002.WAD
Start Date and Time	2011/09/08 13:59:28

Site Details

Site Name	APISHAPA RV A U CR46
Operator(s)	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	0.7%	1.6%
Velocity	2.5%	19.1%
Width	0.2%	0.2%
Method	3.4%	-
# Stations	5.8%	-
Overall	**7.2%**	**19.2%**

Summary

Averaging Int.	40	# Stations	9
Start Edge	LEW	Total Width	1.751
Mean SNR	30.4 dB	Total Area	0.532
Mean Temp	45.29 °F	Mean Depth	0.304
Disch. Equation	Mid-Section	Mean Velocity	0.2966
		Total Discharge	**0.1577**

Supplemental Data (Gauge Height Change = 0.000ft)

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Thu Sep 8 13:56:58 MDT 2011	0.000	0.300		TEMP STAFF
2	Thu Sep 8 14:03:05 MDT 2011	1.650	0.300		
3	Thu Sep 8 14:12:36 MDT 2011	2.301	0.300		
4	Thu Sep 8 14:51:59 MDT 2011	2.701	0.300		ABORTED EDDY ON RGHT

Measurement Results

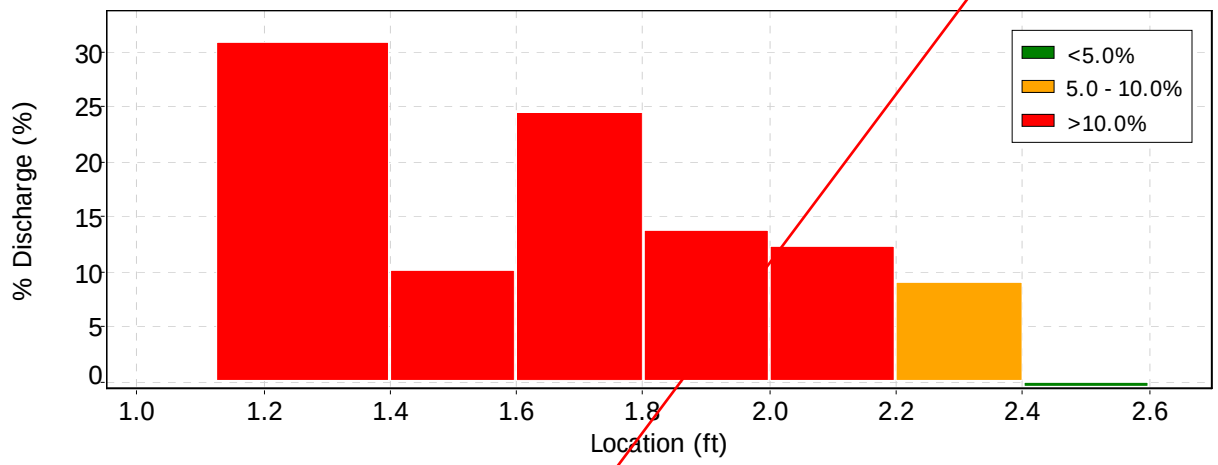
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	13:59	0.95	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*14:02*	*1.30*	*0.6*	*0.310*	*0.6*	*0.124*	*-0.5696*	*-1.00*	*0.5696*	*0.085*	*0.0485*	*30.8*
2	*14:05*	*1.50*	*0.6*	*0.350*	*0.6*	*0.140*	*-0.2274*	*-1.00*	*0.2274*	*0.070*	*0.0159*	*10.1*
3	14:07	1.70	0.6	0.390	0.6	0.156	0.4951	1.00	0.4951	0.078	0.0387	24.5
4	14:10	1.90	0.6	0.390	0.6	0.156	0.2792	1.00	0.2792	0.078	0.0218	13.8
5	14:11	2.10	0.6	0.360	0.6	0.144	0.2697	1.00	0.2697	0.072	0.0194	12.3
6	14:13	2.30	0.6	0.370	0.6	0.148	0.1932	1.00	0.1932	0.074	0.0143	9.1
7	14:14	2.50	0.6	0.370	0.6	0.148	-0.0131	1.00	-0.0131	0.074	-0.0010	-0.6
8	14:14	2.70	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

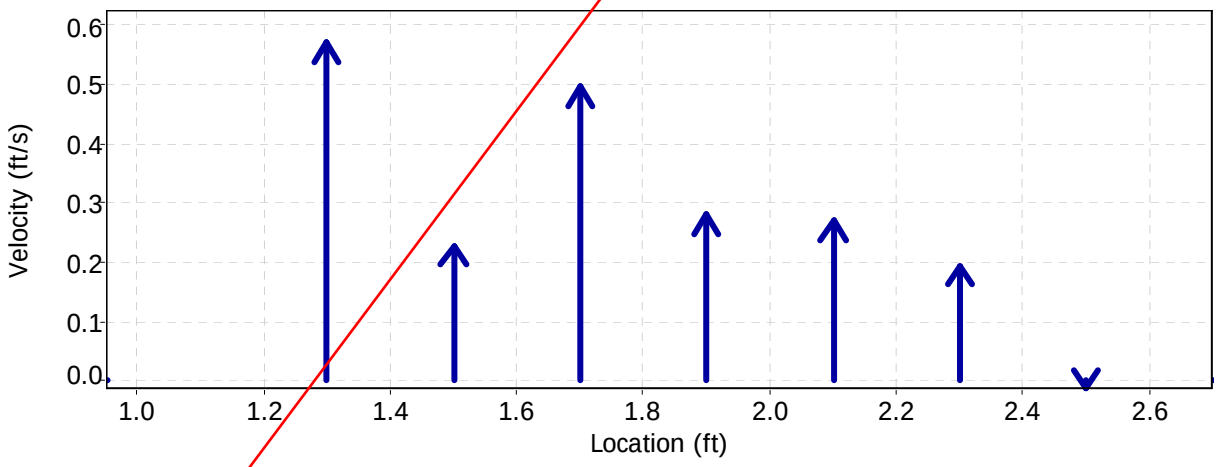
Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

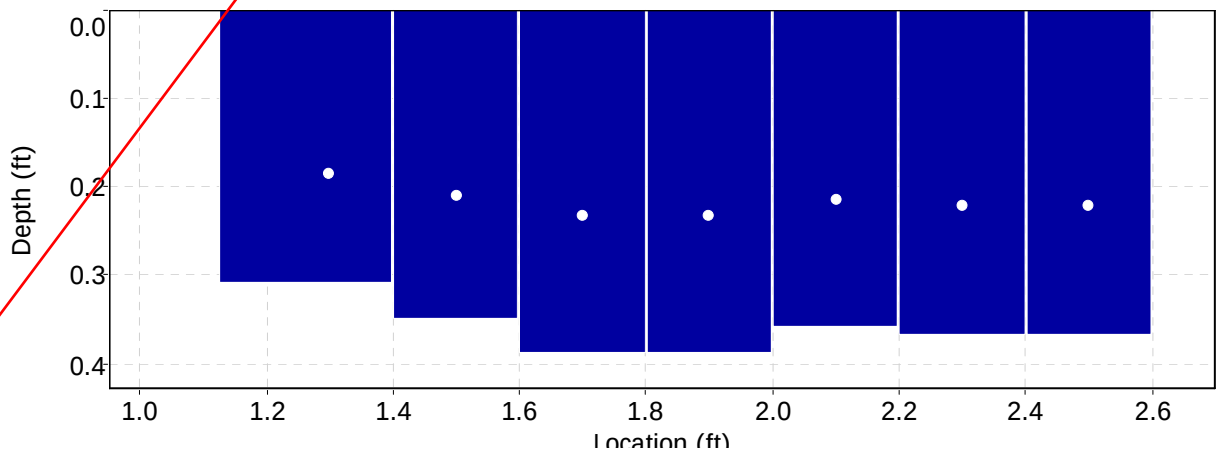
Discharge Measurement Summary

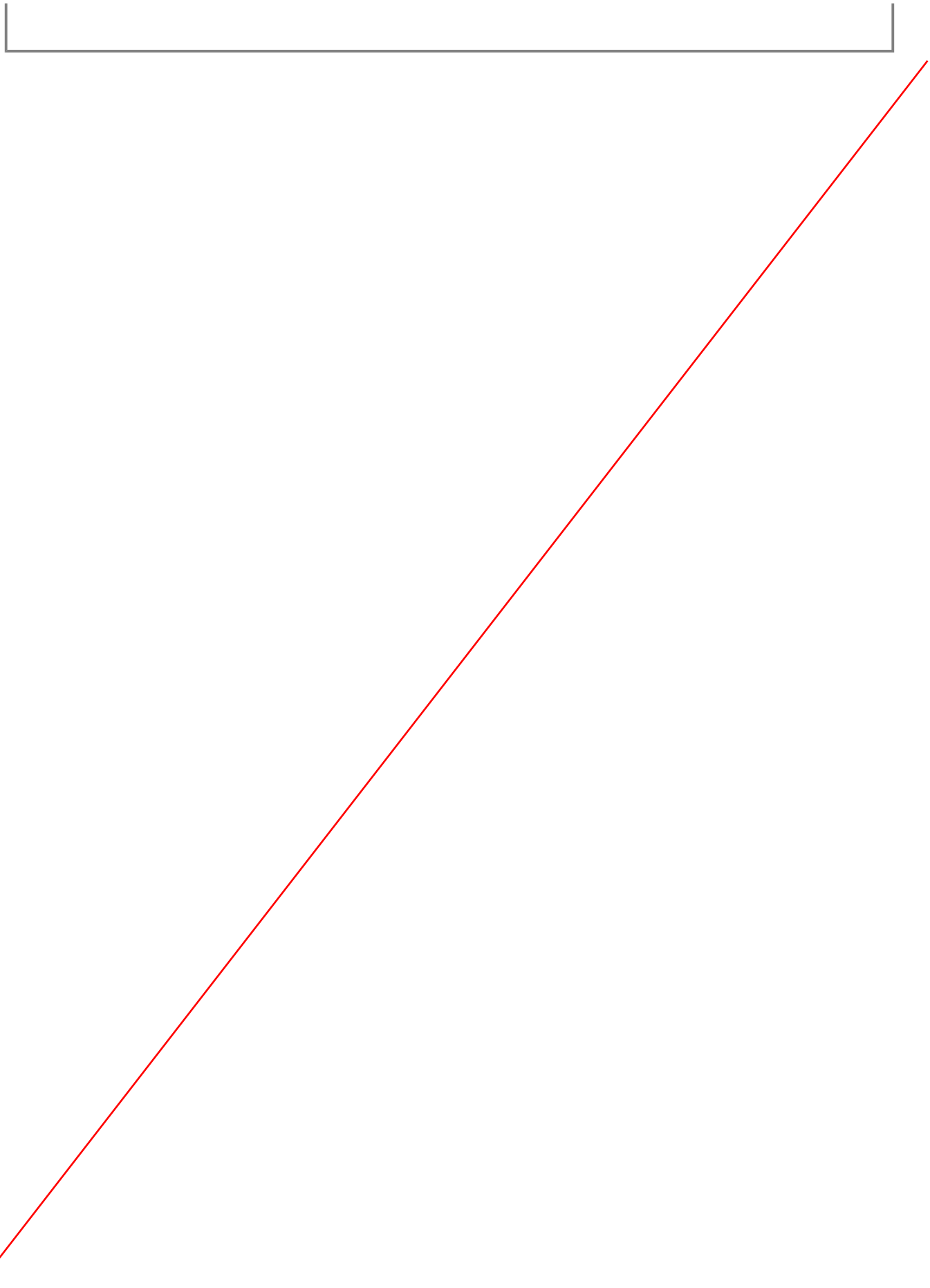
Date Generated: Mon Sep 12 2011

File Information		Site Details	
File Name	APISRVQ2.002.WAD	Site Name	APISHAPA RV A U CR46
Start Date and Time	2011/09/08 13:59:28	Operator(s)	BJE









Discharge Measurement Summary

Date Generated: Mon Sep 12 2011

File Information		Site Details	
File Name	APISRVQ2.002.WAD	Site Name	APISHAPA RV A U CR46
Start Date and Time	2011/09/08 13:59:28	Operator(s)	BJE

Quality Control

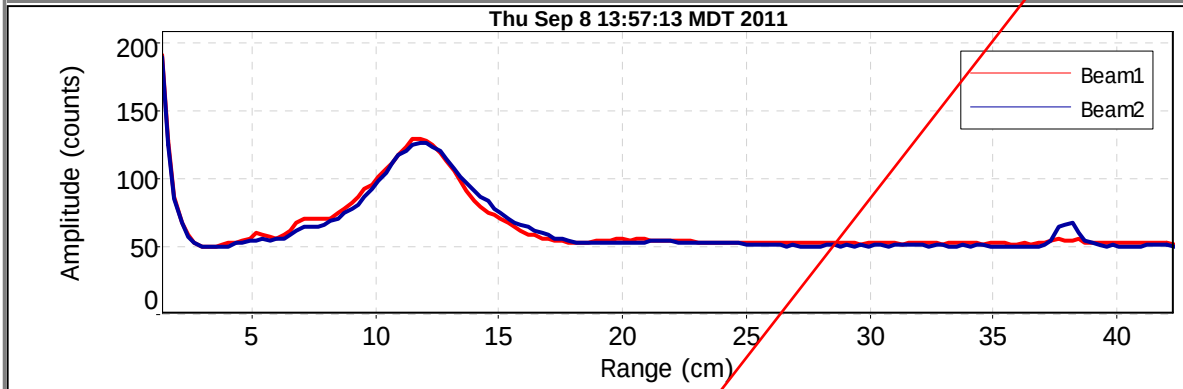
St	Loc	%Dep	Message
1	1.30	0.6	High angle: 173
2	1.50	0.6	High angle: 179

Discharge Measurement Summary

Date Generated: Mon Sep 12 2011

File Information		Site Details	
File Name	APISRVQ2.002.WAD	Site Name	APISHAPA RV A U CR46
Start Date and Time	2011/09/08 13:59:28	Operator(s)	BJE

Automatic Quality Control Test (BeamCheck)



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

2011-09-06 BJE Review Field Data: Corrections made in red.

Discharge Measurement Summary

Date Generated: Tue Sep 6 2011

File Information

File Name	APISAPAR.001.WAD
Start Date and Time	2011/09/01 13:18:16

Site Details

Site Name	APISHAPA RV
Operator(s)	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%	2.4%
Velocity	2.1%	13.7%
Width	0.2%	0.2%
Method	2.9%	-
# Stations	4.6%	-
Overall	**6.0%**	**14.0%**

Summary

Averaging Int.	40	# Stations	11
Start Edge	REW	Total Width	~~2.098~~ 2.1
Mean SNR	38.5 dB	Total Area	~~0.505~~ 0.51
Mean Temp	58.36 °F	Mean Depth	~~0.241~~ 0.27
Disch. Equation	Mid-Section	Mean Velocity	~~0.3886~~ 0.42
		Total Discharge	~~**0.1964**~~ 0.21

Supplemental Data (Gauge Height Change = 0.000ft)

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Thu Sep 1 13:15:10 MDT 2011	0.000	0.190		TEMP STAFF
2	Thu Sep 1 13:22:58 MDT 2011	2.899	0.190		
3	Thu Sep 1 13:34:54 MDT 2011	3.898	0.190		LAST 3 STA MTR RVRS

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	13:18	1.80	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*13:18*	*2.10*	*0.6*	*0.280*	*0.6*	*0.112*	*0.4121*	*1.00*	*0.4121*	*0.070*	*0.0288*	*14.7*
2	13:19	2.30	0.6	0.280	0.6	0.112	0.5794	1.00	0.5794	0.056	0.0324	16.5
3	13:20	2.50	0.6	0.230	0.6	0.092	0.6079	1.00	0.6079	0.046	0.0279	14.2
4	13:21	2.70	0.6	0.240	0.6	0.096	0.7165	1.00	0.7165	0.048	0.0344	17.5
5	*13:23*	*2.90*	*0.6*	*0.260*	*0.6*	*0.104*	*0.4925*	*1.00*	*0.4925*	*0.052*	*0.0256*	*13.0*
6	13:24	3.10	0.6	0.310	0.6	0.124	0.1247	1.00	0.1247	0.062	0.0077	3.9
7	*13:27*	*3.30*	*0.6*	*0.310*	*0.6*	*0.124*	*-0.4849*	*-1.00*	*0.4849*	*0.062*	*0.0300*	*15.3*
8	*13:29*	*3.50*	*0.6*	*0.300*	*0.6*	*0.120*	*-0.2575*	*-1.00*	*0.2575*	*0.060*	*0.0154*	*7.9*
9	*13:31*	*3.70*	*0.6*	*0.250*	*0.6*	*0.100*	*-0.1175*	*1.00*	*-0.1175*	*0.050*	*-0.0059*	*-3.0*
10	13:31	3.90	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

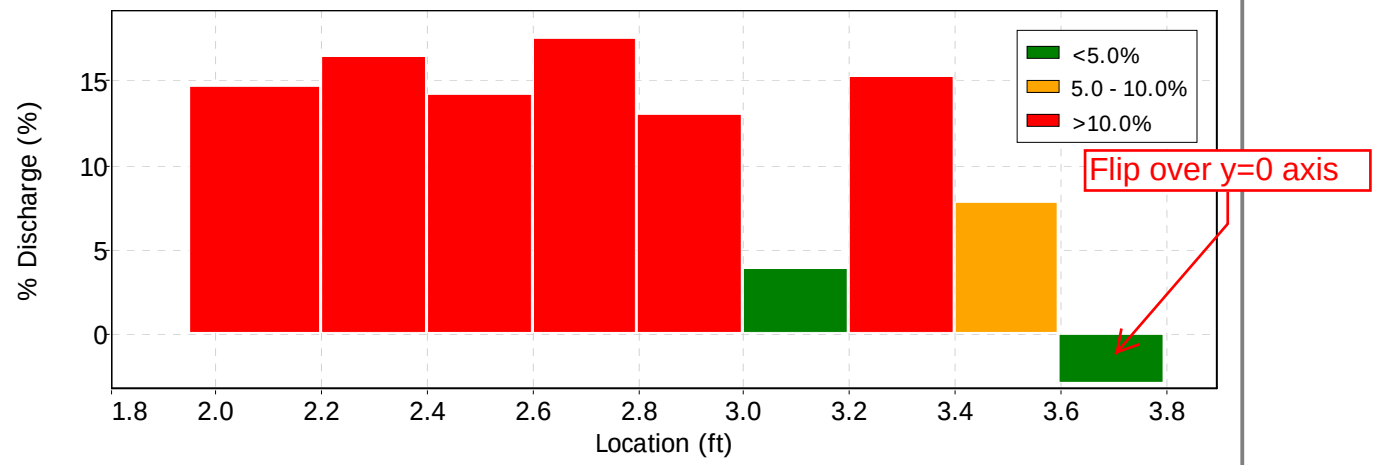
Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

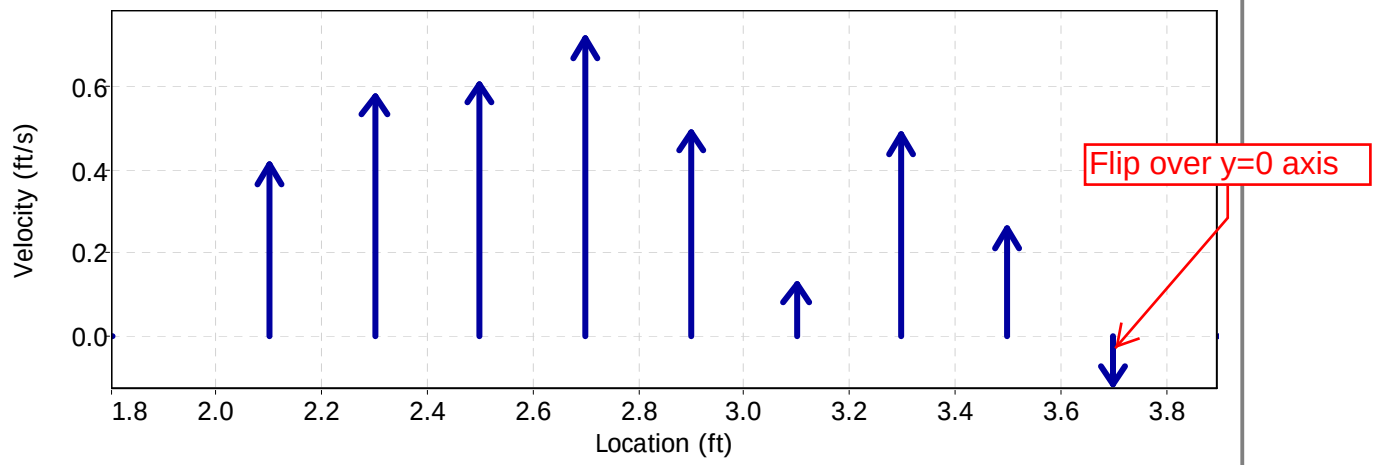
Correction factor should have been -1.0. (BJE 9/6 review)

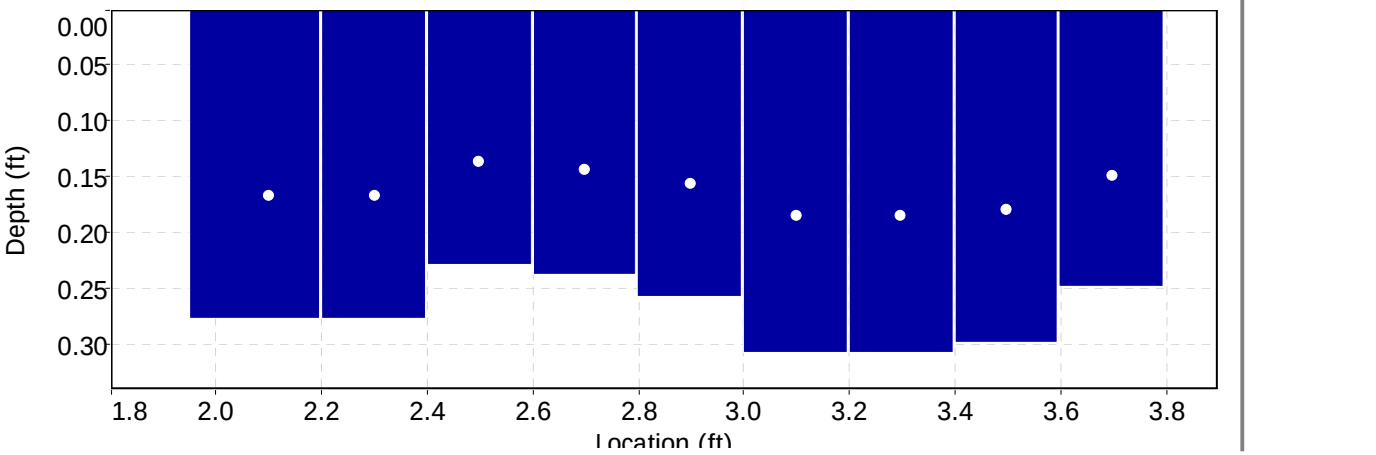
Discharge Measurement Summary

Date Generated: Tue Sep 6 2011

File Information		Site Details	
File Name	APISAPAR.001.WAD	Site Name	APISHAPA RV
Start Date and Time	2011/09/01 13:18:16	Operator(s)	BJE







Discharge Measurement Summary

Date Generated: Tue Sep 6 2011

File Information		Site Details	
File Name	APISAPAR.001.WAD	Site Name	APISHAPA RV
Start Date and Time	2011/09/01 13:18:16	Operator(s)	BJE

Quality Control

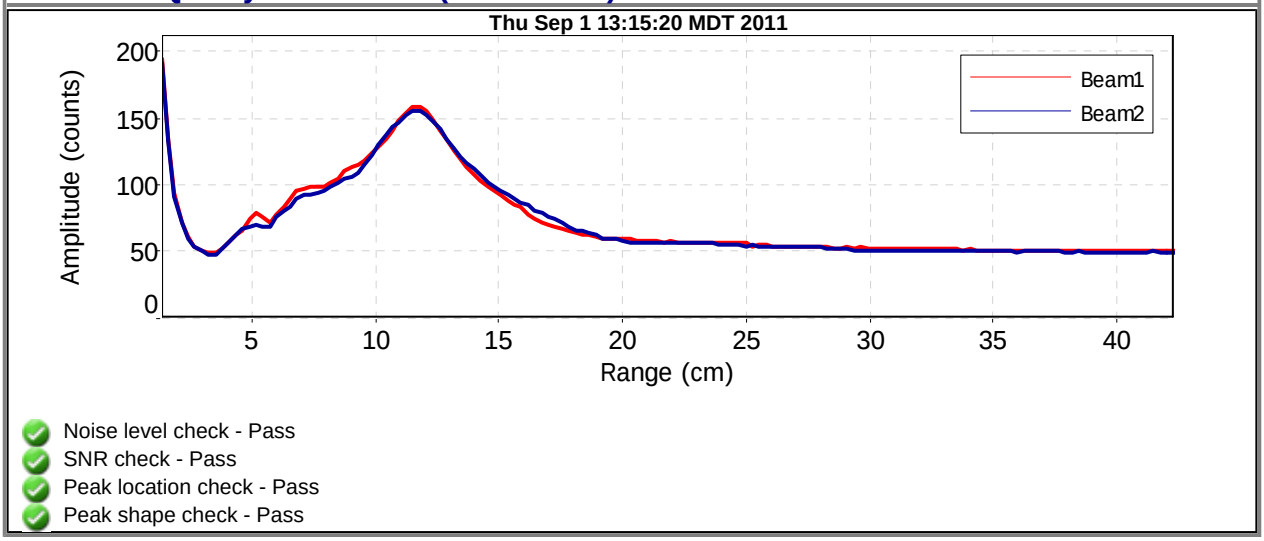
St	Loc	%Dep	Message
1	2.10	0.6	High standard error: 0.030
5	2.90	0.6	High standard error: 0.030
7	3.30	0.6	High angle: -178
8	3.50	0.6	High angle: -176
9	3.70	0.6	High angle: -179

Discharge Measurement Summary

Date Generated: Tue Sep 6 2011

File Information		Site Details	
File Name	APISAPAR.001.WAD	Site Name	APISHAPA RV
Start Date and Time	2011/09/01 13:18:16	Operator(s)	BJE

Automatic Quality Control Test (BeamCheck)



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

Discharge Measurement Summary

Date Generated: Mon Nov 25 2013

File Information

File Name	APISRV21.009.WAD
Start Date and Time	2013/10/30 09:37:19

Site Details

Site Name	
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	0.5%	3.0%
Velocity	1.3%	9.6%
Width	0.2%	0.2%
Method	2.3%	-
# Stations	3.6%	-
Overall	**4.6%**	**10.1%**

Summary

Averaging Int.	40	# Stations	14
Start Edge	REW	Total Width	4.300
Mean SNR	33.2 dB	Total Area	1.027
Mean Temp	33.66 °F	Mean Depth	0.239
Disch. Equation	Mid-Section	Mean Velocity	0.5727
		Total Discharge	**0.5879**

Measurement Results

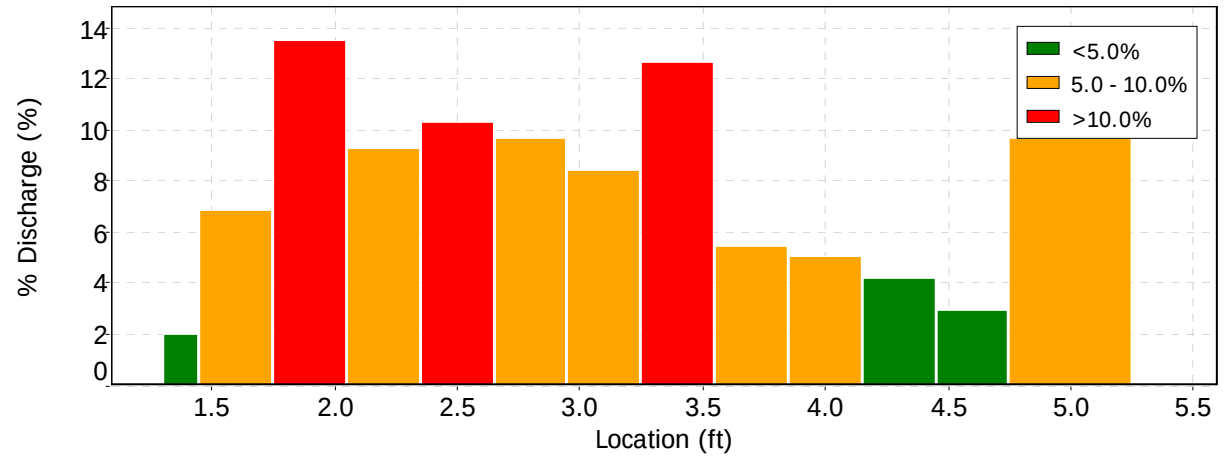
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	09:37	1.30	None	0.175	0.0	0.0	0.0000	1.00	0.4462	0.026	0.0117	2.0
1	*09:46*	*1.60*	*0.6*	*0.300*	*0.6*	*0.120*	*0.4462*	*1.00*	*0.4462*	*0.090*	*0.0402*	*6.8*
2	09:50	1.90	0.6	0.300	0.6	0.120	0.8842	1.00	0.8842	0.090	0.0796	13.5
3	*09:52*	*2.20*	*0.6*	*0.320*	*0.6*	*0.128*	*0.5669*	*1.00*	*0.5669*	*0.096*	*0.0544*	*9.3*
4	09:54	2.50	0.6	0.250	0.6	0.100	0.8097	1.00	0.8097	0.075	0.0608	10.3
5	*09:57*	*2.80*	*0.6*	*0.280*	*0.6*	*0.112*	*0.6765*	*1.00*	*0.6765*	*0.084*	*0.0568*	*9.7*
6	09:58	3.10	0.6	0.300	0.6	0.120	0.5515	1.00	0.5515	0.090	0.0496	8.4
7	10:00	3.40	0.6	0.320	0.6	0.128	0.7759	1.00	0.7759	0.096	0.0745	12.7
8	10:01	3.70	0.6	0.320	0.6	0.128	0.3327	1.00	0.3327	0.096	0.0319	5.4
9	10:02	4.00	0.6	0.250	0.6	0.100	0.3967	1.00	0.3967	0.075	0.0298	5.1
10	10:05	4.30	0.6	0.160	0.6	0.064	0.5092	1.00	0.5092	0.048	0.0245	4.2
11	10:06	4.60	0.6	0.200	0.6	0.080	0.2838	1.00	0.2838	0.060	0.0170	2.9
12	*10:10*	*4.90*	*0.6*	*0.200*	*0.6*	*0.080*	*-0.5702*	*-1.00*	*0.5702*	*0.100*	*0.0569*	*9.7*
13	10:10	5.60	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

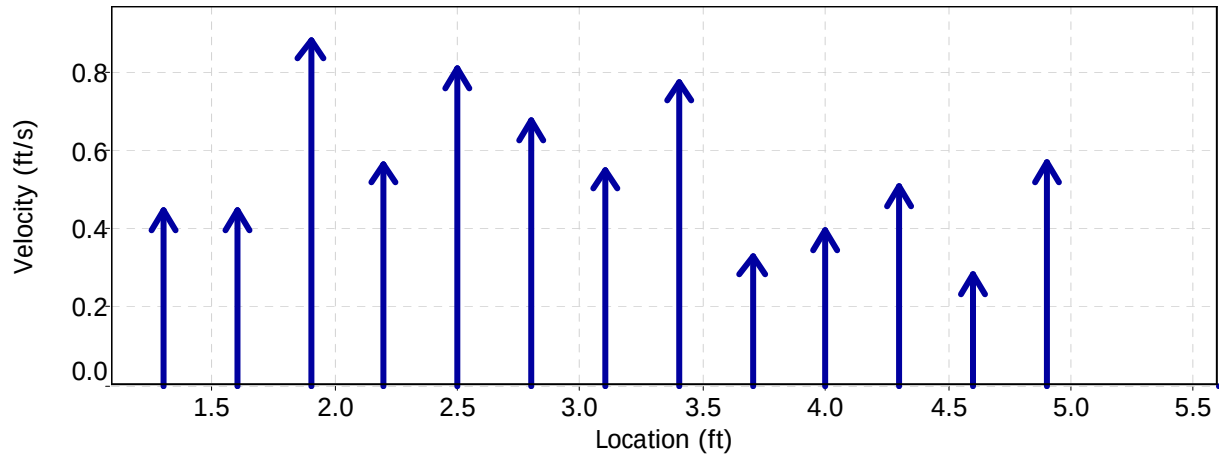
Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

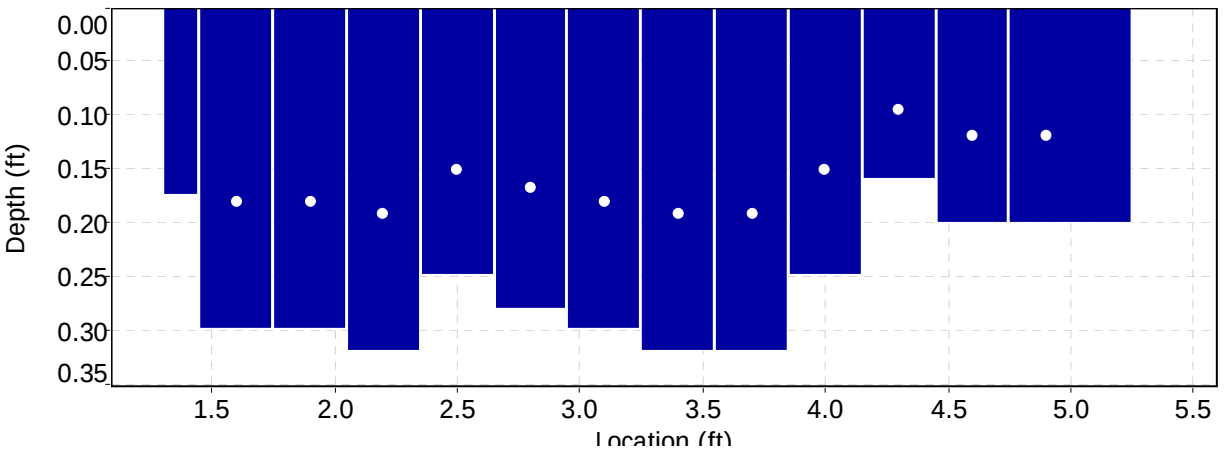
Discharge Measurement Summary

Date Generated: Mon Nov 25 2013

File Information		Site Details	
File Name	APISRV21.009.WAD	Site Name	
Start Date and Time	2013/10/30 09:37:19	Operator(s)	BRIAN EPSTEIN







Discharge Measurement Summary

Date Generated: Mon Nov 25 2013

File Information	
File Name	APISRV21.009.WAD
Start Date and Time	2013/10/30 09:37:19

Site Details	
Site Name	
Operator(s)	BRIAN EPSTEIN

Quality Control

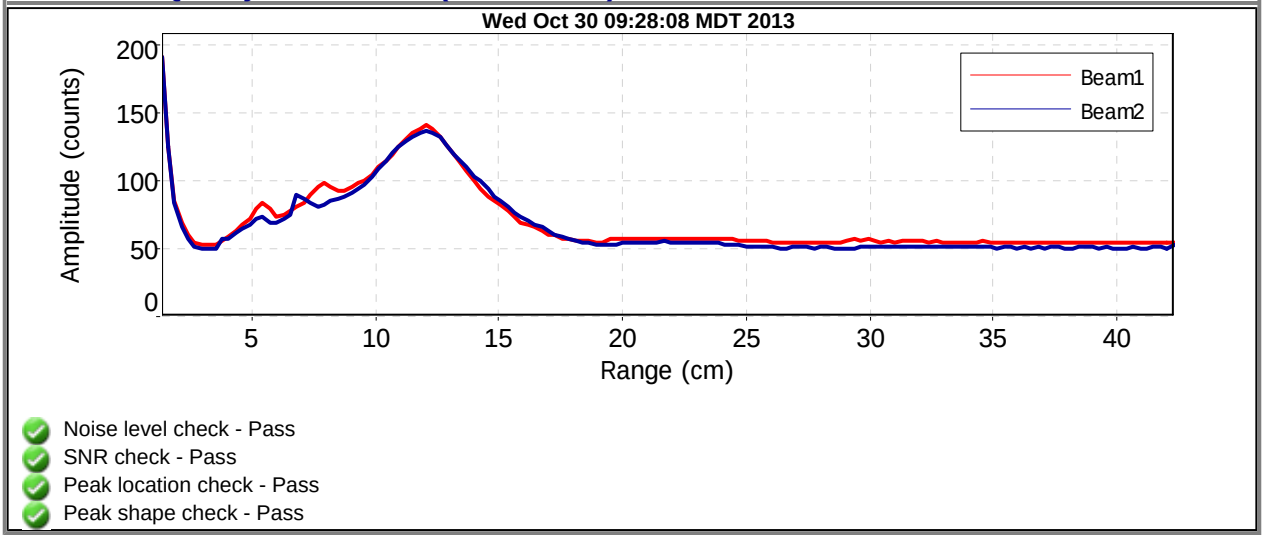
St	Loc	%Dep	Message
1	1.60	0.6	High standard error: 0.037
3	2.20	0.6	High standard error: 0.030
5	2.80	0.6	High standard error: 0.036
12	4.90	0.6	High angle: -172

Discharge Measurement Summary

Date Generated: Mon Nov 25 2013

File Information		Site Details	
File Name	APISRV21.009.WAD	Site Name	
Start Date and Time	2013/10/30 09:37:19	Operator(s)	BRIAN EPSTEIN

Automatic Quality Control Test (BeamCheck)



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

Discharge Measurement Summary

Date Generated: Mon Nov 25 2013

File Information

File Name	APISRVQ1.008.WAD
Start Date and Time	2013/07/08 15:21:22

Site Details

Site Name	
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	0.7%	5.7%
Velocity	1.6%	9.8%
Width	0.2%	0.2%
Method	3.6%	-
# Stations	6.6%	-
Overall	**7.8%**	**11.4%**

Summary

Averaging Int.	40	# Stations	8
Start Edge	REW	Total Width	3.300
Mean SNR	26.3 dB	Total Area	0.590
Mean Temp	56.76 °F	Mean Depth	0.179
Disch. Equation	Mid-Section	Mean Velocity	0.2412
		Total Discharge	**0.1423**

Measurement Results

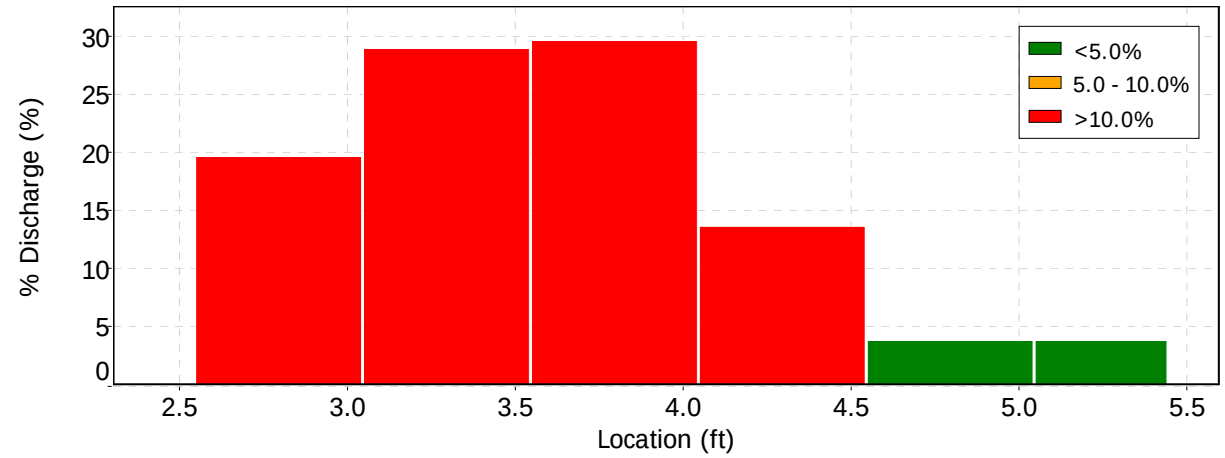
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	15:21	2.30	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	15:21	2.80	0.6	0.260	0.6	0.104	0.2169	1.00	0.2169	0.130	0.0282	19.8
2	15:24	3.30	0.6	0.320	0.6	0.128	0.2589	1.00	0.2589	0.160	0.0414	29.1
3	15:25	3.80	0.6	0.250	0.6	0.100	0.3389	1.00	0.3389	0.125	0.0424	29.8
4	15:29	4.30	0.6	0.160	0.6	0.064	0.2438	1.00	0.2438	0.080	0.0195	13.7
5	15:31	4.80	0.6	0.110	0.6	0.044	0.0988	1.00	0.0988	0.055	0.0054	3.8
6	*15:34*	*5.30*	*0.6*	*0.100*	*0.6*	*0.040*	*-0.1355*	*-1.00*	*0.1355*	*0.040*	*0.0054*	*3.8*
7	15:34	5.60	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

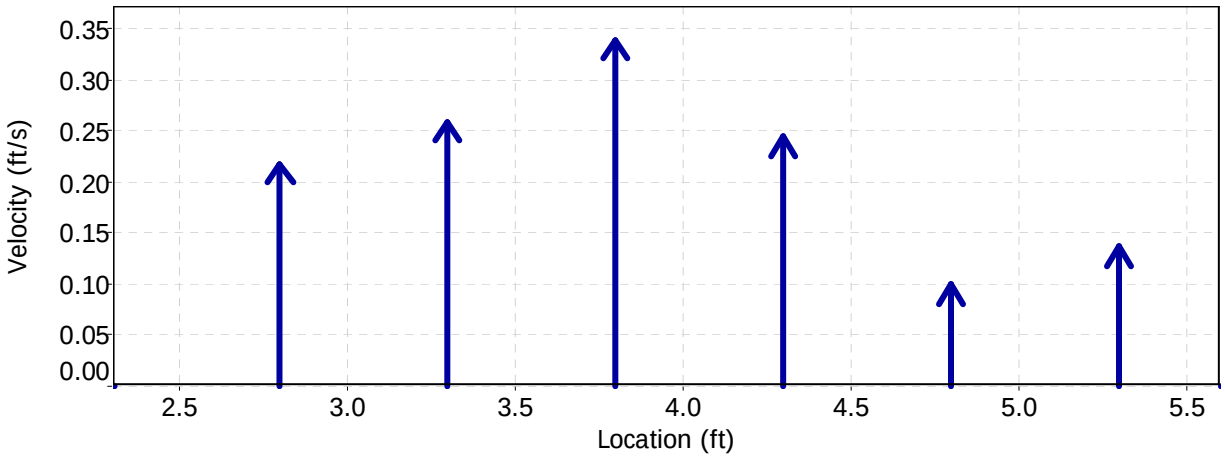
Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

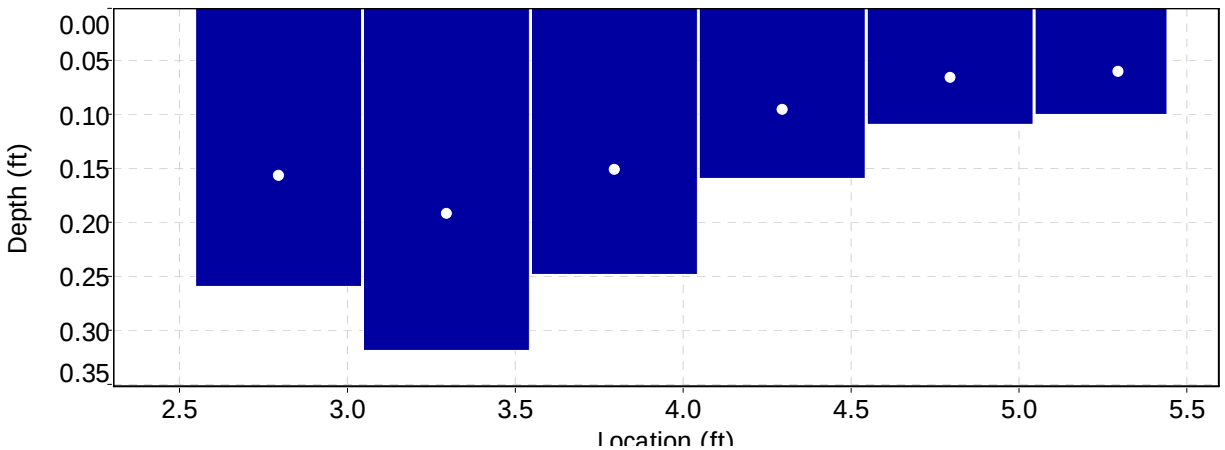
Discharge Measurement Summary

Date Generated: Mon Nov 25 2013

File Information		Site Details	
File Name	APISRVQ1.008.WAD	Site Name	
Start Date and Time	2013/07/08 15:21:22	Operator(s)	BRIAN EPSTEIN







Discharge Measurement Summary

Date Generated: Mon Nov 25 2013

File Information		Site Details	
File Name	APISRVQ1.008.WAD	Site Name	
Start Date and Time	2013/07/08 15:21:22	Operator(s)	BRIAN EPSTEIN

Quality Control

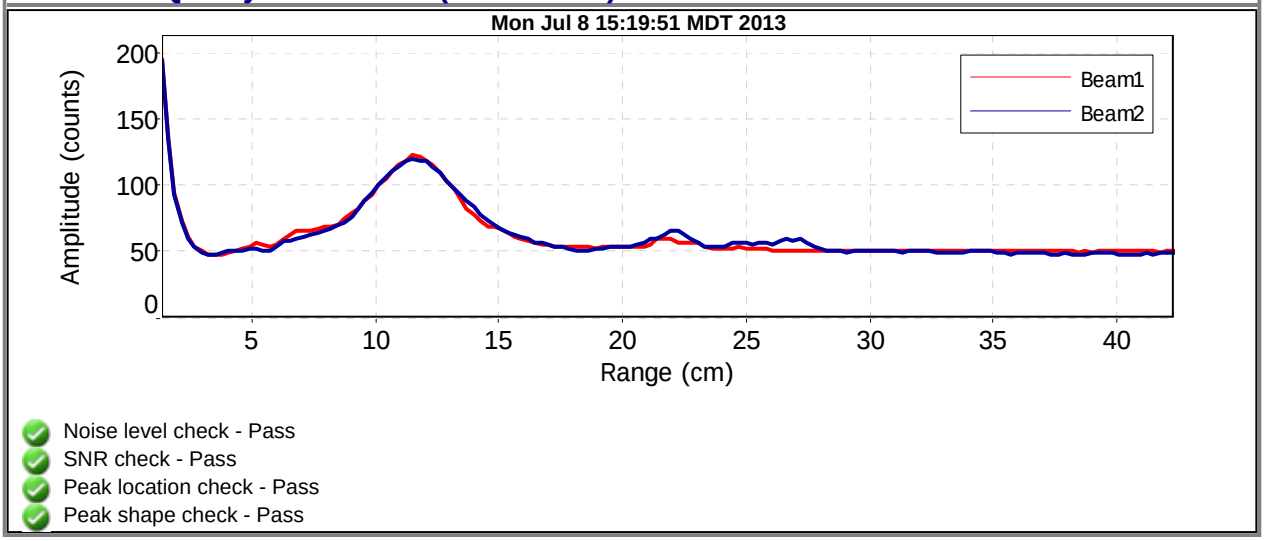
St	Loc	%Dep	Message
6	5.30	0.6	High angle: -163

Discharge Measurement Summary

Date Generated: Mon Nov 25 2013

File Information		Site Details	
File Name	APISRVQ1.008.WAD	Site Name	
Start Date and Time	2013/07/08 15:21:22	Operator(s)	BRIAN EPSTEIN

Automatic Quality Control Test (BeamCheck)



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

Discharge Measurement Summary

Date Generated: Mon Nov 25 2013

File Information

File Name	APISRVQ1.007.WAD
Start Date and Time	2013/05/30 14:23:27

Site Details

Site Name	APISHAPA ABV OLV CNY
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%	3.9%
Velocity	1.3%	4.9%
Width	0.2%	0.2%
Method	2.8%	-
# Stations	4.6%	-
Overall	**5.6%**	**6.3%**

Summary

Averaging Int.	40	# Stations	11
Start Edge	REW	Total Width	5.400
Mean SNR	33.3 dB	Total Area	1.344
Mean Temp	54.52 °F	Mean Depth	0.249
Disch. Equation	Mid-Section	Mean Velocity	0.4664
		Total Discharge	**0.6270**

Supplemental Data (Gauge Height Change = 0.000ft)

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Thu May 30 14:21:39 MDT 2013	1.900	0.640		
2	Thu May 30 14:36:34 MDT 2013	6.000	0.640		

Measurement Results

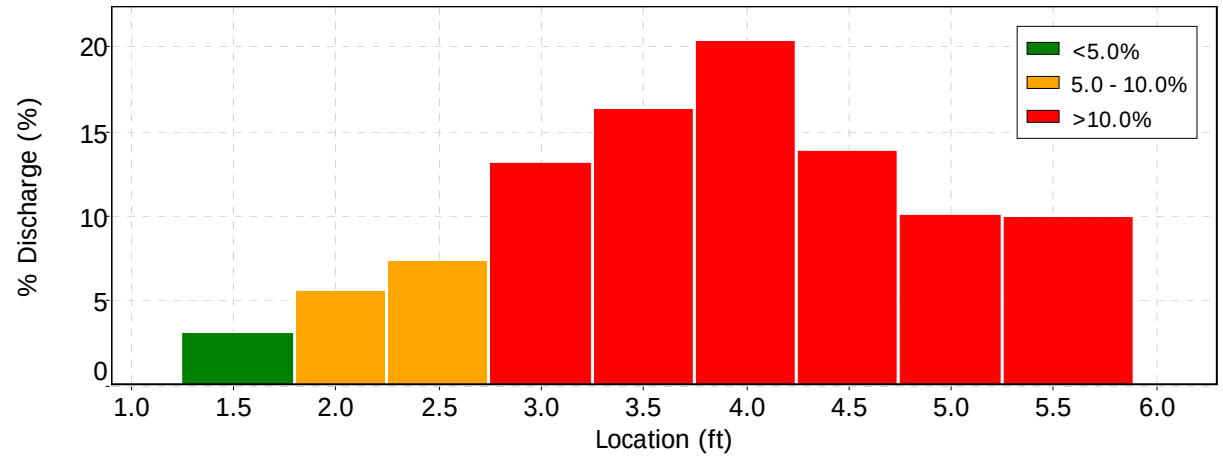
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	14:23	0.90	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	14:23	1.60	0.6	0.250	0.6	0.100	0.1444	1.00	0.1444	0.138	0.0199	3.2
2	14:24	2.00	0.6	0.350	0.6	0.140	0.2251	1.00	0.2251	0.158	0.0355	5.7
3	14:26	2.50	0.6	0.320	0.6	0.128	0.2890	1.00	0.2890	0.160	0.0462	7.4
4	14:27	3.00	0.6	0.300	0.6	0.120	0.5499	1.00	0.5499	0.150	0.0824	13.1
5	14:28	3.50	0.6	0.310	0.6	0.124	0.6604	1.00	0.6604	0.155	0.1024	16.3
6	14:29	4.00	0.6	0.320	0.6	0.128	0.7999	1.00	0.7999	0.160	0.1279	20.4
7	14:31	4.50	0.6	0.260	0.6	0.104	0.6686	1.00	0.6686	0.130	0.0869	13.9
8	14:34	5.00	0.6	0.290	0.6	0.116	0.4350	1.00	0.4350	0.145	0.0631	10.1
9	14:35	5.50	0.6	0.230	0.6	0.092	0.4199	1.00	0.4199	0.149	0.0628	10.0
10	14:35	6.30	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

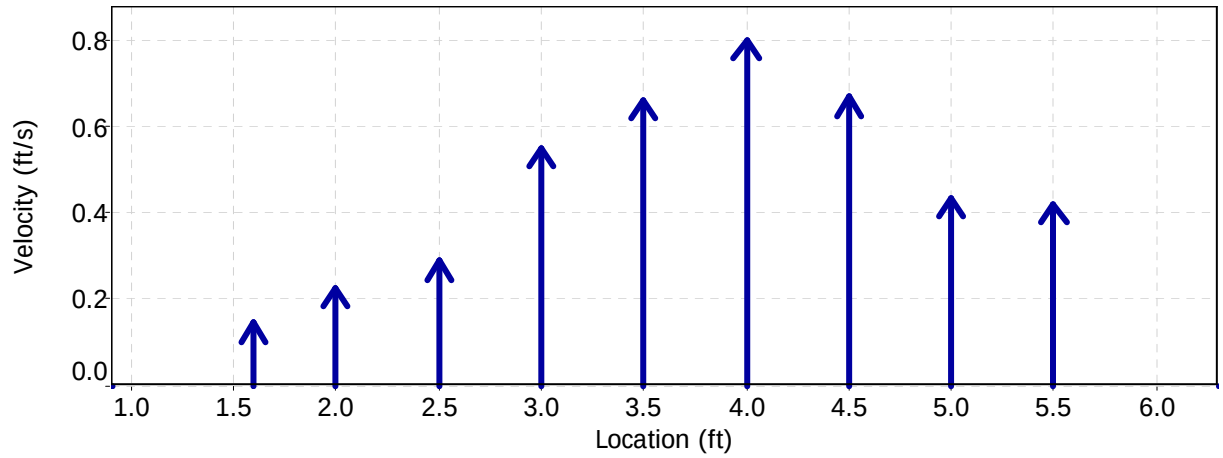
Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

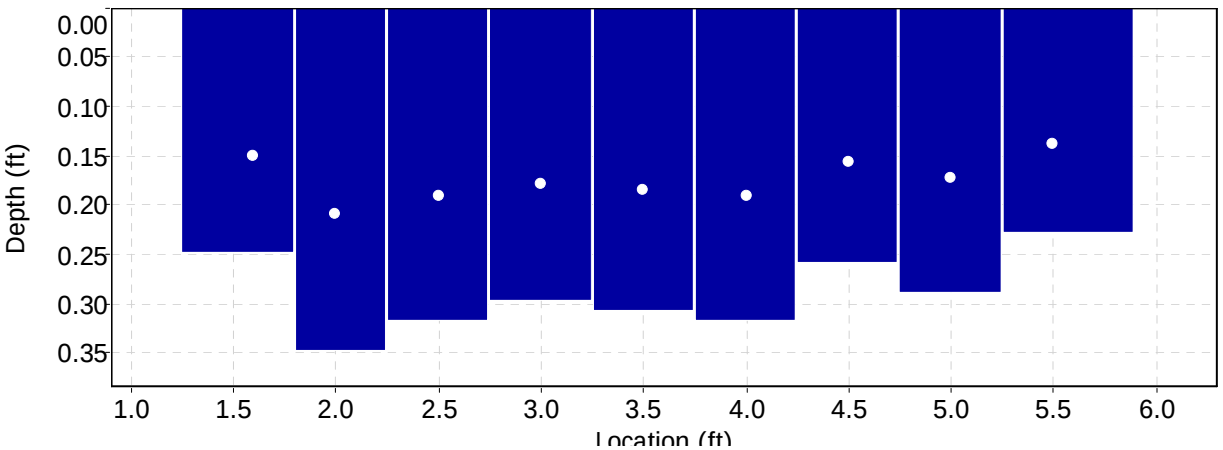
Discharge Measurement Summary

Date Generated: Mon Nov 25 2013

File Information		Site Details	
File Name	APISRVQ1.007.WAD	Site Name	APISHAPA ABV OLV CNY
Start Date and Time	2013/05/30 14:23:27	Operator(s)	BRIAN EPSTEIN







Discharge Measurement Summary

Date Generated: Mon Nov 25 2013

File Information		Site Details	
File Name	APISRVQ1.007.WAD	Site Name	APISHAPA ABV OLV CNY
Start Date and Time	2013/05/30 14:23:27	Operator(s)	BRIAN EPSTEIN

Quality Control

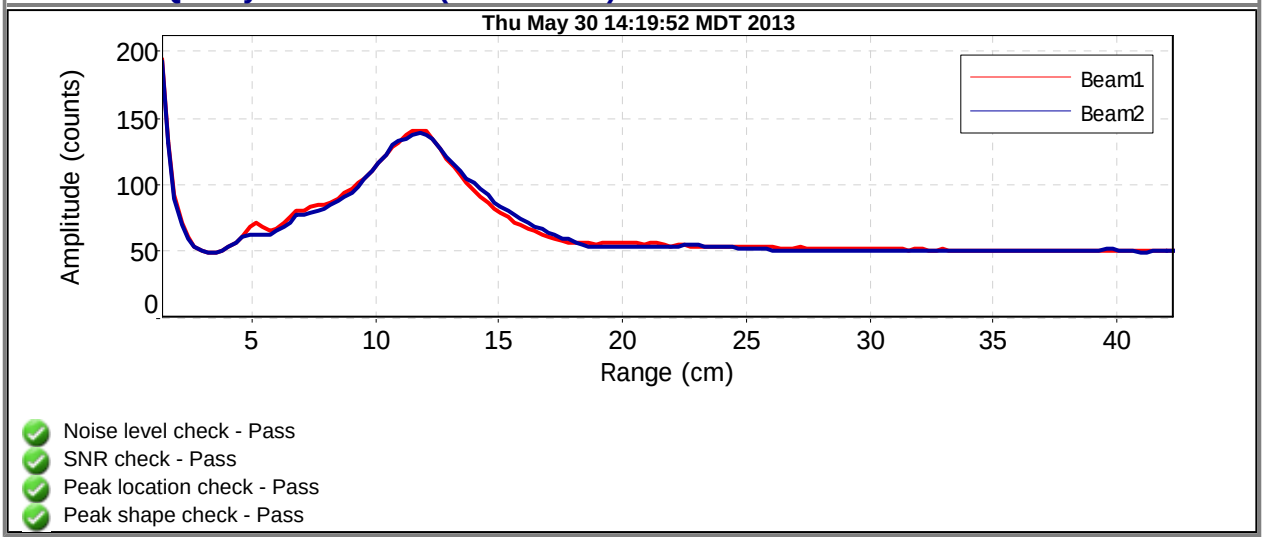
No Quality Control warnings

Discharge Measurement Summary

Date Generated: Mon Nov 25 2013

File Information		Site Details	
File Name	APISRVQ1.007.WAD	Site Name	APISHAPA ABV OLV CNY
Start Date and Time	2013/05/30 14:23:27	Operator(s)	BRIAN EPSTEIN

Automatic Quality Control Test (BeamCheck)



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

Discharge Measurement Summary

Date Generated: Mon Nov 25 2013

File Information

File Name	APISRVQ1.006.WAD
Start Date and Time	2013/04/29 18:46:06

Site Details

Site Name	APISHAPA RV ABV LT
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	0.8%	2.4%
Velocity	1.0%	7.9%
Width	0.3%	0.3%
Method	3.8%	-
# Stations	9.4%	-
Overall	**10.3%**	**8.3%**

Summary

Averaging Int.	40	# Stations	6
Start Edge	REW	Total Width	1.400
Mean SNR	38.4 dB	Total Area	0.446
Mean Temp	46.06 °F	Mean Depth	0.318
Disch. Equation	Mid-Section	Mean Velocity	1.7726
		Total Discharge	**0.7900**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Mon Apr 29 18:51:58 MDT 2013	3.001			REVERSE METER

Measurement Results

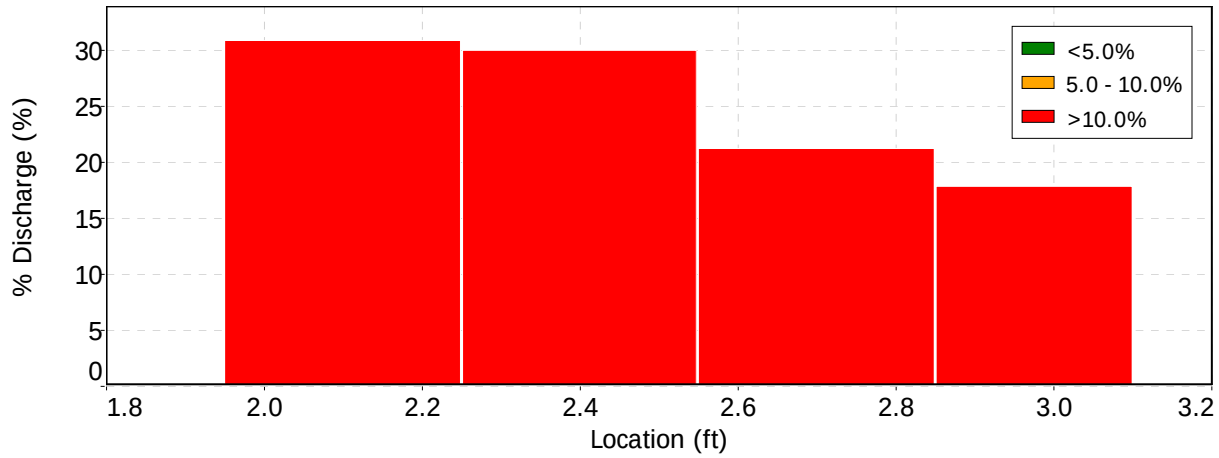
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	18:46	1.80	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	18:46	2.10	0.6	0.400	0.6	0.160	2.0354	1.00	2.0354	0.120	0.2444	30.9
2	18:47	2.40	0.6	0.410	0.6	0.164	1.9288	1.00	1.9288	0.123	0.2375	30.1
3	18:49	2.70	0.6	0.400	0.6	0.160	1.3927	1.00	1.3927	0.120	0.1672	21.2
4	*18:52*	*3.00*	*0.6*	*0.330*	*0.6*	*0.132*	*-1.7096*	*-1.00*	*1.7096*	*0.082*	*0.1410*	*17.8*
5	18:52	3.20	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

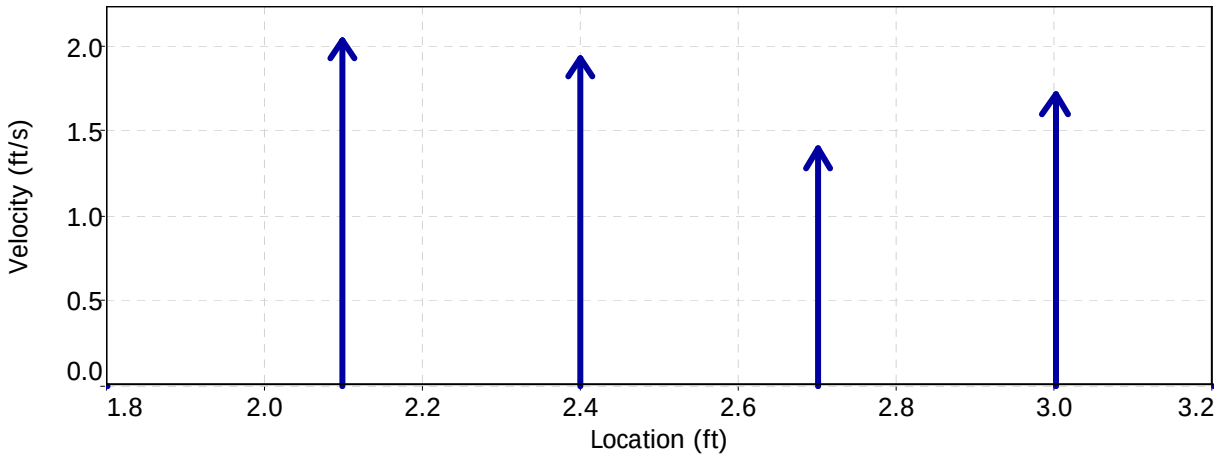
Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

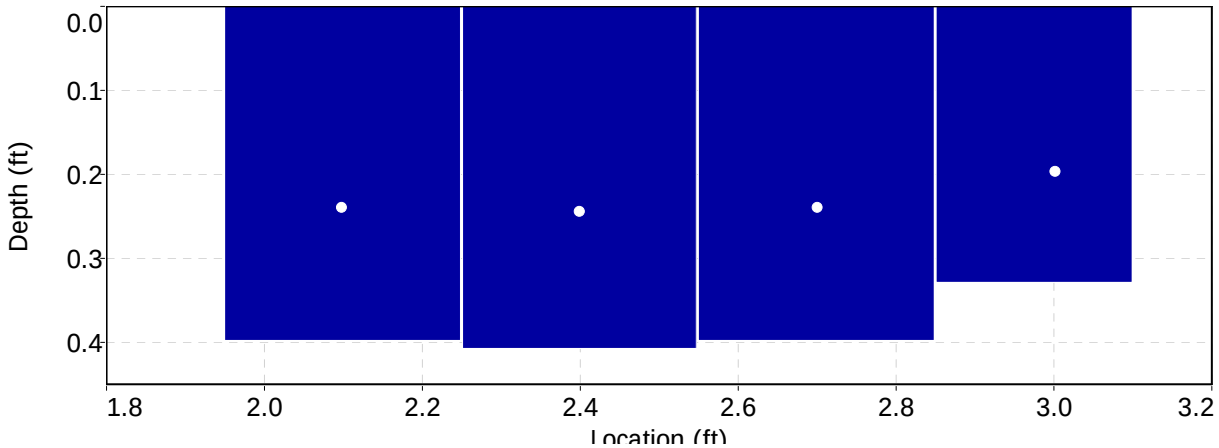
Discharge Measurement Summary

Date Generated: Mon Nov 25 2013

File Information		Site Details	
File Name	APISRVQ1.006.WAD	Site Name	APISHAPA RV ABV LT
Start Date and Time	2013/04/29 18:46:06	Operator(s)	BRIAN EPSTEIN







Discharge Measurement Summary

Date Generated: Mon Nov 25 2013

File Information	
File Name	APISRVQ1.006.WAD
Start Date and Time	2013/04/29 18:46:06

Site Details	
Site Name	APISHAPA RV ABV LT
Operator(s)	BRIAN EPSTEIN

Quality Control

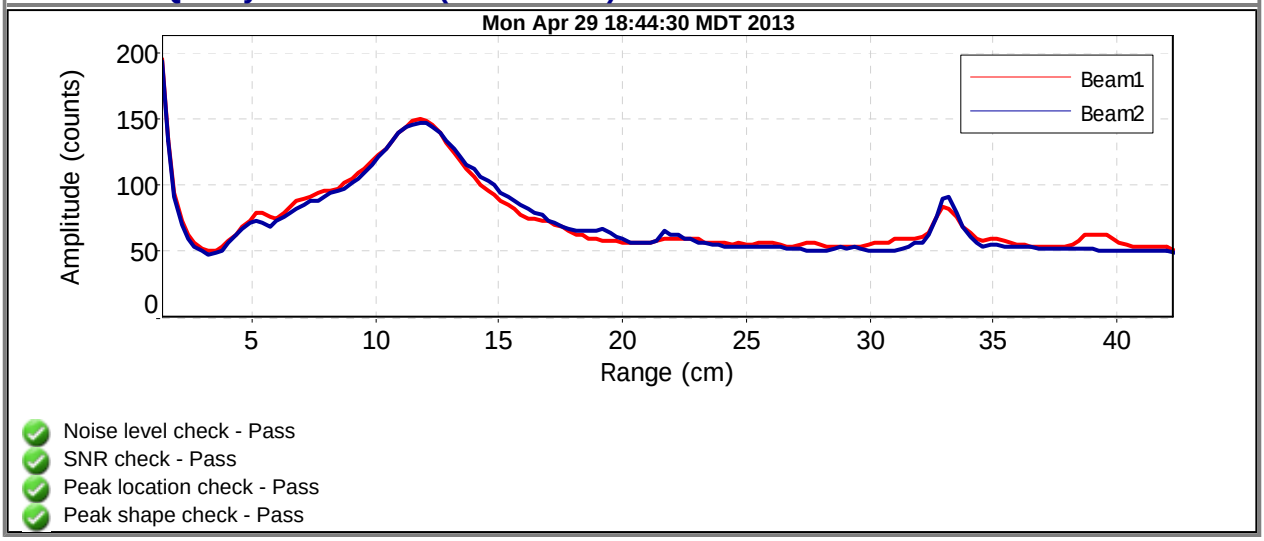
St	Loc	%Dep	Message
4	3.00	0.6	High angle: -170

Discharge Measurement Summary

Date Generated: Mon Nov 25 2013

File Information		Site Details	
File Name	APISRVQ1.006.WAD	Site Name	APISHAPA RV ABV LT
Start Date and Time	2013/04/29 18:46:06	Operator(s)	BRIAN EPSTEIN

Automatic Quality Control Test (BeamCheck)



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

Station Num.	State of Colorado **Colorado Water Conservation Board** ADV Discharge Measurement Notes	Meas. No.: 001 Comp. By: BJE Checked By:

Station Name: Apish RV Q1
Apishapa
(River), Creek, Canal, Ditch
At, Near, (Above) Below: diver Canyon
Latitude: N37°99'41.34" Longitude: W104°58'19.23"
Date: 9/1/2011 Party: Brian Epstein

Conditions

Weather: 83°F Calm Partly Cloudy
Wind Spd / Dir: 0 mph / 0° Water Temp: 58.2°F
X-Sec Desc: Sand bottom with boulders
Flow Conds: laminar
Control Desc.: ~~Ap~~ rock/boulder bar below temp gage

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

Gage Reading

Time	Temp check Outside	Inside	Encoder	Recorder	Other
13:07	0.19				
13:40	0.19				
13:41	0.19				
change	0.0				
Weighted MGH	0.19				
GH Corr.	NA				
Correct MGH	NA				

Discharge Measurement

Manufacturer:	SonTek	Model:	FlowTracker	S/N:	(P2354) P2355
Firmware:	3.7	Software:	2.20		APISAPAR.000
Diag Test File:	Yes		Raw Data File:	~~APISHAPA.001~~	
Meas Type:	(Wading) / Boat / Bridge / Cableway			Method:	0.6
at temp. staff			ft or mi / upstream or downstream of gage		
Start Edge:	REW	Total Width:	3.9-1.8=2.1	# Sections:	11
Start Time:	13:17		End Time:	13:35	
Discharge:	0.196	Uncertainty:	6.0%		
Mean v:	0.39	Width	2.10	Mean d:	0.24
Max v:	0.72	Area:	0.51	Max d:	0.31
Mean SNR:	38.5	cv:	0.022	Mean Temp:	58.4°F

Remarks: Station 3.5, 3.7, 3.9 reverse meter
180° to flow Pictures/Video: 687 - 691

September 1, 2011 Apishapa River Field Work

GPS ApishRvPic2

Pictures/Videos: 695 - 699

GPS ApishRvPic3

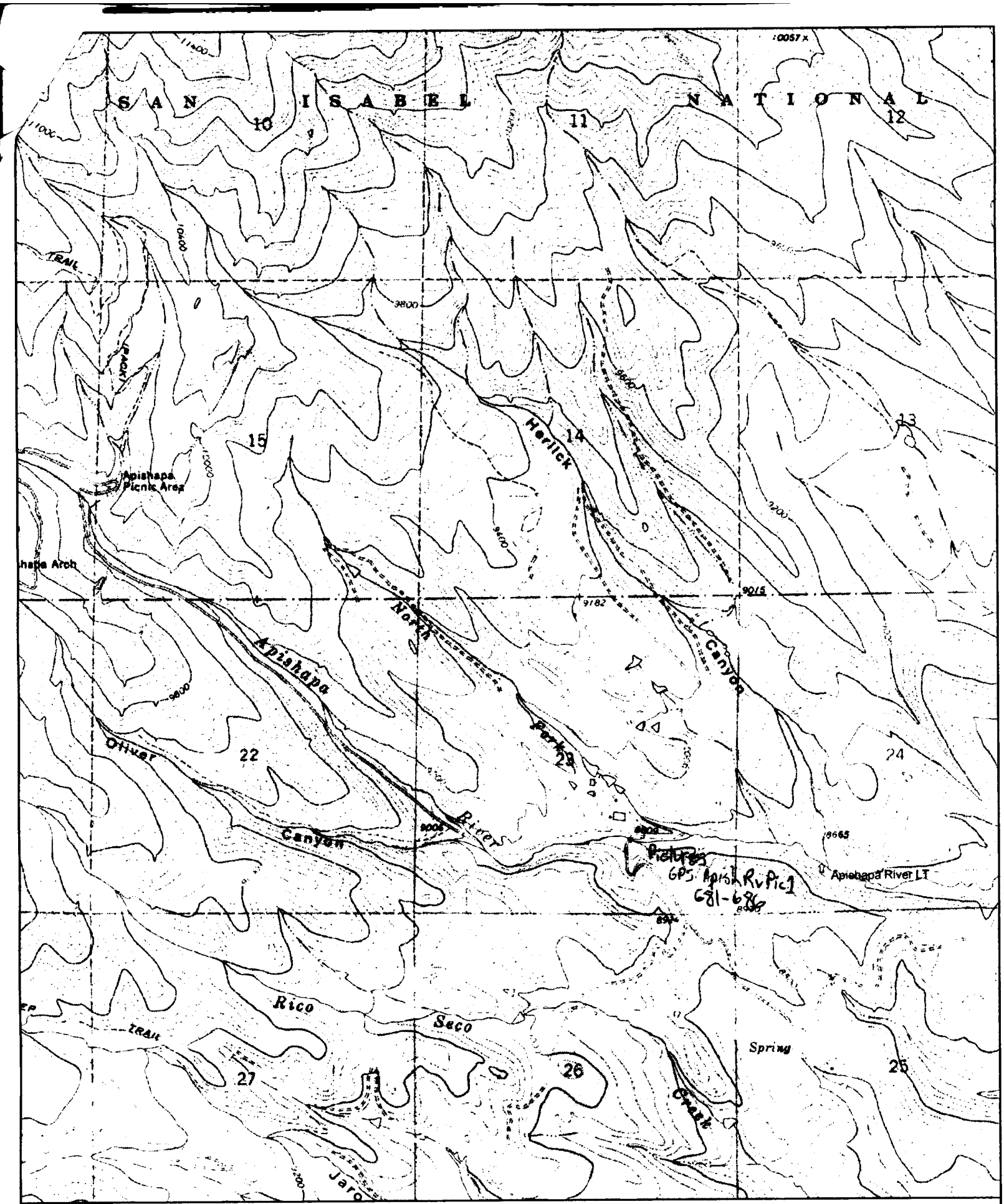
Pictures/Videos: 700 - 703

GPS ApishRvPic4

Pic/Vid: 704 - 706

GPS ApishRvPic5

Pic: 707 down Apishapa Drainage



Name: HERLICK CANYON
Date: 5/10/2011
Scale: 1 inch equals 2000 feet

Location: 037° 20' 15.79" N 104° 58' 07.87" W NAD83
Caption: Apishapa Lower Terminus

Discharge Measurment Field Visit Data Report *(Filters: Name begins with Apishapa;)*

Div	Name	CWCB Case Number	Segment ID	Meas. Date	UTM	Location	Flow Amount (cfs)	Meas #	Rating	Station ID
2	Apishapa River		12/2/A-001	09/01/2011	UTMx: 502479 UTMy: 4131276	above Oliver Canyon	0.2	1	Fair	
2	Apishapa River		12/2/A-001	09/08/2011	UTMx: 500097 UTMy: 4133269	CR 46 Upper Crossing	0.23	3	Poor	2
2	Apishapa River		12/2/A-001	04/10/2012	UTMx: 502485 UTMy: 4131266	Abv Lower Terminus	5.18	1	Fair	
2	Apishapa River		12/2/A-001	05/22/2012	UTMx: 502467 UTMy: 4131292	~ 12 feet below Pressure Transducer	2.48			
2	Apishapa River		12/2/A-001	06/28/2012	UTMx: 502479 UTMy: 4131276	Station 1	0.2	3		1
2	Apishapa River		12/2/A-001	08/01/2012	UTMx: 502485 UTMy: 4131266	~ 17 feet DS of pressure transducer	0.41	4		
2	Apishapa River		12/2/A-001	11/01/2012	UTMx: 502484 UTMy: 4131267	~ 7 feet US of pressure transducer	0.23	5	Poor	
2	Apishapa River		12/2/A-001	04/29/2013	UTMx: 502479 UTMy: 413276	Station 1	0.79			1
2	Apishapa River		12/2/A-001	05/30/2013	UTMx: 502479 UTMy: 4131276	Station 1	0.63	7	Good	1
2	Apishapa River		12/2/A-001	07/08/2013	UTMx: 502479 UTMy: 4131276	Station 1	0.14	8	Fair	1
2	Apishapa River		12/2/A-001	10/30/2013	UTMx: 502479 UTMy: 4131276	station 1	0.59	9	fair	
2	Apishapa River		12/2/A-001	05/13/2015	UTMx: 500925 UTMy: 4132552	37 20 22.7546; 104 59 22.3764	4.47	1		

March 21, 2014 Field Notes

Apishapa River

0 mph wind
partly cloudy
~34° F

→ at former temporary logging station

09:30 video (iPhone) starts upstream pans to downstream

09:30 picture (iPhone) former logging station, ice covered

09:30 picture (iPhone) up stream of former logging station, ice covered, hear under ice flow, solely originates from pictured area

→ at County Road 46 (Apishapa River Road)

1st culvert downstream of former temp logger station

~09:40 Picture Apishapa Flow

~09:40 video Apishapa Flow

~09:55 Estimating Flow

picture cross section

LEW: 0"

REW: 23"

23" 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4

~~0.2'~~ ~~23'~~ 0.07' 0.10' 0.10' 0.17' 0.11' 0.28' 0.18' 0.15' 0.12' 0.12'

0.02' 0.03' 0.06' 0.10' 0.19' 0.26' 0.19' 0.18' 0.10' 0.14'

Flow

3 2 1 0

0.14" 0.18' 0.16 0.0'

[Top line cross section position in inches]

[Bottom line water depth in feet]

Surface float velocity estimate

- using dry aspen leaves, dropped in x-section center
- four feet distance centered on cross section
- picture of set up

Trial	(time) (seconds)	Trial	(time) (seconds)	Trial	(time) (seconds)	Trial	(time) (seconds)	Trial	(time) (seconds)
1	1.38	3	1.56	5	1.46	7	1.61	9	1.58
2	1.61	4	1.51	6	1.55	8	1.35	10	1.40

Page 1 of 2	State of Colorado	Meas. No.: 009
YYYY: 2013	**Colorado Water Conservation Board**	Division: 2
MM-DD: 10-30	ADV Discharge Measurement Notes	District: 18

Station Name: Apishapa River → APISRVQ1

River, Creek, Canal, Ditch

At / Near, Above, Below: Temp Gage abv Oliver Canyon

Latitude: Longitude:

Party: Brian Epstein & Brandy Logan

Conditions

Weather: ~40°F Clear

Wind Spd / Dir: 0mph / 0° Water Temp:

X-Sec Desc: sandy bed

Flow Conds: laminar Study

Control Desc.: natural rock bank slightly different upstream

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.
09:11	• staff knocked over • pressure transducer ripped out				

Pressure Transducer Download

File Name: 20131030-1317_ApishapaRvQ1

Time: 13:17

Weighted MGH

GH Corr. TempPT.csv

Correct MGH

Discharge Measurement

Manufacturer:	SonTek	Model:	FlowTracker	S/N:	P2354 / P2355
Firmware:	3.7	Software:	2.20		
Diag Test File:	Yes or No	Raw Data File:	APISRVQ1.0009		
Meas Type:	Wading / Boat / Bridge / Cableway			Method:	0.6
		15	ft or mi / upstream or downstream of gage		
Start Edge:	REW 1.3'	End Edge:	LEW 5.6'	Total Width:	4.3'
Start Time:	9:30	End Time:	10:10		
Discharge:	0.588	Unsertainty:	4.6	# Stations:	14
Mean v:	0.573	Width	4.3	Mean d:	0.24
Max v:	0.884	Area:	1.026	Max d:	0.32
Mean SNR:	33.1	σv:	0.025	Mean Temp:	33.7

Meas. By: Brandy Logan Notes By: Brian Epstein

Processed By: Brian Epstein Reviewed By: Brian Epstein

Remarks:

Site Condition on arrival:
- previous high flow event ripped pressure transducer out, found sitting on control
  - water deposited silt/sand on left edge gravel bar
  - grass pushed down in downstream direction
- boulders moved in stream bed

Pic 922/923 9:11 gage site on arrival
Pic 924 9:11 gage site looking downstream
Pic 925 9:12 pushed down grass
09:30:45 Computer time = 09:25:25 logger time
09:36 attempt logger download, battery too low
09:38 Pic 926 Brandy measuring discharge
" Pic -927 " " "

Page 1 of 2	State of Colorado	Meas. No.: 008
YYYY: 2013	**Colorado Water Conservation Board**	Division: 2
MM-DD: 07-09	ADV Discharge Measurement Notes	District: 18

Station Name: APISRVQ1

Apishapa (River), Creek, Canal, Ditch

At, Near, (Above), Below Oliver Canyon

Latitude: Longitude:

Party: Brian Epstein

Conditions

Weather: ~65°F Cloudy, Thunder in distance

Wind Spd / Dir: 0mph / 0° Water Temp:

X-Sec Desc: Silty Sandy bed

Flow Conds: laminar steady

Control Desc.: natural rock bank

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.
(see page 2)					

Pressure Transducer Download

File Name: (see Page 2)

Time:

Weighted MGH

GH Corr.

Correct MGH

Discharge Measurement

Manufacturer:	SonTek	Model:	FlowTracker	S/N:	(P2354) / P2355
Firmware:	3.7	Software:	2.20		
Diag Test File:	(Yes) or No	Raw Data File:	APISRVQ1		
Meas Type:	(Wading) / Boat / Bridge / Cableway			Method:	0.6
	11	(ft) or mi / upstream or (downstream) of gage			
Start Edge:	2.3 REW	End Edge:	LEW 5.6	Total Width:	3.3
Start Time:	15:19	End Time:	15:37		
Discharge:	0.142	Unsertainty:	7.8%	# Stations:	
Mean v:	0.241	Width	3.2	Mean d:	0.18
Max v:	0.339	Area:	0.59	Max d:	0.32
Mean SNR:	26.2	σv:	0.007	Mean Temp:	56.8

Meas. By: BJE Notes By: BJE

Processed By: Reviewed By:

Remarks:

14:33 Staff 0.46'
14:45 Staff 0.48' & PT 0.167'
14:46 downloaded pressure transducer
20130708-1446_AnishapaRVQ1_TempPT.CSV
14:50:13 sync PT time to computer time
14:52 set PT to record every 5 minutes
beginning 14:53:57
14:54 clear PT datalogger history
14:59 Pic 833 Gage site from left bank
15:00 Pic 834 Gage site from below control
15:00 Staff 0.46'
15:02 Pic 835-836 Riparian insect
15:16 Pic 837 X-section from left bank
15:16 Pic 838 X-section from downstream
15:16 Staff ~~0.445~~ 0.455
15:38 Staff 0.455
15:50 Downloaded PT
20130708_1550_AnishapaRVQ1_TempPT.CSV
15:51 clear logger history
15:52 set PT to record every 15 minutes
beging 15:59:57

Page 1 of 2	State of Colorado	Meas. No.: 007
YYYY: 2013	**Colorado Water Conservation Board**	Division: 2
MM-DD: ~~06-07~~-30	ADV Discharge Measurement Notes	District: 18

Station Name: APISRVQ1 ~~00~~

At, Near, Above, Below: Apishapa Oliver Canyon — River / Creek, Canal, Ditch

Latitude: Longitude:

Party: Brian Epstein

Conditions

Weather: Sunny, bright breeze, ~ 65°F

Wind Spd / Dir: Water Temp:

X-Sec Desc: 18 feet downstream of staff RTW-center mud

Flow Conds: mostly laminar steady

Control Desc.: Rock bowl natural 3 ft ds staff

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.
14:15	0.64				
14:21	0.64				
14:36	0.64				

Pressure Transducer Download

File Name: (see book)

Time:

Weighted MGH

GH Corr.

Correct MGH

Discharge Measurement

Manufacturer:	SonTek	Model:	FlowTracker	S/N:	P2354 / P2355
Firmware:	3.7	Software:	2.20		
Diag Test File:	Yes or No	Raw Data File:	APISRVQ1.007		
Meas Type:	Wading / Boat / Bridge / Cableway			Method:	0.6
		18	ft or mi / upstream or downstream of gage		
Start Edge:	REW 0.9	End Edge:	LEW 6.3	Total Width:	5.4
Start Time:	14:19	End Time:	14:38		
Discharge:	0.627	Unsertainty:	5.6%	# Stations:	11
Mean v:	0.466	Width	5.400	Mean d:	0.25
Max v:	0.900	Area:	1.344	Max d:	0.35
Mean SNR:	33.2	σv:	0.017	Mean Temp:	64.5

Meas. By: BJE Notes By: BJE

Processed By: Reviewed By:

Remarks:

13:29 PC Time = GPS Time = Camera Time
13:30 Staff 0.64 feet & PT 0.337 feet
13:35 connect to data logger
13:37 Datalogger = PC Time = GPS = Camera
13:37 Downloaded Data Logger ApishapaRvQ1
13:50 Synchronize PT to computer
13:55 set PT to log every minute
13:56 synchronized FlowTracker Time to GPS
14:43 downloaded data loggers
14:45 set PT to log every 15 minutes
15:03 staff = 0.64 feet PT = 0.330 feet

Files downloaded:
20130530-1337_ApishapaRvQ1_TempPT.csv
" -1346- "
" -1443- "

Photographs

time	pic #	content
13:30	744	staff plate as found 0.64 feet
13:33	745	" " after clean 0.64 feet
13:33	746	gage as found
13:33	747	" " " close up
13:33	748	natural control close up
14:14	749	x-section

Page 1 of 2
YYYY: 2013
MM-DD: 04-29

State of Colorado
Colorado Water Conservation Board
ADV Discharge Measurement Notes

Meas. No.: 006
Division: 2
District: 18

Station Name: APISRVQ1

Apishapa
At, Near, (Above), Below — (River), Creek, Canal, Ditch
Lower Terminus Proposed ISF

Latitude: Longitude:

Party: Brian Epstein

Conditions

Weather: 66°F, light gusty wind, Partly Cloudy
Wind Spd / Dir: Cross Stream @ gage — Water Temp:
X-Sec Desc: 8 ft upstream staff plate
Flow Conds: mostly laminar steady
Control Desc.: same rock bank as last year

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.
18:03	0.66	0.37			
18:30	0.67				
18:49	0.67	0.37			
18:58	0.67	0.37			

Pressure Transducer Download
File Name: (see back)
Time:

Weighted MGH
GH Corr.
Correct MGH

Discharge Measurement

Manufacturer: SonTek — Model: FlowTracker — S/N: (P2354) / P2355
Firmware: 3.7 — Software: 2.20
Diag Test File: (Yes) or No — Raw Data File: APISRVQ1.006
Meas Type: (Wading) / Boat / Bridge / Cableway — Method: 0.6
8
(ft) or mi / (upstream) or downstream of gage

Start Edge:	REW 1.8'	End Edge:	LEW 3.2'	Total Width:	1.4'
Start Time:	18:43	End Time:	18:55		
Discharge:	0.79	Unsertainty:	10.3%	# Stations:	
Mean v:	1.773	Width	1.40	Mean d:	0.32
Max v:	2.035	Area:	0.446	Max d:	0.41
Mean SNR:	38.4 dB	σv:	0.034	Mean Temp:	46.1°F

Meas. By: Brian Epstein — Notes By: Brian Epstein
Processed By: — Reviewed By:

Remarks: 17:30 Arrive temp gage location
18:00 = computer time = camera time
18:09:00 = computer time ⇒ 18:03:57 AL Time
18:09 downloaded data logger
file name: 20130429-1804_ApishapaRVQ1_TempRT.CSV
18:19:10 sync time Data Logger to computer
∴ missed 1815 zero interval
18:20:00 set logger to read and record every minute
18:36 sync time flow tracker to camera
19:00 downloaded data logger
file name: 20130429-1900_ApishapaRVQ1_TempRT.CSV
19:03 set logger to read and record every 15 minutes

Photos:

18:04	707	temp gage from LEW
18:05	708	staff plate at 0.66'
18:05	709	control & temp gage from ds
18:30	710	cross-section from downstream
18:30	711	" " " above
18:31	712	staff plate 0.67' (blurry)
18:31	713	" " "
19:24	714	100' below temp gage, ice patch in Apishapa

State of Colorado

Colorado Water Conservation Board

Field Notes

Apishapa River at Temporary Gage

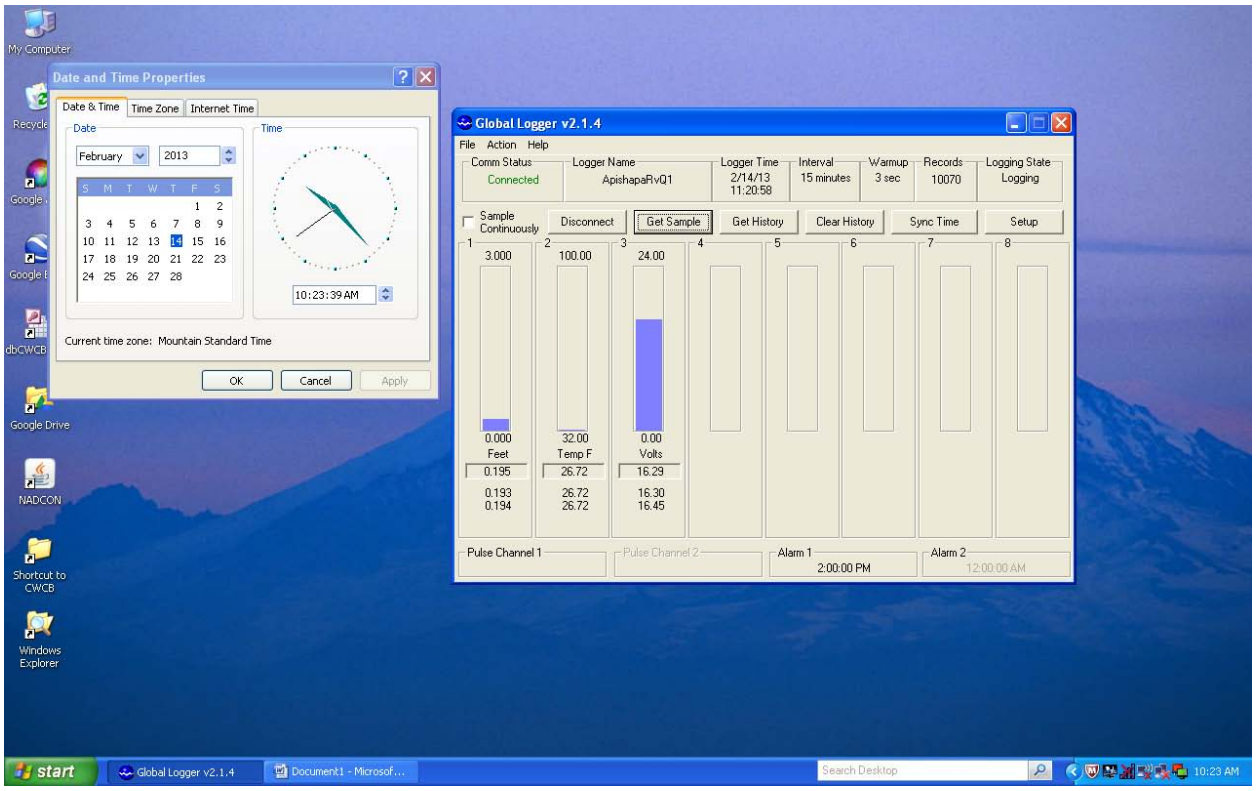
09:46 Arrive at site
09:57 Camera time = gps time
09:59 Pic 604 my tire tracks only tracks coming up road to Cordova Pass
10:00 605 Apishapa River at temp gage, taken from road
10:00 606 " close up
10:01 607 Apishapa River five feet downstream of gage, animal tracks
10:02 608 Apishapa River at temp gage, taken from downstream
10:05 609 staff plate reading 0.97 ice height
10:05 610 Gage site ice affected
10:06 611 "
10:06 612 "
10:08 Video 613 Apishapa River gage site and above (upstream) walk to about the location where water flow audible
10:11 614 Apishapa River ~40 feet upstream of gage site, cutbay into sandstone
10:17 got computer and logged into station
10:23 coordinated times, see computer fieldnotes
10:25 downloaded data
10:34 cleared logger history
10:36 went back to ~~SUV~~ car
10:38 departed site

Notes By: Brian Epstein YYYY-MM-DD: 2013-02-14 Page 1 of 1

Apishapa River temporary gage station field data collection notes

February 14, 2013

10:23:39 Computer time = 10:23:26 gps time = 10:23:26 camera time = 11:20:58 logger time



~ 10:25 data downloaded

~ 10:34 history erased

Page 1 of 2	State of Colorado	Meas. No.: 005
YYYY: 2021	**Colorado Water Conservation Board**	Division: 2
MM-DD: 11-01	ADV Discharge Measurement Notes	District: 18

Station Name: Apishapa

River, Creek, Canal, Ditch

At, Near, Above, Below: Lower Terminus Proposed ISF

Latitude: Longitude:

Party: Brian Epstein

Conditions

Weather: ~58°F

Wind Spd / Dir: Light wind / variable Water Temp:

X-Sec Desc: 7 feet upstream of PT

Flow Conds: laminar steady

Control Desc.: Section control: natural cobbles w/ leaf buildup

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.
12:00	0.49				
	0.49				
	0.49				
13:45	0.49				
14:00	0.49				

Pressure Transducer Download

File Name: 20211101-1332_ApishapaRvQ1_Temp PT.CSV

Time: 13:32

Weighted MGH

GH-corr:

Correct MGH

Discharge Measurement

Manufacturer:	SonTek	Model:	FlowTracker	S/N:	P2354 / P2355
Firmware:	3.7	Software:	2.20		
Diag Test File:	Yes or No	Raw Data File:	APISRVQ1.000		
Meas Type:	Wading / Boat / Bridge / Cableway			Method:	0.6
	7 ft or mi / upstream or downstream of gage				
Start Edge:	REW 1.9	Total Width:	1.4	# Stations:	8
Start Time:	13:00		End Time:	13:19	
Discharge:	0.234	Unsertainty:	10%		
Mean v:	0.819	Width	1.399	Mean d:	0.20
Max v:	1.224	Area:	0.286	Max d:	0.28
Mean SNR:	27.3	σv:	0.033	Mean Temp:	39.6

Meas. By: BJE Notes By: BJE

Processed By: Reviewed By:

Remarks:

11:38	363	Apishapa looking upstream at station
11:38	364	Video "
11:42	365	Water pattern downstream of station
14:02	366	Staff/station and control looking upstream
14:02	367	X-section from above
14:02	368	Control from upstream

Apishapa River at Temporary Gaging Station
November 1, 2012
11:30 Arrive Site
11:47 Log into datalogger
-> functioning
-> Clock drift has occured

12:00 PC Time Staff = 0.49 feet
12:24:06 logger time = 12:26:00 pc time = 12:25:00 gps time
12:27:00 logger time syncronized to pc time
12:32 replaced batteries in datalogger
12:43 Set datalogger to log every 1 minute starting 12:45
13:00 Began Discharge Measurement
-> File Name = APISRVQ1.005
-> Q = 0.234
-> Q Uncertainty = 10%
-> Largest Source = Nummber of Stations
-> Number of Stations = 8
-> Vmean = 0.819
-> Vmax = 1.224
-> W = 1.399 (Start Edge REW 1.9 and Ending Edge LEW 3.3)
-> A = 0.286
-> Dmean = 0.20
-> Dmax = 0.28
-> SNRmean = 27.3
-> V Std Dev Mean 0.033
-> Temp (degF) = 39.6
-> Measurement Quality = Poor
-> Control = Section control, cobble band just below pt, leaf litter built up in control
13:19 End Discharge Measurement
13:32 Downloaded data logger
13:45 Staff = 0.49 feet
13:56 Initial spreadsheet work up of stage discharge relationship has a very nice fit

Page 1 of 2	State of Colorado	Meas. No.:	004
YYYY: 2012	**Colorado Water Conservation Board**	Division:	2
MM-DD: 08-01	ADV Discharge Measurement Notes	District:	18

Station Name: Apishapa

River / Creek, Canal, Ditch

At, Near, Above, Below: Lower Terminus

Latitude: N 37°19'41" Longitude: W 104°58'19" NAD83

Party: Brian Epstein

Conditions

Weather: Mostly Cloudy 75°F

Wind Spd / Dir: 0 spd / 0 Water Temp:

X-Sec Desc: Sandy/Silty with gravels and boulders in middle

Flow Conds: laminar and slow

Control Desc.: natural section control rock bank

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.
11:30	0.55				
11:45	0.55				
12:15	0.55				

Pressure Transducer Download

File Name: 20120901-1219_ApishapaRvQ1_Temp

Time: 12:22

Weighted MGH

PGH Corr.

Correct MGH

Discharge Measurement

Manufacturer:	SonTek	Model:	FlowTracker	S/N:	P2354 / P2355
Firmware:	3.7	Software:	2.20		
Diag Test File:	Yes or No	Raw Data File:	APISRVQ1.004		
Meas Type:	Wading / Boat / Bridge / Cableway			Method:	0.6
	17	ft or mi / upstream or downstream of gage			
Start Edge:	LEW	Total Width:	~~7.4~~ 4.4	# Stations:	7
Start Time:	11:55		End Time:	12:10	
Discharge:	0.411	Uncertainty:	5.7%		
Mean v:	0.539	Width	4.4	Mean d:	0.17
Max v:	0.641	Area:	0.765	Max d:	0.30
Mean SNR:	36.3	σv:	0.015	Mean Temp:	55.9

Meas. By: BJE Notes By: BJE

Processed By: Reviewed By:

LEW 19.1

2 REW 23.5

23.5 19.1 4.4

Remarks:

11:19 Arrive at site
11:30 GPS used to synchronize Camera time
11:40 GPS used to synchronize Flow Tracker
12:19 GPS used to confirm data logger time equal

Pictures

Time	#	Comment
11:30	814	Staff plate reading 0.55'
11:30	815	Temp Gauge site overview
11:51	816	Discharge measurement x-section from left bank
11:51	817	Discharge measurement x-section, from downstream, looking toward gage

Page 1 of 2 YYYY: 2012 MM-DD: 06-28	State of Colorado **Colorado Water Conservation Board** ADV Discharge Measurement Notes	Meas. No.: 003 Division: 2 District: 18

Station Name: Apishapa

(River), Creek, Canal, Ditch

(At) Near, Above, Below Q1

Latitude: N 37°19'41.85" Longitude: W 104°58'19.73" WAD 83

Party: Brian Epstein

Conditions

Weather: ~82°F Partly Cloudy

Wind Spd / Dir: 0 mph / 0° Water Temp:

X-Sec Desc: ~13 feet downstream of gage, sandy, silty, gravely bed

Flow Conds: laminar

Control Desc.: natural rock band 3 feet below staff/PT

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.
12:30	0.48	0.228	14:00	0.47	0.218
13:00	0.475	0.224			
13:15	0.47	0.222			
13:37	0.47				
13:50	0.47				

Pressure Transducer Download

File Name: 20120628_1404_ApishapaRvQ1_TempPT.csv

Time: 14:04

Weighted MGH

GH Corr.

Correct MGH

Discharge Measurement

Manufacturer:	SonTek	Model:	FlowTracker	S/N:	(P2354) / P2355
Firmware:	3.7	Software:	2.20		
Diag Test File:	(Yes) or No	Raw Data File:	APISRVQ1.003		
Meas Type:	(Wading) / Boat / Bridge / Cableway			Method:	0.6
	13	(ft.) or mi / upstream or (downstream) of gage			
Start Edge:	REW	Total Width:	3.8	# Stations:	8
Start Time:	13:40			End Time:	13:50
Discharge:	0.203	Unsertainty:	9.1%		
Mean v:	0.199	Width	3.799	Mean d:	0.27
Max v:	0.358	Area:	1.018	Max d:	0.40
Mean SNR:	32.2	σv:	0.008	Mean Temp:	60.7

REW 6.6
LEW 4.4

4.4
.6
3.8

Meas. By: BJE Notes By: BJE

Processed By: Reviewed By:

Remarks:

12:25 Arrive Site
12:26 Observed three 4-6 inch fish dashing around in area below gauge
13:00 GPS 13:00 = FT 13:00 = Mobile Phone 13:00
13:15 Temp 64.1°F IDS 111.7 µS Conductivity from CDH-SDI Conductivity Meter
13:19 = GWS = Computer Time
13:56 Temp 60.9°F Conductivity 111.4 µS from CDH-SDI Conductivity Meter (set up to log prior to Q measurement)
14:04 = Global Logger = Computer
14:19 Pic 735 Temp Gauge Station & natural control
14:19 Pic 736 0.47' Staff Plate
14:19 Pic 737 X-section look from upstream
14:20 Pic 738 X-section taken from left bank
14:20 Vid 739 Temp Gauge site
14:21 Pic 740 Pressure transducer pvc housing separated from the rest of the PVC (don't know when this occured)

State of Colorado

Colorado Water Conservation Board

Field Notes

June 29, 2012

Apishapa River Preliminary Reach Site Visit

14:48 GPS ApishapaRvPic001
Pic 741 Apishapa River
Vid 742 " "

15:00 Historic GPS Location named ApishRVQ2
Pic 743 Apishapa River upstream of road culvert
Vid 744 " " "

Page 1 of 2	State of Colorado	Meas. No.: 002
YYYY: 2012	**Colorado Water Conservation Board**	Division: 2
MM-DD: 05-22	ADV Discharge Measurement Notes	District: 18

Station Name: APISHAPA

(River) Creek, Canal, Ditch

(At) Near, Above, Below Q1

Latitude: N 37° 19' 41.85" Longitude: W 104° 58' 19.73" NAD83

Party: Brian Epstein

Conditions

Weather: Partly Cloudy ~75°F

Wind Spd / Dir: 0 mph / 0° Water Temp: 51.2°F

X-Sec Desc: ~12 feet below Pressure transducer

Flow Conds: Natural section control, rock bar

Control Desc.: mostly laminar

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.
12:45	0.93	0.574			
13:00	0.93	0.568			
13:15	0.93	0.571			
13:30	0.93	0.576			

Pressure Transducer Download

File Name: 20120522_1351_APISHAPA_RVR_Q1_TempPT.csv

Time: 13:51

Weighted MGH

Correct MGH

Discharge Measurement

Manufacturer: SonTek Model: FlowTracker S/N: (P2354) / P2355

Firmware: 3.7 Software: 2.20

Diag Test File: (Yes) or No Raw Data File: APISRVQ1_002

Meas Type: (Wading) / Boat / Bridge / Cableway Method: 0.6

12 (ft) or mi / upstream or (downstream) of gage

23.2
17.5
5.7

Start Edge: REW Total Width: 5.7 # Stations: 12

Start Time: 12:52 End Time: 13:24

Discharge: 2.476 Unsertainty: 6.0%

Mean v: 0.821 Width 5.7 Mean d: 0.53

Max v: 1.529 Area: 3.015 Max d: 0.90

Mean SNR: 42.6dB σv: 0.042 Mean Temp: 51.7°F

Meas. By: BJE Notes By: BJE

Processed By: Reviewed By:

Remarks:

11:30 MST Arrive at site
11:35 Staff = 0.84 feet
11:40 Pressure Transducer = 0.574 feet
11:40 Battery = 16.57 volts
11:43 Downloaded Datalogger
Apishapa RvQ1
File name: 20120522-1143_ApishapaRvQ1.csv
11:46 Clear Datalogger history
11:49:00 GPS time = 11:48:19 Data logger time
11:50:00 GPS time = 11:50:00 Computer time
11:51:02 GPS time = computer time = data logger time
12:03:00 GPS Time = Camera Time synchronized
12:17 Staff = 0.83 feet
12:31 Staff = 0.83 feet
12:42 GPS Time Flow Track synchronized
12:50 75.245 ; 51.4°F ; 50.1 ppm tds

General note: water bounces on staff +/- 0.005

Time	#	Control
1131	549	looking down at PT & staff
1133	550	looking from left bank at PT & staff & control
11:34	551	staff = 0.83 feet
1135	552	staff = 0.84 feet
13:37	553	looking upstream at X-section, control & staff / PT
13:37	554	Video "
13:38	555	from left bank X-section
13:38	556	from left bank downstream looking at control & station

Page 1 of 8	State of Colorado	Meas. No.: 001
YYYY: 2012	**Colorado Water Conservation Board**	Division: 2
MM-DD: 04-10	ADV Discharge Measurement Notes	District: 18

Station Name: Apishapa

(River), Creek, Canal, Ditch

At, Near, (Above) Below Lower Terminus

Latitude: N 37° 19' 41" Longitude: W 104° 58' 19" NAD83

Party: Brian Epstein

Conditions

Weather: 48°F Sunny

Wind Spd / Dir: 0 mph / 0° Water Temp:

X-Sec Desc: located below control between big trees

Flow Conds: mostly laminar

Control Desc.: rock band 3' below pt, water around (natural) side;

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.
08:45	0.95				
09:00	0.95				
09:10	0.95				

Pressure Transducer Download

File Name: Not Downloaded

Time:

Weighted MGH 0.95

GH Corr. NA

Correct MGH NA

Discharge Measurement

Manufacturer: SonTek Model: FlowTracker S/N: (P2354) / P2355

Firmware: 3.7 Software: 2.20

Diag Test File: (Yes) or No Raw Data File: ABSAGVLT.001

Meas Type: (Wading) / Boat / Bridge / Cableway Method: 0.6

24.9
18.4
6.5

7 (ft) or mi / upstream or (downstream) of gage

Start Edge: REW Total Width: 6.5 # Stations: 13

Start Time: 08:53 End Time: 09:08

Discharge: 5.179 Unsertainty: 5.0%

Mean v: 1.829 Width 6.5 Mean d: 0.44

Max v: 2.817 Area: 2.832 Max d: 0.69

Mean SNR: 47.3 σv: ~~47~~ 0.059 Mean Temp: 34.4°F

Meas. By: BJE Notes By: BJE

Processed By: Reviewed By:

Remarks:

Flow Tracker = Cellular = 08:20
→ synchronized FT

Active	Time	Content
369	08:27	Condition of temp gage station upon arrival
370	08:27	Close up control upon arrival
371	08:28	Video Condition of temp gage station (voice mistake year 2012, is correct.)
372	08:40	Cross section, slightly below control, looking upstream
373	"	"
374	"	Video "
375	08:41	Cross section from left bank

State of Colorado

Colorado Water Conservation Board

Field Notes

April 2, 2012

APISHAPA RIVER

3:00 Arrive Site ApishRvQ1 (GPS location)
32°F Snowing Lite
Prep to Install ✓ Temp Pressure Transducer gage station.

3:36 Set Timelapse Camera time equal to cellular phone time = 3:36 PM

4:30 Completed Install at:
- location off County Road 46
- across from private road cut
- GPS location name ApishRvQ1
- Lat/Long, NAD83
  N 37°19'41"
  W 104°58'19"

Configuration:
Staff Plate
Global Water WL165
SN#
Housing PVC riser, zip tied to root
PT zip tied to PVC with holes and held in halfway w/ a rock
Control is a natural section rock boulder band. I add rocks to the control.

5:06 Confirmed Computer time and cellular time match = 5:06 PM

5:20 Uploaded data logger program ApishapaRiver Q1_2012 04 30 and synchronized DL ~~and~~ to computer time

Pic/Vid	Time	Content
362-363	17:25	install overview
364	17:25	staff plate 0.74 feet
365	17:26	video site overview
366	17:27	looking upstream

pic/vid	time	content
367	17:27	Video stuff plate
368	17:28	under water piece of install
17:29		Removed timelapse camera
17:45		Departe site

Station Num.	State of Colorado	Meas. No.:
2	**Colorado Water Conservation Board**	Comp. By:
	ADV Discharge Measurement Notes	Checked By:

Station Name: Adishaden

River, Creek, Canal, Ditch

At, Near, Above, Below: CR46 Upper Crossing

Latitude: N 37°29'46.01" Longitude: W 104°39'56.05" NAD 83

Date: 9/8/2011 Party: Brian Eastin

Conditions

Weather: Light Rain, Cloudy, 56°F

Wind Spd / Dir: 0 kph Ø° Water Temp:

X-Sec Desc: manmade: box shaped, sandy, cobble, boulder

Flow Conds: Laminar, slight recirculation LEW at edge

Control Desc: rock bar

Measurement Rate: Excelent (2%) / Good (5%) / Fair (8%) / Poor (>8%)

[based on the above conditions]

Gage Reading

Time	Outside	Inside	Encoder	Recorder	Other
	0.30				
	0.30				
Weighted MGH					
GH Corr.					
Correct MGH					

Discharge Measurement

Manufacturer:	SonTek	Model:	FlowTracker	S/N:	P2354 / P2355
Firmware:	3.7	Software:	2.20		
Diag Test File:	Yes	Raw Data File:	ADISRVQ2.003		
Meas Type:	Wading / Boat / Bridge / Cableway			Method:	0.6
	6	ft or m / upstream or downstream of gage		Time Start	
Start Edge:	LEW	Total Width:	1.6'	# Sections:	8
Start Time:	14:53		End Time:	15:20	
Discharge:	0.226	Uncertainty:			
Mean v:	0.433	Width	1.6'	Mean d:	0.33
Max v:	0.648	Area:	0.522	Max d:	0.44
Mean SNR:	35.6	cv:	0.028	Mean Temp:	45.8°F

Remarks:

Remarks (continued):

Location (ft)	H_2O depth (ft)	Comment
1.0	0.00	LEW
1.2	0.36	
1.4	0.47	
1.6	0.44	
1.8	0.40	
2.0	0.38	
2.2	0.39	
2.4	0.37	
2.6	0.00	REW

Picture

741 Apishapa River Upstream Upper CR46 Crossing X-section while measuring 002
742 "
743 Apishapa River X-section 003
744 " " " " Video

Station Num.	State of Colorado **Colorado Water Conservation Board** ADV Discharge Measurement Notes	Meas. No.: 002
2		Comp. By: OE
		Checked By:

Station Name: Apishapa — (River), Creek, Canal, Ditch

At, Near, (Above), Below: CR46 Upper Crossing

Latitude: N 37°20'46.01" Longitude: W 104°59'56.05" NAD83

Date: 9/8/2011 Party: Brian Epstein

Conditions

Weather: 52°F Cloudy Light Rain

Wind Spd / Dir: 0 mph 0° Water Temp:

X-Sec Desc: Sand, cobbles, boulders Man made

Flow Conds: laminar

Control Desc.:

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

REW LEW
3.30 - 0.95 = W = 2.35

Gage Reading

Time	Outside	Inside	Encoder	Recorder	Other
13:27	0.30	Temp Staff			
Weighted MGH					
GH Corr.					
Correct MGH					

Discharge Measurement

Manufacturer: SonTek Model: FlowTracker S/N: (P2354) / P2355

Firmware: 3.7 Software: 2.20

Diag Test File: YES Raw Data File: APISRVQ2.002

Meas Type: (Wading) / Boat / Bridge / Cableway Method: 0.6

6 (ft) or mi / (upstream) or downstream of gage Staff Temp

Start Edge: LEW Total Width: 2.35 # Sections:

Start Time: End Time:

Discharge: Uncertainty: Mean d:

Mean v: Width: Max d:

Max v: Area: Mean Temp:

Mean SNR: QV:

Aborted Edge Right Edge

Remarks:

Remarks (continued):

Location (ft)	H_2O Depth (ft)	Comment
LEW 0.95	Ø	LEW
1.1	0.31	
1.3	0.35	
1.5	0.41	
1.7	0.39	
1.9	0.39	
2.1	0.36	
2.3	0.37	
2.5	0.37	
2.7	0.35	
2.9	0.31	
3.1	0.27	
3.30	Ø	REW

Picture	
734	Apishapa Rv downstream Upper CR46
735	" " " " "
736	" " " " "
737	Apishapa Rv Upstream Upper CR46 X-Section
738	" " " " " "
739	" " " " " "
740	" " " " " " Video

Site Visit Log - Apishapa River Temporary Gage above Oliver Canyon
Brian Epstein

April 2, 2012

- Gage station installed
- At 17:25 Staff Plate = 0.74 and At 17:30 Pressure Transducer Output = 0.58 [must subtract 0.16 from staff to get PT output]
- Section control, rock band approximately five feet downstream from pressure transducer

April 10, 2012

- Upon arrival noted that staff gage was knocked over
- ~07:35 reset staff plate
- 08:45 staff reading = 0.95 ft and pressure transducer = 0.70 [must subtract 0.25 from staff to get PT output]
- Same section control acting on gage
- Turbulence in gage pool area
- Discharge measurement summary 4/10/2012 9:00, 5.18 (cfs), measurement rated fair, 0.95 (ft) staff reading, 0.70 (ft) pressure transducer reading, [0.25 add to pressure transducer to get staff]

May 22, 2012

- Same section control acting on gage
- Discharge measurement summary 5/22/2012 13:10 , 2.48 (cfs), 0.83 (ft) staff reading, 0.57 (ft) pressure transducer reading, [0.26 add to pressure transducer to get staff]

June 28, 2012

- Same section control acting on gage
- Slotted PVC where pressure transducer is connected separated from the rest of the PVC, do not know when this occurred
- Discharge measurement summary 6/28/2012 13:45, 0.203 (cfs), 0.47 (ft) staff reading, 0.22 (ft) pressure transducer reading, [0.25 add to pressure transducer to get staff]

August 1, 2012

- Same section control acting on gage
- Discharge measurement summary 8/1/2012 12:00, 0.411 (cfs), 0.55 (ft) staff reading, 0.30 (ft) pressure transducer reading, [0.25 add to pressure transducer to get staff]

November 1, 2012

- Same section control acting on gage
- Litter build up on control
- Discharge measurement summary 11/1/2012 13:10, 0.234 (cfs), 0.49 (ft) staff reading, 0.25 (ft) pressure transducer reading, [0.24 add to pressure transducer to get staff]

February 14, 2013

- Gage station ice affected
- 2/14/2013 10:05 Ice reading on staff plate 0.97 (ft)
- Water heard flowing under the ice (video captures sound) [In video read the staff gage 0.01 high as 0.98 actual reading is 0.97]
- Stood on ice with no concern
- No discharge measurement taken

STATION NUMBER Apishapa River above Oliver Canyon, CO SOURCE AGENCY: CWCB
LATITUDE 49.28 LONGITUDE -123.11
Date Processed: 02/21/2013 10:53:06 UTC-07:00 By bje
Rating for Discharge (ft^3/s)
RATING ID: 0001 TYPE: Unknown EXPANSION: STATUS: Working
Created by bje on 02/05/2013 @ 21:08:09 UTC, Updated by bje on 02/20/2013 @ 22:15:54 UTC
Remarks: Development

EXPANDED RATING TABLE

Stage (ft)	Discharge (ft^3/s)										DIFF IN Q PER
	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09	.1 UNITS
0.10									0.130*	0.147	0.17
0.20	0.164	0.183	0.203*	0.225	0.247	0.271	0.297	0.323	0.351	0.381	0.25
0.30	0.411*	0.451	0.492	0.537	0.584	0.633	0.685	0.739	0.797	0.857	0.51
0.40	0.920	0.986	1.05	1.13	1.20	1.28	1.36	1.44	1.53	1.62	0.80
0.50	1.72	1.82	1.92	2.02	2.13	2.24	2.36	2.48*	2.64	2.81	1.26
0.60	2.98	3.16	3.35	3.55	3.76	3.97	4.19	4.43	4.67	4.92	2.20
0.70	5.18*	5.45	5.73	6.02	6.32	6.64	6.96*				

"*" indicates a rating descriptor point

ID	Starting Date	Ending Date	Aging	Comments
0001	01/01/2012 00:00:01 UTC-07:00	01/03/2013 23:59:59 UTC-07:00	1	Until ice affected, January