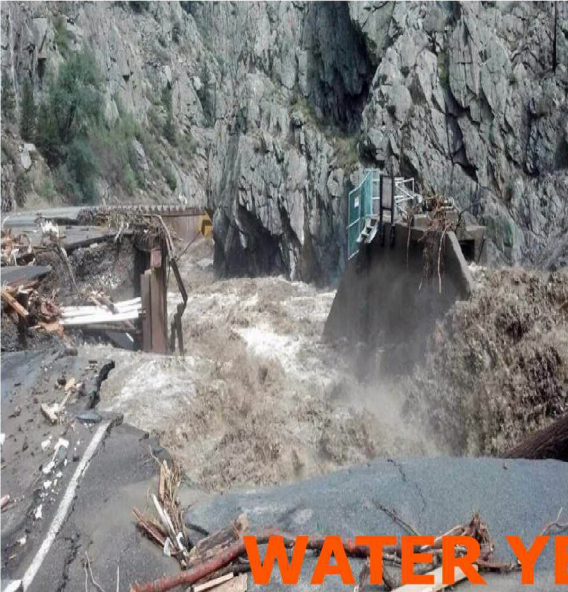




BIG THOMPSON RIVER AT MOUTH OF CANYON NEAR DRAKE (BTCANYCO)



BIG THOMPSON RIVER AT MOUTH OF CANYON NEAR DRAKE (BTCANYCO)



DILLE TUNNEL NEAR DRAKE (DILTUNCO)



BIG THOMPSON RIVER AT MOUTH NEAR LA SALLE (BIGLASCO)

# STREAM FLOW DATA for COLORADO

## WATER YEAR 2013

Computed by the  
Hydrographic  
Branch

Edited by  
Brian Boughton

Pictures above provided by Russell Stroud



**COLORADO**  
Division of Water Resources  
Department of Natural Resources

John Hickenlooper, Governor State of Colorado  
Mike King, Executive Director Department of Natural Resources  
Dick Wolfe, Director/State Engineer Division of Water Resources

# **STATEWIDE HYDROGRAPHIC STAFF**

Scott Cuthbertson, Deputy State Engineer-Public Safety

Matt Hardesty, Chief, Hydrographic and Satellite Monitoring Branch

Thomas Ley, Chief, Hydrographic and Satellite Monitoring Branch (retired)

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David Hutchens

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Craig Bruner

Jana Miller

## **STEAMBOAT SPRINGS**

Dan Meyer

## **DURANGO**

Brian Boughton

Brian Leavesley

PLATTE RIVER BASIN  
06694920 SOUTH PLATTE RIVER ABOVE SPINNEY RESERVOIR  
Water Year 2013

Location.-- Lat. N38° 59' 48.59", Long. W105° 40' 50.48" (NAD83). Gage is located on the left side of a 25-ft. Parshall Flume 0.7 mi above Spinney Reservoir and 6.5 miles SE of Hartsel, CO in Park County, CO.

Drainage Area and Period of Record.-- 668 sq. mi. (From USGS StreamStats utility). ; Daily values are available from the DWR from October 1, 1982 to present.

Equipment.-- Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) and a stand-alone Sutron SDR-0001-1 data logger in a 6-ft. by 8-ft. wooden shelter overtop a 3-ft. by 5-ft. concrete stilling well at a 25-ft. Parshall Flume. An electric tape gage placed on the instrument shelf serves as the primary reference with a supplemental staff gage on the right wing wall of the flume at the Ha location. Elevation of gage is 8,700 ft. (from topographic map). The gage and satellite monitoring equipment are owned and maintained by the City of Aurora. Aurora operates the gage seasonally. Colorado Division of Water Resources (DWR) operates the gage for record purposes and is paid by Aurora to provide real time data.

Hydrologic Conditions.-- Regulated and unregulated flows from areas of varying topography and vegetative type. Flows can be affected by operations at Antero Reservoir, Montgomery Reservoir and irrigation diversions upstream of the gage.

Gage-Height Record.-- The primary record is 15 minute telemetered data with 15-minute logged DCP and SDR data as backup. The record is complete and reliable, except as follows: November 8, 2012 and April 16, 2013 which are partial day records corresponding to shut-down and start-up of the gage. November 8, 2012 was possibly affected by ice, discharge for the day was estimated. The gage was off for winter from November 9, 2012 through April 15, 2013. Discharge data for the winter period was applied to the record from the City of Aurora's Spinney Mountain Reservoir accounting. The days of April 19, 23, 24, 25 and 26, 2013 when the stage-discharge relationship was possibly affected by ice. Discharge for these days was estimated. June 5, 2013 from 21:00 hours to June 6, 2013 17:15 hours when the intakes became plugged. The discharge for this period was estimated. One unit value was adjusted using interpolation on May 3, 2013 at 09:00 hours due to ice removal from the stilling well. Instrument calibration was supported by thirty visits to the gage. No shaft encoder corrections were made this year. The stilling well and intakes were flushed on seven occasions.

Datum Corrections.-- Levels were run on October 13, 2011 using the flume's crest as a base. The base reference was found to be set accurately.

Rating.-- The control is a 25-foot Parshall Flume. STD25FTPF, a standard Parshall Flume rating was continued in use for all of WY2013. High flows have been observed to by-pass the flume by leaving the channel and crossing the access road. This is believed to occur at gage heights greater than 4.00 ft. and at flows in the 1000 cfs range. The rating is well defined to 572 cfs by measurements made since 2001. Wading measurements are made downstream of the foot bridge (measurement section width 30.5 ft.), while section rod and cable measurements are made on upstream side (measurement section width 32.1 ft.). Bridge is indexed on both sides to obtain accurate section widths. Fourteen measurements (Nos. 330 - 343) were made during the water year ranging in discharge from 22.9 to 467 cfs covering the range in flow experienced this year well. The peak flow of 478 cfs occurred at 01:30 on June 14, 2013 at a gage height of 2.67 ft. with a shift of 0.08 ft. exceeding the high flow measurement (No. 335) made June 12, 2013 by 11 cfs and 0.04 ft. of stage respectively.

Discharge.-- Shifts can be caused by algal growth in the flume and by deposition and scour of bed materials above the flume. Algal accumulation was not noted in the flume this year, however several stage-shift tables were used to account for fluvial processes in the weir pool affecting approach velocities. Stage dependent shifting was used for all periods of open water. Variable shift table PLASPICOVST12-A was continued from WY2012 until the gage was shut down for winter on November 8, 2012. PLASPICOVST12-A is defined by fourteen measurements (Nos. 318-331) made during the periods of use. Variable shift table PLASPICOVST13-A was applied from gage start up on April 16, 2013 to measurement No. 335 made near the peak discharge on June 12, 2013 and is defined by four measurements (Nos. 332-335) made during the period of use. Variable shift table PLASPICOVST13-B was applied from June 12, 2013 (No. 335) to August 21, 2013 and is defined by four measurements (Nos. 335-339) made during the period of use. Variable shift table PLASPICOVST13-C was applied from August 21, 2013 to November 11, 2013 at gage shut down and is defined by six measurements (Nos. 339-344) made during the period of use. All measurements were give full weight except for No. 337 which was discounted by 0.77% to smooth the stage-shift distribution.

Special Computations.-- Ice affected days were estimated from adjacent good record with respect to temperature trends recorded at the PLAHARCO gage and Spinney Mountain Reservoir accounting figures. Discharge for the winter period (November 9, 2012 through April 15 2013) was applied to the record from the City of Aurora's Spinney Mountain Reservoir accounting. These figures are based on reservoir elevation readings, and tend to show step-wise changes. DWR cannot confirm accuracy of daily accounting.

Remarks.--

The record is good, except for days of ice affect, partial day record and winter estimates, which are estimated and poor. Station maintained and record developed by Mike Wild.

Recommendations.-- Levels need to be run in the 2014 Water Year.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06694920 SOUTH PLATTE RIVER ABOVE SPINNEY RESERVOIR

RATING TABLE-- STD25FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

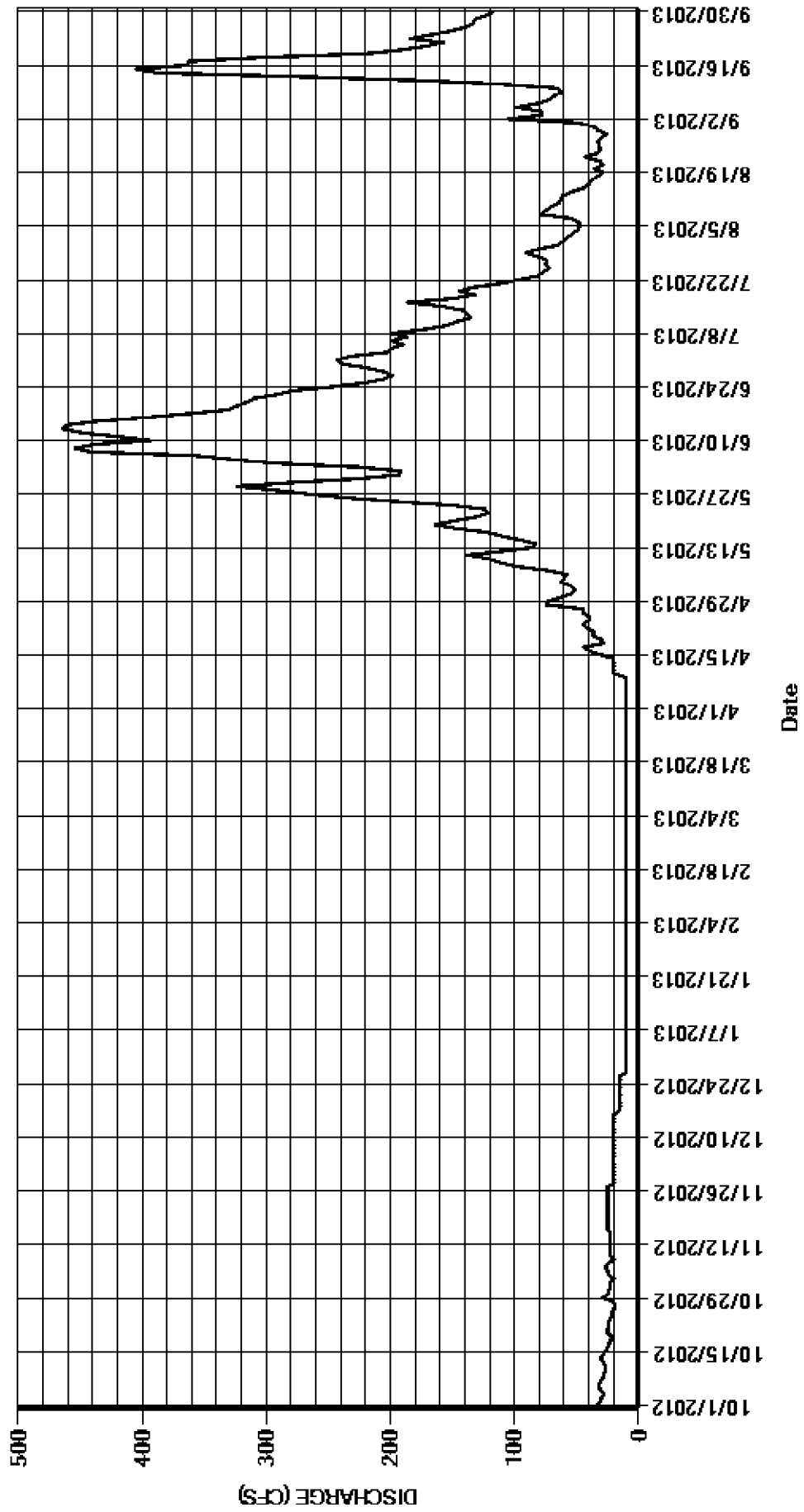
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	33	23	e20	e10	e10	e10	e10	54	193	243	61	51
2	31	23	e20	e10	e10	e10	e10	51	192	231	58	105
3	30	20	e20	e10	e10	e10	e10	54	226	202	53	78
4	28	24	e20	e10	e10	e10	e10	63	290	199	49	79
5	31	25	e20	e10	e10	e10	e10	60	e327	190	48	98
6	32	27	e20	e10	e10	e10	e10	58	e356	199	48	82
7	31	24	e20	e10	e10	e10	e10	73	442	187	55	72
8	29	e20	e20	e10	e10	e10	e10	97	454	200	79	68
9	28	e23	e20	e10	e10	e10	e10	111	438	173	75	62
10	27	e23	e20	e10	e10	e10	e20	120	394	156	71	66
11	27	e23	e20	e10	e10	e10	e20	138	420	147	64	108
12	28	e23	e20	e10	e10	e10	e20	110	450	136	63	173
13	31	e23	e20	e10	e10	e10	e20	85	464	138	61	268
14	29	e23	e20	e10	e10	e10	e20	83	461	142	53	387
15	27	e23	e20	e10	e10	e10	e30	95	437	159	44	405
16	25	e25	e20	e10	e10	e10	e40	110	397	186	40	364
17	24	e25	e15	e10	e10	e10	44	121	362	150	38	363
18	22	e25	e15	e10	e10	e10	28	147	330	132	32	305
19	22	e25	e15	e10	e10	e10	e30	164	324	144	29	218
20	25	e25	e15	e10	e10	e10	37	148	316	134	36	191
21	25	e25	e15	e10	e10	e10	36	131	310	112	29	170
22	24	e25	e15	e10	e10	e10	42	122	291	97	31	157
23	24	e25	e15	e10	e10	e10	e45	124	277	81	43	184
24	22	e25	e15	e10	e10	e10	e40	150	246	77	34	167
25	22	e25	e15	e10	e10	e10	e40	194	221	72	31	151
26	20	e25	e15	e10	e10	e10	e45	234	205	75	32	139
27	19	e25	e10	e10	e10	e10	45	266	198	74	33	133
28	21	e20	e10	e10	e10	e10	74	292	206	82	30	132
29	29	e20	e10	e10	---	e10	73	323	219	91	26	123
30	25	e20	e10	e10	---	e10	62	280	239	81	33	117
31	24	---	e10	e10	---	e10	---	224	---	66	36	---
TOTAL	815	707	520	310	280	310	901	4282	9685	4356	1415	5016
MEAN	26.3	23.6	16.8	10.0	10.0	10.0	30.0	138	323	141	45.6	167
AC-FT	1620	1400	1030	615	555	615	1790	8490	19210	8640	2810	9950
MAX	33	27	20	10	10	10	74	323	464	243	79	405
MIN	19	20	10	10	10	10	10	51	192	66	26	51

CAL YR	2012	TOTAL	13093	MEAN	35.8	MAX	119	MIN	10	AC-FT	25970
WTR YR	2013	TOTAL	28597	MEAN	78.3	MAX	464	MIN	10	AC-FT	56720

MAX DISCH: 478 CFS AT 01:30 ON JUN 14, 2013 GH 2.67 FT SHIFT 0.08 FT  
 MAX GH: 2.67 FT AT 01:30 ON JUN 14, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06694920 SOUTH PLATTE RIVER ABOVE SPINNEY RESERVOIR  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06695000 SOUTH PLATTE RIVER ABOVE ELEVENMILE RESERVOIR  
Water Year 2013

Location.-- Lat. N. 38°58'4.2"; Long. W105°34'53.5" (NAD83). Gage is located on the left side of a 25 ft. Parshall flume 2.2 miles downstream from the Spinney Mountain Reservoir Dam or 190 ft. east of where the South Platte River crosses County Road 59 and 9.1 miles southeast of the town of Hartzel in Park County, CO. The gage is also 2.5 mi. upstream from the high water line of Elevenmile Canyon Reservoir, at elevation 8,561 ft.

Drainage Area and Period of Record.-- 884 mi<sup>2</sup> (USGS Colorado StreamStats utility). ; Daily values are available from June 1939 to present.

Equipment.-- Digital incremental Sutron 56-0540-400-DTR shaft encoder, air temperature sensor and tipping bucket rain gage connected to a Sutron SatLink2 Data Collection Platform (DCP) and a standalone Sutron Stage Discharge Recorder (SDR) in a wooden shelter overtop a concrete Ha / Hb stilling well at a 25-foot Parshall Flume. An electric tape gage placed on the instrument shelf is the primary reference with a supplemental staff gage located on the right wing wall of the flume at the Ha location. Gage ownership is unknown. The Colorado Division of Water Resources reconstructed the gage shelter in 2011 and owns all instrumentation. The gage is located on City of Aurora property and has markers suggesting the structure was constructed by the Denver Water Board.

Hydrologic Conditions.-- Controlled release. The gage is approximately two miles below Spinney Mountain Reservoir, flows are controlled by Spinney Reservoir operations. A small unregulated drainage is intercepted by the river between Spinney and the gage which at times can contribute significant flow during localized events. The record is generally flat showing stepwise changes. At extreme release rates (1,000+ cfs) water can enter a bypass channel and bypass the flume. This was last observed in 1995.

Gage-Height Record.-- The primary record is 15-minute telemetered encoder data with 15-minute logged DCP and SDR data as backup. The record is complete and reliable, except for: December 10,11,16,17,19, 23, 24, 2012; January 1,7,8,9, 12-23, 29-31, 2013; February 1-4, 17-28, 2013 when the gage had varying degrees of ice affect. Missing values on November 28, 2012; May 9, 2013; June 3, 2013 and September 25, 2013 were interpolated from adjacent record or taken from good SDR record without loss of accuracy. A training day for inner city Denver students resulted in false unit values on September 25, 2013 when a student inadvertently adjusted the SE, the changes were quickly rectified and interpolated for the record. Instrument calibration was maintained by 38 visits to the gage. Three instrument calibration corrections ranging from +0.03 to -0.02 ft. were applied to the record as defined by observations made at the gage. Due to the gage's proximity to Spinney Mountain Reservoir, ice accumulation is generally not an issue. However, when winter releases are below 100 cfs ice can affect the gage in two ways: ice jams upstream of the gage can cause a drop in flow followed by surges as the ice dam releases or overtops, and by accumulation of ice on the flume walls above the normal stage level. This can be evident on the hydrograph as spikes in flow, however the daily values will remain equal to releases from Spinney Reservoir. Generally these operate in conjunction with each other and can compound the degree of ice affect.

Datum Corrections.-- Levels were run on October 13, 2011 using RM 3 as base. No correction to the base reference was required nor made.

Rating.-- The control is a 25-foot Parshall flume. Movement of cobble, gravel and silt and development of a sand bar above the flume as well as vegetal growth in the flume and in the weir pool approach section can affect the flume's performance. A standard 25-foot Parshall flume rating, STD25FTPF, was continued in use for all of WY2013. Twenty discharge measurements (Nos. 908-927) were made this year, ranging in discharge from 34.8 to 300 cfs. with shifts ranging from -0.01 to 0.04. Measurements made this year cover the range in stage experienced this year well. The peak flow of 303 cfs occurred at 2345 on July 8, 2013 at a gage-height of 2.06 ft. with a shift of +0.01 ft. exceeding the high flow measurement (No. 923) made July 9, 2013 by 3 cfs and 0.02 ft of stage respectively.

Discharge.-- Shifting control method was applied for all periods of open water. Measurements made this year showed unadjusted shifts varying between -0.01 and 0.04 ft. Stage dependent shifting using variable shift table PLAHARCOVST12-B was continued from last water year until November 20, 2012. It is defined by eight measurements (903-910) made during the period of use. Variable shift table PLAHARCOVST13-A was applied from November 20, 2012 through March 29, 2013. It is defined by eight measurements (910-915) made during the period of use. Shifting was applied as defined by measurements (915-916) and were distributed mainly by time from March 29, 2013 to April 17, 2013 when vegetal growth in the flume and in the weir pool approach section started to affect the flume's performance. Variable shift table PLAHARCOVST13-C was applied from April 17, 2012 through July 1, 2013 to account for vegetal growth in the flume and in the weir pool approach section during this period. It is defined by eight measurements (916-922) made during the period of use. Shifts outside the above periods were applied by time with consideration to change in stage as defined by measurements. All measurements were given full weight except for Nos. 909, 914, and 920, which were discounted up to ±4.50% to smooth shift distributions. The shift for measurement no. 918 was not used as the stage was erratic.

Special Computations.--

Discharge for ice affected periods were estimated from adjacent good record with respect given to Spinney Mountain Reservoir operating reports. A mass balance spreadsheet comparing the daily computed record to the Spinney Mountain Reservoir release (36" and 14" magnetic meter flow meters) used to identify ice affected days . The computed record will exceed the Spinney Mountain Reservoir figures when the gage is ice affected.

Remarks.--

The record is rated good, except for periods of ice effect which are estimated and fair. Station maintained and record developed by Mike Wild.

Recommendations.--

An additional reference point should be established the next time levels are run. Variable shift tables developed over the last several years show consistent patterns. Also, the existing rating has a maximum gage height of 6 ft. whereas the flume walls are 8 ft. in height. Either a custom rating or rating extension should be considered.



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06695000 SOUTH PLATTE RIVER ABOVE ELEVENMILE RESERVOIR

RATING TABLE-- STD25FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

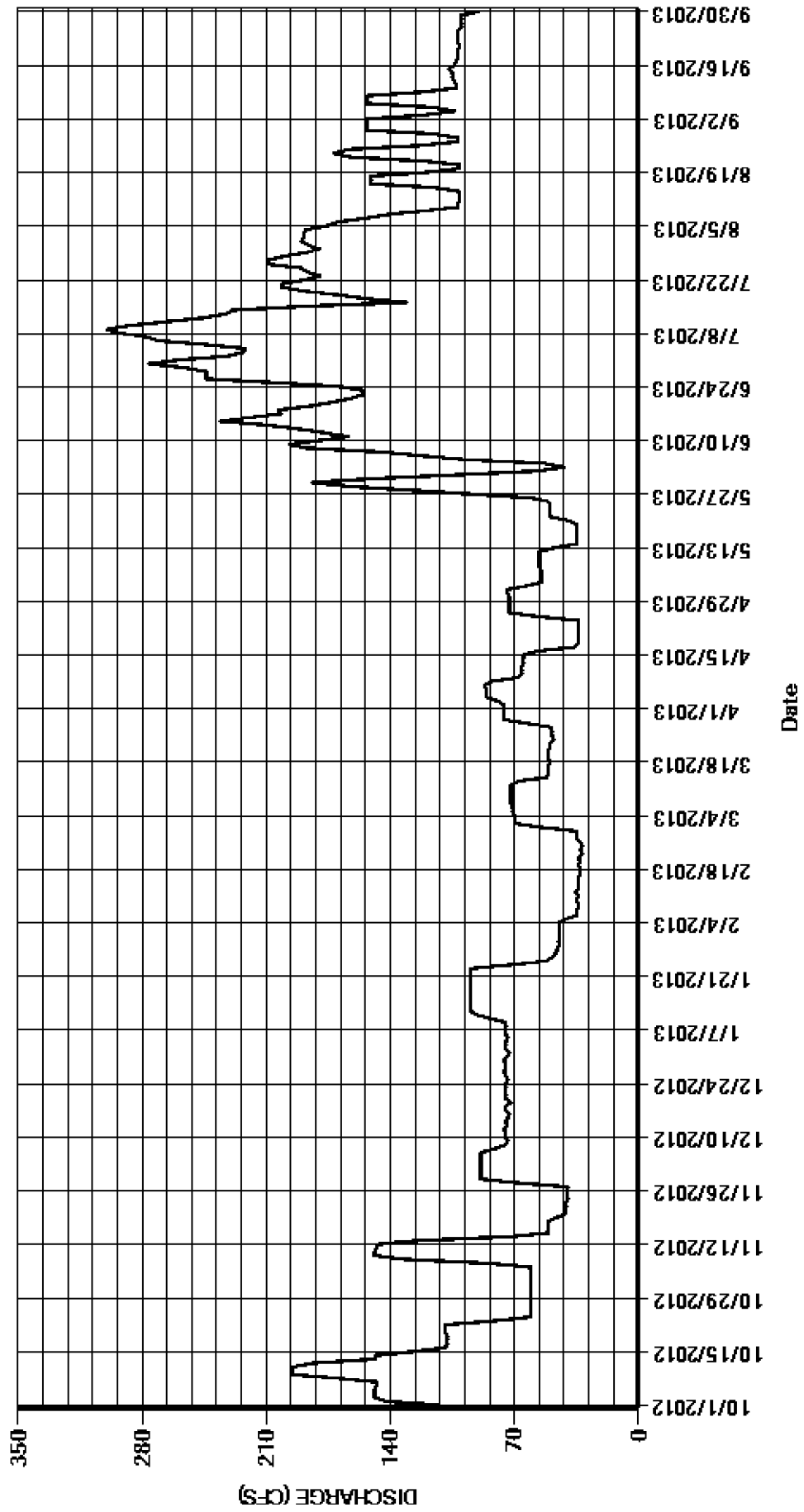
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	112	61	89	e73	e45	56	76	74	102	261	190	153
2	143	61	89	75	e45	70	76	74	56	232	189	153
3	149	61	89	75	e45	70	80	63	42	223	189	122
4	149	61	89	75	e45	70	86	55	54	222	188	104
5	149	61	89	74	41	71	86	55	98	244	176	116
6	148	61	89	75	35	71	86	55	121	271	170	153
7	148	84	81	e75	35	72	87	55	145	278	154	153
8	169	131	75	e75	34	72	83	56	187	292	141	153
9	195	149	74	e75	34	72	68	56	197	300	120	121
10	195	149	e75	84	35	72	66	56	180	288	102	103
11	195	148	e75	92	34	72	66	56	164	267	102	103
12	183	148	76	e95	36	72	66	56	178	246	101	104
13	149	125	74	e95	34	68	65	46	192	233	101	105
14	148	73	75	e95	34	52	65	35	211	229	101	105
15	126	51	74	e95	34	51	65	35	236	189	114	107
16	109	51	e73	e95	34	51	57	35	220	131	151	104
17	108	51	e75	e95	e33	51	36	35	202	154	151	103
18	108	51	75	e95	e33	50	34	35	203	170	151	102
19	108	46	e72	e95	e34	51	34	35	185	188	119	102
20	109	41	75	e95	e33	51	34	39	173	201	101	102
21	109	41	75	e95	e34	51	34	50	162	201	101	101
22	109	41	75	e95	e32	50	34	50	155	188	120	102
23	82	41	e75	e95	e33	50	34	50	155	180	162	102
24	61	40	e75	72	e32	48	34	50	168	187	172	102
25	61	40	74	52	e33	49	56	51	203	190	164	102
26	61	40	75	49	e35	49	73	60	244	209	124	100
27	61	40	76	47	e35	49	73	94	244	209	102	100
28	61	68	75	46	e35	62	73	128	244	201	102	100
29	61	89	75	e45	---	76	73	164	256	188	115	100
30	61	89	76	e45	---	76	73	184	276	180	153	90
31	61	---	74	e45	---	76	---	150	---	186	153	---
TOTAL	3688	2193	2408	2389	1002	1901	1873	2037	5253	6738	4279	3367
MEAN	119	73.1	77.7	77.1	35.8	61.3	62.4	65.7	175	217	138	112
AC-FT	7320	4350	4780	4740	1990	3770	3720	4040	10420	13360	8490	6680
MAX	195	149	89	95	45	76	87	184	276	300	190	153
MIN	61	40	72	45	32	48	34	35	42	131	101	90

CAL YR	2012	TOTAL	41452	MEAN	113	MAX	250	MIN	40	AC-FT	82220
WTR YR	2013	TOTAL	37128	MEAN	102	MAX	300	MIN	32	AC-FT	73640

MAX DISCH: 303 CFS AT 23:45 ON JUL 08, 2013 GH 2.06 FT SHIFT 0.01 FT  
 MAX GH: 2.06 FT AT 23:45 ON JUL 08, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06695000 SOUTH PLATTE RIVER ABOVE ELEVENMILE RESERVOIR  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06696000 SOUTH PLATTE RIVER NEAR LAKE GEORGE  
Water Year 2013

Location.-- 38°54'19.59"N 105°28'24.07"W Referenced from Google Earth (WGS 84) Park County, Hydrologic Unit 10190001, on left bank 700 ft downstream from Elevenmile Canyon Reservoir and 8.05 miles southwest of town of Lake George.

Drainage Area and Period of Record.-- 963 mi<sup>2</sup>; October 1, 1929 to present.

Equipment.-- Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) and a stand-alone Sutron SDR-0001-1 Stage Discharge Recorder (SDR) in a concrete shelter at a 15-foot concrete Parshall Flume. A 10-foot rectangular bypass channel is located adjacent to the Parshall Flume on the right side. The bypass channel can become active at a gage-height of 3.40 ft. but is normally kept closed by stop logs. An adjustable reference point and metal drop tape serve as the primary reference with a supplemental staff gage located on the right side of the flume at the Ha location. The gage is owned and operated by Denver Water in cooperation with the Colorado Division of Water Resources.

Hydrologic Conditions.-- Semi-controlled release. Eleven Mile Reservoir (97,780 AF) is immediately upstream from the gage, regulating flows. Eleven Mile Reservoir also has a spillway which can be active for extended periods of time. When the spillway is active abrupt gage-height changes are experienced at this gage due to wave action over the spillway. Spinney Mountain Reservoir (53,651 AF) and Antero Reservoir (22,300 AF) are located upstream of Eleven Mile Reservoir and can operationally affect hydrologic conditions at this gage. Discharge changes can occur in a stepwise fashion as releases are made from the outlet works to control water temperature for fish habitat.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged data (DCP) and SDR data as backup. The shelter and stilling well are heated in winter months and ice accumulation is generally not an issue. The record is complete and reliable except for January 3 through 7, 2013 when the stilling well is suspected to have frozen. Missing telemetered values occurring on November 13, 2012 filled in with observed data without loss of accuracy. Instrument calibration was maintained by 19 visits made to the gage. No shaft encoder corrections were made to the gage. Algal growth in the flume can affect the flume's performance. Algal growth was cleaned from the flume on May 22, 2013 and did not return a cleaning correction.

Datum Corrections.-- Levels were run on August 8, 2010 using RM4 as a base. The RP was found to be 0.004 ft low. No corrections were necessary. MTL - 8.405

Rating.-- Flow was confined to the Parshall flume section all year. The control is a 15-foot Parshall Flume. STD15FTPF, a standard 15-foot Parshall Flume rating was continued in use for WY2013. Eighteen measurements (Nos. 1141-1158) were made during the year ranging in discharge from 38.4 to 239 cfs. Measurements made this year cover the range in stage with the exception of lower mean daily flow on November 28, 2012 and the higher mean daily flows on July 8, through July 14, 2013. The peak flow of 278 cfs occurred at 14:00 hours on July 10, 2013 at a gage-height of 2.67 ft. with a shift of 0.00 ft. exceeding the high flow measurement (No. 1155) by 39 cfs and 0.23 ft. of stage respectively. The peak was most likely caused by a wind event.

Discharge.-- Shifts are caused by constricted approach conditions, and aquatic growth in the flume and approach section. Shifting control method was used for the entire year. Shifts were distributed by time as defined by measurements with respect to stage for the entire water year. Measurements made this year showed unadjusted shifts varying from -0.02 (moss) to 0.01 ft. this year. All were given full weight except for Nos. 1147, 1149, 1151, 1153, 1155 and 1157 which were adjusted to the rating by -1.76% and 1.42% respectively.

Special Computations.-- None.

Remarks.-- The record is rated good with exception of January 3 through 7, 2013 which is rated fair. Station maintained and record developed by Mike Wild.

Recommendations.-- Approach conditions cause velocities to be greater than 0.50 ft/s in the stilling pool immediately upstream of the flume. This could be abated if the stilling pool were cleared of accumulated cobble and gravel. An area of concrete spalling was noted following the 2011 water year. It appears to be confined to the lower vertical walls below the crest on the left edge water (LEW) side. The spalling did not affect the performance of the structure in the 2013 water year but needs to be monitored and is most likely caused by mechanical weathering. Denver Water was made aware of the issue when the structure was inspected by Denver Water officials during the a dam inspection on August 1, 2012. Continue to monitor spalling on departure section of the Parshall flume.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06696000 SOUTH PLATTE RIVER NEAR LAKE GEORGE

RATING TABLE-- STD15FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

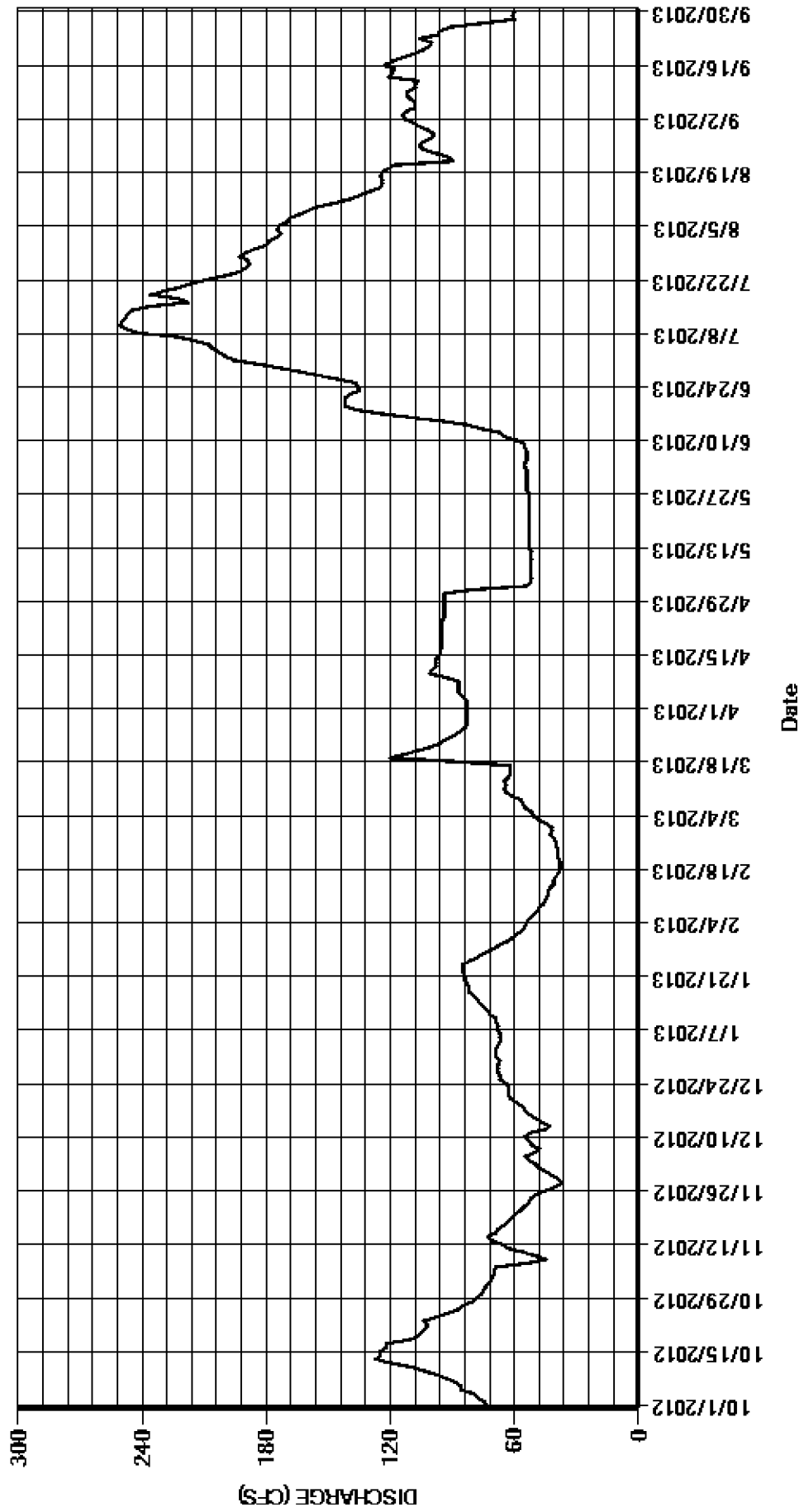
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	73	74	45	69	59	42	83	94	54	196	179	109
2	75	72	48	69	56	45	83	79	54	200	175	113
3	78	71	50	e68	55	49	83	54	55	203	173	114
4	80	70	53	e67	54	51	85	52	55	206	175	112
5	86	70	55	e67	53	52	87	52	54	208	174	108
6	86	69	50	e67	51	55	87	52	54	215	170	108
7	89	54	48	e68	49	56	87	52	54	223	169	110
8	93	45	52	68	48	57	87	52	55	241	164	112
9	98	50	53	69	46	61	93	52	55	247	160	112
10	104	56	55	69	45	64	101	52	59	251	156	108
11	110	63	53	72	44	65	100	52	65	250	147	108
12	120	66	45	73	44	64	98	52	67	248	140	107
13	127	71	43	75	43	65	98	53	76	247	135	121
14	125	73	47	77	41	63	98	53	83	245	130	119
15	125	69	50	78	41	62	96	53	95	236	125	118
16	122	68	53	80	40	62	96	53	110	218	124	123
17	122	65	55	82	39	62	95	53	124	223	124	119
18	111	63	56	82	38	87	95	53	137	236	125	114
19	107	61	59	83	38	120	95	53	142	230	124	108
20	105	59	62	84	38	113	95	53	142	222	121	104
21	103	57	63	84	39	107	95	53	142	216	118	101
22	102	55	63	85	39	100	95	53	140	209	90	100
23	104	53	63	85	39	96	95	53	135	200	92	106
24	98	52	64	85	40	93	95	53	136	193	98	97
25	92	50	67	82	40	89	94	53	137	190	104	96
26	87	45	67	78	41	86	94	53	146	188	106	91
27	85	40	68	75	43	84	94	53	155	189	104	75
28	80	37	68	71	42	83	94	54	164	193	100	60
29	78	39	68	68	---	83	94	54	174	190	99	61
30	76	42	67	64	---	83	94	54	185	186	102	60
31	75	---	69	61	---	83	---	54	---	180	106	---
TOTAL	3016	1759	1759	2305	1245	2282	2786	1706	3104	6679	4109	3094
MEAN	97.3	58.6	56.7	74.4	44.5	73.6	92.9	55.0	103	215	133	103
AC-FT	5980	3490	3490	4570	2470	4530	5530	3380	6160	13250	8150	6140
MAX	127	74	69	85	59	120	101	94	185	251	179	123
MIN	73	37	43	61	38	42	83	52	54	180	90	60

CAL YR	2012	TOTAL	37742	MEAN	103	MAX	238	MIN	37	AC-FT	74860
WTR YR	2013	TOTAL	33844	MEAN	92.7	MAX	251	MIN	37	AC-FT	67130

MAX DISCH: 278 CFS AT 14:00 ON JUL 10, 2013 GH 2.67 FT SHIFT 0.00 FT  
 MAX GH: 2.67 FT AT 14:00 ON JUL 10, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06696000 SOUTH PLATTE RIVER NEAR LAKE GEORGE  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
TARRYALL CREEK BELOW TARRYALL RESERVOIR  
Water Year 2013

Location.-- Lat. N39°13'18.1", Long. W105°36'09.1" (NAD83) Park County, CO. Gage is on the right edge water downstream of bridge on Park County Road 77 approximately 1000 ft. downstream from the Tarryall Reservoir dam and 15 miles southeast of Jefferson, CO.

Drainage Area and Period of Record.-- 355 sq. mi., from DWR Dam Safety Section database. ; The gage has been operated infrequently records were kept from June 20, 1975 to September 30, 1980 and resumed in 2005. The Colorado Division of Water Resources (DWR) made the first known discharge measurement in August 1974. Satellite monitoring was installed in 2005. Daily values are available from June 20, 1975 through September 30, 1980 and from October 1, 2005 to present.

Equipment.-- Digital incremental Sutron SDR-0001-4 shaft encoder, temperature sensor and a tipping bucket rain gage connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly in a 60-inch CMP structure overtop a 48-inch concrete stilling well located on the right side of the channel below a bridge on Park County Road 77 below Tarryall Reservoir. The stilling well is connected to channel via three 2-inch steel intakes with flushing provisions. An electric tape gage in the shelter is the primary reference with a supplemental staff gage located in the gage pool adjacent to the shelter. Gage is operated and equipment maintained by the Colorado Division of Water Resources (CDWR) under a cooperative agreement with the Colorado Division of Parks and Wildlife, the owner of Tarryall Reservoir.

Hydrologic Conditions.-- High mountain alluvial plateau mostly devoid of forest. Conditions remain stable with light residential development upstream. Discharge affected by irrigation diversions, return flows from irrigated areas. releases from Jefferson Lake, James Tingle Reservoir and releases from Tarryall Reservoir.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged DCP data and 5-minute logged SDR data as backup. Instrument calibration was supported by twenty-five visits to the gage by CDWR personnel. One instrument corrections of -0.01 ft. were made just after start up and applied to the record as defined by visits made to the gage. The record is complete and reliable except for: November 11 and 12, 2012 when the stage-discharge relation was possibly affected by ice or freezing of the stilling well and the days of December 11, 2012 and May 13, 2013 which are partial day record due to seasonal gage shut down and start up. Four missing values due to firmware upgrades to the DCP on November 13, 2012; were interpolated from adjacent record and from on site observations without loss of accuracy. The stilling well was flushed with a large capacity pump on October 29, 2012 which required one value to be adjusted to adjacent values and from on site observations without loss of accuracy. There was some degree of backwater due to a downstream beaver dam from September 18, 2013 to gage shut down. Debris was cleaned from the control on July 8, 2013 resulting in a gage height correction of -0.02 ft. which was prorated back to the last visit when the control was observed to be clear. The gage is not operated in winter months. The gage was shut down due to ice on December 11, 2012 and was reactivated for the season on May 13, 2013. The period of record for the 2013 Water Year is October 1, 2012 through December 11, 2012 and May 13, 2013 through September 30, 2013.

Datum Corrections.-- Levels were run for the first time on the newly constructed gage on November 16, 2012. Construction and realignment of the bridge destroyed all markers used for the previous gage datum. Levels run on October 15, 2013 using the RM4 as base finding the gage to be well within tolerances. The 2013 levels run found the elevation for the ETG of 15.098 was identical to the previous year.

Rating.-- The control is a boulder cross-vane. TARTARCO04 was developed on July 26, 2012 in an expedited fashion to address some Safety of Dams concerns associated with Tarryall Reservoir that had come to the light in the days prior to development of the rating (contact the Safety of Dam's Engineer or the Water Commissioner for specific details). TARTARCO04 is defined by measurements from 3.59 to 41.4 cfs. The rating has been extrapolated approximately 400% above the high measurement (No. 164) for several reasons; current Safety of Dams event, known symmetry of the control and approach / departure channel and a relatively linear progression seen in the stage-discharge relation. TARTARCO05 was developed June 19, 2013 and uses many of the same elements used to create TARTARCO04 but adjusts for apparent movement or settling of the control at lower stages and includes the higher discharge measurements made in the 2013 water year. Measurement Nos. 171-186, were heavily weighted to determine deviations from TARTARCO04 rating. TARTARCO05 is defined by measurements from 4.87 to 179 cfs. It is extrapolated 1.63 times the 2013 high measurement (No. 186). TARTARCO04 was applied from the start of water year 2013 to seasonal gage shut down with TARTARCO05 applied from gage start up in the spring of 2013 to the end of the water year. Sixteen discharge measurements (Nos. 177 - 192) were made this year ranging in discharge from 4.56 to 179 cfs covering the range in stage experienced this year well. The peak flow of 181 cfs occurred at 00:45 on June 13, 2013 at a gage-height of 2.89 ft. with a shift of 0.00 ft. exceeding this year's high flow by 2 cfs and 0.01 ft. of stage respectively.

Discharge.--

Shifting control method was used all year. This year, shifts were primarily caused by settling of the control structure and backwater caused by beaver activity downstream of the gage. Other factors influencing the stage-discharge relation were fill and scour of materials through the gage pool, vegetal growth in the channel. Stage dependent shifting was applied from the start of water year 2013 to the seasonal gage shut down due to ice on December 11, 2012 using variable shift table TARTARCOVST13A, defined by four measurements made during the period of use. From gage start up on May 13, 2013 through September 30, 2013 shifts were applied by time as defined by measurements. Open water measurements showed unadjusted shifts varying between -0.13 and +0.01 ft. All measurements were given full weight except for Nos. 182, 184, 187, 189 and 191 which were discounted up to  $\pm 4.61\%$  to smooth shift distributions.

Special Computations.-- Discharge for the ice affected period remained as calculated and flagged as possibly ice affected. Discharge for partial day records was estimated from adjacent good record with respect given to discharge measurements made the same day or time period.

Remarks.-- The record is good with exception of: periods of ice affect which are rated fair; partial day record which is estimated and fair; and periods of backwater caused by beaver activities downstream of the gage which are poor. This is a partial year record; the period of record for the 2013 Water Year is October 1, 2012 through December 11, 2012 and May 13, 2013 through September 30, 2013. Station maintained by Mike Wild.

Recommendations.-- Continue efforts to make discharge measurements through the entire range of flows experienced to better define the stage-discharge relation.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

TARRYALL CREEK BELOW TARRYALL RESERVOIR

RATING TABLE-- TARTARCO04 USED FROM 01-OCT-2012 TO 11-DEC-2012  
 TARTARCO05 USED FROM 13-MAY-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.6	14	4.5	---	---	---	---	---	93	82	42	31
2	8.4	14	4.6	---	---	---	---	---	81	77	39	49
3	7.5	13	5.0	---	---	---	---	---	75	69	37	52
4	6.5	12	5.0	---	---	---	---	---	76	65	35	51
5	5.7	12	5.2	---	---	---	---	---	94	62	34	58
6	5.1	13	5.2	---	---	---	---	---	118	64	32	49
7	4.9	13	5.3	---	---	---	---	---	140	71	35	40
8	4.8	13	5.2	---	---	---	---	---	153	75	42	35
9	4.7	12	5.2	---	---	---	---	---	156	77	45	31
10	4.7	13	4.9	---	---	---	---	---	159	71	41	34
11	4.8	e10	e4.0	---	---	---	---	---	171	66	39	52
12	5.8	e8.5	---	---	---	---	---	---	177	64	36	77
13	7.7	7.9	---	---	---	---	---	e48	180	68	35	107
14	9.0	7.0	---	---	---	---	---	44	177	81	36	138
15	10	6.2	---	---	---	---	---	42	172	86	34	131
16	11	5.9	---	---	---	---	---	44	164	89	30	129
17	11	5.8	---	---	---	---	---	45	157	80	27	117
18	8.7	5.8	---	---	---	---	---	51	152	68	24	99
19	8.5	5.7	---	---	---	---	---	59	137	67	22	88
20	9.7	5.7	---	---	---	---	---	56	122	73	22	82
21	11	5.8	---	---	---	---	---	50	112	71	22	74
22	12	5.7	---	---	---	---	---	45	105	56	22	68
23	12	5.7	---	---	---	---	---	45	97	45	24	70
24	12	5.6	---	---	---	---	---	52	95	39	29	71
25	12	5.5	---	---	---	---	---	67	93	40	32	65
26	12	5.3	---	---	---	---	---	83	86	41	32	58
27	11	5.1	---	---	---	---	---	99	83	41	30	53
28	9.5	4.9	---	---	---	---	---	112	83	43	28	50
29	11	4.7	---	---	---	---	---	118	88	50	26	50
30	12	4.5	---	---	---	---	---	116	86	51	25	48
31	13	---	---	---	---	---	---	109	---	46	26	---
TOTAL	275.6	250.3	54.1	---	---	---	---	1285	3682	1978	983	2057
MEAN	8.89	8.34	4.92	---	---	---	---	67.6	123	63.8	31.7	68.6
AC-FT	547	496	107	---	---	---	---	2550	7300	3920	1950	4080
MAX	13	14	5.3	---	---	---	---	118	180	89	45	138
MIN	4.7	4.5	4.0	---	---	---	---	42	75	39	22	31

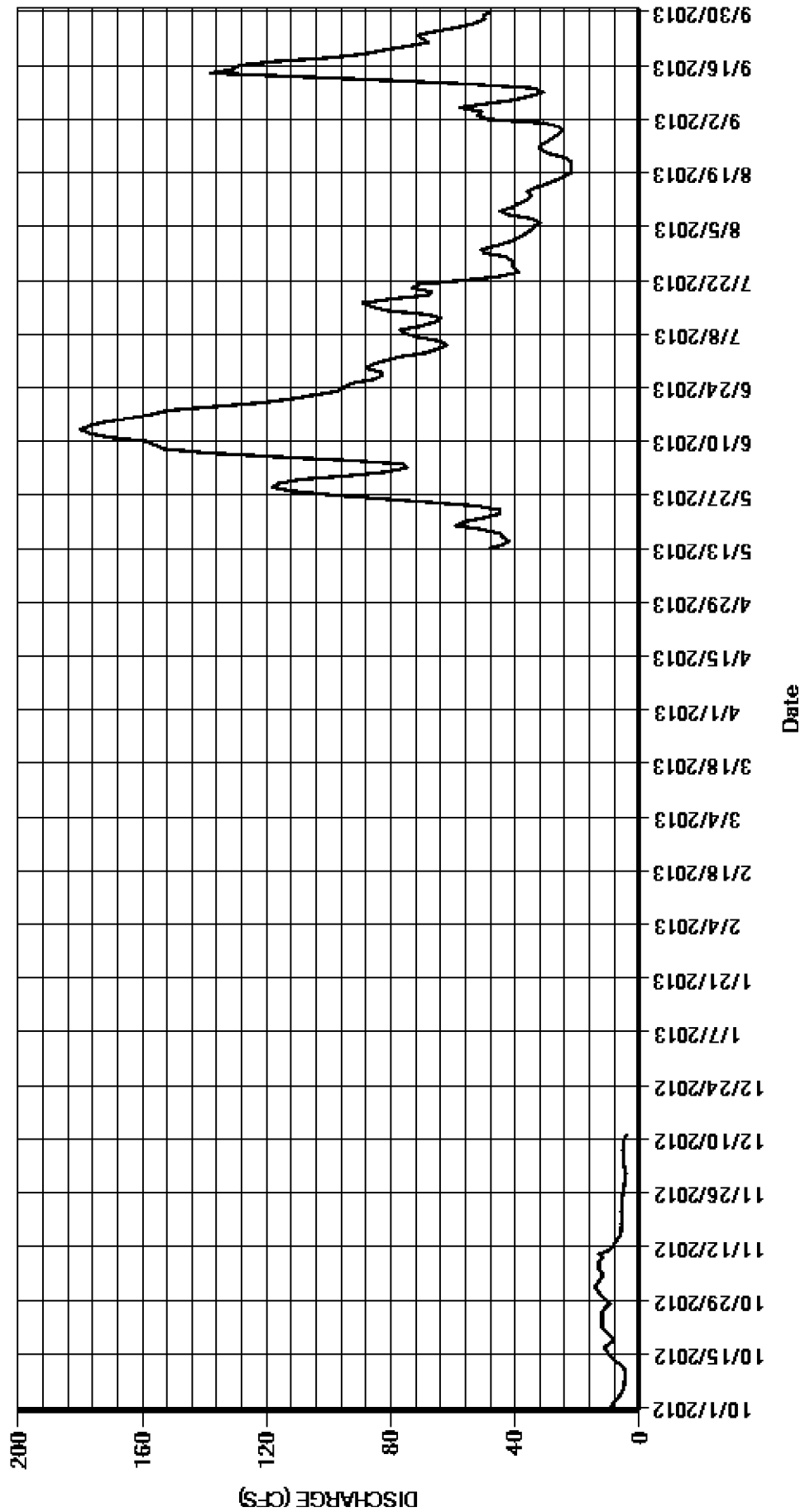
CAL YR	2012	TOTAL	4832.3	MEAN	18.3	MAX	69	MIN	4.0	AC-FT	9580 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	10565.0	MEAN	49.6	MAX	180	MIN	4.0	AC-FT	20960 (PARTIAL YEAR RECORD)

MAX DISCH: 181 CFS AT 00:45 ON JUN 13, 2013 GH 2.89 FT SHIFT 0.00 FT  
 MAX GH: 2.89 FT AT 00:45 ON JUN 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



TARRYALL CREEK BELOW TARRYALL RESERVOIR  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06701500 SOUTH PLATTE RIVER BELOW CHEESMAN RESERVOIR  
Water Year 2013

Location.-- Lat. N39°12'33.58"; Long. W105°16'4.83" (NAD83) Jefferson County, Hydrologic Unit 10190002. Gage is located on the left side of a 30-ft. Parshall Flume, approximately 1,400-ft. downstream from the toe of Cheesman Dam and 3.8 miles SW of Deckers, CO.

Drainage Area and Period of Record.-- 1760 sq. mi. (USGS Colorado StreamStats utility). ; October 1, 1925 to present.

Equipment.-- Digital incremental Sutron SDR-0001-4 Data Logger connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly in a rectangular concrete shelter and concrete stilling well at a 30-ft. Parshall Flume. An electric tape gage (ETG) in the shelter is the primary reference with no provisions for a supplemental reference. The stilling well is connected to the flume via one 2-in. intake without flushing equipment. Gage is owned and maintained by Denver Water and operated cooperatively with the Colorado Division of Water Resources.

Hydrologic Conditions.-- Regulated and unregulated flow. Cheesman Reservoir, an on-channel reservoir, regulates all flows at the gage unless the reservoir is spilling. Cheesman Reservoir is in the center of the 2002 Hayman burn area. The fire severely damaged the watershed. Denver Water Board has performed extensive erosion control in the area surrounding the reservoir.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged DCP data and 15-minute logged SDR data as backup. Instrument calibration was maintained by 22 visits made to the gage by DWR personnel. A datum correction due to levels made on November 19, 2012 (when the ETG was adjusted) resulted in a instrument correction of -0.02 ft. One unit value per day was deemed erroneous during measurements or flume cleaning activities and manually adjusted from adjacent good record without loss of accuracy on November 19, 2012, December 12 and 27, 2012, February 12, 2013, March 21, 2013 and July 16, 2013. One missing unit value due to firmware upgrades to the DCP on November 15, 2012 was taken from the SDR back-up log without loss of accuracy. The record is complete and reliable. Due to the flume's proximity to the dam, ice accumulation in the approach, flume and departing section is normally not an issue. Vegetal growth in the flume and in the weir pool approach section can affect the flume's performance. The flume was cleaned four times; October 3, 2012, November 16, 2012, February 20, 2013 and March 27, 2013 returning cleaning corrections from -0.03 to -0.06 ft. Shifting was affected by vegetal growth in the weir pool approach section from early October until mid November until freezing conditions when the mass sloughed off.

Datum Corrections.-- Levels were run November 16, 2012 using the flume crest as base. The ETG was found to be 0.02 ft. high with respect to the flume crest. The correction was applied to the record and the gage-heights of measurements from October 5, 2011 through November 19, 2012 (date when the correction was made). Levels were run again on October 17, 2013 using the flume crest as base, the gage was found to be within acceptable tolerances.

Rating.-- The control for all stages is a 30-ft. Parshall Flume. PLACHECO11, developed in 1995 in an attempt to compensate for submergence of the flume at high stages, was continued this year. The rating is well defined except for the upper ranges (~1000 cfs) where submergence appears to cause a break in the slope of the curve. Shifts have been typically positive unless extensive vegetal growth is present. A new rating showing a more even distribution of shifts throughout the range of expected flow has been developed and is currently being evaluated. Twenty four measurements (Nos. 285-308) were made this year, ranging in discharge from 35.2 to 262 cfs. Measurements made this year cover the range in stage experienced this year well except for higher daily flows from August 17 through August 22, 2013, August 30, 2013 and September 19 through September 24, 2013. The peak flow of 313 cfs occurred at 16:30 on September 18, 2013 at a gage-height of 1.86 feet with a corresponding shift of +0.07 ft. exceeding the high flow measurement (No. 305) made July 25, 2013 by 51 cfs and 0.20 ft. of stage respectively.

Discharge.-- Shifting control method was used all year. Shifts are caused by scour and fill of channel materials upstream of the flume and vegetal growth within the flume and or approach section. Shifts were distributed by time with consideration given to change in stage from October 3, 2012 to November 19, 2012. Variable shift table PLACHECOVST13-A, defined by five measurements (Nos. 289-293) was applied from November 19, 2012 starting at the time the Tape Length and SDR were corrected -0.02 feet due levels to January 31, 2013. Shifts were distributed by time with consideration given to change in stage from January 31, 2013 to July 16, 2013. Variable shift table PLACHECOVST13-C, defined by five measurements (Nos. 304-308) was applied from July 16, 2013 to September 10, 2013. Shifts were distributed by time for the remainder of the water year. Open water measurements showed shifts varying between -0.01 and +0.07 ft. All were given full weight except for Nos. 301 and 308 which were discounted up to 2% to smooth shift distributions.

Special Computations.-- Generally if the flume is cleaned by a State Hydrographer. A measurement is made before and after the flume cleaning with shifts applied accordingly.

Remarks.-- The record is rated good. Station maintained by Mike Wild record developed by Mike Wild and Division One Hydrographic staff.

Recommendations.--

Continue to evaluate the efficacy of the new rating.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06701500 SOUTH PLATTE RIVER BELOW CHEESMAN RESERVOIR

RATING TABLE-- PLACHECO11 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

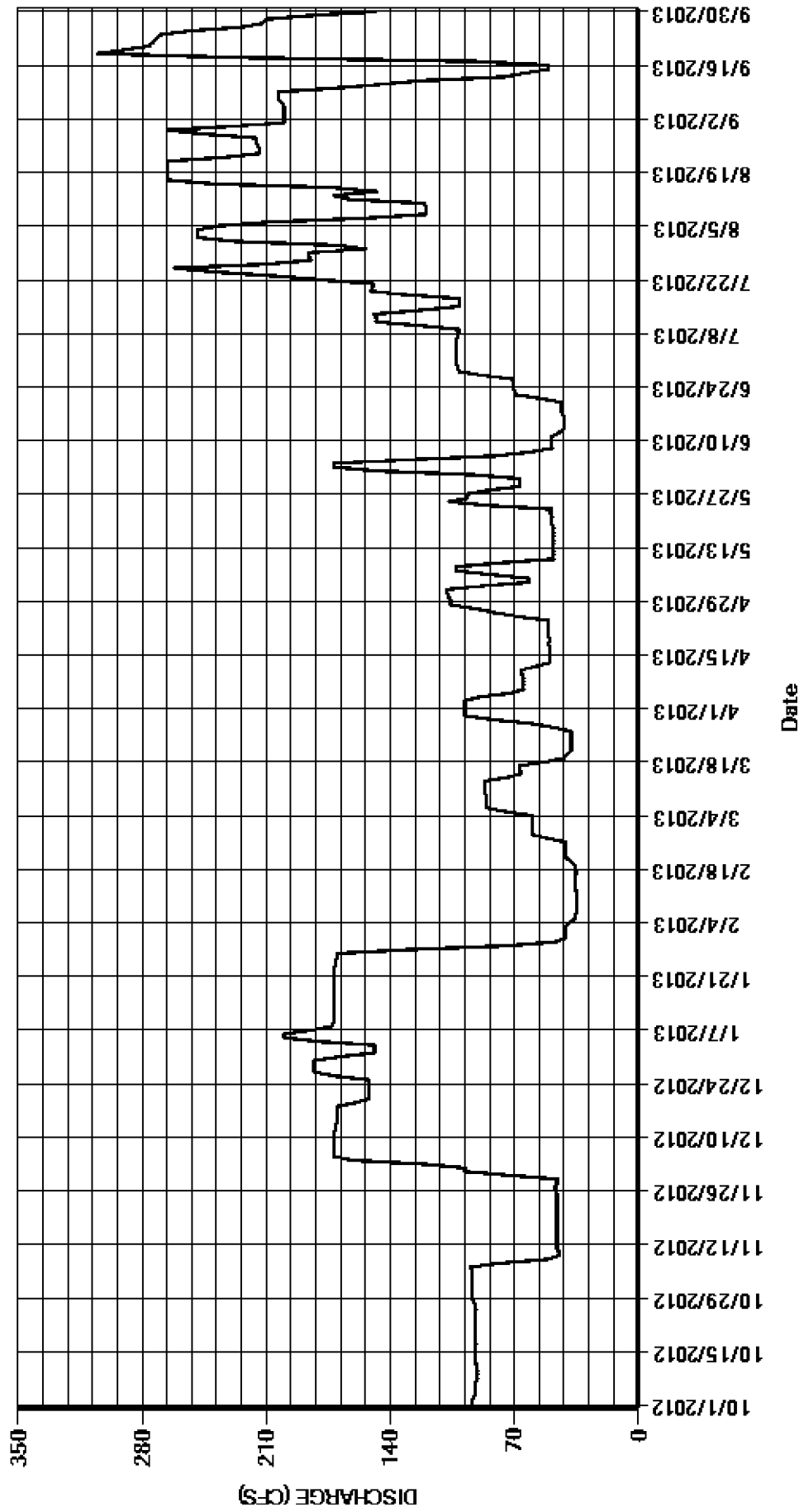
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	94	94	98	149	41	60	98	108	93	103	227	200
2	94	94	98	149	41	60	98	108	148	103	249	200
3	93	94	121	149	41	60	98	88	172	103	249	200
4	92	94	162	179	39	60	90	62	172	103	249	200
5	92	94	172	200	36	75	72	62	128	103	237	200
6	92	95	172	200	36	86	65	84	81	103	208	201
7	92	79	172	184	35	86	65	103	61	102	154	203
8	91	52	172	173	35	86	65	103	49	102	120	203
9	91	45	172	172	35	86	65	78	49	101	120	203
10	91	45	172	172	35	87	66	48	49	123	120	170
11	91	46	172	172	35	87	66	48	49	148	121	146
12	92	46	171	172	35	87	58	48	45	148	164	124
13	92	46	171	172	36	87	50	48	42	149	172	76
14	92	46	170	172	36	74	50	48	42	123	148	64
15	92	46	170	172	36	66	50	48	42	101	171	51
16	92	46	170	172	36	67	50	48	42	101	240	51
17	92	46	170	172	35	67	50	48	43	101	266	92
18	92	46	170	172	36	52	51	48	44	131	266	227
19	92	46	160	172	36	42	50	49	44	151	266	305
20	92	46	152	172	38	40	51	49	44	150	266	290
21	92	46	152	172	41	38	51	49	56	150	266	276
22	92	46	152	172	41	38	51	50	70	180	266	274
23	92	46	152	172	41	38	51	49	70	206	233	272
24	92	46	152	171	41	38	51	87	71	239	214	270
25	92	46	152	171	41	38	68	107	71	262	214	253
26	92	47	171	170	51	38	81	97	71	210	215	223
27	92	47	183	170	60	48	91	97	88	185	216	212
28	93	46	183	130	60	60	106	85	101	186	216	210
29	94	46	183	74	---	82	106	67	102	186	246	184
30	94	74	183	47	---	98	107	67	103	154	265	148
31	94	---	168	41	---	98	---	67	---	169	231	---
TOTAL	2860	1736	5018	4937	1109	2029	2071	2148	2242	4476	6595	5728
MEAN	92.3	57.9	162	159	39.6	65.5	69.0	69.3	74.7	144	213	191
AC-FT	5670	3440	9950	9790	2200	4020	4110	4260	4450	8880	13080	11360
MAX	94	95	183	200	60	98	107	108	172	262	266	305
MIN	91	45	98	41	35	38	50	48	42	101	120	51

CAL YR	2012	TOTAL	61597	MEAN	168	MAX	481	MIN	45	AC-FT	122200
WTR YR	2013	TOTAL	40949	MEAN	112	MAX	305	MIN	35	AC-FT	81220

MAX DISCH: 313 CFS AT 16:30 ON SEP 18, 2013 GH 1.86 FT SHIFT 0.07 FT  
 MAX GH: 1.86 FT AT 16:30 ON SEP 18, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06701500 SOUTH PLATTE RIVER BELOW CHEESMAN RESERVOIR  
 WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
NORTH FORK SOUTH PLATTE RIVER AT GRANT

Water Year 2013

Location.-- Lat. N.39°27'28.7", Long. W.105°39'32.6" (WGS84) Park County, CO. Gage is located on the left side of the channel 1,350 ft. downstream from Geneva Creek and 1.0 miles downstream from the east portal of the Harold D. Roberts Tunnel or 0.25 miles southeast of the US 285 and County Road 62 intersection in Grant, CO.

Drainage Area and Period of Record.-- 127 mi<sup>2</sup>; (From topographic maps.); Daily values are available from the Colorado Division of Water Resources from October 1, 1990 to present.

Equipment.-- Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) and a graphic Stevens A type water stage recorder in a wooden shelter overtop a 36-inch concrete stilling well next to a concrete trapezoidal channel section and spillway. A metal drop tape and adjustable reference point serve as the base reference. There are no provisions for a supplemental reference. The gage is equipped with A/C power, heat lamps and heat tape to prevent freezing of the stilling well and intakes in winter months. The gage is owned and maintained by Denver Water in cooperation with the Colorado Division of Water Resources.

Hydrologic Conditions.-- Semi-controlled release. Gage is affected by natural stream flows from Kenosha Creek, Geneva Creek and discharges from the East Portal of the Roberts tunnel. Rapid changes in stage are caused by the regulation of Roberts Tunnel, 1 mile upstream. When Roberts Tunnel is operating in winter months, the gage is usually free of ice. Insufficient stilling due to rock and cobble build up at gage pool produces choppy water surfaces and fast velocities in the gage pool.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged DCP data and chart record as backup. Instrument calibration was supported by twenty four visits made to the gage. Four instrumentation corrections were applied to the record as defined by visits: -0.01 applied October 24, 2012 and May 2, 2013, and +0.01 applied January 16, and August 16, 2013. Three shaft encoder resets were applied when nearby lightning activity had resulted in 0.00 default, July 1 and July 12, and August 12, 2013. One flush correction was also applied on December 14, 2012. The record is complete and reliable except for December 10 when the stage-discharge relationship was affected by ice when stilling well communication with the channel was impaired.

Datum Corrections.-- Levels were last run on November 1, 2012 using RM 4 as base. The base reference was within allowable tolerances.

Rating.-- The control for stages below 4.00 ft. is a broad crested weir with slightly raised edges. The overflow control has good getaway conditions and should not become submerged. Both banks are clear up to a stage of approximately 5.00 ft. Rating No. 12 (PLAGRACO12), in use since October 1, 2001 was continued this year. It is defined by measurements from 15.6 to 700 cfs. Fifteen discharge measurements (Nos. 1122-1136) were made during the year, ranging in discharge from 36.1 to 395 cfs covering the range in stage experienced this year well. The peak discharge of 482 cfs occurred at 0115 on September 10, 2013 at a gage-height of 1.69 ft. with a shift of -0.01 ft. It exceeded this year's high flow measurement (No. 1131) by 87 cfs and 0.12 ft. of stage.

Discharge.-- Shifts are caused by scour and fill of the weir pool and by the gradual erosion of the control. Open water measurements made this year showed unadjusted shifts varying between +0.04 and -0.01 ft. All measurements were given full weight except for Nos. 1124, 1128, 1129, and 1135 which were adjusted -2.64, -3.48, 6.56, and -1.86% respectively to smooth shift distributions. Shifting control method was used for all periods of open water. Shifts were applied to the record as follows: June 27 through October 1, 2013, stage dependent shifting using variable shift table PLAGRACOVSC13-A, defined by seven measurements (Nos. 1131-1137) made during the period of use; from October 1, 2012 through June 27, 2013 shifts were distributed by time as defined by measurements.

Special Computations.-- Discharge for periods of ice affect were estimated from adjacent periods of good record, discharge measurements made at the gage and temperature trends recorded at the gage. A spreadsheet was used to compute the daily difference between the Grant gage and Roberts Tunnel. This difference represents the native flow in the North Fork without Roberts Tunnel. This year, Roberts Tunnel released throughout the winter months. As a result, very little ice was encountered.

Remarks.-- The record is good with exception of the ice affected period which is estimated and poor. Station maintained by Tony Arnett, record developed by Tony Arnett.

Recommendations.-- The Roberts Tunnel and North Fork of the South Platte at Grant record should be worked on a monthly basis. A wire weight gage should be installed at this gage as there is a need for an outside reference to verify the primary reference.

STATE OF COLORADO  
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 OFFICE OF STATE ENGINEER

NORTH FORK SOUTH PLATTE RIVER AT GRANT

RATING TABLE-- PLAGRACO12 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

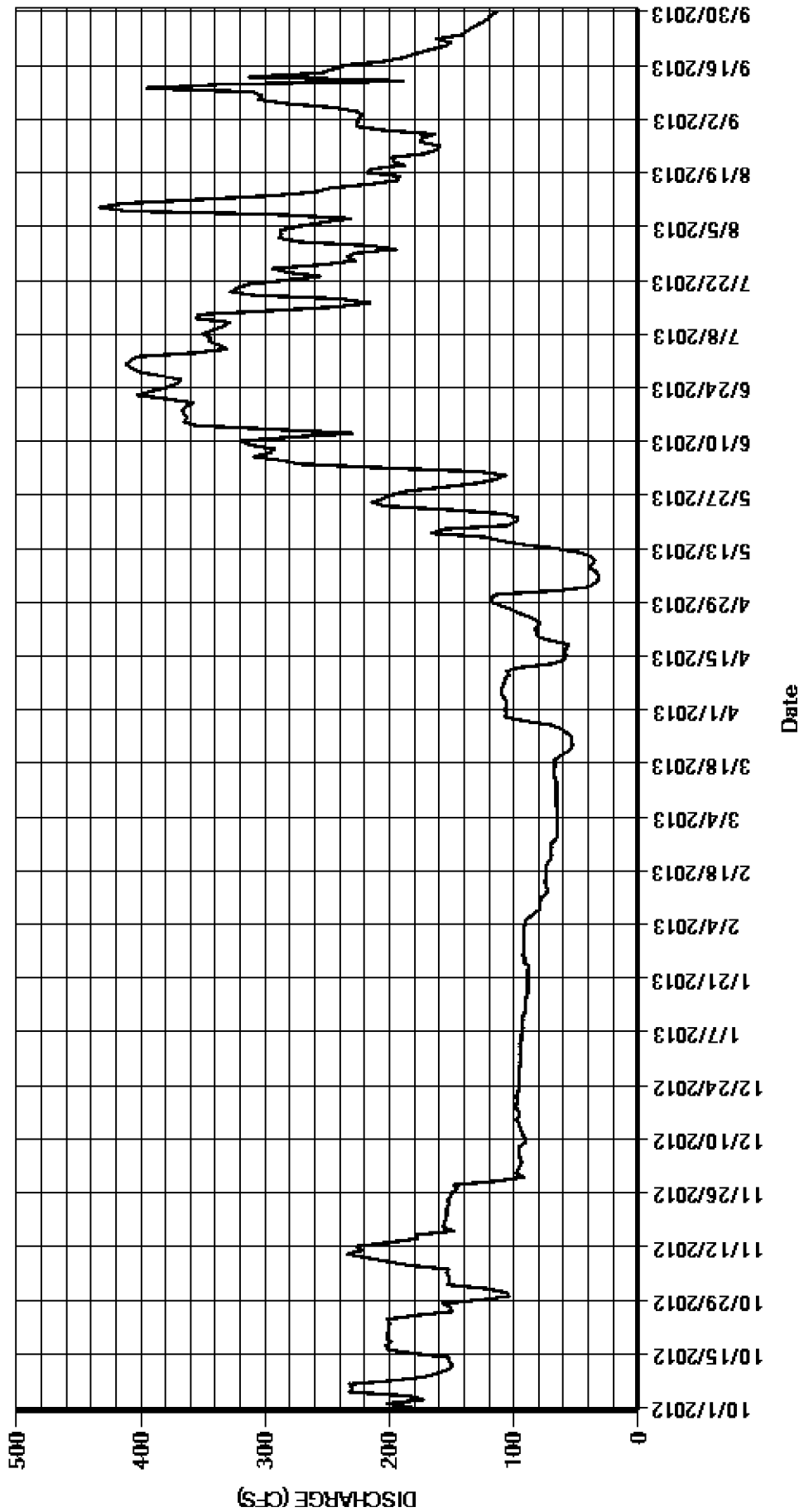
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	182	122	98	95	92	65	107	114	107	408	272	226
2	202	153	97	95	92	65	106	64	127	404	289	225
3	173	152	95	95	92	65	106	40	206	357	287	222
4	185	152	94	95	91	65	108	35	273	331	288	226
5	232	154	95	94	91	65	110	32	287	337	273	245
6	230	153	96	94	87	65	110	32	309	345	255	282
7	232	184	96	93	83	66	109	34	296	344	232	305
8	198	202	96	93	79	66	108	40	293	351	288	303
9	172	219	91	93	79	66	107	37	312	342	412	310
10	161	234	91	93	79	66	104	35	319	334	433	395
11	152	223	93	93	78	66	106	39	281	329	415	339
12	150	226	94	91	74	66	95	49	230	355	356	189
13	152	202	95	91	73	66	69	67	290	354	296	313
14	152	178	96	91	74	67	60	92	356	296	259	255
15	179	178	98	91	75	68	58	110	365	242	248	246
16	201	149	96	90	74	68	59	123	363	216	215	236
17	203	157	96	89	74	67	58	166	365	238	194	205
18	199	156	98	89	74	67	56	158	367	309	192	189
19	202	155	98	89	74	67	71	106	364	328	218	179
20	202	154	97	89	73	62	81	98	358	322	214	168
21	201	154	98	89	70	57	82	97	379	313	188	155
22	201	154	97	89	70	54	83	108	403	283	197	151
23	200	152	96	89	70	53	80	150	391	256	198	162
24	202	153	96	88	70	54	80	204	379	282	172	142
25	178	151	96	92	70	54	86	214	371	294	162	138
26	150	150	96	91	67	58	95	206	368	253	160	133
27	151	146	96	93	65	62	101	198	383	228	175	127
28	157	148	96	92	65	71	110	186	400	234	174	121
29	128	113	95	92	---	92	118	157	407	228	164	119
30	104	92	95	92	---	107	119	130	412	195	204	113
31	106	---	95	92	---	106	---	115	---	215	226	---
TOTAL	5537	4916	2966	2842	2155	2086	2742	3236	9761	9323	7656	6419
MEAN	179	164	95.7	91.7	77.0	67.3	91.4	104	325	301	247	214
AC-FT	10980	9750	5880	5640	4270	4140	5440	6420	19360	18490	15190	12730
MAX	232	234	98	95	92	107	119	214	412	408	433	395
MIN	104	92	91	88	65	53	56	32	107	195	160	113

CAL YR	2012	TOTAL	71665	MEAN	196	MAX	445	MIN	7.0	AC-FT	142100
WTR YR	2013	TOTAL	59639	MEAN	163	MAX	433	MIN	32	AC-FT	118300

MAX DISCH: 482 CFS AT 01:15 ON SEP 10, 2013 GH 1.69 FT SHIFT -0.01 FT  
 MAX GH: 1.69 FT AT 01:15 ON SEP 10, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

NORTH FORK SOUTH PLATTE RIVER AT GRANT  
WY2013 HYDROGRAPH





PLATTE RIVER BASIN  
06707500 SOUTH PLATTE RIVER AT SOUTH PLATTE  
Water Year 2013

Location.-- Lat. N.39° 24'31.85", Long. W105° 10'11.61" (NAD83), Jefferson County, CO Hydrologic Unit 10190002. Gage is located on the left bank of the South Platte River approximately 350 ft. downstream from the bridge on State Highway 75 and 500 ft. downstream from the confluence of the South and North forks of the South Platte River.

Drainage Area and Period of Record.-- 2,580 mi<sup>2</sup> (USGS Colorado StreamStats utility).; Daily values are available from the CDWR from: Jan 1, 1896 June 30, 1897; January 1, 1899 to May 31, 1900; June 1, 1901 to present.

Equipment.-- Digital incremental Sutron SDR-0001-1 shaft encoder, temperature sensor and tipping bucket rain gage connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly in a concrete shelter overtop a 60-inch CMP well on the left bank. The primary gage is an electric tape gage (ETG) mounted on the equipment shelf with a supplemental cantilever wire weight gage (WWG) 20 feet downstream of the shelter. A cableway is just upstream of the shelter for measurement of flows that are too high to wade. The gage is on Denver Water property and has AC power. Satellite equipment is owned and maintained by the Colorado Division of Water Resources (CDWR). A Sutron 56-0540-400-DTR shaft encoder was removed and the gage was placed in the above configuration on August 1, 2012.

Hydrologic Conditions.-- The stream is heavily regulated by upstream reservoirs, diversions from and deliveries to the stream. Drainage area is mountainous with flows being principally controlled by releases from Cheesman Reservoir on the South Fork of the South Platte and transmountain deliveries made to the North Fork of the South Platte via Roberts Tunnel. A large portion of the drainage area is in areas having significant burn areas from the Hayman, Schoonover, Buffalo Creek, Lower North Fork and Lime Creek fires. Soil erosion from the older fires has been stabilizing and turbidity, though still present, was decreasing. Trees and other organic material migrate down river during heavy precipitation events.

Gage-Height Record.-- The primary record is 15-minute satellite data with logged 15-minute logged DCP data and 5-minute logged SDR data as backup. The record is complete and reliable except as follows: December 27 - 31, 2012, January 1 -8, 12-22 and 28-31, February 4, 5, and 11 through March 4, 8 and 21-25, 2013 when the stage-discharge relation was affected by ice. Missing values on November 15, 2012 and March 26, 2013 were filled in with logged SDR data with no loss of accuracy. Instrument calibration was maintained by twenty five visits made to the gage by CDWR staff. One instrument correction of 0.01 ft. was made.

Datum Corrections.-- Levels were last run on October 17, 2013 using RM5 as base. The primary reference was found to be 0.06 ft. high with respect to RM5 and the supplemental WWG was found to be 0.13 ft. high. Inspection of previous levels runs to the gage found that this issue was present in 2006 and again in 2008 using different reference marks as base. The base reference was not corrected in either previous levels runs. The tape length of the primary reference and the WWG dial reading was adjusted at the time levels were run (December 5, 2012). The correction was applied to the gage-height record and the gage-heights of discharge measurements from October 5, 2011 through December 12, 2012 (date the gage was corrected).

Rating.-- The low stage control is a slight narrowing of the channel with a rock riffle below the gage. For moderate to high stages the channel and banks are the control. A constriction in the channel approximately 0.25 miles downstream will affect extremely high stages. Rating No. 16, in use since October 1, 2002 was continued this year. It is defined by measurements to 3350 cfs. Sixteen discharge measurements (Nos. 864-879) were made this year ranging in discharge from 159 to 870 cfs, covering the range in stage experienced this year well except for: the lower daily discharges of February 6 - 28, March 3 - 5, 19 - 27, April 15 - 19, and May 5-6, 2013, and the higher daily discharge of September 16, 2013. The peak discharge of 968 cfs occurred at 08:30 on September 16, 2013 at a gage-height of 3.75 ft. with a shift of 0.17 ft., exceeding this year's high flow measurement (No. 878), made on September 16, 2013 by 0.15 ft. of stage and 98 cfs.

Discharge.-- Shifts are primarily caused by the movement of sand and gravel through the measurement section. Winter ice conditions can cause dramatic changes to shifting patterns. Shifting control method was used all year. Shifts were applied as defined by measurements with consideration given to change in stage from September 14, 2012 to August 27, 2013 and from September 30, 2013 to October 17, 2013. Variable shift table PLASPLCOVSC13-A, defined by Measurement Nos. 869, 877-879, was applied from August 27, 2013 to September 30, 2013. Open water measurements made this year showed unadjusted shifts varying between -0.01 ft. and 0.17 ft.. All measurements were given full weight.

Special Computations.-- Periods of ice affect are identified by comparing computed record against Denver Water accounting for computed inflow to Strontia Springs Reservoir, approximately 2 miles downstream. A spreadsheet is developed for the ice period displaying computed record, Strontia computed inflow, tributary inflows from Cheesman Reservoir and the North Fork of the South Platte at Grant. Ice periods are apparent when computed discharges are higher than Strontia inflow and out-of-line with trends from tributary gages. Generally, the computed record will start to greatly exceed the Denver Water figures shortly after winter weather sets in. Most years the computed figures will remain high until sustained warm weather. When gage figures and Denver Water figures get close again, ice-affect is assumed to be over.

Remarks.-- The record is good, except for periods of ice effect, which are estimated and poor. Station maintained by Tony Arnett, record developed by Division One Hydrographic Staff.

Recommendations.-- Winter measurements and visits should continue to be made if possible in order to better determine ice affected days. Measurements should also continue to be made twice a month as conditions allow. Levels need to be run in the 2014 water year to monitor stability.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06707500 SOUTH PLATTE RIVER AT SOUTH PLATTE

RATING TABLE-- PLASPLCO16 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

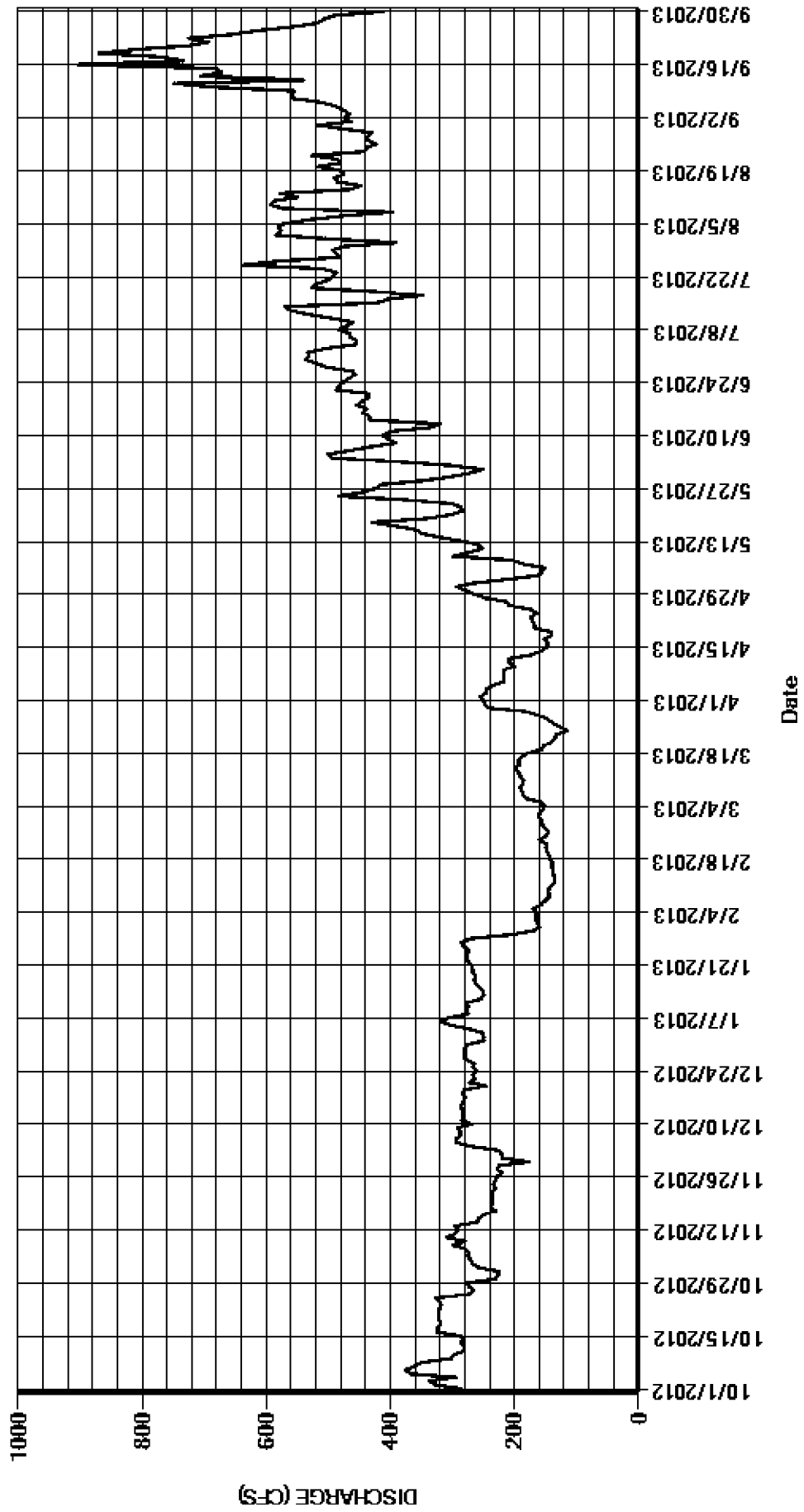
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	287	226	220	e250	164	e161	251	294	252	532	505	464
2	328	258	221	e250	165	e160	255	265	304	533	584	474
3	337	268	226	e250	165	e154	246	212	383	501	577	466
4	294	271	268	e270	e165	e152	245	161	494	456	581	476
5	368	275	294	e300	e170	158	233	156	501	455	571	489
6	377	274	294	e320	157	182	217	151	466	466	528	510
7	361	279	287	e307	151	187	218	186	432	466	475	557
8	348	300	288	e275	144	e188	217	203	392	484	396	557
9	302	280	292	278	145	191	217	299	403	469	572	556
10	298	309	269	275	145	187	200	274	413	461	594	686
11	281	296	285	278	e140	186	208	252	401	497	588	749
12	281	291	284	e255	e135	191	210	258	336	534	550	541
13	286	297	283	e250	e136	194	173	281	320	561	578	706
14	284	260	285	e250	e137	199	157	317	433	570	466	673
15	287	258	286	e255	e138	192	149	348	434	421	447	680
16	325	249	282	e262	e140	194	146	358	444	403	486	902
17	324	230	280	e265	e139	188	152	390	439	349	490	734
18	319	238	283	e263	e142	180	141	429	454	424	475	768
19	321	236	281	e267	e145	157	141	342	445	527	482	870
20	323	235	245	e268	e148	153	168	303	436	521	520	808
21	322	235	272	e270	e149	e140	168	284	434	502	482	722
22	321	235	264	e275	e149	e135	172	286	487	492	485	693
23	319	231	267	276	e160	e132	173	304	483	487	526	725
24	321	234	261	277	e150	e115	164	379	476	508	443	658
25	326	231	267	273	e145	e128	173	483	468	636	439	615
26	274	228	265	283	e150	139	208	446	457	583	423	557
27	266	220	e280	286	e155	147	214	425	461	482	438	518
28	273	228	e280	e270	e156	163	248	414	502	488	437	508
29	276	225	e280	e205	---	183	265	349	519	494	430	489
30	231	177	e280	e170	---	242	279	304	536	473	480	411
31	226	---	e275	e160	---	248	---	272	---	392	519	---
TOTAL	9486	7574	8444	8133	4185	5326	6008	9425	13005	15167	15567	18562
MEAN	306	252	272	262	149	172	200	304	434	489	502	619
AC-FT	18820	15020	16750	16130	8300	10560	11920	18690	25800	30080	30880	36820
MAX	377	309	294	320	170	248	279	483	536	636	594	902
MIN	226	177	220	160	135	115	141	151	252	349	396	411

CAL YR	2012	TOTAL	142829	MEAN	390	MAX	780	MIN	120	AC-FT	283300
WTR YR	2013	TOTAL	120882	MEAN	331	MAX	902	MIN	115	AC-FT	239800

MAX DISCH: 968 CFS AT 08:30 ON SEP 16, 2013 GH 3.75 FT SHIFT 0.17 FT  
 MAX GH: 3.75 FT AT 08:30 ON SEP 16, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06707500 SOUTH PLATTE RIVER AT SOUTH PLATTE  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06707501 SOUTH PLATTE RIVER BELOW STRONTIA SPRINGS  
Water Year 2013

Location.-- Lat. N39°26'8"; Long. W105°7'27.3" (NAD83) in Douglas County, CO. Gage is on the right bank approximately 1200 ft. downstream from Strontia Springs Reservoir and 9 mi. SSW from the Chatfeild Reservoir dam.

Drainage Area and Period of Record.-- 2596 sq. mi. (CDWR Dam Safety database).; The station was established when Strontia Springs dam was built. Daily values are available from CDWR from October 1, 1983 to present.

Equipment.-- A digital incremental Sutron Stage Discharge Recorder SDR-0001-1 connected to a Sutron SatLink2 Data Collection Platform (DCP) and a Steven's A-70 water-stage recorder in a 6 ft. by 6 ft. concrete shelter and stilling well set on bedrock in the channel. An adjustable reference point with graduated tape on the float drive of the recorder is the primary reference with an adjustable reference point and metal drop located below the floor of the shelter, accessible through a manhole and an outside staff gage as supplemental references. A cableway is located approximately 100 ft. below the shelter. The gage's instrumentation was updated to the above configuration on May 3, 2012. The gage is owned and maintained by Denver Water. Satellite equipment is owned and gage operations are done by CDWR.

Hydrologic Conditions.-- 2596 sq. mi. of drainage area heavily influenced by numerous diversions from and transbasin deliveries to the channel as well as several on-stream reservoirs. Flows will reflect extreme basin conditions when upstream reservoirs are either very low or completely full. The gage sits directly below Strontia Springs Reservoir which will regulate flows when not spilling. Ice effect is generally not seen due to the gages proximity to the dam. However, this year ice did affect the gage height during the coldest period of record.

Gage-Height Record.-- The primary record is 15-minute telemetered data with 15-minute logged DCP, 5-minute SDR data and chart record as backup. The record is complete and reliable except for February 11, 12, 13, 15, 16, 19, 22, 23 and 25, 2013, when the stage-discharge relation was affected by ice. Two missing gage-height values and one erroneous gage-height value were interpolated from adjacent record on May 4 and 15, and August 8, 2013, without loss of accuracy. Instrument calibration was supported this year by thirty-one visits to the gage by CDWR staff. One instrument correction of +0.01 ft. was made on March 29, 2013, and one instrument correction of -0.01 was made May 17, 2013. Both corrections were applied to the record as defined by visits to the gage.

Datum Corrections.-- Levels were last run on November 16, 2012 using RM1 as base. The base reference was found within allowable tolerances. Prior to the September 2009 level run, it was believed that running levels on this gage was unnecessary because the stilling well and shelter are cast on bedrock and would thereby be more stable than surrounding features. Three additional reference marks were established on September 23, 2009.

Rating.-- The control is a boulder and cobble riffle approximately 50 ft. below the gage. The channel grade changes abruptly and significantly approximately 170 ft. below the gage. The riffle is considered the controlling feature for flows up to about 800 cfs. Above this point, the channel becomes the control. PLASTR004, dated March 19, 2008, is defined by measurements up to 1670 cfs and was continued in use for all of WY2013. Twenty-four discharge measurements (Nos. 524-547) were made this year ranging in discharge from 29.4 to 494 cfs covering the range in stage experience this year well except for the higher daily flows of: September 16-20, 2013. This period of higher daily flows coincided with the Strontia Springs Dam spilling over the crest. The peak flow of 691 cfs occurred at 13:15 September 17, 2013 at a gage-height of 4.83 ft. with a shift of -0.03 ft., exceeding this year's high flow Measurement (No. 547) made September 17, 2013 by 197 cfs and 0.35 ft. of stage.

Discharge.-- Shifting control method was used all year. Shifts at low flows are variable and generally caused by changes to the rock riffle and by vegetal growth in the channel. Shifting at moderate flows (GH 3.00-3.80) are caused by scour and fill in the control section below the gage. Shifting at high flow stages is influenced by downstream channel gradients and impedance factors. Shifts were applied by time as defined by measurements with consideration given to change in stage. Stage dependent shifting using variable shift table PLASTR0VSC13-A, defined by Measurement Nos. 542-548, was applied from August 6 through October 3, 2013. Measurements made this year showed unadjusted shifts varying between -0.03 and +0.08 ft. All were given full weight except for Nos. 524, 543 and 545 which were adjusted up to -7.43% to smooth shift distributions.

Special Computations.-- Discharge for days of ice affect was done via straight-line interpolation of stage values from adjacent good record to estimate discharge. Strontia Springs Reservoir typically releases constant amounts for long periods of time and this helped to confirm the record. The Caretakers at Strontia Springs Dam rely heavily on the correlation of electrical output of their generators to flow values measured downstream.

Remarks.-- The record is good, except for periods of ice affect which are fair. Station maintained by Tony Arnett and record developed by Division One Hydrographic staff.

Recommendations.-- The Strontia—Chatfield gages need to be measured with the highest possible accuracy, otherwise the shifts can cause bad water balances within the Waterton Canyon and Chatfield systems. These gages need to be operated by experienced personnel who are familiar with stage-shift relationships and the diversion flows that are balanced by gage figures. Frequent measurements at high flows are needed since the channel does change. Additional measurements are particularly desirable around 1000 cfs, as computed flows in this range sometimes do not balance well with downstream gages. The stilling well of this gage needs to be inspected periodically for excessive sediment accumulation as there seems to be an occasional sluggish reaction to gate changes of the Strontia Springs Dam. More frequent intake flushes also may be required to address the stilling well response to changes in water levels. A standard electric tape gage should be placed and used as the base reference.

STATE OF COLORADO  
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06707501 SOUTH PLATTE RIVER BELOW STRONTIA SPRINGS

RATING TABLE-- PLASTRCO04 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

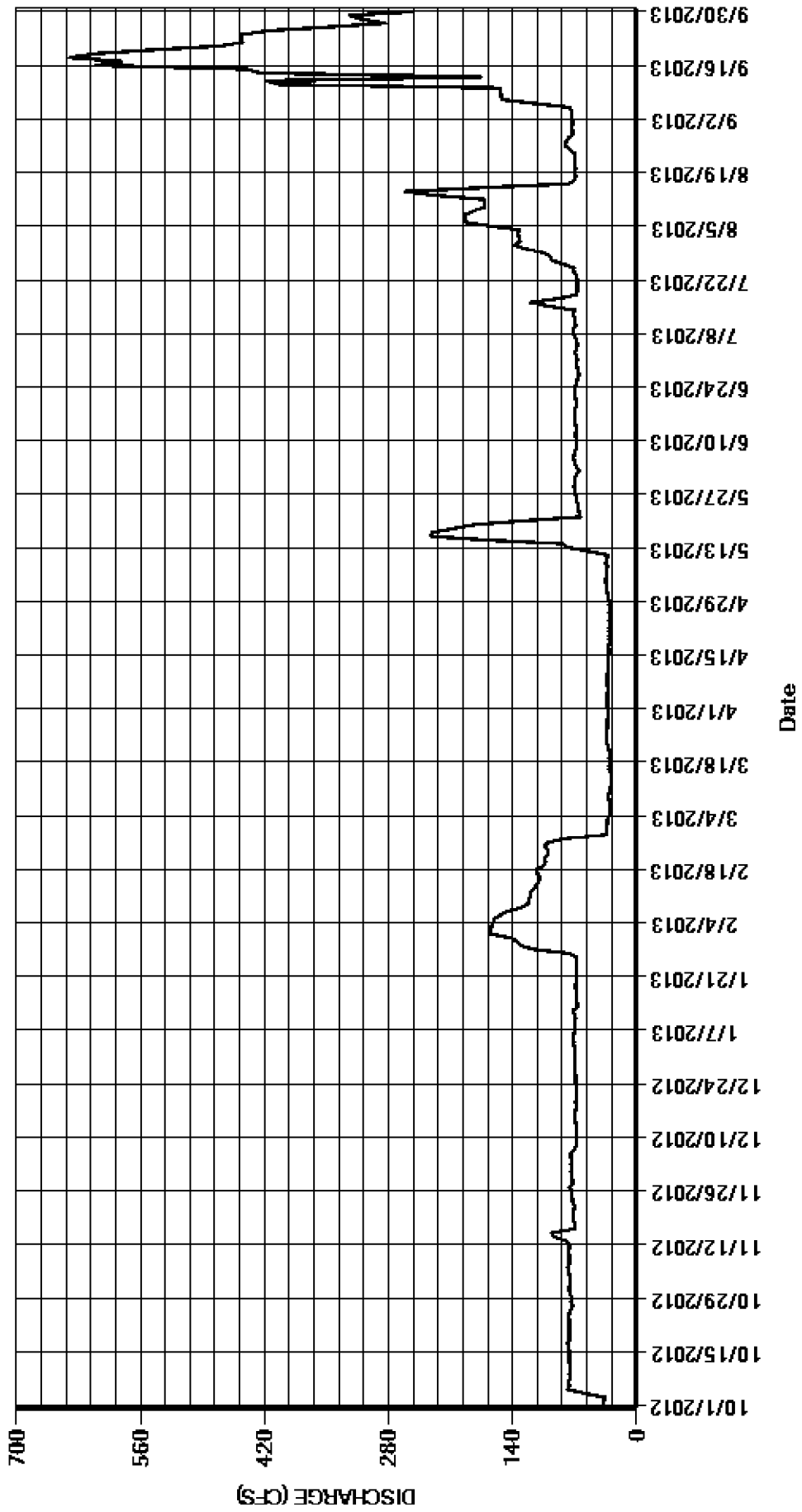
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	37	76	74	70	165	34	33	33	68	67	132	72
2	37	75	74	70	165	33	33	34	65	68	133	73
3	36	75	74	71	164	33	33	34	68	70	134	73
4	57	76	73	71	162	31	33	35	70	68	133	73
5	78	77	75	72	161	30	33	35	71	67	167	76
6	76	78	74	71	154	30	32	34	71	68	194	115
7	77	76	70	70	147	30	33	34	70	70	193	152
8	75	76	68	70	130	31	33	33	68	71	193	153
9	76	76	68	70	122	32	33	35	68	72	184	154
10	75	77	68	69	122	31	33	34	68	69	172	154
11	75	76	68	70	e120	30	32	32	69	70	172	404
12	76	76	68	72	e120	29	32	54	69	70	172	417
13	76	80	68	67	e115	29	32	79	68	72	226	176
14	76	93	69	67	113	29	32	84	69	70	262	425
15	76	96	70	68	e110	29	32	166	70	99	175	440
16	77	70	70	68	e110	31	31	232	70	120	77	610
17	78	70	69	68	112	31	32	231	70	88	70	582
18	76	71	68	69	113	31	31	206	70	68	69	640
19	76	72	69	69	e105	31	31	184	68	67	70	611
20	76	72	68	68	103	31	31	127	68	67	69	545
21	76	71	68	68	104	31	31	64	69	67	70	469
22	76	70	68	68	e100	32	31	65	70	67	70	445
23	76	72	68	68	e100	34	31	66	70	68	70	446
24	77	73	69	68	104	34	31	66	69	71	70	446
25	76	73	69	68	e100	34	31	68	68	71	76	418
26	74	73	69	68	79	34	31	68	67	82	81	347
27	72	76	70	75	34	33	30	69	65	96	80	284
28	74	72	70	115	34	33	31	70	66	98	77	310
29	73	73	70	130	---	33	31	71	67	105	72	324
30	75	73	70	135	---	32	32	70	68	125	73	252
31	76	---	70	141	---	32	---	70	---	138	73	---
TOTAL	2211	2264	2166	2394	3268	978	955	2483	2057	2469	3809	9686
MEAN	71.3	75.5	69.9	77.2	117	31.5	31.8	80.1	68.6	79.6	123	323
AC-FT	4390	4490	4300	4750	6480	1940	1890	4930	4080	4900	7560	19210
MAX	78	96	75	141	165	34	33	232	71	138	262	640
MIN	36	70	68	67	34	29	30	32	65	67	69	72

CAL YR	2012	TOTAL	35524	MEAN	97.1	MAX	305	MIN	33	AC-FT	70460
WTR YR	2013	TOTAL	34740	MEAN	95.2	MAX	640	MIN	29	AC-FT	68910

MAX DISCH: 691 CFS AT 13:15 ON SEP 17, 2013 GH 4.83 FT SHIFT -0.03 FT  
 MAX GH: 4.83 FT AT 13:15 ON SEP 17, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06707501 SOUTH PLATTE RIVER BELOW STRONTIA SPRINGS  
 WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06708000 SOUTH PLATTE RIVER AT WATERTON  
Water Year 2013

Location.-- Lat. 39°29'18", Long. 105°05'32", in NE¼ sec. 34, T.6 S., R.69 W., Jefferson County, Hydrologic Unit 10190002. Gage is on the left bank 168 ft. downstream from the bridge on State Highway 221, 0.4 mi. south of Waterton, CO, 4.7 mi. west of Louviers, CO and 6 mi upstream from Plum Creek.

Drainage Area and Period of Record.-- 2,620 mi<sup>2</sup> (USGS Colorado StreamStats utility).; Daily values are available from May 1, 1926 to present.

Equipment.-- Digital incremental Sutron SDR-0001-1 shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) in a 54-inch galvanized corrugated metal pipe shelter and stilling well. The gage is connected to the stream by two 2-inch inlets with flushing apparatuses. The primary reference is an electric tape gage with a supplemental cantilever style chain gage (largely not functional). The gage has AC power and is equipped with heat lamps to prevent the well from freezing. A bank operated cableway is located approximately 10-ft. upstream. Station owned and operated by the Colorado Division of Water Resources. The gage is on Denver water property and Denver provides power and has instrumentation installed in the gage shelter.

Hydrologic Conditions.-- The stream is heavily regulated by numerous diversions, deliveries and on-stream reservoirs above the gage. Flows at this gage are largely determined by operations occurring at Strontia Springs Reservoir and diversions within Waterton Canyon. Denver Water can divert water through Conduit 20, the Highline Canal and the Last Chance Ditch, upstream of the gage facility. Prior to the reconstruction of the Last Chance ditch in 2003, Denver attempted to maintain a winter flow at Waterton gage of 30 cfs, but the use of the Last Chance diversion allows Denver's minimum streamflow at Waterton to drop to 15 cfs. These changes have resulted in lower streamflows than have been historically seen at this gage.

With the Last Chance ditch running, the FERC minimum stream flow is 15 cfs between September 16 and May 14, and 45 cfs between May 15 and September 15.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged DCP and SDR data as backup. The record is complete and reliable except for: December 10-13, 16, 17 and December 19, 2012 through March 11, 2013 and March 22-26, 2013 when the stage-discharge relation was affected by ice and / or the stilling well was frozen. Instrument calibration was maintained by thirty visits to the gage. Six instrument corrections ranging from -0.02 to +0.03 ft. were made and applied to the record as defined by observations made at the gage. Missing gage-height values occurring on May 4 and 15, 2013 were interpolated from adjacent record without loss of accuracy.

Datum Corrections.-- Levels were last run on November 16, 2012 using R.M. 8 as base. The gage was found to be reading accurately.

Rating.-- The control is a concrete grouted pipeline crossing approximately 35 feet below the gage. PLAWATCO10, defined by measurements from 13 to 2000 cfs, was continued in use for the entire water year. Twenty-four discharge measurements (Nos. 990-1013) were made this year ranging in discharge from 15.1 to 302 cfs covering the range in stage experienced well, except for higher daily flows of September 16-19, 2013. The peak flow of 562 cfs occurred at 10:15 on September 16, 2013 at a gage height of 1.77 ft with a zero shift, exceeded this year's high flow measurement (No.1013) made on September 19, by 260 cfs and 0.37 feet of stage.

Discharge.-- Shifting control method was for all periods of open water. Shifts are caused by scour and fill of the gage pool, vegetal growth in the channel and debris hung-up on the control. Shifts were applied by time as defined by measurements with some consideration given to change in stage. Open water measurements showed shifts varying between +0.01 and -0.02 ft. All were given full weight except for Nos. 991, 1001, 1006 and 1012 which were discounted up to ±8% to smooth shift distributions.

Special Computations.-- Discharges for periods of ice affect and frozen intakes were estimated from a mass balance spreadsheet accounting for releases made from Strontia Springs Reservoir (PLASTRACO) minus Denver Water provided diversion record for diversions within Waterton Canyon with consideration given to adjacent record, temperature trends and 4 measurements made during the affected period (Nos. 995-998). The mass balance estimate was found to be about 5 cfs higher than periods of good record. This offset was incorporated into estimates. These spreadsheets should be used with caution on days of flow change, since Denver's accounting is based on 8am to 8am period rather than midnight to midnight figures.

Remarks.-- The record is good, except for periods of ice affect and frozen intakes, which are estimated and fair. Station maintained and record developed by Tony Arnett.

Recommendations.-- Visit notes, chart inspection, temperature data and Denver Water's Chatfield Check Sheet are used to determine ice effects and flow estimates. Without visit notes it is difficult to distinguish between ice effect at the gage and diurnal flow due to ice melting in the canyon. Also, ice affect can occur during a warm-up due to floating ice jamming on the control. Winter visits are critical and should be made on a regular basis. The channel and control should be cleared of ice during warm periods in the winter.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06708000 SOUTH PLATTE RIVER AT WATERTON

RATING TABLE-- PLAWATCO10 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	19	19	e18	e27	e20	15	21	70	49	92	67
2	19	19	19	e16	e28	e22	15	21	65	48	93	68
3	19	19	19	e17	e22	e20	16	21	67	49	94	68
4	23	19	18	e18	e25	e17	15	21	64	49	93	69
5	23	18	18	e17	e22	e15	15	21	48	48	115	71
6	19	19	19	e16	e20	e15	16	21	41	47	148	100
7	19	20	19	e17	e25	e15	16	20	40	48	154	149
8	18	22	18	e17	e20	e14	16	20	39	49	153	151
9	18	22	19	e17	e25	e15	17	35	38	50	149	152
10	18	22	e20	e18	e23	e15	17	37	37	50	130	153
11	18	22	e18	e18	e25	e15	17	32	38	56	131	219
12	19	22	e17	e18	e24	15	16	32	38	46	131	264
13	19	20	e17	e16	e25	15	16	31	38	49	170	116
14	20	23	16	e16	e25	15	17	34	39	50	210	303
15	19	40	17	e16	e22	14	17	62	39	51	160	269
16	20	18	e18	e25	e25	15	16	78	39	48	76	499
17	23	17	e15	e23	e24	15	17	75	38	48	65	417
18	22	18	16	e23	e25	15	17	61	39	48	65	419
19	26	19	e19	e23	e26	15	16	39	38	48	66	352
20	35	19	e19	e25	e26	15	16	38	39	48	65	274
21	35	18	e18	e23	e26	14	16	41	37	48	65	187
22	35	17	e16	e23	e26	14	17	41	39	54	66	161
23	35	18	e17	e24	e26	e15	18	41	39	61	68	173
24	37	20	e18	e23	e27	e15	18	41	38	66	67	171
25	36	20	e18	e25	e24	e15	17	41	37	67	69	146
26	35	20	e22	e25	e30	e15	17	41	42	73	77	81
27	30	23	e22	e30	e25	15	17	41	47	91	76	84
28	31	20	e20	e28	e22	15	17	41	47	95	74	190
29	31	19	e20	e33	---	15	17	42	50	90	68	265
30	33	19	e17	e30	---	15	18	39	50	91	68	150
31	25	---	e17	e40	---	15	---	56	---	94	69	---
TOTAL	782	611	565	678	690	480	495	1185	1320	1809	3127	5788
MEAN	25.2	20.4	18.2	21.9	24.6	15.5	16.5	38.2	44.0	58.4	101	193
AC-FT	1550	1210	1120	1340	1370	952	982	2350	2620	3590	6200	11480
MAX	37	40	22	40	30	22	18	78	70	95	210	499
MIN	18	17	15	16	20	14	15	20	37	46	65	67

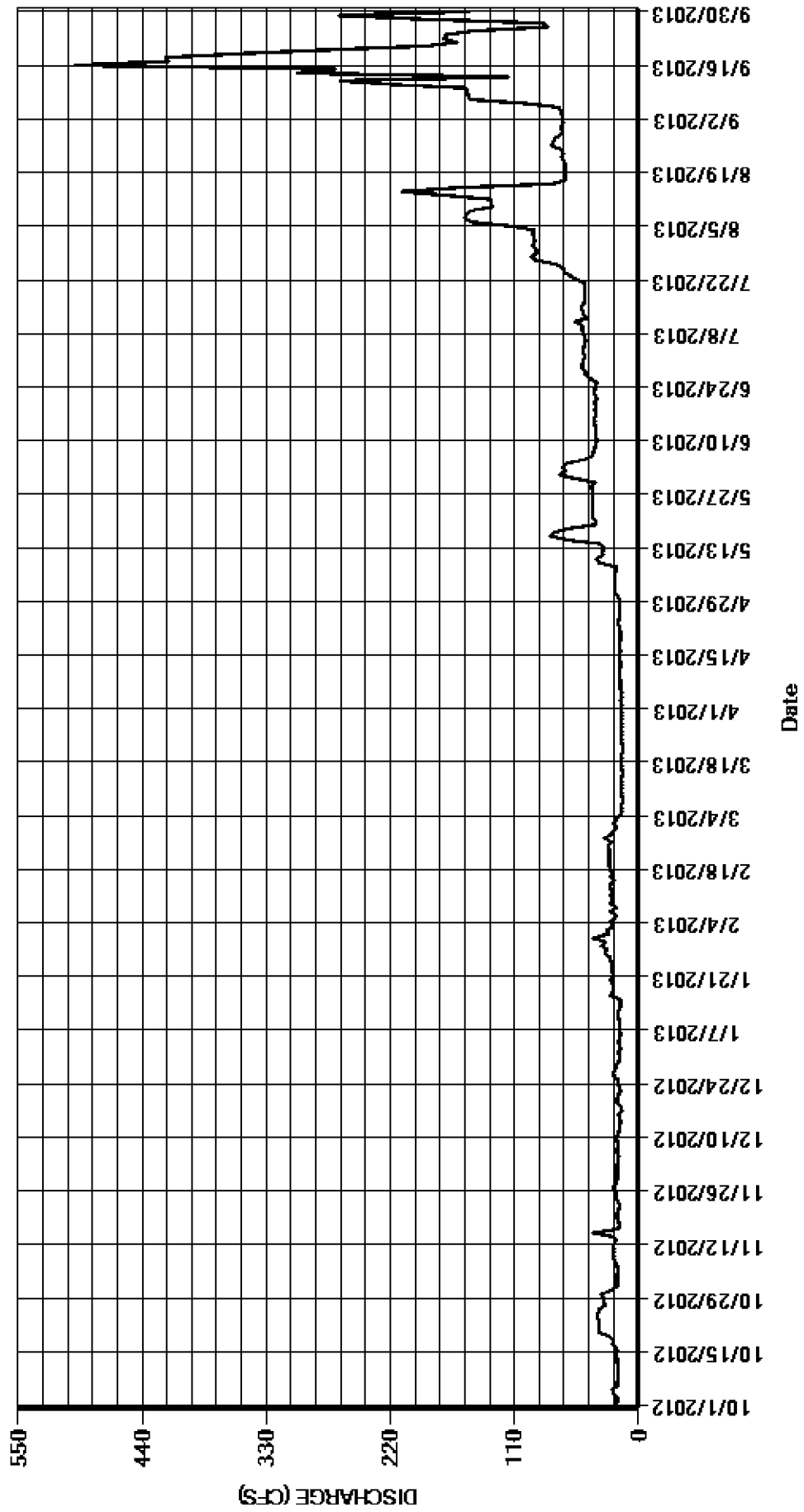
CAL YR	2012	TOTAL	11584	MEAN	31.6	MAX	160	MIN	8.6	AC-FT	22980
WTR YR	2013	TOTAL	17530	MEAN	48.0	MAX	499	MIN	14	AC-FT	34770

MAX DISCH: 562 CFS AT 10:15 ON SEP 16, 2013 GH 1.77 FT SHIFT 0.00 FT  
 MAX GH: 1.77 FT AT 10:15 ON SEP 16, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



06708000 SOUTH PLATTE RIVER AT WATERTON  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
SOUTH PLATTE RIVER BELOW CHATFIELD RESERVOIR  
Water Year 2013

Location.-- Lat. N39°33'45"; Long. W105°03'35" (NAD83) in Jefferson County, CO Hydrologic Unit 10190002. Gage is located on the left bank 815 ft. downstream from the outlet works of Chatfield Reservoir.

Drainage Area and Period of Record.-- 3018 sq. miles (from CDWR Dam Section database); First measurement made at gage was on June 3, 1975.

Equipment.-- The primary record is 15-minute satellite data with 15-minute logged DCP and SDR data as backup sheltered in a 6 ft. by 6 ft. concrete block shelter overtop a 60 in. concrete stilling well approximately 50 ft. upstream of a low head concrete dam. The well is connected to the channel via three 4 inch intakes equipped with flushing apparatuses. An electric tape gage placed on the instrument shelf is the primary reference with no provisions for an outside supplemental reference. A cableway is located approximately 30 ft. upstream from the gage. The gage is owned by the Army Corps of Engineers and maintained by the Colorado Division of Water Resources.

Hydrologic Conditions.-- Drainage area heavily regulated by diversions from and deliveries to the channel, including transbasin imports via Roberts Tunnel (ROBTUNCO) as well as several on-channel reservoirs upstream of the gage. All flows at the gage are regulated by Chatfield Reservoir, 815 ft. upstream. Releases from Chatfield Reservoir during flood events are regulated to limit the total flow at the Henderson gage (PLAHENCO) to about 5000 cfs. There are no minimum streamflow requirements below Chatfield Reservoir. Flows will periodically go to zero for short to prolonged periods.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged DCP and SDR data as backup. Twenty visits made to the gage by DWR personnel showed good agreement between the base reference and instrumentation. The record is complete and reliable. Due to the gage's proximity to the reservoir ice accumulation is generally not an issue. Algal growth in the gage pool can affect the gage's performance. Large algal plumes were not noted this year.

Datum Corrections.-- Levels were last run on September 23, 2009 using R.M. 1 as base. Levels showed the new elevation of the ETG to be 0.12 ft. higher at 20.090 ft. confirming levels run on July 26, 2006. No corrections were made as shifts are generally computing near zero. Further investigation needs to be done to determine if the gage datum should be changed.

Rating.-- The control is a massive low-head sloped concrete dam approximately 50 feet below the gage in a deep stilling basin extending about 800ft. back to the reservoir outlet pipe. Measurement conditions near the gage are not good. The channel is very rocky and flow is deep and often extremely slow. The initial and subsequent ratings have incorporated a lot of scatter in the measurements. Variations in shifts at lower (wading) flows are probably more due to measurement error rather than conditions affecting the control. If enough measurements are made with the highest possible precision, it should be possible to develop a table that does not require shifts, or measurements at lower flows. In fact, shift variations at low flows have at times made administration of the release problematic. Rating PLACHACO03, well defined to about 2500 cfs, was continued in use for all of WY2013. Twelve discharge measurements (Nos. 447- 458) were made during the year ranging in discharge from 10.4 to 236 cfs. Measurements and three observations of no flow cover the range in stage experienced this year well. The peak flow of 288 cfs occurred at 0945 on June 20, 2013 at a gage-height of 2.54 ft. with a shift of 0.02 ft.; exceeding this year's high flow measurement (No. 453) made June 21, 2013 by 52 cfs and 0.18 ft. of stage.

Discharge.-- Variable shift curve (PLACHACOVSC13-A) was created and used for the entire Water Year 2013. Shifts are caused by some ambiguity in the rating combined with some degree of measurement error. Open water measurements made this year showed shifts varying between -0.02 and +0.02 ft. All were given full weight except for No. 456 which was discounted 4.90% to better fit VSC13-A (this measurement was not used in VSC13-A due to duplicate measurements at same gage height).

Special Computations.-- Zero flow is determined operationally. The well retains a resident positive gage-height when releases are not being made. Small residuals draining through the control section were not considered. Observation made after releases were stopped quantified the resident residual gage-height of 0.37 ft. with no flow passing over the control. Thus, sustained gage-heights of 0.37 ft. and below occurring on part of the day or all day on the following days: November 3-30; December 1-9, 12-31, 2012; January 1, 5-7, 12, 13, 18-22, 26, 27, and 31; February 6, 7, 20; March 21; April 16-21; June 10 and 25; and September 13-30, 2013 were considered zero.

Remarks.-- The record is good. Zero flow is determined operationally. Station maintained and record developed by Tony Arnett.

Recommendations.-- Cableway markings should be verified using a tagline at water level and a horizontal tape strung between the A-Frames. Vegetative growth in the stilling pool should be observed. Levels should be run in the 2014 Water Year to confirm elevations of the RM's and PZF, and reconcile any tape length problems.

STATE OF COLORADO  
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SOUTH PLATTE RIVER BELOW CHATFIELD RESERVOIR

RATING TABLE-- PLACHACO03 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

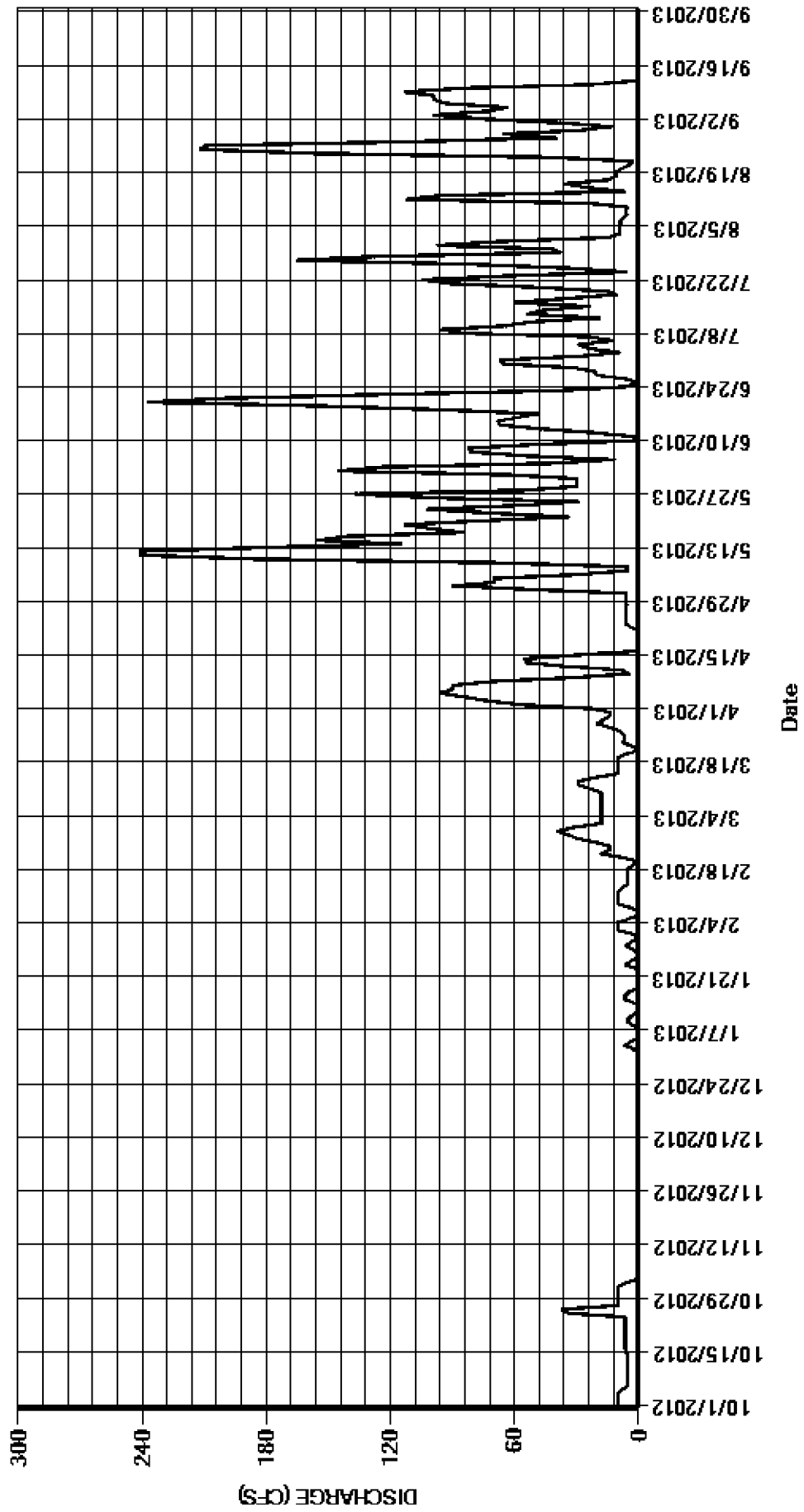
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	10	0.00	0.00	2.7	31	23	6.2	63	67	67	38
2	10	5.9	0.00	2.9	10	18	57	52	145	28	15	74
3	10	0.00	0.00	6.8	10	18	73	90	124	9.6	9.3	99
4	10	0.00	0.00	3.7	10	18	84	70	40	24	9.2	73
5	8.2	0.00	0.00	0.00	5.2	18	96	70	12	29	9.0	64
6	5.3	0.00	0.00	0.00	0.00	18	90	29	54	12	8.9	93
7	5.3	0.00	0.00	0.00	0.00	18	90	5.6	81	24	7.6	99
8	5.4	0.00	0.00	2.1	4.4	18	71	5.6	82	84	5.9	99
9	5.6	0.00	0.00	5.0	10	18	31	66	48	95	6.0	113
10	5.6	0.00	0.00	5.0	10	18	4.8	186	0.00	64	5.8	83
11	5.6	0.00	0.34	2.5	10	23	8.0	241	2.5	52	24	22
12	5.5	0.00	0.00	0.00	10	29	35	241	22	19	112	1.6
13	5.5	0.00	0.00	0.00	8.2	29	54	179	47	54	96	0.00
14	5.5	0.00	0.00	2.1	5.3	20	55	115	67	46	6.8	0.00
15	6.0	0.00	0.00	6.5	5.3	10	29	155	68	24	24	0.00
16	6.5	0.00	0.00	6.5	5.3	10	0.00	141	59	60	36	0.00
17	6.5	0.00	0.00	4.6	5.3	10	0.00	85	49	35	15	0.00
18	6.5	0.00	0.00	0.00	5.3	10	0.00	101	93	11	11	0.00
19	6.5	0.00	0.00	0.00	3.1	10	0.00	113	153	15	11	0.00
20	6.5	0.00	0.00	0.00	0.00	6.6	0.00	76	237	48	8.1	0.00
21	6.5	0.00	0.00	0.00	7.3	0.00	0.00	34	200	91	4.7	0.00
22	6.5	0.00	0.00	0.00	18	2.1	2.8	72	124	104	2.9	0.00
23	6.5	0.00	0.00	1.6	14	7.3	6.2	102	38	63	44	0.00
24	6.6	0.00	0.00	6.3	14	7.1	6.2	56	6.4	6.0	157	0.00
25	34	0.00	0.00	3.8	21	7.1	6.1	29	0.00	34	212	0.00
26	37	0.00	0.00	0.00	30	8.8	6.0	95	6.4	82	210	0.00
27	10	0.00	0.00	0.00	34	14	6.1	137	20	165	111	0.00
28	10	0.00	0.00	2.7	39	20	5.9	56	21	128	40	0.00
29	10	0.00	0.00	6.4	---	17	6.0	30	31	38	65	0.00
30	10	0.00	0.00	3.6	---	14	6.1	30	65	41	27	0.00
31	10	---	0.00	0.00	---	14	---	30	---	97	13	---
TOTAL	283.1	15.90	0.34	72.10	297.40	462.00	852.20	2698.4	1958.30	1649.6	1374.2	858.60
MEAN	9.13	0.53	0.011	2.33	10.6	14.9	28.4	87.0	65.3	53.2	44.3	28.6
AC-FT	562	32	0.7	143	590	916	1690	5350	3880	3270	2730	1700
MAX	37	10	0.34	6.8	39	31	96	241	237	165	212	113
MIN	5.3	0.00	0.00	0.00	0.00	0.00	0.00	5.6	0.00	6.0	2.9	0.00

CAL YR	2012	TOTAL	7223.06	MEAN	19.7	MAX	142	MIN	0.00	AC-FT	14330
WTR YR	2013	TOTAL	10522.14	MEAN	28.8	MAX	241	MIN	0.00	AC-FT	20870

MAX DISCH: 288 CFS AT 09:45 ON JUN 20, 2013 GH 2.54 FT SHIFT 0.02 FT  
 MAX GH: 2.54 FT AT 09:45 ON JUN 20, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH PLATTE RIVER BELOW CHATFIELD RESERVOIR  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06710500 BEAR CREEK AT MORRISON  
Water Year 2013

Location.-- Lat. N39° 39' 10.60"; Long. W 105° 11' 44.13" (NAD83) Jefferson County, Hydrologic Unit 10190002. Gage is on the left bank of the creek, 180 ft. upstream from bridge on State Highway 8 and 0.2 mi upstream from Mount Vernon Creek.

Drainage Area and Period of Record.-- 164 mi<sup>2</sup>. ; Sporadic, incomplete data Sep. 1881 to Feb. 1902. Good data October 1919 to current year. Monthly data for some periods only. Some early years published as near Morrison, at Starbuck (Starbuck Heights, pre-1933), at Idledale.

Equipment.-- Digital incremental Sutron SDR-0001-1 shaft encoder and a temperature sensor connected to a Sutron SatLink2 Data Collection Platform (DCP) in a 60-inch metal pipe shelter ovetop a 48-inch stilling well at a compound weir. A metal drop tape and adjustable reference point serve as the primary reference. A supplemental cantilever chain gage is present and the gage is equipped with a bank operated cableway. The encoder float is inside an oil cylinder containing ISOPAR (an anti-freezing agent).

Hydrologic Conditions.-- The Bear Creek drainage above Morrison, CO is a mixture of mountainous and urban landscapes. It extends from the mountains near Mt. Evans down to the City of Morrison, CO. In the summer of 2005, the City of Morrison constructed a new bike path along the creek and past the gage. The bike path and the increased traffic by the gage facility have not had a negative effect on the gage's operation.

Gage-Height Record.-- The primary record is 15-minute telemetered data with logged DCP and SDR data as backup. The record is complete and reliable, except for: December 9-13, 16-18, 20-31, 2012; January 1-18, 27-31, February 8-28 and March 1, 4-7, 19, 20, 22-26, 2013 when either the stage-discharge relation was affected by ice or the stilling well's intakes were frozen. Missing values on March 26, 2013 were filled in with logged SDR data with no loss of accuracy.

Datum Corrections.-- Instrument calibration was maintained by 35 visits made by Division One hydrographic staff. One instrument correction of -0.01 ft was made on June 28, 2013 and was applied to the record as defined by observations made to the gage. A flush correction of +0.17 ft. was made on July 10, 2013. The flush correction was applied to the record by proration from July 4, 2013, when the intakes are thought to have become sluggish, to the time the flush correction was made.

Datum Corrections.-- Levels were last run to the base reference on November 1, 2012 using RM5 as base. The gage was found to read 0.014 ft. high. No correction was made at the time of levels as the base reference is within allowable tolerances.

Rating.-- The control is a compound weir consisting of a broad crested concrete wall with a six-foot sharp-crested Cipoletti notch (one-foot deep) for low flows. Rating BCRMORCO23 was developed from the standard Cipoletti for the first foot and from measurements made in 2003 above the first foot. The rating shows a break in slope around 6.10 ft.as flow goes above the notch and out over the much wider section of the broad crested weir. Rating 23 is not well defined around 6.00 ft. of stage where flow transitions from the low flow notch section to the weir section.

Rating BCRMORCO23 was used all year and is defined by measurements from 3.66 to 1200 cfs. Following the September flood period, BCRMORCO23 was extrapolated upward to 2,660 cfs. from 850 cfs by linear extrapolation using Msmt. No. 1053 as a basis.

Discharge.-- Eighteen discharge measurements, Nos. 1038-1055, were made this year, ranging in discharge from 5.72 to 1200 cfs. Late summer flows experienced this year were higher than seen in previous years of record. The peak flow of 2660 cfs occurred at 09:30 on September 13, 2013 at a gage-height of 9.05 ft. with a shift of 0.00 exceeding this year's high flow measurement, No. 1053, made September 17, 2013 by 0.92 ft. in stage and 1460 cfs respectively.

Discharge.-- Shifting control method was used all year. Shifts are principally caused by changing approach conditions from fill and scour of the weir pool. Fill and scour conditions are accelerated by ice cover in winter months. Shifts were distributed as follows: October 16, 2012 - May 17, 2013, stage dependent shifting using variable shift table BCRMORCOVST13-A, defined by Msmt. Nos. 1038-1045 made during the period of use; May 17, 2013 - September 17, 2013, stage dependent shifting using variable shift table BCRMORCOVST13-B, defined by Msmt. Nos. 1044-1053 made during the period of use; September 17, to the end of the water year, shifts were distributed by time as defined by measurements.

Special Computations.-- Open water discharge measurements made this year showed unadjusted shifts varying between -0.04 and +0.03. All were given full weight except for Nos. 1038, 1039, 1043, 1045, 1048, 1050, 1052 and 1055 which were adjusted up to ± 5.8% to smooth the respective shift distributions.

Special Computations.-- Discharge for periods of ice affect were estimated from adjacent record with consideration given to adjacent good record, measurements made during the affected period, temperature trends recorded at the streamgage as well as at a nearby streamgage and observations made at the gage.

Remarks.-- The record is good, except for: periods of ice affect which are estimated and poor; July 4 - 10, 2013 when the intakes were sluggish which is rated fair; and September 13 -17, 2013 which is rated as fair due to lack of definition in the extended rating table. Station maintained by Tony Arnett and record developed by Division One hydrographic staff.

Recommendations.-- Frequent visits are necessary through the winter months and should be a priority to better estimate flows affected by ice. A new rating table may be necessary for higher flows. A series of measurements should be focused at and around the control's transition zone. It would also be a good idea to check the highway bridge for a MSL benchmark and tie the control BM back to sea level.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06710500 BEAR CREEK AT MORRISON

RATING TABLE-- BCRMORCO23 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

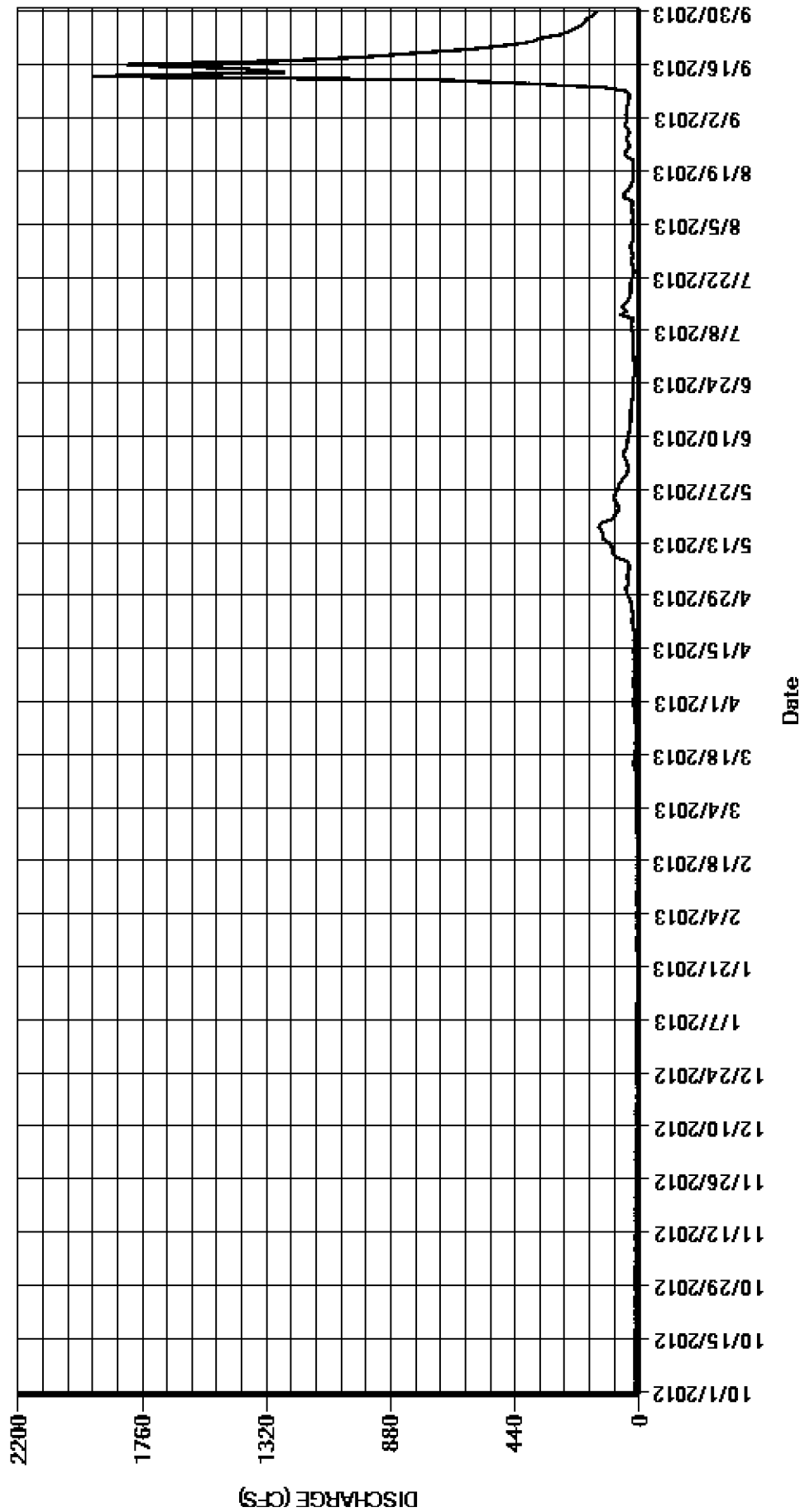
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16	14	13	e9.0	8.1	e8.0	19	50	41	20	22	45
2	16	14	11	e9.0	7.4	9.5	19	39	41	23	23	47
3	14	13	13	e9.0	7.9	9.9	18	41	46	22	22	47
4	13	13	10	e9.5	8.6	e9.5	18	44	49	22	22	45
5	14	12	11	e9.5	6.9	e10	20	39	57	22	26	44
6	17	12	12	e9.5	7.5	e11	20	37	55	22	25	40
7	16	14	11	e10	8.9	e11	19	37	46	23	23	37
8	14	13	9.6	e10	e8.5	12	18	43	44	26	25	37
9	16	12	e9.0	e10	e8.0	11	19	83	41	26	26	48
10	15	14	e7.0	e9.0	e8.0	12	15	96	38	27	26	132
11	14	14	e10	e9.0	e7.0	12	16	96	37	23	24	391
12	15	9.7	e12	e7.0	e7.5	11	19	100	34	66	55	700
13	15	7.4	e13	e6.0	e8.0	11	17	109	34	45	54	1930
14	15	11	13	e5.0	e7.5	16	21	129	31	62	39	1260
15	15	13	10	e6.0	e7.0	20	19	130	31	48	31	1410
16	15	13	e7.5	e7.0	e8.0	21	16	134	31	39	25	1810
17	15	13	e8.0	e6.0	e7.5	17	19	143	31	33	23	1260
18	12	14	e8.0	e6.0	e7.5	16	16	137	28	30	22	976
19	13	12	7.2	6.1	e7.5	e13	17	97	27	31	22	802
20	14	12	e7.5	6.2	e7.5	e12	21	88	24	32	23	606
21	13	13	e8.0	5.8	e7.0	15	23	77	23	28	22	477
22	14	12	e8.5	5.5	e6.5	e12	26	73	23	24	25	386
23	13	13	e9.0	6.1	e7.0	e12	24	79	22	20	48	353
24	14	12	e8.0	6.7	e7.5	e12	23	87	22	21	50	279
25	15	11	e8.0	7.9	e8.0	e12	26	89	22	24	38	242
26	14	9.5	e8.5	8.8	e8.0	e13	28	85	18	29	36	216
27	11	11	e8.5	e9.0	e8.0	14	30	77	18	25	45	198
28	14	10	e9.0	e9.0	e8.0	17	33	73	17	24	43	187
29	16	11	e10	e8.0	---	16	42	65	17	28	36	164
30	16	12	e11	e7.0	---	18	46	57	20	33	42	152
31	15	---	e9.0	e8.0	---	20	---	45	---	27	52	---
TOTAL	449	364.6	300.3	240.6	214.8	413.9	667	2479	968	925	995	14321
MEAN	14.5	12.2	9.69	7.76	7.67	13.4	22.2	80.0	32.3	29.8	32.1	477
AC-FT	891	723	596	477	426	821	1320	4920	1920	1830	1970	28410
MAX	17	14	13	10	8.9	21	46	143	57	66	55	1930
MIN	11	7.4	7.0	5.0	6.5	8.0	15	37	17	20	22	37

CAL YR	2012	TOTAL	5425.6	MEAN	14.8	MAX	62	MIN	3.3	AC-FT	10760
WTR YR	2013	TOTAL	22338.2	MEAN	61.2	MAX	1930	MIN	5.0	AC-FT	44310

MAX DISCH: 2660 CFS AT 09:30 ON SEP 13, 2013 GH 9.05 FT SHIFT 0.00 FT  
 MAX GH: 9.05 FT AT 09:30 ON SEP 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06710500 BEAR CREEK AT MORRISON  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06711500 BEAR CREEK AT SHERIDAN  
Water Year 2013

Location.-- Lat. N39°39'8.3"; Long. W105°1'58.6" (NAD83) Arapahoe County, CO Hydrologic Unit 1019002. Gage is on the left bank downstream from the intersection of S. Lowell Blvd. and US HWY 285, 2.5 miles northwest of Marston Lake.

Drainage Area and Period of Record.-- 261 mi<sup>2</sup> (USGS Colorado StreamStats utility). ; Daily values are available from March 1, 1927 to present.

Equipment.-- A digital incremental Sutron Stage Discharge Recorder SDR-0001-1 connected to a Sutron SatLink2 Data Collection Platform (DCP) in a 42-inch corrugated metal pipe shelter and stilling well at a concrete shrouded boulder and rubble control. The well is connected to a stream by two 2-inch intakes with flushing equipment. An adjustable reference point and metal drop tape is the primary reference with no provisions for a supplemental reference.

Hydrologic Conditions.-- Stream is heavily regulated upstream by numerous diversions and Bear Creek Lake, an on-stream reservoir 6-miles upstream from gage. Flow conditions are generally steady due to the regulation the reservoir; however, the area around the gage is urban. Hardened surfaces around the gage and recently introduced storm water culverts near the gage cause sharp peaks following rain events.

Gage-Height Record.-- The primary record is 15-minute telemetered data with 15-minute logged SDR and DCP data as backup. Instrument calibration was supported by twenty-seven visits to the gage. One instrument correction of +0.01 ft. was made on November 9, 2012 and was applied to the record as defined by visits made to the gage. The gage is flushed often to prevent plugging of the inlets. No flush corrections were encountered this year due to frequent inlet flushes and low daily flows. Accumulation of debris on the control can affect the gage-height record. This year, no debris removal corrections were made. The record is complete and reliable except for: January 28 and 29, 2013 when the stage-discharge relation was affected by ice. Missing GH was recovered from the SDR log for the following days : November 29, 2012; May 4 and 15; August 26; September 27, 2013;

Datum Corrections.-- Levels were last run on November 29, 2012 using RM6 as base. No correction was necessary to the base reference. Reference marks 7 and 8 were established at the time of levels.

Rating.-- The control for all stages is a concrete shrouded boulder and rubble pile approximately 10-ft. below the gage. Backwater conditions have never been observed. Rating BCRSHECO32, developed in 1998, was continued in use through October 16, 2012. For the remainder of Water Year 2013, BCRSHECO33 was developed with BCRSHECO32 as a base and new low flow measurements to extend the lower end. The rating is defined by measurements up to 661 cfs but has been extrapolated to 3000 cfs to accommodate transient peaks. Flows above 1000 cfs need to be considered estimates and rated as poor without confirming measurements. Seventeen measurements (Nos. 1024-1040) were made this year ranging in discharge from 1.84 to 632 cfs, covering the range in stage experienced this year very well. The peak flow of 659 cfs occurred at 2045 on September 27, 2013 at a gage-height of 4.63 ft. with a shift of +0.08 ft. The peak exceeded this year's high flow measurement (No. 1040) made on September 27, 2013 by 0.05 ft. of stage and 27 cfs.

Discharge.-- Shifting control method was used all year. Shifts are caused by fill and scour of pool upstream of the control and materials passing over the control. Shifts were distributed by time as defined by measurements with some consideration given to change in stage. Variable shift table BCRSHECOVST13-A, defined by Measurement Nos. 1038-1040, was applied from September 7, 2013 to September 27, 2013. Open water measurements showed unadjusted shifts varying between -0.01 and +0.08 ft. All measurements were given full weight except for Nos. 1025, 1026, 1028, 1036 and 1037 which were discounted 2.63%, -7.13%, -5.83%, 2.13%, and 3.52% respectively to smooth shift distributions.

Special Computations.-- Discharge for periods of ice affect were estimated from adjacent good record with consideration given to temperature trends recorded at the BCRMORCO gage.

Remarks.-- The record is good, except for January 28 and 29, 2013 which are fair due to some degree of ice effect. Station maintained by Tony Arnett and record developed by Division One Hydrographic staff.

Recommendations.-- Continue visits every two weeks to ensure the control stays clear of debris, especially after rain events. If possible, extra visits should be made during extreme cold to break ice in the well. Light construction should be done to remove the catch points on the control to help with debris affecting gage height. Pictures should be taken of the interior of the gage since new equipment installation. The rating above 1000 cfs needs to be confirmed by slope-area or some other indirect method.



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06711500 BEAR CREEK AT SHERIDAN

RATING TABLE-- BCRSHECO32 USED FROM 01-OCT-2012 TO 16-OCT-2012  
 BCRSHECO33 USED FROM 16-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

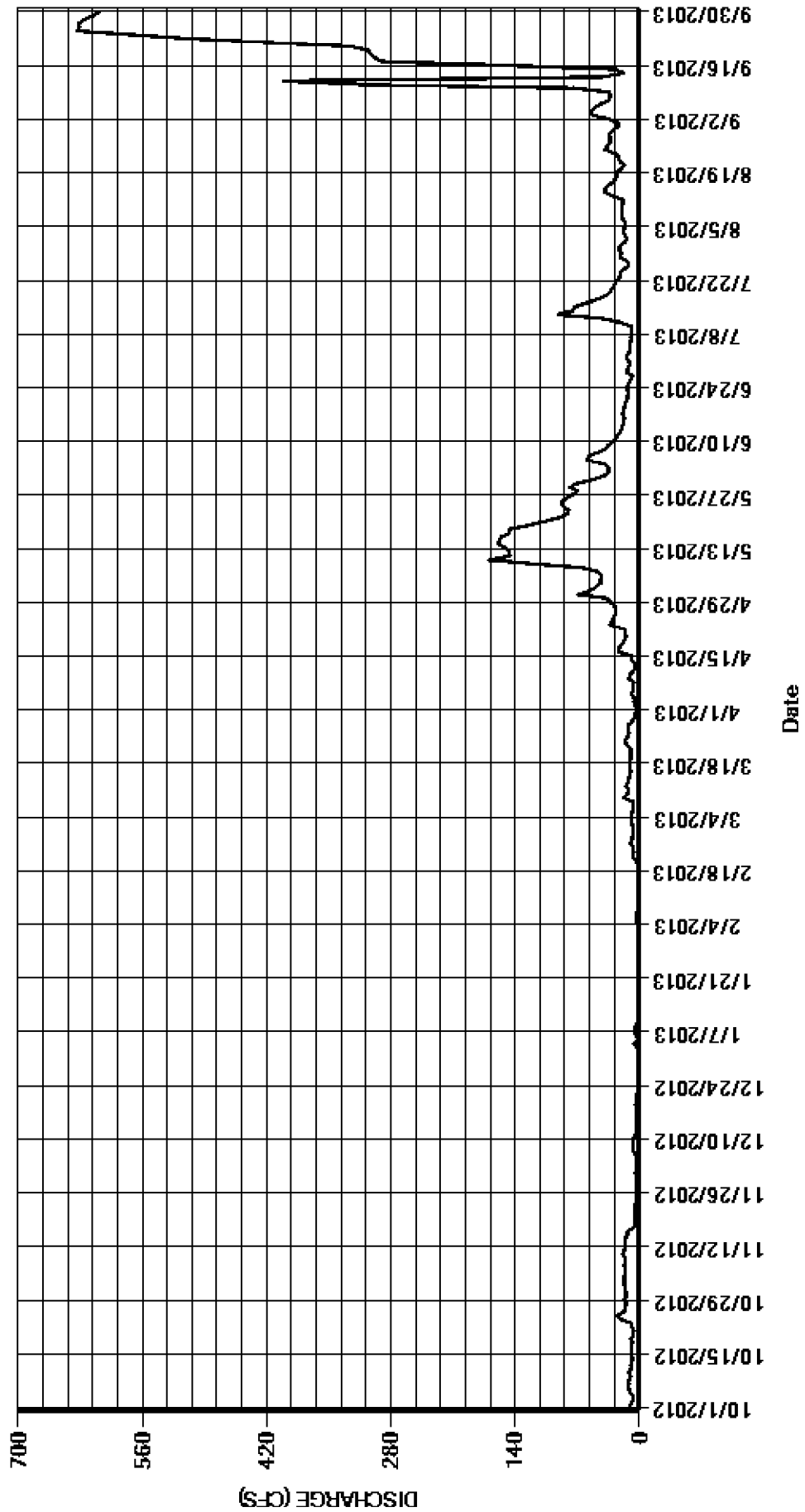
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	16	4.6	1.4	1.4	7.5	3.8	69	39	12	16	24
2	9.4	17	3.2	1.5	1.8	8.0	4.3	55	35	15	14	34
3	7.3	17	3.3	3.1	1.2	8.9	6.0	49	35	12	17	52
4	6.7	17	3.5	6.3	2.8	9.5	6.0	44	39	11	18	55
5	11	16	3.2	1.5	2.6	8.2	8.9	44	59	11	16	50
6	12	16	4.6	3.5	2.6	7.6	7.5	43	57	9.9	16	43
7	12	17	7.2	5.3	3.3	7.5	7.2	48	48	9.5	19	34
8	12	16	7.3	5.4	1.2	7.5	6.5	64	38	8.6	20	33
9	10	16	7.3	3.4	1.0	18	12	121	35	9.1	20	34
10	12	19	7.0	1.1	1.1	14	11	169	30	9.6	20	74
11	9.7	17	5.6	1.3	0.99	12	7.0	146	26	22	19	316
12	9.6	16	2.3	0.99	2.3	15	4.6	147	23	42	18	401
13	8.4	16	3.8	0.93	1.9	13	4.4	150	20	92	31	42
14	8.1	16	3.9	0.92	1.8	12	9.3	159	19	75	39	18
15	9.7	14	3.6	0.87	1.7	11	8.7	158	18	73	38	27
16	8.9	13	3.6	0.81	1.7	10	23	156	17	59	33	152
17	8.6	6.1	4.0	0.81	1.7	11	23	147	19	47	28	290
18	8.2	5.8	4.1	0.81	1.9	11	20	147	18	37	26	298
19	9.6	5.5	4.3	0.76	2.1	10	17	127	17	33	25	303
20	6.9	4.5	4.2	0.71	2.5	9.8	15	108	16	30	21	306
21	6.7	4.9	3.8	0.80	6.1	9.8	16	91	14	28	17	327
22	8.6	4.8	2.0	0.95	7.2	10	17	81	13	25	22	421
23	9.0	4.5	1.6	0.72	6.6	15	33	80	13	22	23	508
24	21	4.0	1.7	0.84	7.5	16	31	86	14	22	27	572
25	25	4.2	2.2	0.89	10	13	29	88	12	16	39	634
26	17	4.1	1.6	1.1	8.2	12	27	84	10	12	36	631
27	16	3.5	1.6	1.1	7.9	12	27	76	7.5	15	33	632
28	15	3.3	1.4	e1.1	7.2	12	28	70	14	22	33	625
29	17	3.3	1.4	e1.1	---	8.0	33	78	13	20	34	615
30	15	3.3	1.4	1.2	---	5.4	37	70	11	23	30	609
31	15	---	1.5	1.3	---	4.4	---	51	---	22	24	---
TOTAL	356.4	320.8	110.8	52.51	98.29	329.1	483.2	3006	729.5	844.7	772	8160
MEAN	11.5	10.7	3.57	1.69	3.51	10.6	16.1	97.0	24.3	27.2	24.9	272
AC-FT	707	636	220	104	195	653	958	5960	1450	1680	1530	16190
MAX	25	19	7.3	6.3	10	18	37	169	59	92	39	634
MIN	6.7	3.3	1.4	0.71	0.99	4.4	3.8	43	7.5	8.6	14	18

CAL YR	2012	TOTAL	4712.90	MEAN	12.9	MAX	207	MIN	1.4	AC-FT	9350
WTR YR	2013	TOTAL	15263.30	MEAN	41.8	MAX	634	MIN	0.71	AC-FT	30270

MAX DISCH: 659 CFS AT 20:45 ON SEP 27, 2013 GH 4.63 FT SHIFT 0.08 FT  
 MAX GH: 4.63 FT AT 20:45 ON SEP 27, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06711500 BEAR CREEK AT SHERIDAN  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06714000 SOUTH PLATTE RIVER AT DENVER  
Water Year 2013

Location.-- Lat. N39°45'34", Long. W105°0'14.42" (Spotted from Google Earth). Gage is located on the right bank at a grouted rock dam 110-ft. upstream from the 18th Street Bridge, 0.4 mi. downstream from the confluence with Cherry Creek and 1.75 miles NW of the Capitol Building in Denver, CO.

Drainage Area and Period of Record.-- 3860 sq. mi. (USGS Colorado StreamStats utility).; Daily values are available from July 1, 1895 to present.

Equipment.-- A digital incremental Sutron Stage Discharge Recorder (SDR) connected to a Sutron SatLink 2 Data Collection Platform (DCP) transmitting in a 6 ft. by 6 ft. precast concrete shelter otop a 60 inch corrugated metal pipe stilling well at a grouted rock dam. A Stevens A-35 water-stage recorder was removed in Water Year 2013. The well is connected to the channel by three 2 inch inlets equipped with flush risers and valves. A potable water line is plumbed into the shelter for flushing the inlets. An electric tape gage located in the shelter is the primary reference with a cantilever style wire weight gage as a supplementary reference. The Urban Drainage and Flood Control District contracts OneRain Inc. and the USGS to operate early warning flood detection instrumentation and a water quality sampler respectively at the gage.

Hydrologic Conditions.-- 3860 sq. mi. of drainage area of varying topography. Gage is located approximately 0.4 miles downstream from the confluence of the South Platte River and Cherry Creek. The channel is heavily regulated upstream of the gage by numerous diversions, reservoirs and inflows to the system. Gage is subject to rapid changes in stage resulting from storm events in the Denver area from hardened surfaces draining to the river. The channel is principally composed of gravels and sand that are continually scouring and filling in the gage pool formed by the control, causing both positive and negative shifts. Directly across the channel from the gage, and above the control, is a spillback gate for the Farmers and Gardeners Ditch. The spillback chute to the river is very steep and flows are shallow, turbulent, air entrained, extremely fast and practically not measureable with Price meters. During routine operation of the ditch, this flow is often estimated at about 10 cfs. The ditch rider states that the head gate will draw about 35 cfs from the river and the ditch is decreed at 24 cfs. The remainder is spilled.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged DCP data as backup. The record is complete and reliable. Instrument calibration was maintained by sixteen visits to the gage by DWR staff.

Datum Corrections.-- Levels were last run on October 17, 2011. Following replacement of the instrument shelf, established the primary reference at a new elevation of 19.786 ft. using RM 9 as base.

Rating.-- The control of all expected flows is a grouted rock dam approximately 50-ft. below the gage. Rating 34 (PLADENCO34), in use since October 1, 2008, was continued in use for all of WY2013. It is defined by measurements from 39.4 to 5340 cfs and has been extended to 12600 cfs using a peak flow on July 25, 1998 that was indirectly calculated using records from downstream gages. Fifteen discharge measurements (Nos. 1043-1057) were made this year, ranging in discharge from 64.7 to 3380 cfs covering the range in stage experienced this year well. The peak flow of 3930 cfs occurred on at 1100 on September 12, 2013 at a gage-height of 7.41 ft. with a shift of -0.05 ft.; exceeding this year's high flow Measurement (No. 1056), made September 12, 2013 by 550 cfs and 0.37 ft of stage.

Discharge.-- Shifts are mainly caused by scour and fill of materials in the pool created by the control structure, vegetal growth and debris on the control. Shifting control method was used all year. Shifts were distributed as follows: September 25, 2012 through February 27, 2013, shifts were distributed by time as defined by measurements; February 27 through May 10, 2013, stage dependent shifting using variable shift table PLADENCOVSC13-A, defined by measurement Nos. 1047-1050 made during the period of use; May 10 through September 12, 2013, stage dependent shifting using variable shift table PLADENCOVSC13-B, defined by measurement Nos. 1050, 1051 and 1053-1056 made during the period of use; September 12 through October 16, 2013, stage dependent shift using variable shift table PLADENCOVSC13-C, defined by measurement Nos. 1056 - 1058, made during the period of use.

Measurements made this year showed unadjusted shifts varying between -0.09 and 0.09 ft. All were given full weight with exception of Nos. 1043, 1051, 1054, 1055 and 1057 which were discounted up to  $\pm 4.3\%$  to smooth shift distributions. Measurement No. 1052 was deemed unreliable and was not used due to heavy algal growth fouling the meter during the measurement.

Special Computations.-- None.

Remarks.-- The record is good. Station maintained Colorado Division of Water Resources Staff and record developed by Matt Rusch.

Recommendations.-- Continued efforts to measure peak events should be strived for. Measurements should be made shortly after events. Levels must be run in WY2013 to confirm establishment and stability of the primary reference.

STATE OF COLORADO  
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06714000 SOUTH PLATTE RIVER AT DENVER

RATING TABLE-- PLADENCO34 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

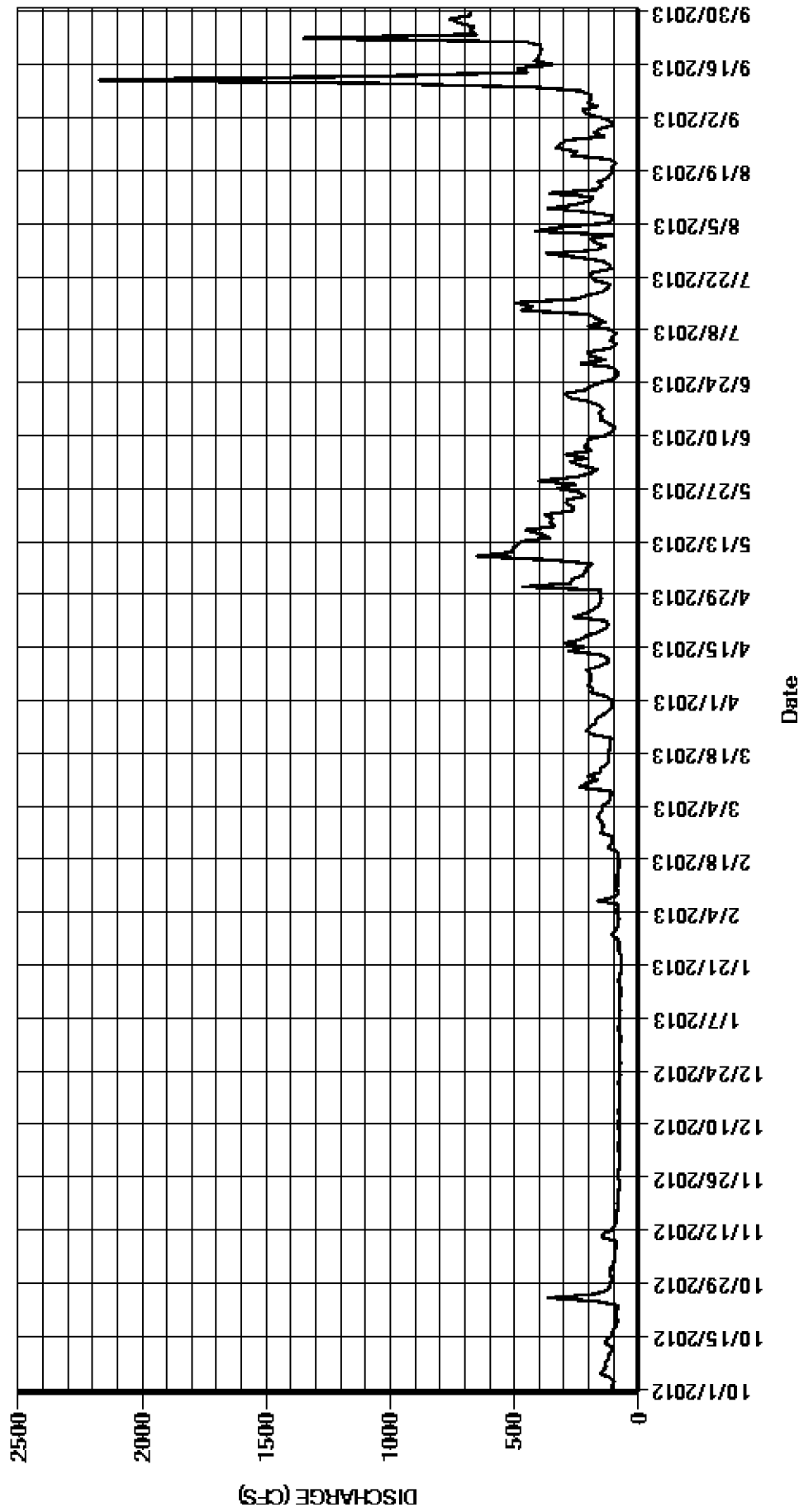
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	110	113	78	73	83	166	110	464	168	193	191	109
2	105	111	78	74	80	158	129	275	236	205	106	151
3	100	102	80	75	84	146	190	268	276	113	417	209
4	115	97	80	82	88	146	185	225	212	90	320	225
5	155	95	81	79	86	122	204	214	292	113	135	169
6	140	97	78	76	82	114	193	210	193	105	102	204
7	133	95	78	78	163	111	193	187	219	92	107	191
8	134	89	77	77	96	113	196	335	206	116	203	192
9	121	91	81	75	83	237	210	649	200	202	366	236
10	120	145	79	77	89	211	158	516	133	136	262	429
11	108	142	80	78	87	165	125	507	106	174	194	1010
12	106	107	77	77	85	204	123	489	97	197	184	2170
13	135	95	80	72	87	153	154	474	119	471	357	1040
14	127	92	79	74	86	153	279	359	152	430	170	450
15	111	90	78	73	82	130	220	395	148	496	148	487
16	106	90	78	76	80	121	301	456	159	253	162	348
17	98	87	77	82	79	123	234	339	144	205	126	418
18	88	83	78	76	81	123	210	357	158	144	112	403
19	87	86	77	73	82	118	159	347	203	125	110	397
20	88	84	77	72	89	115	131	378	283	118	106	393
21	89	83	82	72	122	116	122	266	294	174	92	396
22	87	83	77	72	110	111	133	265	216	194	114	452
23	87	78	74	69	106	189	264	290	193	189	268	1350
24	163	78	77	75	107	210	211	289	146	110	252	656
25	365	78	77	80	151	195	182	215	99	115	331	680
26	182	84	74	81	148	172	161	240	85	143	315	665
27	130	82	76	79	141	172	154	328	88	248	289	722
28	116	79	78	88	152	146	152	258	101	370	140	760
29	116	77	77	108	---	124	156	399	232	171	177	682
30	106	78	76	94	---	109	155	251	136	134	153	678
31	114	---	77	85	---	105	---	192	---	176	103	---
TOTAL	3842	2791	2416	2422	2809	4578	5394	10437	5294	6002	6112	16272
MEAN	124	93.0	77.9	78.1	100	148	180	337	176	194	197	542
AC-FT	7620	5540	4790	4800	5570	9080	10700	20700	10500	11900	12120	32280
MAX	365	145	82	108	163	237	301	649	294	496	417	2170
MIN	87	77	74	69	79	105	110	187	85	90	92	109

CAL YR	2012	TOTAL	50973	MEAN	139	MAX	1510	MIN	55	AC-FT	101100
WTR YR	2013	TOTAL	68369	MEAN	187	MAX	2170	MIN	69	AC-FT	135600

MAX DISCH: 3930 CFS AT 11:00 ON SEP 12, 2013 GH 7.41 FT SHIFT -0.05 FT  
 MAX GH: 7.41 FT AT 11:00 ON SEP 12, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06714000 SOUTH PLATTE RIVER AT DENVER  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06720000 CLEAR CREEK AT DERBY  
Water Year 2013

Location.-- Lat 39°49'42", long 104°57'30", in SW¼SW¼ sec. 36, T.2 S., R.68 W., Adams County, Hydrologic Unit 10190004, on right bank 875 ft downstream from York Street bridge, 0.5 mi upstream from mouth, and 2.5 mi west of Derby.

Drainage Area and Period of Record.-- 575 mi². April-Nov. 1914.; 1927 to present

Equipment.-- Sutron Satlink2 Data Collection Platform (DCP) with a Stage Discharge Recorder (SDR) in a 60 inch corrugated metal shelter and well, Primary reference is by Electric Tape Gage (ETG) inside the shelter and well. There is no outside reference. An external temperature sensor is installed in the gage.

Hydrologic Conditions.-- Water is collected from the Clear Creek Drainage areas upstream and deposited ½ mile downstream into the South Platte River. Summer flows are affected by municipal and agricultural diversions upstream. In years of high snowpack, the runoff will exceed demand and much of the runoff will leave the basin past this gage. Gage also collects urban storm runoff and will see sharp peaks after rainstorms.

Gage-Height Record.-- The primary record is 15-minute data taken from satellite telemetry with the DCP and SDR logs as back-up. The record is complete and reliable, except for December 26, 2012 through January 9, January 12 through 18, and January 29, 2013 when ice caused backwater at the gage. Ice affected backwater days were estimated using adjacent days of good record and smoothed using average daily temperature. The period June 13-21, 2013 when the SDR tape jumped the studs on the wheel continued to track the stage well and was not corrected. Two instrument calibration corrections were applied this year on May 10, 2013, and July 24, 2013

Datum Corrections.-- Levels were last run to the ETG using BM 10 as base on August 25, 2011. No correction was necessary or made at that time.

Rating.-- The control is a rock dam formed by a pipeline crossing approximately 25 feet below the gage. Shifts are caused by changes in the channel geometry, accumulation of material on the control and possible ice affect. Rating No. 35, put into use on October 5, 2011, was used for the entire 2013 Water Year. It is defined by measurements ranging from 0.77 cfs to 3,030 cfs. Nineteen measurements (Nos. 1015 - 1033) were made this year ranging from 2.14 to 3,030 cfs. They cover the range in discharge experienced this year well. The peak flow of 3,510 cfs occurred at 04:15 on September 13, 2013 at a gage height of 5.29 ft with a shift of -0.32 ft. It exceeded measurement No. 1032 by 0.31 feet of stage and 480 cfs.

Discharge.-- Shifting control method was used for the entire water year. Shifts were distributed by time with consideration of stage from October 1, 2012 through April 5, 2013. Five Variable Shift Curves (CLEDERCOVSC-A through E) were created and used as follows (All VSC's used M1031 and M1032 as upper ends): VSC-A (M1021 - M1024) used 04/05/13 - 05/17/13; VSC-B (M1024 - M1027) used 05/17/13 - 06/13/13; VSC-C (M1027 - M1029) used 06/13/13 - 07/24/13; VSC-D (M1030 - M1032) used 07/24/13 - 09/13/13; VSC-E (M1031 - M1034) used 09/13/13 - 10/16/13. All measurements were given full weight except Nos. 1017 which was adjusted 4.31% for possible ice effect. Measurement 1018 was not used in the development of the record, it shows signs of being ice affected.

Special Computations.-- Ice affect has been an issue at the gage in past years. The gage pool can remain frozen long after the control is clear if little change in stage occurs. Ice affect was estimated using adjacent periods of good data and temperature trends. Debris corrections are also common at this gage and did have an impact this year. Debris corrections were applied in addition to shifts, except for a -0.01 debris correction which was applied from May 8 - 10, 2013, which was run as a flush correction due to the use of the variable shift table during this time.

Remarks.-- The record is rated good, except for the period when ice caused backwater at the gage, which was estimated and rated fair. The period when the SDR tape jumped its studs but continued to track the gage height well, which is rated fair. Station maintained by Division of Water Resources staff and record developed by Matt Rusch.

Recommendations.-- The upstream side of the control was lined with rip rap following the September flood, well into Water Year 14. Extra measurements and gage visits will be required to minimize debris corrections and establish a new rating.

STATE OF COLORADO  
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06720000 CLEAR CREEK AT DERBY

RATING TABLE-- CLEDERCO35 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

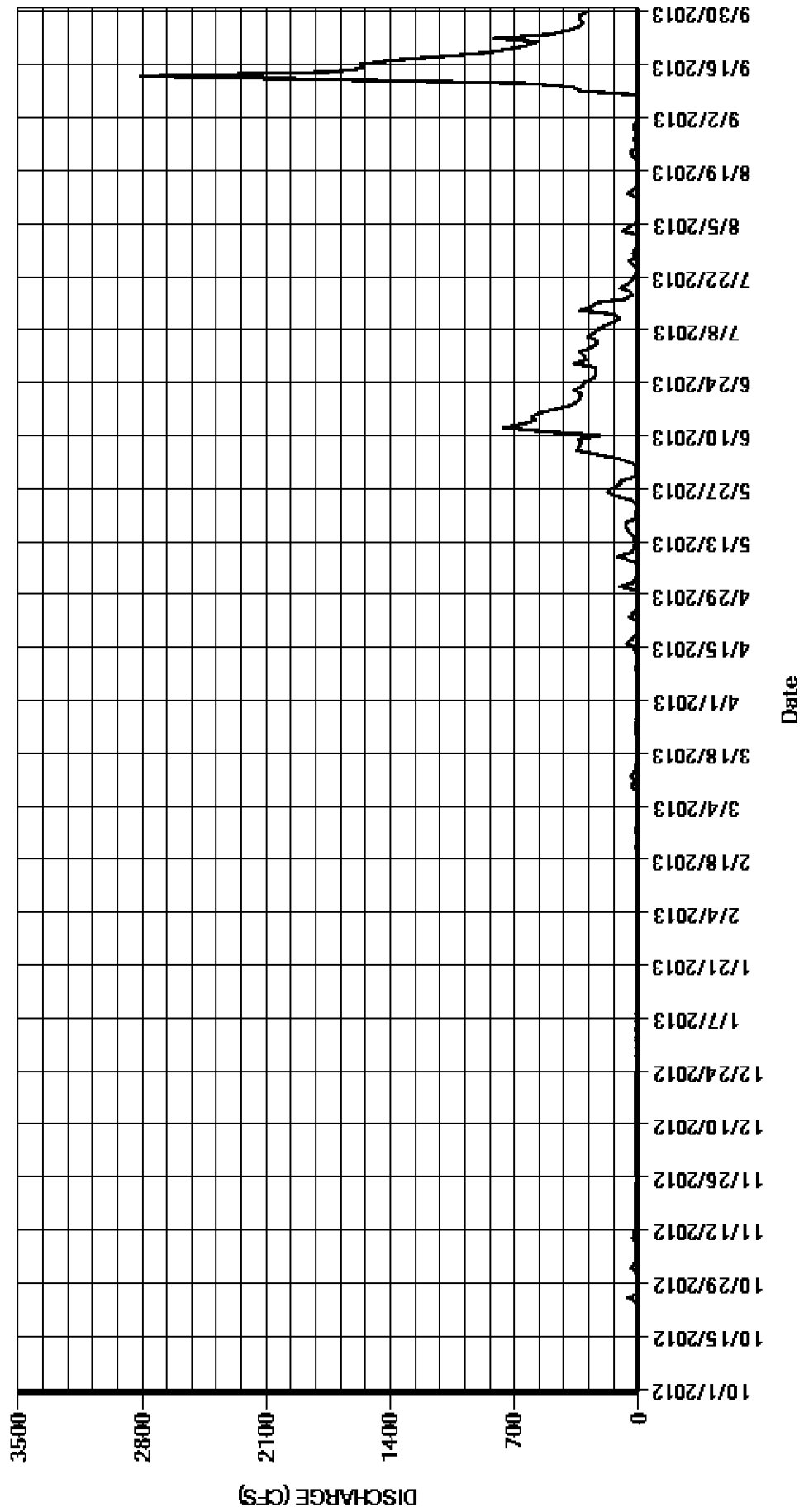
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.4	19	14	e12	2.1	6.3	0.89	107	18	308	6.8	9.1
2	2.2	43	14	e12	1.9	5.8	1.2	35	7.8	332	4.4	13
3	3.7	23	13	e12	1.7	7.6	4.5	20	57	274	91	7.5
4	4.1	20	14	e13	1.7	5.9	1.9	9.3	122	235	54	6.4
5	4.4	20	14	e12	1.7	6.8	2.0	4.7	239	238	13	6.5
6	4.2	20	14	e12	2.5	4.1	1.4	4.2	345	287	6.7	5.7
7	4.4	20	13	e12	4.1	3.2	1.2	4.3	337	254	5.3	6.3
8	4.8	20	13	e12	2.5	3.6	1.1	55	324	227	5.2	5.6
9	4.7	19	13	e8.0	3.7	38	18	117	336	197	4.8	332
10	5.4	30	13	3.6	4.2	29	13	41	220	139	8.2	367
11	5.5	25	13	3.2	2.4	24	4.0	26	533	108	10	606
12	6.3	19	13	e3.0	2.4	42	6.1	21	762	135	14	1620
13	7.4	13	14	e3.0	3.1	23	5.9	20	656	332	59	2810
14	6.0	16	14	e3.0	3.5	19	21	27	579	261	31	1760
15	4.9	17	14	e3.0	4.8	13	26	44	602	242	6.6	1560
16	5.2	15	15	e2.5	3.7	8.3	67	61	560	78	4.5	1570
17	4.9	15	15	e2.0	2.7	3.8	37	71	462	38	4.5	1420
18	4.4	14	14	e1.5	3.1	2.0	20	73	377	47	3.8	1140
19	3.6	14	15	0.83	2.4	1.1	6.8	9.8	348	103	3.6	880
20	3.6	14	15	0.74	3.7	0.82	3.9	19	329	62	3.7	738
21	3.9	15	15	0.68	15	0.90	3.0	14	325	40	11	632
22	4.6	14	12	0.61	8.9	1.0	6.6	8.0	362	25	11	569
23	6.6	13	14	0.52	6.0	13	50	15	318	11	36	813
24	20	13	12	1.2	6.7	18	30	45	307	10	45	510
25	58	12	11	5.2	18	15	14	126	253	28	16	402
26	14	12	e11	4.5	15	12	4.9	176	240	51	11	342
27	5.2	14	e11	3.9	11	12	3.7	154	241	18	30	311
28	3.1	14	e12	4.2	8.6	7.6	3.8	105	247	31	12	332
29	4.6	14	e12	e5.0	---	3.3	5.0	103	362	22	15	331
30	4.8	14	e12	2.4	---	0.97	10	19	298	8.2	27	294
31	4.5	---	e11	2.1	---	0.91	---	19	---	5.9	25	---
TOTAL	221.4	531	410	161.68	147.1	332.00	373.89	1553.3	10166.8	4147.1	579.1	19399.1
MEAN	7.14	17.7	13.2	5.22	5.25	10.7	12.5	50.1	339	134	18.7	647
AC-FT	439	1050	813	321	292	659	742	3080	20170	8230	1150	38480
MAX	58	43	15	13	18	42	67	176	762	332	91	2810
MIN	2.2	12	11	0.52	1.7	0.82	0.89	4.2	7.8	5.9	3.6	5.6

CAL YR	2012	TOTAL	5882.10	MEAN	16.1	MAX	358	MIN	1.2	AC-FT	11670
WTR YR	2013	TOTAL	38022.47	MEAN	104	MAX	2810	MIN	0.52	AC-FT	75420

MAX DISCH: 3510 CFS AT 04:15 ON SEP 13, 2013 GH 5.29 FT SHIFT -0.32 FT  
 MAX GH: 5.29 FT AT 04:15 ON SEP 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06720000 CLEAR CREEK AT DERBY  
WY2013 HYDROGRAPH





PLATTE RIVER BASIN  
06720500 SOUTH PLATTE RIVER AT HENDERSON

Water Year 2013

Location.-- Lat. 39° 55'20.36", Long. 104°52'7.72"(NAD83), Adams County, CO Hydrologic Unit 1019003. Gage is located on the left bank 315 ft. upstream from the 124th Ave. bridge and 0.2 miles northwest of Henderson, CO. A new gage was established at this left bank location on April 9, 2010 at the same datum as the discontinued right bank gage described below and was run concurrently with the right bank gage from April 9, 2010 to May 17, 2011 (15:15). The right bank location was discontinued at 15:15 on May 17, 2011.

Drainage Area and Period of Record.-- 4,760 mi<sup>2</sup> (USGS Colorado StreamStats utility).; May 1, 1926 to present. Monthly data only prior to 1933. Periodic water quality data available starting in 1955.

Equipment.-- Sutron Constant Flow Bubbler (CFB) and tipping bucket rain gage with a SatLink2 DCP in a 6 ft. by 6 ft. concrete shelter. Three orifice lines are buried in conduit to the channel. A second Sutron Constant Flow Bubbler unit is connected to the another orifice line as backup. A cantilever type wire weight gage is suspended directly over the orifice lines serving as the primary reference.

Hydrologic Conditions.-- Flows are heavily regulated upstream by numerous transmountain diversions, storage reservoirs, diversions from and deliveries to the channel as well as return flows from irrigated areas. Diversions for irrigation are estimated at about 253,000 acres. Because of the heavy regulation upstream of the gage, a strong diurnal pattern from the metro effluent releases is present and is the main component of flows during low flow periods. Peak events typically are short transitory events steaming from storm events in the metro area combined with spring and summer snowmelt. The Army Corps of Engineers utilize this gage to regulate releases out of Chatfield and Cherry Creek Reservoirs to keep the flow at or below 5,000 cfs at the Henderson Gage.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged DCP and 5-minute logged CFB data as backup. The record is complete and reliable. No missing values for this water year. Instrument calibration was maintained by twenty-nine visits to the gage. Seven instrument calibration corrections ranging from +0.04 to -0.04 ft. were required this year. The larger corrections appear to be related to changing flow conditions. It is suspected that there may be an unknown transition from static head to dynamic head as experienced at the orifice face. The third orifice line, installed this year, is about 30 ft. upstream in hopes of correcting this problem. Instrument corrections were applied to the record as defined by visits made to the gage.

Datum Corrections.-- Levels were last run on August 17, 2012 using RM10 as base. The results were all within tolerance.

Rating.-- The control is a grouted rock dam, constructed in 2002 as a grade control structure by the Urban Drainage and Flood Control District. The rock dam has a low flow notch in the right of center portion of the control, and will effectively regulate flow at all stages. In March of 2010, the UDFCD sloped and revetted the left bank to resolve some bank stabilization issues. Prior to construction of the dam, the control was a shifting sand and gravel channel, with high flows being influenced by the 124th Ave. bridge opening. The channel had been scouring during the entire history of the gage. The dam effectively raised the channel bed and PZF by about 2-ft. Rating PLAHENCO34, developed in the 2011 Water Year accounted for changes in pool dynamics from the right bank location to the left bank location as well as some degree of drawdown experienced at the right bank location. It is defined by measurements from 107 to 11,000 cfs. Twenty-three discharge measurements (Nos. 636-658) were made this year ranging in discharge from 101 to 11,000 cfs, covering the range in stage experienced this year well. The peak flow of 11,200 cfs occurred at 1630 on September 12, 2013 at a gage-height of 11.65 ft. with a shift of -0.01 ft. The peak exceeded high flow Measurement No. 655 made the same day by 200 cfs and 0.05 ft. of stage.

Discharge.-- Shifting control method was used all year. Shifts are caused by fill and scour of the channel and pool above the control as well as some lack of definition in the new rating. From October 1, 2012 through August 7, 2013 shifts were distributed by time as defined by measurements with consideration given to change in stage. From August 7 through September 12, 2013 stage dependent shifting using variable shift table PLAHENCOVSC13-A was applied. It is defined by five measurements (Nos. 651-655) made during the period of use. From September 12 through September 30, 2013 variable shift table PLAHENCOVSC13-B was applied. It is defined by five measurements (Nos. 655-659) made during the period of use. Measurements made this year showed unadjusted shifts varying between -0.10 and +0.11 ft. All were given full weight except for Nos. 636, 638, 640, 651, 652, and 658 which were discounted up to 4.77% to smooth shift distributions.

Special Computations.-- All measurements made this year were performed using half counts (20 second counts instead of 40 second counts). This method is employed to counteract the large and rapid changes in stage due to Denver-Metro Sewer releases and storm events. The measurement section changes occasionally to account for newly deposited sand or scoured channel. The best attempt is made to measure as close as possible to the gage as to not incur time lag in determining the measured gage-height. Many measurements have been adjusted for time lag as the gage-height changes rapidly. Use of weighted mean gage-height computations are necessary for large changes that occur during the measurement.

Remarks.-- The record is good. Station maintained by Division One Hydrographic staff, record developed by Patrick Tyler.

Recommendations.--

Measurements throughout the range in stage experienced are required to better define the rating. Photographs of the control at various high water stages would be helpful determining the transition to channel control. Photographs taken should be labeled with the date and gage-height. Continue to make improvements that will counteract the bubbler adjustments due to high flow events.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06720500 SOUTH PLATTE RIVER AT HENDERSON

RATING TABLE-- PLAHENCO34 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

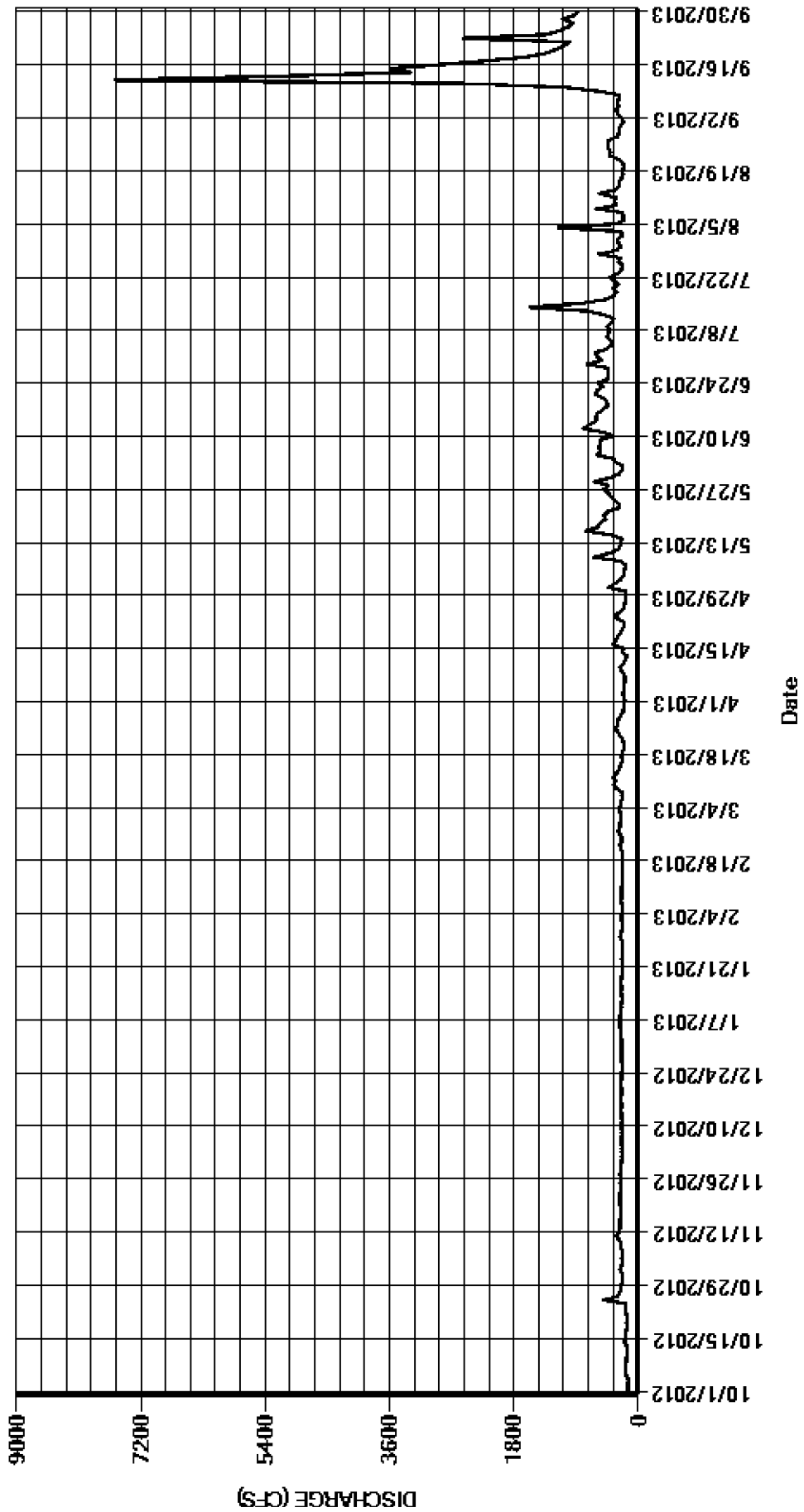
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	147	229	240	238	236	251	197	440	226	597	303	212
2	151	266	238	247	239	256	200	356	226	629	226	242
3	150	243	239	257	242	272	222	268	324	453	256	295
4	144	234	238	256	238	266	204	221	347	392	1150	323
5	169	240	241	266	232	257	204	208	592	395	311	284
6	188	230	239	265	233	239	196	195	550	452	216	298
7	182	233	243	269	250	238	192	187	571	442	216	283
8	182	254	237	265	245	233	203	267	547	409	239	276
9	172	256	239	255	240	317	245	646	546	447	612	595
10	171	281	244	246	240	352	263	432	358	378	317	1060
11	164	317	237	245	243	332	219	292	515	355	345	2380
12	157	281	243	237	231	361	190	259	799	486	329	7570
13	174	266	240	240	230	314	162	249	705	742	563	5270
14	201	261	250	246	227	281	238	242	611	1560	329	3300
15	188	266	243	243	236	262	214	416	615	813	276	3600
16	180	256	247	245	233	237	364	760	591	484	274	2890
17	177	258	252	248	230	239	324	591	518	349	243	2210
18	164	259	244	244	235	240	301	558	440	316	224	1630
19	171	263	240	235	236	221	254	474	459	360	225	1340
20	166	265	244	234	229	211	231	495	504	289	211	1190
21	171	262	252	238	258	215	205	442	621	348	221	1070
22	181	266	246	238	266	226	207	288	600	407	276	989
23	183	253	242	238	240	268	312	283	510	287	413	2540
24	185	256	245	235	240	309	315	343	584	245	409	1340
25	504	263	228	232	269	320	237	397	438	225	435	1140
26	299	260	233	228	291	301	206	432	435	286	435	1010
27	272	264	244	231	262	293	192	498	441	262	442	955
28	249	253	241	240	262	256	187	432	445	571	299	1090
29	245	248	244	263	---	225	185	636	741	317	280	934
30	234	248	240	244	---	215	179	402	526	260	281	872
31	229	---	247	237	---	211	---	278	---	288	252	---
TOTAL	6150	7731	7500	7605	6813	8218	6848	11987	15385	13844	10608	47188
MEAN	198	258	242	245	243	265	228	387	513	447	342	1573
AC-FT	12200	15330	14880	15080	13510	16300	13580	23780	30520	27460	21040	93600
MAX	504	317	252	269	291	361	364	760	799	1560	1150	7570
MIN	144	229	228	228	227	211	162	187	226	225	211	212

CAL YR	2012	TOTAL	94638	MEAN	259	MAX	1880	MIN	120	AC-FT	187700
WTR YR	2013	TOTAL	149877	MEAN	411	MAX	7570	MIN	144	AC-FT	297300

MAX DISCH: 11200 CFS AT 16:30 ON SEP 12, 2013 GH 11.65 FT SHIFT -0.01 FT  
 MAX GH: 11.65 FT AT 16:30 ON SEP 12, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06720500 SOUTH PLATTE RIVER AT HENDERSON  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
MIDDLE SAINT VRAIN AT PEACEFUL VALLEY

Water Year 2013

Location.-- Lat. N40° 07' 47"; Long W105° 31' 07" (from topographic map), Boulder County, CO. 1-mile west of Peaceful Valley, CO, approximately 4.6-miles above the mouth of Cave Creek and just below the USFS Camp Dick Campground.

Drainage Area and Period of Record.-- 18.0 sq. mi. (USGS Colorado StreamStats utility). ; Daily values are available from the DWR from May 14, 1998 to present

Equipment.-- Digital incremental Sutron 56-0540-400-DTR shaft encoder and temperature sensor connected to a Sutron SatLink2 Data Collection Platform (DCP) and a graphic water-stage recorder in a 42-inch corrugated metal pipe shelter and well. The stilling well is connected to the channel via three 2-inch intakes, which are equipped with valves and flushing equipment. The primary reference is a metal drop tape and adjustable reference point. No supplemental reference is available.

Hydrologic Conditions.-- Uninhabited forested lands of varying topography. Gage is located in the Indian Peaks Wilderness Area of Roosevelt National Forest, at the Peaceful Valley / Camp Dick campground facilities. There are no known diversions occurring upstream of the gage. Marked diurnal flow patterns occur during peak snowmelt months. Due to heavy winter conditions and the remoteness of this gage, year-round operation of the gage is not possible.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged DCP data and chart record as backup. Instrument calibration was maintained by thirteen visits to the gage this year. No instrument calibrations were needed nor made this Water Year. The record is complete and reliable except for: October 7, 8, 17, 18, 2012, when the stage-discharge relation was affected by ice and November 6, 2012 and May 21, 2013, which are partial day records. No gage-height record is available for the winter period (November 7, 2012 through May 20, 2013). No discharge record is available for September 12 and 13, 2013 due to flood waters taking Gh above the rating.

Datum Corrections.-- Levels were last run to the inside gage on October 23, 2013 using Reference Mark (RM) 2 as base. The gage was found to be reading accurately.

Rating.-- The control for low to moderate flows is a placed boulder cross-vane control approximately 30-ft. below the gage. The channel is straight for about 80-ft. above and below the gage. Shifts are caused by the movement of material across the gage pool. Vegetal growth and debris accumulation was not an issue this year. Rating MIDSTECO05, developed in the 2011 Water Year was used again this year. It is defined by measurements from 10.9 to 341 cfs. Eleven discharge measurements (Nos. 137 -147) were made this year, ranging in discharge from 4.8 to 149 cfs covering the range in stage experienced this year except for the peak flow event which was caused by a rain fall event on September 12 and 13, 2013. The peak GH from this event occurred at 00:45 on September 13, 2013 at a gage-height of 4.98 ft. As this flow is above the MIDSTECO05 rating, peak discharge cannot be calculated for this water year. The peak GH exceeded high flow Measurement No. 146 made September 16, 2013 by 1.33 ft. of stage respectively.

Discharge.-- Shifting control method was used for all periods of open water. Stage dependent shifting using variable shift table MIDSTECOVS12-2 was applied from October 1, 2012 to Winter shutdown on November 6, 2012. MIDSTECOVS12-2 is defined by seven measurements (Nos. 132-138) made during the period of application. Stage dependent shifting using variable shift table MIDSTECOVSC13-A was applied from Spring opening on May 21, 2013 to the peak flow event on September 13, 2013. MIDSTECOVSC13-A is defined by seven measurements (Nos. 139-146) made during the period of application. After the high water event on September 13, shifts were prorated by time through the end of the year on September 30, 2013. Open water measurements showed shifts varying between -0.13 and +0.00 ft. All were given full weight except for No. 139 and 140 which were discounted up to 5% to better fit the shift distribution. Measurement No. 144 was not used in the development of the record.

Special Computations.-- Discharge for the ice affected periods was estimated from adjacent good record with consideration given to temperature trends. Partial day record discharges were estimated from adjacent good record and discharge measurements made prior to shutdown and startup respectively.

Remarks.-- The record is good except for ice affected periods and partial day record which are estimated and poor. This is a partial year record, no discharge record is kept in winter months. The period of record for the 2013 Water Year is October 1 through November 6, 2012 and May 21 through September 30, 2013. No discharge record is available for the rain event on September 12 and 13, 2013. Station maintained and record developed by Patrick Tyler.

Recommendations.-- Efforts should be taken to better define the new rating at all stages. Levels need to be run in the 2014 Water Year to verify establishment of RM's 5 and 6 and set a supplemental outside staff gage. A cross-section across the control should also be shot to help identify breakpoints in the rating as well as the point of zero flow.

STATE OF COLORADO  
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 OFFICE OF STATE ENGINEER

MIDDLE SAINT VRAIN AT PEACEFUL VALLEY

RATING TABLE-- MIDSTECO05 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

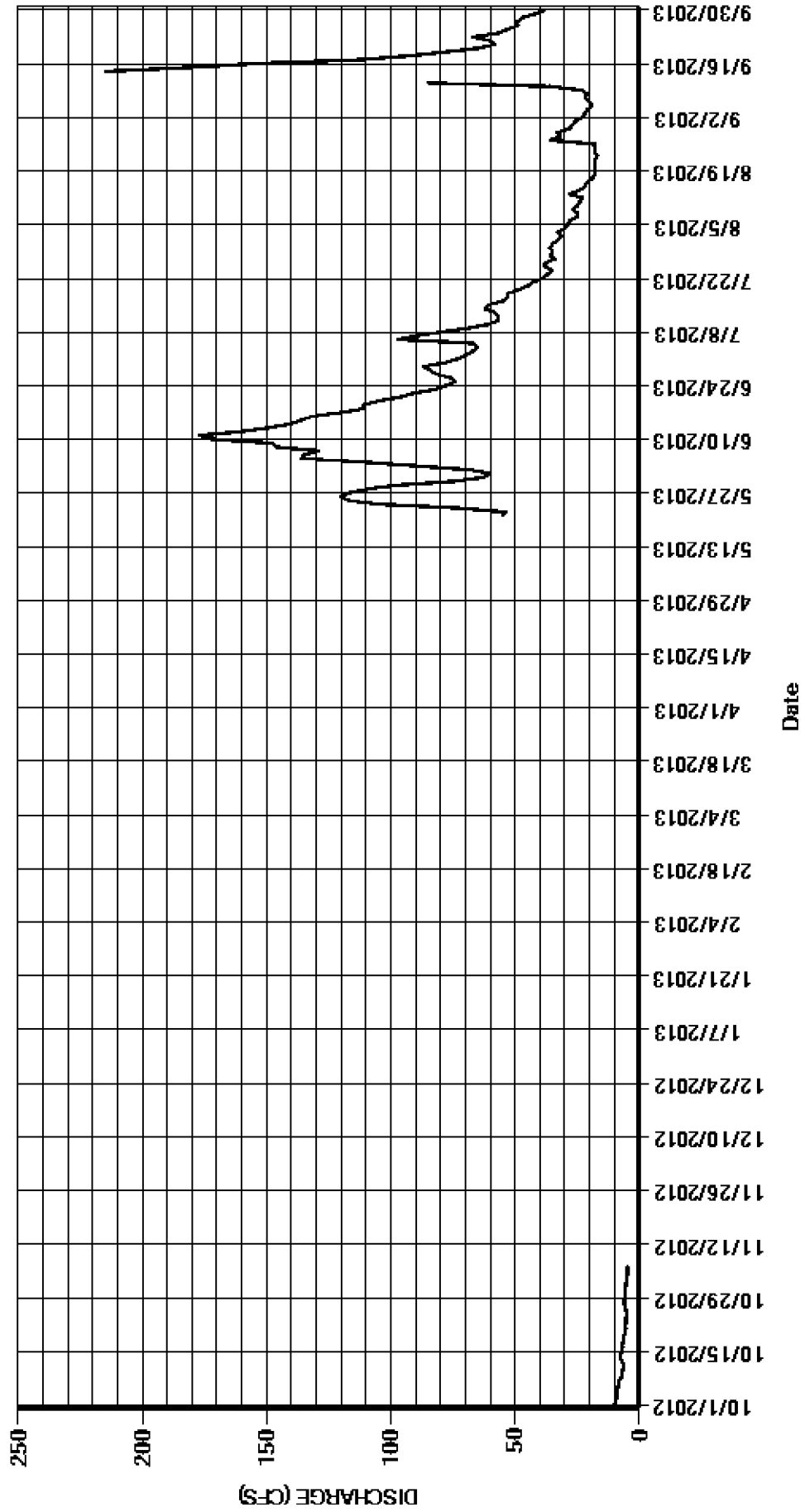
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	5.6	---	---	---	---	---	---	60	73	33	26
2	9.6	5.4	---	---	---	---	---	---	68	70	31	23
3	9.2	5.1	---	---	---	---	---	---	90	67	33	22
4	8.9	4.8	---	---	---	---	---	---	111	65	30	21
5	9.0	4.8	---	---	---	---	---	---	136	67	29	19
6	8.5	e4.8	---	---	---	---	---	---	135	97	28	20
7	e8.5	---	---	---	---	---	---	---	129	89	25	22
8	e7.5	---	---	---	---	---	---	---	146	80	25	21
9	7.0	---	---	---	---	---	---	---	148	69	27	23
10	6.8	---	---	---	---	---	---	---	172	61	25	36
11	6.5	---	---	---	---	---	---	---	177	57	24	85
12	6.6	---	---	---	---	---	---	---	160	57	23	---
13	7.7	---	---	---	---	---	---	---	149	58	28	---
14	7.6	---	---	---	---	---	---	---	140	62	24	215
15	7.1	---	---	---	---	---	---	---	136	61	22	182
16	6.8	---	---	---	---	---	---	---	132	55	21	155
17	e6.8	---	---	---	---	---	---	---	120	53	19	113
18	e6.5	---	---	---	---	---	---	---	111	53	18	93
19	6.4	---	---	---	---	---	---	---	111	49	18	78
20	5.8	---	---	---	---	---	---	---	105	45	18	65
21	5.6	---	---	---	---	---	---	e55	96	43	18	58
22	5.6	---	---	---	---	---	---	54	91	39	18	60
23	5.4	---	---	---	---	---	---	73	82	37	17	67
24	5.4	---	---	---	---	---	---	105	78	35	18	57
25	5.1	---	---	---	---	---	---	117	74	38	18	53
26	5.6	---	---	---	---	---	---	120	76	38	18	49
27	6.0	---	---	---	---	---	---	117	82	34	36	49
28	6.1	---	---	---	---	---	---	110	84	36	32	47
29	5.7	---	---	---	---	---	---	98	87	35	33	42
30	5.7	---	---	---	---	---	---	75	78	36	28	38
31	5.7	---	---	---	---	---	---	63	---	35	27	---
TOTAL	214.7	30.5	---	---	---	---	---	987	3364	1694	764	1739
MEAN	6.93	5.08	---	---	---	---	---	89.7	112	54.6	24.6	62.1
AC-FT	426	60	---	---	---	---	---	1960	6670	3360	1520	3450
MAX	10	5.6	---	---	---	---	---	120	177	97	36	215
MIN	5.1	4.8	---	---	---	---	---	54	60	34	17	19

CAL YR	2012	TOTAL	6181.6	MEAN	30.8	MAX	134	MIN	4.8	AC-FT	12260 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	8793.2	MEAN	52.3	MAX	215	MIN	4.8	AC-FT	17440 (PARTIAL YEAR RECORD)

MAX DISCH: (Peak discharge not determined for this water year.)  
 MAX GH: 4.98 FT AT 00:45 ON SEP 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MIDDLE SAINT VRAIN AT PEACEFUL VALLEY  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06722500 SOUTH SAINT VRAIN NEAR WARD  
Water Year 2013

Location.-- Lat. 40°05'27", Long. 105°30'53" (NAD83) in Boulder County, 3.5 mi downstream of Brainard Lake and 1.25 miles north of Ward, Colorado.

Drainage Area and Period of Record.-- 14.4 mi<sup>2</sup>.; Records are available from: 1925-27,28-31, 54-73, 1992 to present.

Equipment.-- Sutron 56-0450-400-DTR digital incremental shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) and a Steven's Type A graphic water-stage recorder in a 42-inch corrugated metal pipe shelter and well on the left side of the Saint Vrain Creek near Ward, CO. The primary reference is a metal drop tape and adjustable reference point (RP) located on the equipment shelf of the shelter. A supplemental RP has been attached to the outside of the shelter. The drop tape is used to get inside and outside readings as well.

Hydrologic Conditions.-- Drainage area is virtually uninhabited forested lands up to the Continental Divide, with no artificial diversions. This site is commonly used for watershed studies. The gage is approximately 3.5 miles downstream from Brainard Lake, a naturally occurring water body. Water passing this gage is diverted by the Lefthand Ditch Company into the Lefthand Creek basin about 1/3 mile downstream (LEFTHDCO). Normally the entire flow is diverted up to the point where it spills over the Lefthand diversion structure. Often, the two gages report similar, if not identical, discharges except during very high flow periods. However, the point when water bypasses LEFTHDCO is not well defined. Measurements made at this gage are sometimes also used for determination of flows at the Lefthand gage, when it is observed that 100% is being diverted. The historic flood of September 11, 2013 had flows exceed the rating at the gage but no damage other than some movement in the riffle control.

Gage-Height Record.-- The primary record is 15-minute telemetered data with 15-minute logged DCP data and graphical chart record as backup. The record is complete and reliable except for October 7 - 8, 17 - 18 and 25 - 28; November 2 - 6, 2012; May 21-28, 2013 when the stage-discharge relationship was affected by ice and November 7, 2012 through May 20, 2013 corresponding to winter shutdown and startup of the stream gage. This is a partial year gage and no gage height record was obtained during the winter period. One equipment correction was applied to the record this year as defined by visits to the station. On September 11, 2013, a large rain event causing mass flooding at lower elevations, caused the cobble in the control to move. The movement in the control altered shifts for the remainder of the Water Year.

Datum Corrections.-- Levels were run on October 24, 2013 using RM No. 1 as base. The elevation of the RP was found to be 0.029 ft. high. No correction was made at this time. Levels are expected to be shot again as the gage opens in the Spring of 2014.

Rating.-- The control for low to moderate flow is a rock riffle composed of embedded river boulders approximately 30 feet downstream from the gage. The high water control is a sharp bend and gradient change in the stream channel approximately 50 feet downstream of the gaging station. The control is subject to shifting boulders moving into and out of the control area as well as material embedding and being released from the rock riffle. Rating No. 11 developed in water year 2007 was originally defined by measurements from 4.74 to 156 cfs. The rating was extended in 2010 to 510 cfs to include a 2009 measurement of 317 cfs. The rating was theoretically extended to 693 cfs in WY 2013 to cover the flows of the flood event. Fourteen discharge measurements (Nos. 237-250) were made this year ranging in discharge from 4.58 cfs to 176 cfs. They cover the range of stage experienced this water year, except for the higher mean daily flows on September 13, 2013. The peak discharge of 656 cfs occurred at 02:45 on September 13, 2013 at a gage-height of 3.30 feet with a shift of 0.16 ft. exceeding this year's high flow Measurement No. 242 made on June 12, 2013 by 0.20 feet of stage.

Discharge.-- Shifting control method was used for all periods of open water. Moss growth and debris accumulation is generally not an issue at this gage; however fill and scour conditions as well as control movement does occur. Shifts were applied by time as defined by measurements from October 1 to winterization of the gage on November 6, 2012. Shifts were again run by time from opening of the gage in Spring on May 21 to June 12, 2013. Stage dependent variable shift table SSVWARCOVSC13-A was applied from June 12, 2013 up to the peak event of September 12, 2013. SSVWARCOVSC13-A is defined by Measurements Nos. 242-248, made during the period of use. At the full force of the peak flow, the rock riffle control was altered and started a new shift regime. SSVWARCOVSC13-C is a simple straight line graph that contours the periods together and is only run for 2 hours during September 13, 2013. Once the control stabilizes again, time shifting is used to Measurement No. 249 on September 16, 2013. As the effects of the rain event subsides, stage dependent shifting is again applied using SSVWARCOVSC13-B from September 16-25, 2013 and defined by Measurement Nos. 249 and 250. Shifts are then run by time through the remainder of the Water Year. Open water measurements made this year showed unadjusted shifts ranging from -0.34 to 0.24 ft. All measurements were given full weight except for Nos. 244 which was adjusted 2.8% to smooth shift distributions. This is a partial year gage and discharges are not estimated for the winter period, November 7, 2012 to May 20, 2013.

Special Computations.-- Discharge for periods of ice affect were estimated from adjacent record with consideration given to temperature trends and discharges recorded at the downstream station (LEFTHDCO).

Remarks.-- The record is good, except for periods of ice affect and partial day record which are estimated and poor. The peak is rated poor and the mean daily discharge on September 13, 2013 is also considered poor due to lack of confirming measurements in this flow range. Station maintained and record developed by Patrick Tyler.

Recommendations.--



Defining high flows remains a problem. High water measurements at or above about 160 cfs cannot be waded. Crane measurements off the bridge at the gage are difficult and poor due to turbulence caused by a constriction at the bridge abutments, high velocities, and debris firmly lodged in the channel bed at the bridge section. Due to the remoteness of this gage, efforts to find a more suitable measurement location have been unsuccessful. Moreover, under high water conditions measurement at LEFTHDCO is not an option due to diversion practices and supercritical velocities encountered at the only available cabling location due to the LEFTHDCO structure lay out. Bridge replacement at the gage has been suggested. If construction is planned, bridge should be designed with high flow measurements in mind.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06722500 SOUTH SAINT VRAIN NEAR WARD

RATING TABLE-- SSVWARCO11 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

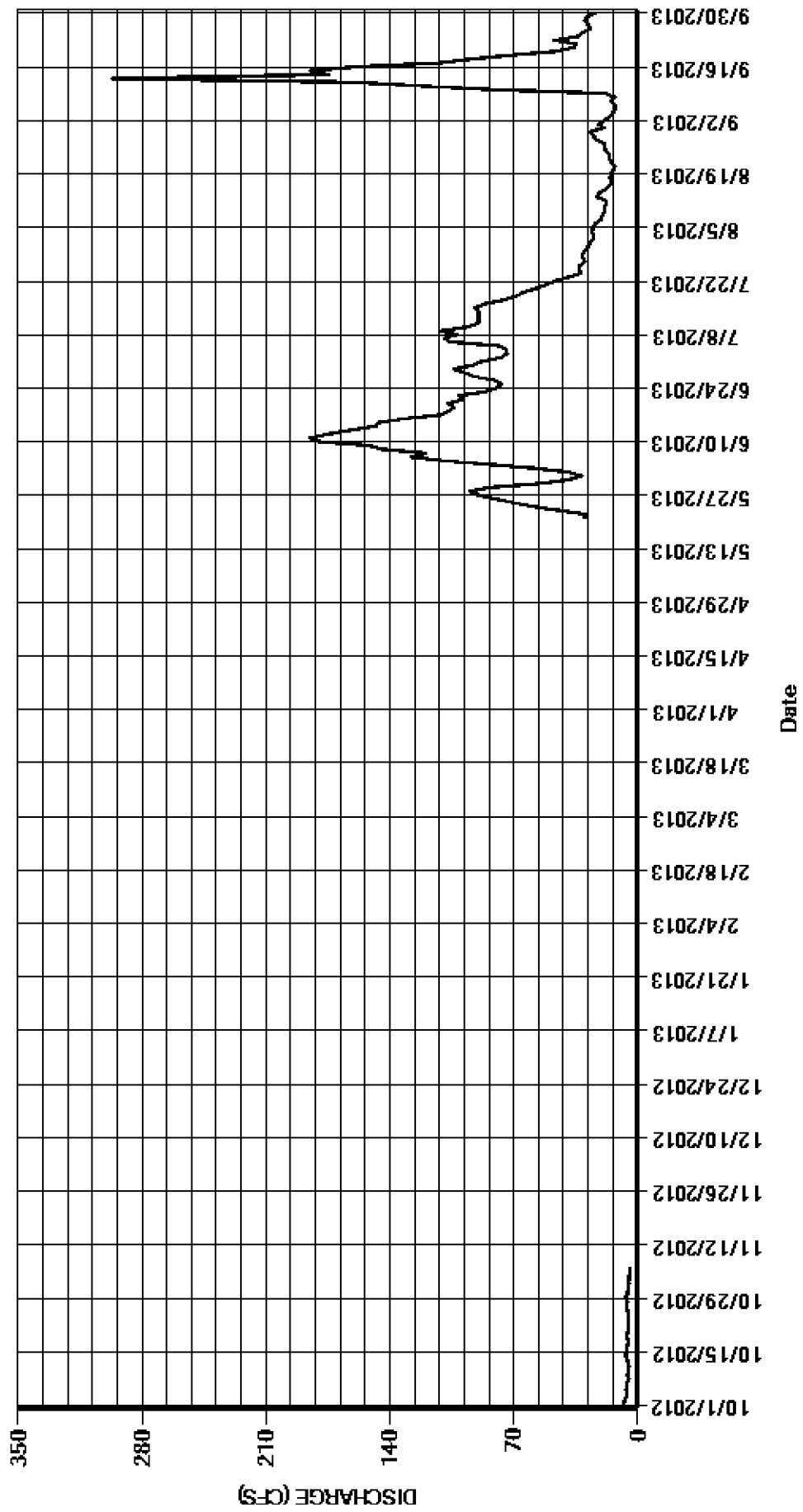
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.2	5.5	---	---	---	---	---	---	32	88	27	22
2	7.6	e5.1	---	---	---	---	---	---	39	77	25	19
3	6.7	e5.0	---	---	---	---	---	---	59	74	25	16
4	6.2	e4.8	---	---	---	---	---	---	84	74	26	14
5	6.6	e4.6	---	---	---	---	---	---	110	79	25	13
6	6.5	e4.5	---	---	---	---	---	---	128	106	24	13
7	e6.0	---	---	---	---	---	---	---	120	109	21	15
8	e5.0	---	---	---	---	---	---	---	144	102	20	13
9	5.9	---	---	---	---	---	---	---	152	111	19	18
10	5.3	---	---	---	---	---	---	---	180	97	19	82
11	5.1	---	---	---	---	---	---	---	185	90	18	122
12	5.2	---	---	---	---	---	---	---	174	90	18	159
13	6.2	---	---	---	---	---	---	---	162	90	23	297
14	7.0	---	---	---	---	---	---	---	148	90	22	175
15	6.3	---	---	---	---	---	---	---	146	92	18	185
16	6.4	---	---	---	---	---	---	---	132	86	16	159
17	e5.5	---	---	---	---	---	---	---	112	76	15	112
18	e5.5	---	---	---	---	---	---	---	107	69	16	94
19	6.4	---	---	---	---	---	---	---	104	65	15	72
20	5.7	---	---	---	---	---	---	---	107	58	14	47
21	5.4	---	---	---	---	---	---	e30	99	52	13	36
22	5.5	---	---	---	---	---	---	e30	101	47	15	35
23	5.2	---	---	---	---	---	---	e45	86	39	16	47
24	5.3	---	---	---	---	---	---	e60	80	32	16	34
25	e5.5	---	---	---	---	---	---	e70	77	33	18	31
26	e6.0	---	---	---	---	---	---	e80	81	33	19	27
27	e6.0	---	---	---	---	---	---	e90	92	30	19	28
28	e6.0	---	---	---	---	---	---	e95	98	31	24	30
29	7.2	---	---	---	---	---	---	84	104	31	25	29
30	6.1	---	---	---	---	---	---	56	93	30	27	24
31	5.7	---	---	---	---	---	---	39	---	28	19	---
TOTAL	187.2	29.5	---	---	---	---	---	679	3336	2109	617	1968
MEAN	6.04	4.92	---	---	---	---	---	61.7	111	68.0	19.9	65.6
AC-FT	371	59	---	---	---	---	---	1350	6620	4180	1220	3900
MAX	8.2	5.5	---	---	---	---	---	95	185	111	27	297
MIN	5.0	4.5	---	---	---	---	---	30	32	28	13	13

CAL YR	2012	TOTAL	5623.1	MEAN	29.4	MAX	163	MIN	4.5	AC-FT	11150 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	8925.7	MEAN	52.5	MAX	297	MIN	4.5	AC-FT	17700 (PARTIAL YEAR RECORD)

MAX DISCH: 656 CFS AT 02:45 ON SEP 13, 2013 GH 3.30 FT SHIFT 0.16 FT  
 MAX GH: 3.30 FT AT 02:45 ON SEP 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06722500 SOUTH SAINT VRAIN NEAR WARD  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
LEFT HAND DIVERSION NEAR WARD

Water Year 2013

Location.--	Lat. 40°05'29", Long. 105°30'31" (NAD83) , In Boulder County, CO. The gage is located ½ mile downstream from gage on S. St. Vrain Creek off Highway 72.
Drainage Area and Period of Record.--	14.4 sq mi. ; May 21, 1992 to present.
Equipment.--	Sutron 56-0540-400-DTR digital incremental shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) and a Steven's Type A graphic water-stage recorder in a 36-inch corrugated metal pipe shelter ovetop a 42-inch concrete stilling well. The well is connected to the channel with two two-inch polyvinyl conduit (PVC) inlets, equipped with ball valves, street keys and flushing risers. The primary reference is a metal drop tape and adjustable reference point (RP) located on the equipment shelf of the shelter. An adjustable RP was also mounted to the outside of the shelter this year, also to be used with the drop tape. A PVC baffle has been added to the inlets to help combat the drawdown issue.
Hydrologic Conditions.--	Semi-regulated diversion point. Gage measures water diverted from the South Saint Vrain Creek into James Creek and thence to Lefthand Creek in the Boulder Creek watershed. Diversions usually encompass the entire flow of the South Saint Vrain Creek at this point. The drainage area listed for the upstream gage, South Saint Vrain Near Ward, CO (SSVWARCO) is approximately 3.5 miles below Brainard Lake and approximately 0.4 miles above the Left Hand Diversion at South Saint Vrain Creek (LEFTHDCO) gage. The LEFTHDCO diversion structure is comprised of a concrete diversion dam, and a 10-foot wide radial gate with trash rack approximately 55-feet upstream from the control. The radial gate is operated in such a way that it is under pressure for a majority of the season creating a somewhat regulated diversion. Due to this operational regime, peaks and troughs encountered by the SSVWARCO gage can be somewhat attenuated at this gage. Some inflow is expected to occur between the SSVWARCO and LEFTHDCO gage during runoff and storm events which accounts for some computational differences. The historic flood event of September 11, 2013 had no affect at the station as most of the high flow continued down the natural channel.
Gage-Height Record.--	The primary record is 15-minute telemetered data with 15-minute logged DCP data and chart record as backup. The record is complete and reliable except for October 7 - 8, 17 and 18, and 25 - 29, 2012 when the stage-discharge relationship was affected by ice and November 6, 2012 and May 21, 2013 which are partial day records corresponding to winterization and startup of the gage. This is a partial year record. No record from November 7, 2012 through May 20, 2013. Instrument calibration was maintained by 16 visits to the gage. Three calibration corrections of -0.02, -0.01, and 0.01 ft. were applied to the record as defined by visits made to the gage.
Datum Corrections.--	Levels were last run on October 24, 2013 using RM2 as base. The base reference was found to be 0.022 ft. high in the 2011 levels run and verified this year with results of 0.023 ft. high. The tape was adjusted to match the verified elevation. Since levels were run in the 2014 Water Year, no adjustment was made to measurements in the 2013 Water Year. The discrepancy in datum is absorbed in the shifts and will be applied to measurements in the 2014 Water Year. The Point of zero flow (PZF) was last verified on September 24, 2005 and determined to occur at a gage-height of 0.86 feet.
Rating.--	The control is a broad crested concrete dam approximately 10 feet below the gage shelter. Rating No. 3 in use since October 2005 was continued this year. It was extended in 2010 to include Measurement 143, the highest measurement recorded at this gage. Flows above approximately 95 cfs cannot be measured at the gage, therefore high water measurements must be made upstream at SSVWARCO and applied to LEFTHDCO. Fourteen discharge measurements (Nos. 182-195) were made this year ranging in discharge from 4.49 to 138 cfs. They cover the range experienced for this water year well. Measurement Nos. 186 thru 189 and 193 and 194 were all made at SSVWARCO due to high flow and lightning. Typically all natural flow from SSVWARCO is diverted through LEFTHDCO. Only the highest flows will top the diversion structure and continue down the natural channel of South Saint Vrain Creek. Measurement Nos. 187 and 194 applied from SSVWARCO were made when a portion of flow was flowing down the natural channel. Supplemental measurements were made on the natural channel and applied to both measurements. The peak flow of 250 cfs occurred at 00:45 on September 12, 2013 at a gage height of 2.42 ft with a shift of +0.06 ft., exceeding this year's high flow measurement (No. 194), made September 16, 2013, by 0.30 ft in stage.
Discharge.--	Shifting control method was used for all periods of open water. Moss and debris accumulation is generally not an issue at this gage; however, larger debris such as tree limbs can catch on the control. Larger cobble can also come to rest near the crest and erroneously raise the GH. Velocities are high past the gage and inlet drawdown has been speculated as a source of GH irregularity and consequent shifts. SSVWARCO and LEFTHDCO are in such close proximity to each other that discharges should be quite consistent. Shifts were applied by time as defined by measurements with consideration given to change in stage from October 1 to November 6, 2012; May 21 to July 17 and September 9 to September 30, 2013. Shifts were applied based on a stage/shift relationship for the period from July 17 to September 9, 2013 using Variable Shift Curve LEFTHDCOVSC13-A. Measurements made this year showed unadjusted shifts varying from 0.00 to 0.20 ft. All measurements were given full weight except for Nos. 189 and 192 which were adjusted up to ±4.00% to smooth shift distributions.
Special Computations.--	Discharge for periods of ice effect and partial day record were estimated from adjacent record, temperature trends and the upstream gage (SSVWARCO). A comparison spreadsheet has been prepared and is included in the record to confirm the flow relationships between the upstream and downstream gages. This is a partial year record. No record and discharge is available from November 7, 2012 through May 20, 2013. Diversion from the South Saint Vrain continues through the winter.
Remarks.--	The record is good, except for periods of ice effect and partial day record which are estimated and poor. Station maintained and record developed by Patrick Tyler.
Recommendations.--	

Work at the gage during the 2013 WY should be verified with many measurements in all range of flow. Hopefully the outside gage and inlet baffles will dampen the drawdown affects at high flows. Once a variety of measurements can be made, a new rating should be developed for the gage. High flow measurements are difficult and dangerous to perform at this gage as well as the SSVWARCO gage and are often poor. Due to the remoteness of these gages, other locations for performing high water measurements are not possible. If a bank operated cableway were installed at the SSVWARCO gage, some resolution of these issues may occur. That said, another measurement in the 200-300 cfs range would be very helpful in building a new rating. Such a measurement would need to incorporate observations about gate operation and GH reliability. Levels should be shot again in the 2014 WY upon opening of the station in the Spring.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

LEFT HAND DIVERSION NEAR WARD

RATING TABLE-- LEFTHDCO03 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

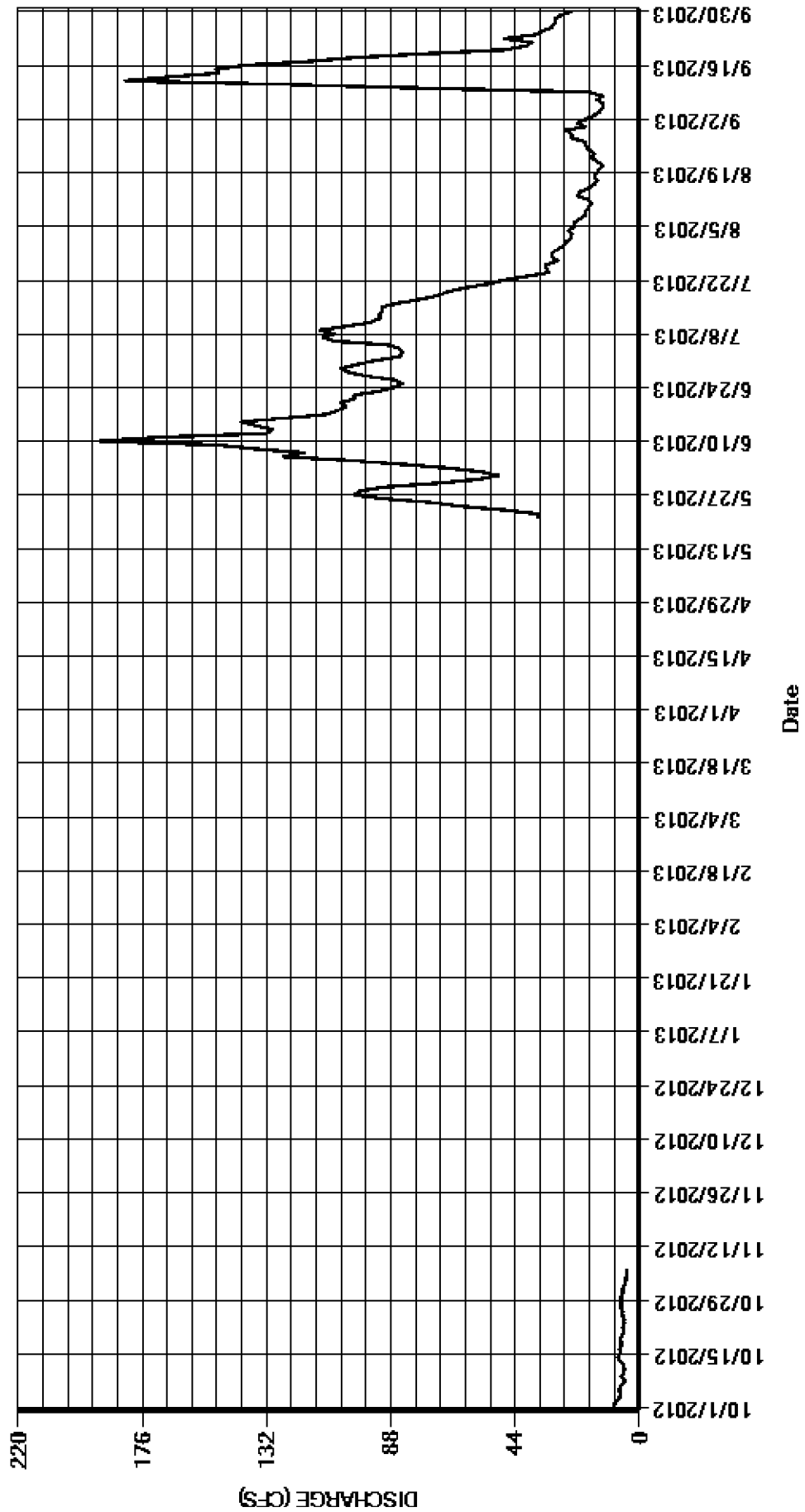
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.1	5.9	---	---	---	---	---	---	50	94	26	22
2	8.8	5.2	---	---	---	---	---	---	56	85	24	19
3	7.6	4.9	---	---	---	---	---	---	69	84	24	16
4	6.7	4.7	---	---	---	---	---	---	85	85	25	14
5	7.0	4.5	---	---	---	---	---	---	103	88	23	13
6	7.0	e4.5	---	---	---	---	---	---	126	108	23	13
7	e6.0	---	---	---	---	---	---	---	119	112	21	15
8	e5.0	---	---	---	---	---	---	---	136	108	19	13
9	6.5	---	---	---	---	---	---	---	149	113	19	18
10	5.7	---	---	---	---	---	---	---	191	104	18	77
11	5.4	---	---	---	---	---	---	---	170	95	17	123
12	5.5	---	---	---	---	---	---	---	132	92	18	182
13	6.7	---	---	---	---	---	---	---	130	92	22	167
14	7.6	---	---	---	---	---	---	---	136	91	21	149
15	6.8	---	---	---	---	---	---	---	141	91	18	150
16	7.0	---	---	---	---	---	---	---	126	85	16	140
17	e6.5	---	---	---	---	---	---	---	111	77	15	117
18	e6.5	---	---	---	---	---	---	---	107	71	16	101
19	6.8	---	---	---	---	---	---	---	104	68	15	76
20	6.0	---	---	---	---	---	---	---	106	62	14	48
21	5.7	---	---	---	---	---	---	e36	101	54	13	40
22	5.8	---	---	---	---	---	---	36	101	48	15	38
23	5.5	---	---	---	---	---	---	48	92	40	17	48
24	5.5	---	---	---	---	---	---	64	87	32	16	37
25	e6.0	---	---	---	---	---	---	74	84	33	18	34
26	e6.0	---	---	---	---	---	---	90	87	33	19	31
27	e6.5	---	---	---	---	---	---	101	97	29	19	30
28	e6.5	---	---	---	---	---	---	99	103	31	24	30
29	e6.5	---	---	---	---	---	---	91	106	31	24	28
30	6.5	---	---	---	---	---	---	72	100	29	26	24
31	6.0	---	---	---	---	---	---	57	---	27	19	---
TOTAL	200.7	29.7	---	---	---	---	---	768	3305	2192	604	1813
MEAN	6.47	4.95	---	---	---	---	---	69.8	110	70.7	19.5	60.4
AC-FT	398	59	---	---	---	---	---	1520	6560	4350	1200	3600
MAX	9.1	5.9	---	---	---	---	---	101	191	113	26	182
MIN	5.0	4.5	---	---	---	---	---	36	50	27	13	13

CAL YR	2012	TOTAL	5645.4	MEAN	29.6	MAX	202	MIN	4.5	AC-FT	11200 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	8912.4	MEAN	52.4	MAX	191	MIN	4.5	AC-FT	17680 (PARTIAL YEAR RECORD)

MAX DISCH: 250 CFS AT 00:45 ON SEP 12, 2013 GH 2.42 FT SHIFT 0.06 FT  
 MAX GH: 2.42 FT AT 00:45 ON SEP 12, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**LEFT HAND DIVERSION NEAR WARD  
WY2013 HYDROGRAPH**



PLATTE RIVER BASIN  
06724000 SAINT VRAIN CREEK AT LYONS, CO

Water Year 2013

Location.--	Lat. 40°13'13.27"; Long. 105°15'45.36" (NAD83), in Boulder County, CO, Hydrologic Unit 10190005. Gage is on the left bank 75 ft southwest of U.S. Highway 36 adjacent to State Highway 66 at southeast edge of Lyons, 400 ft upstream from St. Vrain Supply Canal, and 0.4 mi downstream from confluence of North and South St. Vrain Creeks. After the destruction of the September 2013 flood, gage was relocated 350 ft. upstream to the pedestrian bridge.
Drainage Area and Period of Record.--	216 mi <sup>2</sup> (USGS Colorado StreamStats utility).; Daily values are available from 1887 to Present. On March 23, 2003, the gage was moved approximately 0.2 mi upstream. In the new location, the gage is above the Supply Ditch diversion, whereas the old location was below this diversion. September 26, 2013, gage was moved 350 ft. upstream due to flood destruction.
Equipment.--	Sutron Stage Discharge Recorder (SDR-001), temperature sensor and a tipping bucket rain gage connected to a Sutron SatLink2 Data Collection Platform (DCP) in a 6-foot by 6-foot exposed aggregate precast concrete building overtop a 42 -inch precast concrete stilling well upstream of a low head concrete diversion dam. An Electric Tape Gage (ETG) located on the instrument shelf is the primary reference with a supplementary cantilever chain gage located 10 feet downstream of the shelter. The stilling well is connected to the channel via four 2-inch inlets, three of which are equipped with valves and flushing equipment. A bank operated cableway is located 15 ft downstream from the shelter. A secondary shaft encoder is installed on the instrument shelf of the shelter. This shaft encoder is used for the Highland Ditch Company's Supervisory Control and Data Acquisition (SCADA) system. This instrument is maintained by the Colorado Division of Water Resources (CDWR) and operated such that the instruments stage reading is set to the base gage stage plus or minus the last measured shift.  A historic flood on September 12, 2013 destroyed every part of the station, channel and much of the Town of Lyons. On September 26, 2013 a new gage was constructed upstream 350 ft. of the old location at the pedestrian bridge. A Wire Weight Gage and a Campbell Scientific CS476 Radar Unit are mounted on the pedestrian bridge. A Sutron SatLink2 Data Collection Platform (DCP) is mounted inside a Nema-4 Enclosure on the North side of the bridge.
Hydrologic Conditions.--	Drainage area mainly comprised of forested and grassy areas with varying topography. Gage is located below the confluence of the south and north forks of the Saint Vrain and below most of Lyons Colorado. Beaver Creek and Button Rock Reservoirs are upstream of this gage as well as numerous other diversions of varying magnitude. This station is susceptible to rapid increases in stage due to storm runoff events from hardened surfaces within the Town of Lyons, CO.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP and SDR data as backup. After September 12, 2013, The SDR unit backup is no longer available as it was destroyed in the flood. Instrument calibration was maintained by twenty-eight visits to the gage this year. Three instrument corrections were made this year and applied to the record as defined by visits to the gage. Accumulation of debris on the diversion dam was a common problem this year and is responsible for three corrections ranging from -0.03 to -0.04 ft. Debris removal corrections were applied to the record as shift corrections. Twice this water year, sand bags and rock were placed on the control in order for the low flows to have enough head to continue down the diversion ditch. Specific shifts were used to account for the raise in GH for both periods December 17, 2012 to winter shutdown and April 3 to April 16, 2013. The record is complete and reliable except for: December 9, 10, and 19 through January 7, 2013 when the gage was shutdown for winter operation because the stage-discharge relation was affected by ice; January 7 through March 6, 2013 when the gage was winterized. Values are not available for the period between the September 12 flood and September 25, 2013 due to destruction by the flood. Partial day values are available for September 11 and 26, 2013 and have been estimated.
Datum Corrections.--	Levels were last run to the inside gage on September 9, 2010 using R.M. No. 2 as base. The ETG elevation was found to be within the allowable limits.  All reference marks have been destroyed with the exception of RM No. 1 which may have been damaged in the September 2013 flood. An arbitrary GH has been set at the new location 350 ft. upstream. Levels have not yet been shot at the new sight.
Rating.--	The flood of September 12, 2013 destroyed the gage, control, and channel. However, for Water Year 2013, October 1, 2012 to September 12, 2013, the control for low to mid level stages was a low-head concrete diversion dam for the Supply Ditch approximately 570 feet below the gage. At higher stages the gage reverted to channel control; which, had not been fully defined since the gage relocation in 2003. The diversion dam and ditch check structure approximately 1000 feet below the gage can gather debris and cause backwater conditions at the gage under certain operational circumstances. Rating No. 26 in use since October 1, 2009 is defined by measurements from 13.6 to 1230 cfs. was used up to the time of flood. On September 26, 2013 a temporary replacement station was constructed approximately 350 ft. upstream from the previous location. The control for the new gage is a grouted boulder control. Rating No. 27 was created for use with the new gage and was applied from September 26 through 30, 2013. Twenty-six discharge measurements (Nos. 634-659) were made this year ranging in discharge from 10.5 to 584 cfs covering the range in stage experienced this year well except for the high flows of the flood experienced September 11 and 12, 2013 prior to the destruction of the gage. The peak GH and Discharge were not determined for Water Year 2013 as the peaks would have been at the time of gage destruction. This year's high flow measurement was 584 cfs made on June 11, 2013 at a stage of 2.85.
Discharge.--	Shifting control method was use for all periods of open water both before and after the flood. Shifts are caused by the fill and scour of the gage pool as well as debris accumulation on the low water control. Shifts were applied by time with consideration given to change in stage as defined by measurements and cleanings of the control structure. Open water measurements showed shifts varying between -0.13 ft and 0.01 ft. All were given full weight except for Nos. 637 and 642 which were discounted up to ± 5.41% to smooth distributions.
Special Computations.--	



Discharge for ice affected periods as well as the winter period was estimated from adjacent record and discharge measurements made through the period with consideration given to logged temperature trends. Several gage-height values recorded during the course of clearing debris from the control were adjusted to smooth computed discharges during affected periods.

Remarks.-- The record is good except for: periods of ice affect, winter record, and September 11 and 26, 2013(flood related) which are estimated and poor. Station maintained and record developed by Patrick Tyler.

Recommendations.-- Construction of the new gage will require full definition of the new rating. Every attempt should be made to get good measurements and varying gage heights. A series of levels should be run in the 2014 Water Year.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06724000 SAINT VRAIN CREEK AT LYONS, CO

RATING TABLE-- SVCLYOCO26 USED FROM 01-OCT-2012 TO 12-SEP-2013  
 SVCLYOCO27 USED FROM 13-SEP-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	34	20	18	e16	e16	e19	33	211	268	273	92	69
2	31	18	18	e17	e16	e20	33	197	242	267	84	71
3	25	16	20	e18	e16	e20	30	189	226	249	87	59
4	31	15	18	e20	e16	e19	30	207	244	237	87	53
5	38	13	17	e20	e16	e19	26	192	290	231	72	58
6	43	13	17	e22	e16	e21	28	164	317	293	70	60
7	39	13	18	e24	e16	20	25	188	349	326	64	59
8	37	14	17	e22	e16	19	24	253	477	286	58	59
9	35	16	e13	e22	e16	20	28	329	551	253	58	62
10	31	17	e12	e20	e16	e20	21	331	589	223	61	120
11	32	15	13	e20	e16	20	26	293	617	200	55	e450
12	31	14	13	e16	e17	20	26	299	618	199	54	---
13	36	11	17	e16	e17	20	24	332	561	200	65	---
14	37	13	20	e16	e16	21	25	324	509	206	71	---
15	36	16	19	e16	e17	22	27	315	485	246	58	---
16	29	13	18	e18	e19	23	26	355	458	205	50	---
17	30	15	17	e18	e20	22	33	421	437	183	46	---
18	28	15	18	e18	e19	20	32	432	401	171	42	---
19	24	13	e17	e18	e19	20	35	369	380	179	39	---
20	28	11	e17	e18	e19	19	42	281	371	165	39	---
21	26	9.6	e18	e18	e19	22	47	240	347	149	39	---
22	24	14	e18	e18	e19	e22	57	217	322	119	36	---
23	23	11	e18	e18	e19	e22	53	230	293	106	40	---
24	23	12	e17	e18	e19	e22	56	303	285	103	45	---
25	27	12	e16	e16	e19	e24	62	306	268	113	40	---
26	23	11	e15	e16	e19	e26	78	329	274	124	42	e350
27	19	7.7	e15	e16	e19	30	106	388	284	104	54	348
28	22	11	e15	e16	e19	31	128	413	299	101	67	327
29	21	10	e15	e15	---	31	140	406	319	107	62	296
30	23	15	e15	e15	---	32	156	371	299	108	59	278
31	22	---	e15	e15	---	32	---	303	---	103	56	---
TOTAL	908	404.3	514	556	491	698	1457	9188	11380	5829	1792	2719
MEAN	29.3	13.5	16.6	17.9	17.5	22.5	48.6	296	379	188	57.8	170
AC-FT	1800	802	1020	1100	974	1380	2890	18220	22570	11560	3550	5390
MAX	43	20	20	24	20	32	156	432	618	326	92	450
MIN	19	7.7	12	15	16	19	21	164	226	101	36	53

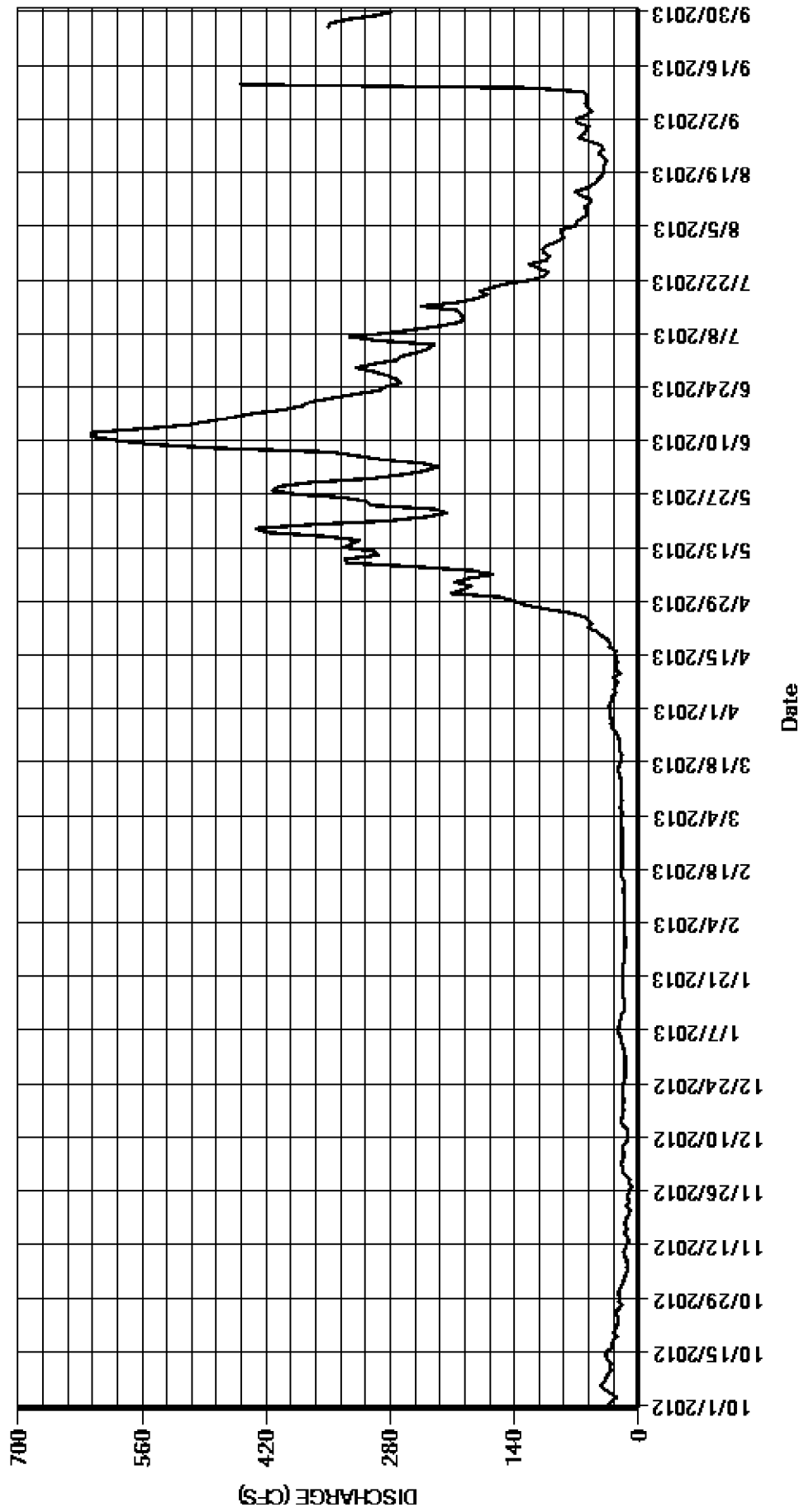
CAL YR	2012	TOTAL	21196.3	MEAN	57.9	MAX	303	MIN	7.7	AC-FT	42040
WTR YR	2013	TOTAL	35936.3	MEAN	102	MAX	618	MIN	7.7	AC-FT	71280 (PARTIAL YEAR RECORD)

MAX DISCH: (Peak flow not determined for Water Year 2013)

MAX GH: (Peak GH not determined for Water Year 2013)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06724000 SAINT VRAIN CREEK AT LYONS, CO  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06727000 BOULDER CREEK NEAR ORODELL  
Water Year 2013

Location.-- Lat. N.40°0'23.5"; Long. W.105°19'49.8" (NAD83) Boulder County, CO, Hydrologic Unit 10190005. Gage is on the left bank of Boulder Creek 0.3 miles downstream from the City of Boulder's Boulder Canyon Hydroelectric Facility and 1.1 miles upstream from Fourmile Creek, or 8.5 miles east of Barker Reservoir and 2.6 miles west of the Boulder Public Library which is adjacent to the Boulder Creek at Boulder, CO (BOCOBOCO) stream gage.

Drainage Area and Period of Record.-- 102 mi<sup>2</sup> (USGS Colorado StreamStats utility). ; Daily values are available from October 1, 1906 to November 30, 1915 and March 1, 1916 to present.

Equipment.-- Sutron SDR-0001-1 and a temperature sensor connected to a Sutron SatLink2 Data Collection Platform (DCP) in a 6-ft by 6-ft. precast concrete shelter sitting ovetop a 54-inch corrugated metal pipe stilling well. A Digital incremental Sutron 56-0540-400-DTR shaft encoder was removed June 11, 2013. The well is connected to the stream via three 2-inch intakes equipped with flushing provisions. An electric tape gage on the instrument shelf is the primary reference. The gage has AC power to keep the well and intakes open in winter months. OneRain Inc. operates and maintains a pressure transducer connected to an early warning radio under contract with the City of Boulder.

Hydrologic Conditions.-- Flows are regulated by operations of Barker Reservoir and diversions from Barker Reservoir. Water diverted for power generation at the Boulder Canyon Hydroelectric Facility is returned a few hundred feet above the gage. Hydroelectric operations can cause rapid changes in gage-height. Power generation activities in winter months help keep the channel at the gage open.

Gage-Height Record.-- The primary record is 15-minute satellite data with SDR and DCP log as backup. The record is complete and reliable, except for: November 11-16, 27; December 10 - 18, 2012; April 9 - 11, 17 - 19, 24, 2013 which were ice affected and are considered estimated and poor and the period of winter shut-down which is December 19, 2012 through April 2, 2013. Instrument calibration was supported by 22 visits to the gage this year. Two equipment corrections were required this year. The first, November 11, 2012 when the SDR was corrected -0.01, was removed due to gage visits after and preceding this correction that show it fluctuating within 0.005 of the primary reference gage. Since the SDR and not the shaft encoder was used as the primary data for this record the correction was removed to better match readings made with the electric tape index. The second instrument correction of +0.01 was made May 15, 2013.

Datum Corrections.-- Levels were last run on August 17, 2011 using RM5 as base. The base reference was within allowable tolerances.

Rating.-- The control for low to mid level flows is a cobble and boulder riffle approximately 60 ft. below the gage. Channel control at higher stages. Rating BOCOROCO14, in use since October 1, 2004, is defined by measurement up to 757 cfs was continued all year. Thirteen discharge measurements (542 - 554) were made this year ranging in discharge from 8.90 to 478 cfs covering the range in stage experienced this year well except for the higher daily flows of September 12- 13, 2012. The peak flow of 1540 cfs occurred at 23:30 September 12, 2013 at a gage-height of 4.06 ft. with a shift of -0.16 ft. This peak is considered estimated and poor due to lack of confirming measurements at this stage. The peak exceeded high flow Measurement No. 553 made September 17, 2013 by 1,062 cfs and 0.74 ft. of stage.

Discharge.-- Shifting control method was used all year. Shifts are caused by fill and scour of materials through the gage pool and movement of the control at higher flows. Shifts were distributed by time as defined by measurements unless otherwise stated. Three variable shift tables were used this water year. BOCOROCOVSC13-A used from May 3 through June 11, 2013 defined by measurements 546 -549 (553 and 519 for upper end). BOCOROCOVSC13-B used from August 6 to the peak on September 12, 2013 at 23:30 defined by measurements 551 -552 (519 for upper end). BOCOROCOVSC13-C used from peak of September 12 through October 18, 2013 defined by measurements 553 -555 (519 for upper end then extended to capture peak gage height of 4.06 feet). Open water measurements showed shifts varying between -0.17 and -0.02 ft. All were given full weight except for No. 547 which was discounted 4.63% to smooth the shift distribution.

Special Computations.-- Winter record was not developed this year. Stream gage was shutdown December 18 and reopened April 3, 2013.

Remarks.-- The record is good, except for the days, when the average daily flow exceeded 700 cfs which is rated poor as the flows exceeded high flow measurement No. 553 by more than 150% and the control is known to have changed with boulders being washed downstream. Days when ice formed on the control were estimated and should be considered poor. No data was collected during winter shut-down which is December 19, 2012 through April 2, 2013. Station maintained by Division One Hydrographic staff and record developed by Matt Rusch

Recommendations.-- A Bank Operated Cableway was installed in the 2013 Water Year. Every effort should be made to get the highest range of flow measurements for the development of the new rating. Levels need to be run in the 2014 Water Year to monitor stability in the newly established reference marks.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06727000 BOULDER CREEK NEAR ORODELL

RATING TABLE-- BOCOROCO14 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

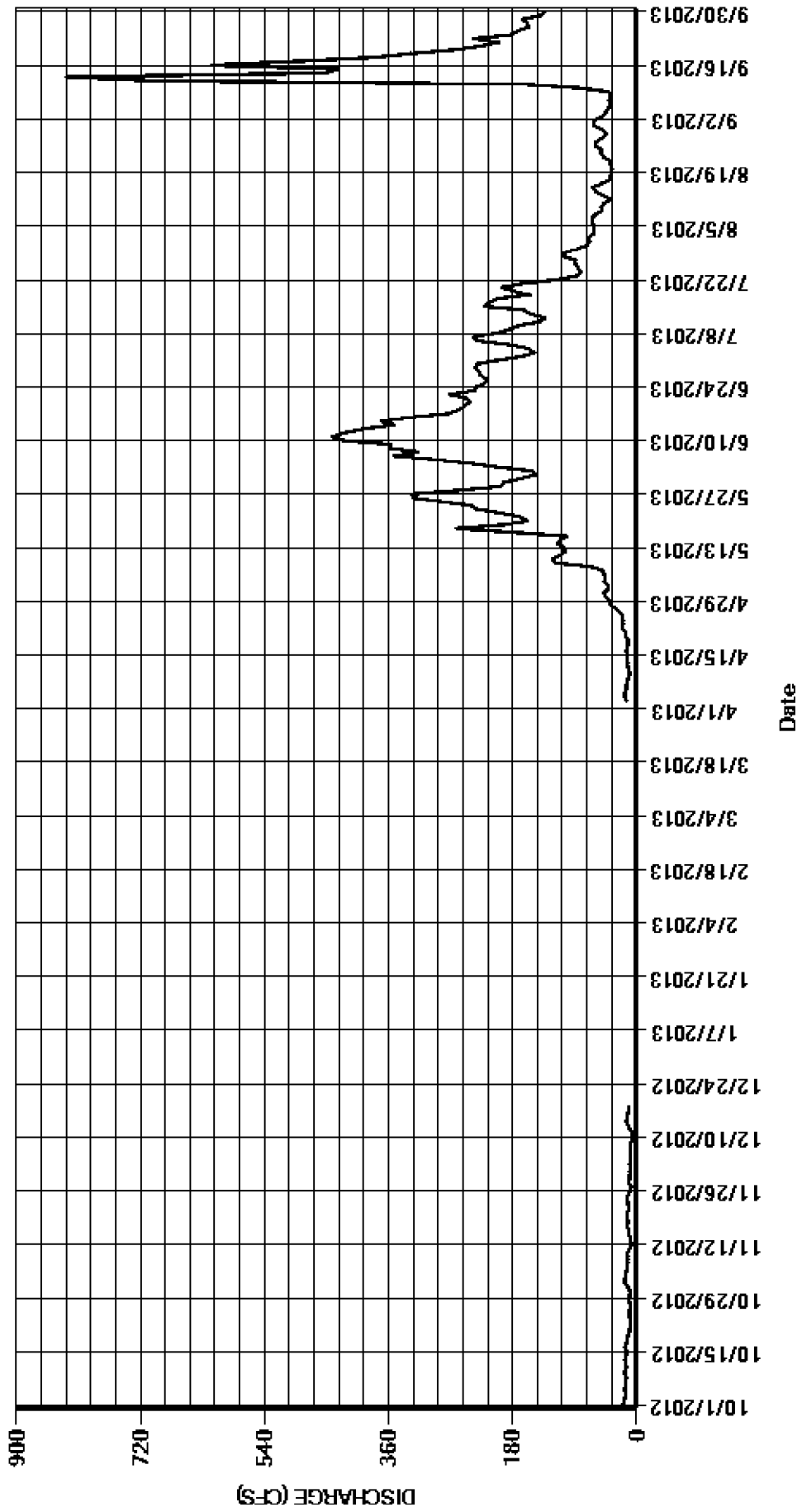
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	20	13	10	---	---	---	---	48	146	201	68	63
2	18	17	10	---	---	---	---	42	152	165	71	58
3	17	17	10	---	---	---	e15	41	203	149	62	48
4	16	16	10	---	---	---	17	47	242	158	62	44
5	18	15	9.8	---	---	---	17	46	294	186	62	40
6	16	14	8.8	---	---	---	15	47	352	231	65	38
7	16	13	8.8	---	---	---	15	49	317	237	65	40
8	15	13	9.1	---	---	---	14	66	359	204	60	38
9	17	13	7.5	---	---	---	e12	118	358	185	50	41
10	17	13	e5.0	---	---	---	e10	122	427	172	52	80
11	15	e10	e7.0	---	---	---	e12	110	442	142	47	158
12	16	e7.0	e10	---	---	---	13	103	422	133	38	703
13	17	e9.0	e12	---	---	---	13	106	397	153	49	827
14	15	e10	e15	---	---	---	14	115	353	163	59	452
15	15	e12	e14	---	---	---	14	111	370	221	64	435
16	17	e12	e13	---	---	---	15	102	332	214	52	617
17	15	14	e12	---	---	---	e14	179	273	203	40	496
18	14	12	e11	---	---	---	e12	261	258	155	38	382
19	13	14	---	---	---	---	e13	192	250	178	37	328
20	11	14	---	---	---	---	16	158	242	196	36	265
21	10	12	---	---	---	---	17	169	247	167	38	225
22	9.0	12	---	---	---	---	21	198	271	116	39	200
23	8.8	13	---	---	---	---	20	232	235	87	48	237
24	10	14	---	---	---	---	e20	241	232	80	52	182
25	11	12	---	---	---	---	20	284	220	85	52	172
26	10	10	---	---	---	---	24	325	218	89	60	156
27	9.4	e8.0	---	---	---	---	30	326	227	89	59	159
28	11	12	---	---	---	---	38	258	229	105	50	166
29	11	11	---	---	---	---	39	198	234	105	45	139
30	10	10	---	---	---	---	44	193	231	86	49	134
31	10	---	---	---	---	---	---	169	---	72	61	---
TOTAL	428.2	372.0	183.0	---	---	---	524	4656	8533	4727	1630	6923
MEAN	13.8	12.4	10.2	---	---	---	18.7	150	284	152	52.6	231
AC-FT	849	738	363	---	---	---	1040	9240	16930	9380	3230	13730
MAX	20	17	15	---	---	---	44	326	442	237	71	827
MIN	8.8	7.0	5.0	---	---	---	10	41	146	72	36	38

CAL YR	2012	TOTAL	12726.2	MEAN	36.1	MAX	288	MIN	5.0	AC-FT	25240 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	27976.2	MEAN	108	MAX	827	MIN	5.0	AC-FT	55490 (PARTIAL YEAR RECORD)

MAX DISCH: 1540 CFS AT 23:30 ON SEP 12, 2013 GH 4.06 FT SHIFT -0.16 FT (Near extent of rating extrapolation)  
 MAX GH: 4.06 FT AT 23:30 ON SEP 12, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06727000 BOULDER CREEK NEAR ORODELL  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
BOULDER CREEK AT BOULDER, CO  
Water Year 2013

Location.-- Lat N.40° 0' 52.63", Long. W.105° 16' 49.9" (WGS84), in Boulder County, CO. Gage is on the right bank in Central Park, 1 block west of the Broadway St. Bridge over Boulder Creek. Gage is located where the center line from 11th St. would cross Boulder Creek.

Drainage Area and Period of Record.-- 135 Sq. Mi. (USGS Colorado StreamStats utility). ; Daily values are available from CDWR from May 2004 to present

Equipment.-- Sutron Constant Flow Bubbler (CFB) unit connected to a Sutron SatLink 2 Data Collector Platform (DCP) transmitting hourly in a 3 ft. by 2.5 ft. by 1 ft. NEMA4 enclosure on the right bank of the channel in downtown Boulder, CO. A staff gage placed on the right side of the channel near the orifice line is the primary and only reference.

Hydrologic Conditions.-- Flows are regulated by storage in Barker Reservoir and by diversions below Barker Reservoir. Several inflows including North Boulder Creek and Four Mile Creek occur to the stream below Barker Reservoir. North Boulder Creek which converges with Middle Boulder Creek above the Boulder Creek at Orodell (BOCOROCO) streamgage and Four Mile Creek converges below BOCOROCO. The channel generally will stay open and free of ice during the winter months. However, during periods of sustained cold, ice may build up on the boulder control approximately 50 ft. downstream of the gage.

Gage-Height Record.-- The primary record is 15-minute telemetered data with 15-minute logged DCP and CFB data as backup. The record is complete and reliable except for: December 20, 24- 27, 2012, January 8, 12- 15, 2013, and February 18- 20, 2013 when the gage-height was affected by ice. January 18 through February 17, 2013 was a period of questionable instrument performance which was estimated and flagged as missing data, as the considerable gage height chatter was not representative of actual stage. March 27 shows an event peak that does not correspond to any other stream gages or precipitation data, assumed to be an ice dam, the daily flow was estimated to be 1 cfs lower and flagged as an "a" day. The bubbler's erratic behavior is attributed to the channel scouring and uncovering the orifice line as well as the deposition of debris. It is suspected that the difference in pressure between when the line was buried in sand vs. just laying on the channel floor was enough to create a bouncing affect in data. Many steps were taken to fix the problems as can be seen by the corrections in the data.

Datum Corrections.-- Levels were last run on December 21, 2012 using RM1 as base. No correction to the base reference was needed and all other reference marks were within tolerances.

Rating.-- Section control through the expected range of flows. The control was a placed boulder cross vein approximately 50 ft. downstream from the gage. A second boulder cross vein grade control structure is located approximately 30 ft. further downstream. The channel is primarily composed of cobble, gravel and sands. Rating BOCOBOCO03, developed on May 24, 2005 was continued again this year. The rating was extended in 2010 and again in 2011 to accommodate higher flow rates seen in those years. However, there is little definition at these higher ranges. Sixteen discharge measurements (Nos. 171-186) were made this year ranging in discharge from 7.32 to 850 cfs. However the 850 cfs measurement was made after the control had been destroyed. Measurements made this year covered the range in stage well except for the higher daily flows of June 10, and September 11, 2012, for which historic measurement 148 was used to help define the upper end of the experienced stage. The peak discharge which would have occurred during the September flood could not be calculated, as the control was destroyed.

Discharge.-- Shifts are caused by the fill and scour of the gage pool and accumulation of debris on the control. The control was composed of large boulders. The gaps between the boulders were susceptible to getting clogged. Cobble and leaf debris is continuously moving through the area causing shifts to fluctuate especially in fall months. Shifts were distributed by time as defined by measurements from September 28, 2012 through May 6, 2013. Stage dependent shifting using variable shift table BOCOBOCOVSC13-A was used from May 6 through June 11, 2013. It is defined by four measurements (Nos. 148, and 179- 181) using historic measurement 148 to define the established break in the rating, and cover the 0.25 feet of stage above the seasonal high measurement No. 181. Measurement No. 181 shows a previously undefined break in the rating and was not discounted as it follows the trend of measurements made near this stage. BOCOBOCOVSC13-B was used from June 11, 2013 through the end of reliable data September 11, 2013. It is define by five measurements (Nos. 148, and 181- 184) again using historic measurement 148 to define the break in rating seen above the stage of the seasonal high measurement. No discharge was calculated for the period after September 11, 2013, as the control was destroyed. Open water measurements made this year showed unadjusted shifts varying between -0.14 and 0.05 ft. All measurements were given full weight.

Special Computations.-- The period from January 18 to February 17, 2013 was a period of questionable instrument performance which was estimated and flagged as missing data, as the considerable gage height chatter was not representative of actual stage. Discharge was estimated using adjacent periods of good record and the trend in gage height data. Ice affected backwater days were estimated using adjacent periods of good record and temperature trends.

Remarks.-- Record is good, except for: The period when the gage experienced significant gage-height chatter which was estimated and should be considered fair. The period when ice on the control caused backwater is estimated and rated poor. September 11, 2013 was flagged as an "a" day because the shift curve could not accurately represent the changes occurring at the gage, and the period beginning September 12 through the end of the water year could not be developed because the control was destroyed. Station maintained by division one hydrographic staff and record developed by Matt Rusch.

Recommendations.--

The control was destroyed September 12, 2013. It will not likely be replaced in Water Year 13.



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER  
 BOULDER CREEK AT BOULDER, CO

RATING TABLE-- BOCOBOCO03 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

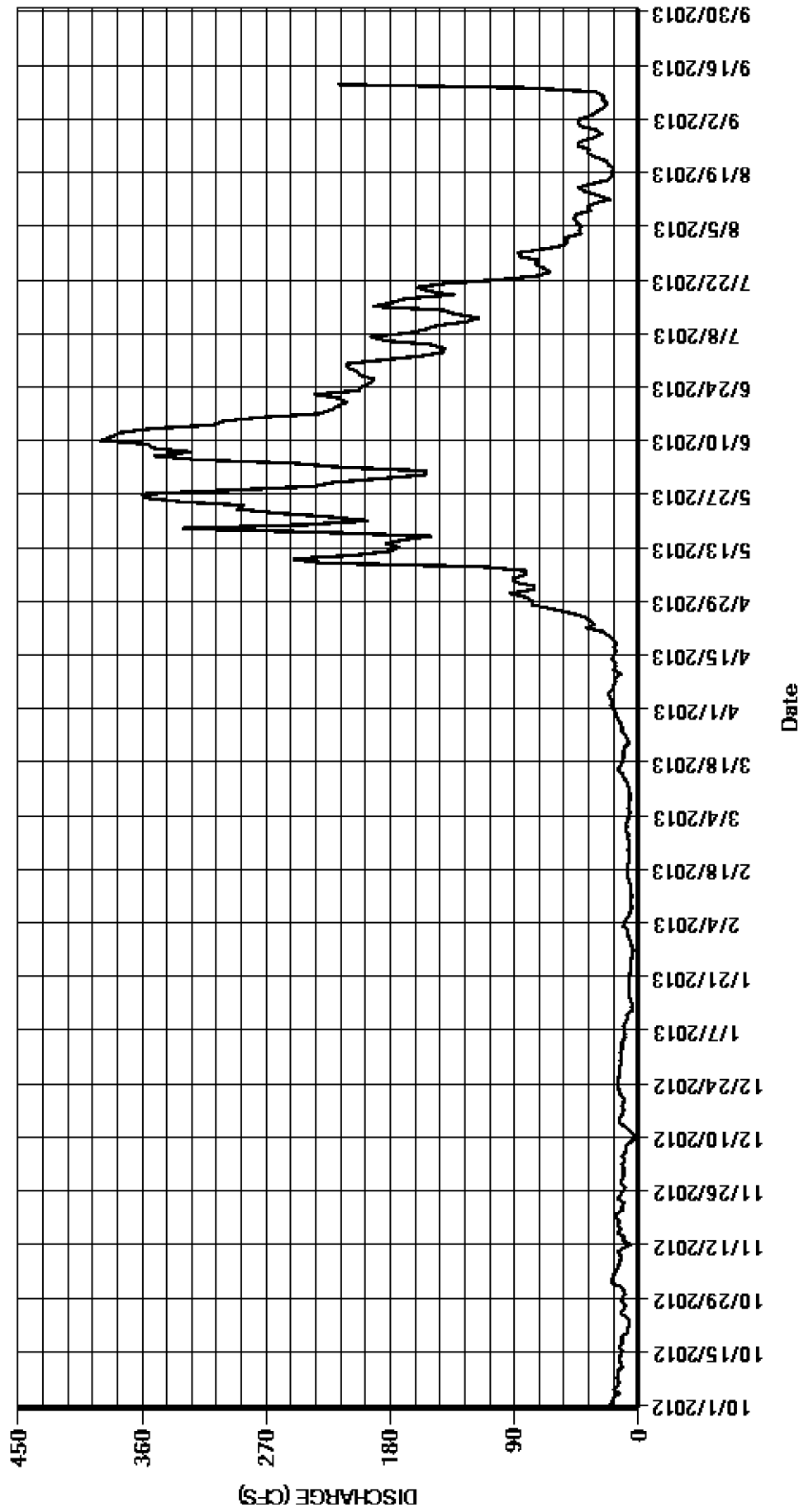
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	21	13	11	13	e8.0	8.6	18	93	155	187	52	44
2	19	20	11	12	e8.0	9.2	20	76	154	159	53	43
3	18	19	12	12	e11	7.5	19	76	218	142	42	34
4	14	18	10	12	e10	7.0	21	90	251	141	43	30
5	18	16	12	10	e9.0	6.3	22	91	321	151	42	25
6	15	15	9.9	10	e7.0	7.3	19	82	351	184	45	23
7	14	14	9.4	10	e6.0	6.9	18	82	325	194	47	26
8	16	13	8.7	e11	e5.0	6.5	17	115	352	169	45	26
9	15	13	4.6	9.6	e6.0	6.3	17	232	356	155	35	31
10	15	15	2.8	8.1	e6.0	6.5	13	250	390	147	37	79
11	12	12	4.6	8.6	e5.0	6.6	18	206	382	125	32	e218
12	13	5.9	7.5	e5.0	e6.0	8.1	17	181	376	116	21	---
13	14	11	11	e5.0	e6.0	8.9	17	174	355	133	29	---
14	13	11	14	e5.0	e6.0	11	19	183	309	142	39	---
15	12	15	14	e6.0	e7.0	12	18	172	301	192	44	---
16	14	13	12	6.9	e8.0	15	16	151	275	179	34	---
17	12	15	11	7.0	e8.0	13	18	229	232	169	22	---
18	12	14	12	e7.0	e8.0	12	16	330	223	134	19	---
19	12	17	11	e7.0	e8.0	11	19	240	218	151	20	---
20	8.0	16	e10	e7.0	e7.0	11	22	197	212	161	18	---
21	8.3	12	13	e7.0	6.9	11	26	224	217	141	22	---
22	6.7	12	14	e6.0	7.0	10	38	263	235	101	23	---
23	6.8	11	15	e6.0	7.4	7.2	32	291	203	73	31	---
24	9.2	15	e15	e6.0	6.8	8.0	35	287	201	64	37	---
25	13	13	e15	e6.0	6.9	9.8	40	333	194	69	36	---
26	11	11	e14	e5.0	7.9	12	50	357	192	75	44	---
27	9.4	9.9	e14	e5.0	7.4	e12	63	360	202	73	43	---
28	12	13	14	e4.0	9.3	13	77	298	204	86	33	---
29	12	12	13	e5.0	---	15	77	236	211	87	27	---
30	10	11	13	e6.0	---	16	82	222	212	69	31	---
31	11	---	13	e7.0	---	17	---	187	---	54	42	---
TOTAL	396.4	405.8	351.5	235.2	204.6	311.7	884	6308	7827	4023	1088	579
MEAN	12.8	13.5	11.3	7.59	7.31	10.1	29.5	203	261	130	35.1	52.6
AC-FT	786	805	697	467	406	618	1750	12510	15520	7980	2160	1150
MAX	21	20	15	13	11	17	82	360	390	194	53	218
MIN	6.7	5.9	2.8	4.0	5.0	6.3	13	76	154	54	18	23

CAL YR	2012	TOTAL	11110.5	MEAN	30.4	MAX	263	MIN	2.8	AC-FT	22040
WTR YR	2013	TOTAL	22614.2	MEAN	65.4	MAX	390	MIN	2.8	AC-FT	44860 (PARTIAL YEAR RECORD)

MAX DISCH: (Not determined. Control destroyed.)  
 MAX GH: (Not determined. Control destroyed.)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**BOULDER CREEK AT BOULDER, CO  
WY2013 HYDROGRAPH**



PLATTE RIVER BASIN  
06729450 SOUTH BOULDER CREEK BELOW GROSS RESERVOIR  
Water Year 2013

Location.-- Lat. N39° 56' 18.12", Long. W105° 20' 52.68" (NAD83). Gage is located on the right side of a 25-ft. Parshall Flume approximately 0.8 mi. downstream of Gross Dam in Boulder County, CO.

Drainage Area and Period of Record.-- 93.2 sqmi (USGS Colorado StreamStats utility) of east slope drainage area. Transmountain water delivered via Moffat Tunnel from tributaries of the Fraser River in the Colorado River Basin are routed through Gross Reservoir and will pass through this structure to terminal storage at other facilities.; Daily values are available from the DWR from October 1, 1967 to present.

Equipment.-- A digital incremental Sutron Stage Discharge Recorder (SDR) connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly and a Stevens A-35 water stage recorder in a rectangular concrete shelter and Ha stilling well at a 25-ft. Parshall Flume. A Digital incremental Sutron 8500 shaft encoder was replaced 1/28/2013. The primary reference is an electric tape gage with a supplemental staff gage located in the flume. A foot bridge crosses the flume above the Ha location and is used for measuring higher flows. Facilities are owned, operated and maintained by Denver Water

Hydrologic Conditions.-- Controlled release from Gross Reservoir, with only partial control when the reservoir's spillway is in use. Water retained and released by Gross Reservoir includes transmountain water conveyed from the Fraser River Basin via the Moffat Tunnel Near Rollinsville, CO (MOFTUNCO) as well as waters native to South Boulder Creek. Water released from Gross Reservoir into South Boulder Creek can be diverted to Denver's treatment facilities about 3 miles downstream at the South Boulder Creek Diversion (BOSDELCO) structure.

Gage-Height Record.-- The primary record is 15-minute telemetered data with 15-minute logged DCP data and chart record as back up. The record is complete and reliable except for January 14, 2013, when the stage-discharge relationship was affected by ice. Instrument calibration was supported by 17 visits made to the gage this year. One instrument correction of +0.01 ft was made on January 28, 2013 and applied to the record as defined by visit made to the gage.

Datum Corrections.-- Levels were last run on November 24, 2011 using the flume's crest as base. The ETG index elevation was found to be within allowable tolerances. R.M. 4 was established on this date.

Rating.-- The control is a 25 ft. Parshall Flume approximately 0.8 mi downstream of the Gross Reservoir outlet facilities. A standard 25 ft. Parshall flume rating (STD25FTPF) was continued in use this year. The flume is generally in good condition. However, the floor has some areas of increased roughness which cause velocity variations and promotes the establishment of algal growth. Shifts at lower stages are generally due to slower velocities through the flume. The stilling pool upstream of the flume is inadequate, and scour and deposition of materials above the flume will affect the flume's performance. A sand bar which had developed in Water Year 2012, just upstream of the flume on the left side of the channel was removed by Denver Water Personnel with no significant change in stage. The sandbar affected velocities at all ranges of stage and significantly changed the velocity profile of the flume after its removal. Sixteen measurements (Nos. 709-724) were made this year ranging in discharge from 6.66 to 570 cfs. The peak flow of 600 cfs occurred at 11:45 on June 12, 2013 at a gage height of 3.17 ft with a 0.00 shift. The peak exceeded high flow Measurement No. 721 made June 13, 2013 by 0.03 ft. of stage and 30 cfs.

Discharge.-- Historically, discharge measurements within ±5% of the rating have been adjusted to the rating. However, the lowest flows consistently produce negative shifts. Due to this stage/discharge relationship a variable shift curve was created (BOCBGRCOVSC13-A) and run from October 2, 2012 to June 13, 2013. For the remainder of the year, shifts are run by time with consideration to stage. From June 13 to August 9, 2013 negative shifting is caused by moss growth on the control. And from September 11 to October 1, 2013, negative shifting is caused by gravel and cobble deposited inside the flume by high flow rain event. Measurements made this year showed shifts varying between -0.07 and +0.02 ft. All measurements were given full weight and applied directly except for measurement nos. 709, 710, 712, 713, 717, 720, 721, 723 and 724 which were discounted up to 5% to smooth shift distribution.

Special Computations.-- One day of ice affected period was estimated from adjacent periods of good record. This record is directly used to estimate winter flows at the South Boulder Creek At Eldorado Springs (BOCESLCO) gage.

Remarks.-- The record is good, except for one ice affected day which is estimated and fair, periods when the average daily flow fell below 12 cfs which are considered fair, and the period following the September high flow rain event which washed cobble into the flume and affected velocities from 9/11/13 into Water Year 2014, which is rated fair. Station maintained and record developed by Matt Rusch.

Recommendations.-- Better documentation of Denver Water staff's daily visits, stream improvements, and flume cleanings should be requested. Levels need to be run again in the 2014 Water Year to confirm establishment of R.M. 4.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06729450 SOUTH BOULDER CREEK BELOW GROSS RESERVOIR

RATING TABLE-- STD25FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

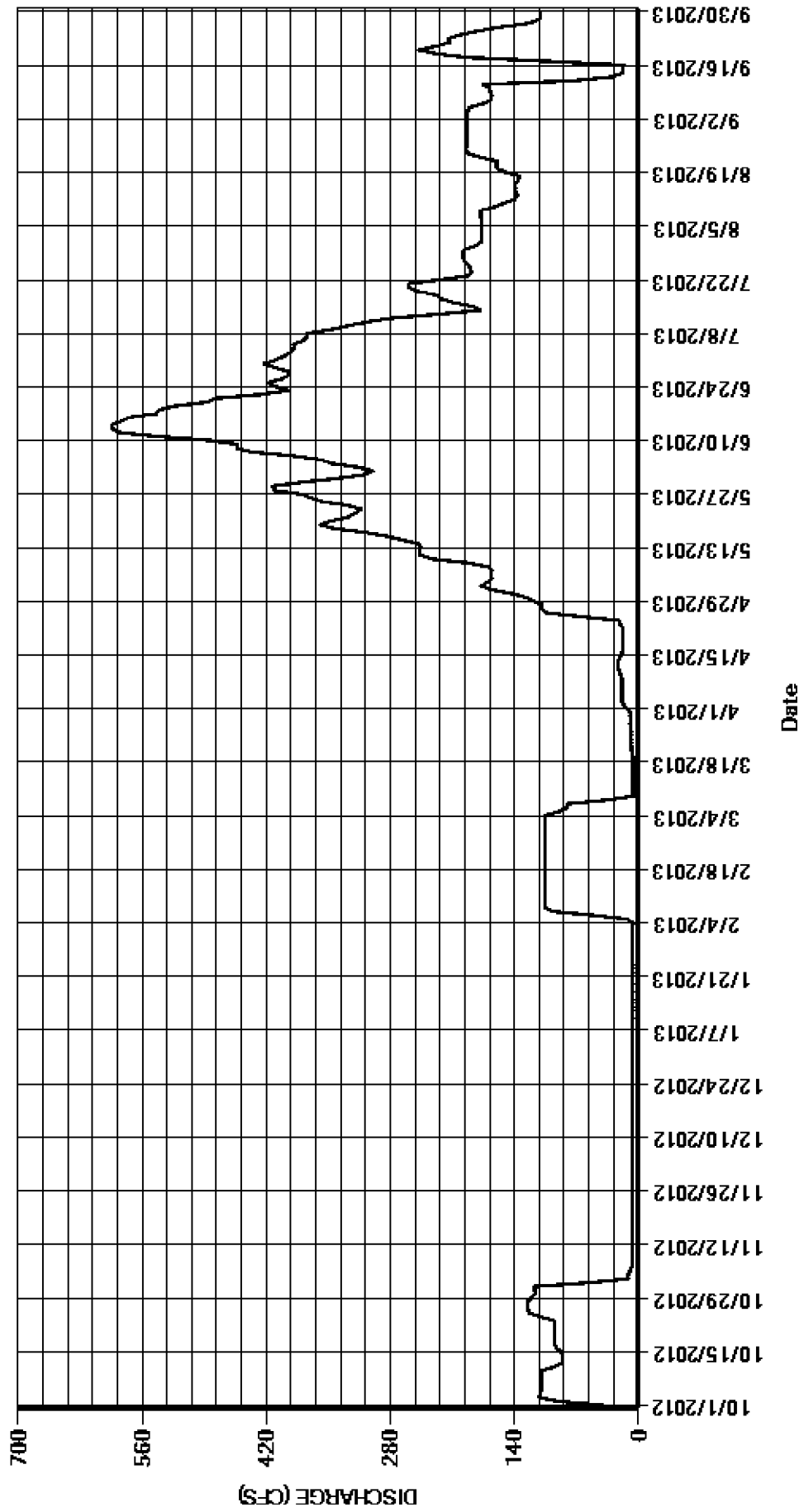
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	41	118	7.2	7.2	7.0	106	13	144	310	410	177	193
2	91	57	7.5	7.2	7.1	106	17	167	300	400	177	193
3	112	12	7.4	7.2	7.1	106	19	178	318	393	177	193
4	111	12	7.2	7.2	6.0	106	19	171	347	389	177	193
5	110	9.8	7.2	7.2	14	90	19	166	359	389	177	191
6	110	7.9	7.2	7.2	52	81	19	166	390	379	177	175
7	110	7.2	7.2	7.4	97	81	19	166	437	374	178	166
8	110	7.2	7.6	6.9	106	37	19	170	453	374	178	166
9	110	7.2	7.3	6.6	106	6.1	19	194	453	347	179	167
10	110	7.2	7.2	6.6	106	6.1	21	232	484	328	163	168
11	95	7.2	7.2	6.6	106	6.1	22	247	541	306	152	176
12	86	7.2	7.2	6.6	106	6.1	23	247	585	278	140	74
13	86	7.2	7.2	6.6	106	6.1	23	246	594	223	136	30
14	86	7.2	7.2	6.5	106	6.1	22	248	595	179	139	18
15	88	7.2	7.2	6.6	106	6.1	20	266	584	187	139	18
16	93	7.2	7.2	6.6	106	6.1	18	284	576	210	139	17
17	95	7.2	7.2	6.6	106	6.1	18	308	544	224	136	100
18	95	7.2	7.2	6.6	106	6.1	18	345	541	229	134	193
19	95	7.2	7.2	6.6	106	6.1	18	359	523	250	150	230
20	95	7.2	7.2	6.6	106	7.2	18	346	488	260	160	248
21	95	7.2	7.2	6.6	106	7.9	18	327	476	259	160	227
22	95	7.4	7.2	6.6	106	8.2	18	320	427	224	160	213
23	95	7.5	7.2	6.6	106	8.4	21	313	395	193	179	215
24	110	7.2	7.2	6.6	106	8.4	22	328	409	189	193	201
25	123	7.3	7.2	6.6	106	8.4	65	358	419	190	195	181
26	125	7.8	7.2	6.9	106	8.4	105	369	403	193	194	155
27	125	7.6	7.2	7.2	106	9.2	109	381	395	197	194	123
28	125	7.4	7.2	7.2	106	9.6	109	411	395	199	194	112
29	121	7.2	7.2	7.2	---	9.6	118	414	409	199	193	111
30	117	7.2	7.2	6.9	---	9.6	128	383	423	196	193	111
31	117	---	7.2	7.0	---	9.6	---	342	---	183	193	---
TOTAL	3177	391.3	224.2	212.0	2416.2	884.6	1097	8596	13573	8351	5233	4558
MEAN	102	13.0	7.23	6.84	86.3	28.5	36.6	277	452	269	169	152
AC-FT	6300	776	445	421	4790	1750	2180	17050	26920	16560	10380	9040
MAX	125	118	7.6	7.4	106	106	128	414	595	410	195	248
MIN	41	7.2	7.2	6.5	6.0	6.1	13	144	300	179	134	17

CAL YR	2012	TOTAL	30730.3	MEAN	84.0	MAX	283	MIN	6.1	AC-FT	60950
WTR YR	2013	TOTAL	48713.3	MEAN	133	MAX	595	MIN	6.0	AC-FT	96620

MAX DISCH: 600 CFS AT 11:45 ON JUN 12, 2013 GH 3.17 FT SHIFT 0.00 FT  
 MAX GH: 3.17 FT AT 11:45 ON JUN 12, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06729450 SOUTH BOULDER CREEK BELOW GROSS RESERVOIR  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
SOUTH BOULDER CREEK DIVERSION NEAR ELDORADO SPRINGS  
Water Year 2013

Location.-- Lat 39°55'58", long 105°18'29" (NAD 83), Boulder County. Gage is located on the right side of a 12 ft. Parshall flume at the entrance of the conduit connecting the South Boulder Creek Diversion to Ralston Reservoir.

Drainage Area and Period of Record.-- Controlled diversion, diverting water from South Boulder Creek to Ralston Reservoir.; Daily values are available from October 1, 1958 to September 30, 1961, and October 20, 1968 to present.

Equipment.-- Digital Incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) and a Stevens Type F weekly water-stage recorder in a timber shelter ovetop a concrete stilling well at a 12 ft. Parshall flume. An electric tape gage located on the instrument shelf is the primary reference with supplemental outside staff. The facilities and water-stage recorder are owned, operated and maintained by Denver Water. Satellite monitoring equipment owned and gage operation is conducted by the Colorado Division of Water Resources.

Hydrologic Conditions.-- Controlled diversion. Diversion conveys water released from Gross Reservoir, about 3 miles upstream, to Ralston Reservoir for municipal uses. Water diverted through the diversion will include west slope water delivered to the So. Boulder Creek Basin via the Moffat Tunnel system. Accurate measurement at this gage is important to insure that the proper amount of water passes to the downstream users. As the gage is controlled at the diversion point as well as at Gross Reservoir flow patterns are stepwise. At times, a transitory peak can occur prior to a shut down as the canal is used to help drain the diversion pool.

Gage-Height Record.-- The primary record is 15-minute logged DCP data with telemetered data and chart record as backup. The record is complete and reliable. Zero flow is determined operationally in conjunction with Denver Water accounting spreadsheet. Residual gage-heights occurring during shut-down or startup of the canal were adjusted to zero. Instrument calibration was maintained by fourteen visits to the gage. One instrument correction of -0.01 ft. was made this year.

Datum Corrections.-- Levels were last run on March 16, 2012 using RMO as base. The base reference (ETI) was found to be 0.016 ft. low. Although within allowable tolerances, a correction was made to tape length.

Rating.-- The control at all stages is a 12 ft. Parshall flume. A standard 12 ft. Parshall flume rating was continued this year. Positive shifts are often seen as there is little stilling provided upstream of the flume. A large timber is hung in the canal upstream of the flume to help dampen surging and dissipate energy. Vegetal growth in the flume will affect the magnitude of shifts and can become a large factor if the diversion runs for long periods of time. Three discharge measurements (Nos. 379-381) were made this year, ranging in discharge between 77.2 and 287 cfs. Discharge measurements made this year and two observations of no flow cover the range in stage experienced this year well. The peak discharge of 298 cfs occurred at 10:45 on June 18, 2013 at a stage of 3.17 ft. using a stage distributed shift of +0.01 ft. exceeding this year's high measurement (No. 381) made June 14, 2013 by 0.07 ft. of stage and 11 cfs.

Discharge.-- Shifting control method was used for all periods of record. From October 1, 2012 through the end of the water year shifts were distributed by stage using variable shift table BOCDELCOVST13-1. The variable shift table is defined by all measurements made this year and measurements Nos. 371 and 375 made in WY2011. Measurements made this year showed unadjusted shifts varying by stage from 0.01 to 0.03 ft. All measurements were given full weight.

Special Computations.-- Zero flow is determined operationally in conjunction with Denver Water provided accounting. Residual gage-heights recorded after the diversion is shut off were adjusted to compute a zero discharge. Zero flow was determined to occur part of the day or the entire day on the following days: October 1, 2012; November 2, 2012- February 6, 2013; March 8- April 25, 2013; and September 12- 30, 2013.

Remarks.-- The record is good. Station operated and maintained, and record developed by Matt Rusch.

Recommendations.-- Levels should be run in WY2014 to confirm establishment and stability of RMs 3 and 4; and to check on the adjustments made to the ETI gage and tape length in WY12.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

SOUTH BOULDER CREEK DIVERSION NEAR ELDORADO SPRINGS

RATING TABLE-- STD12FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

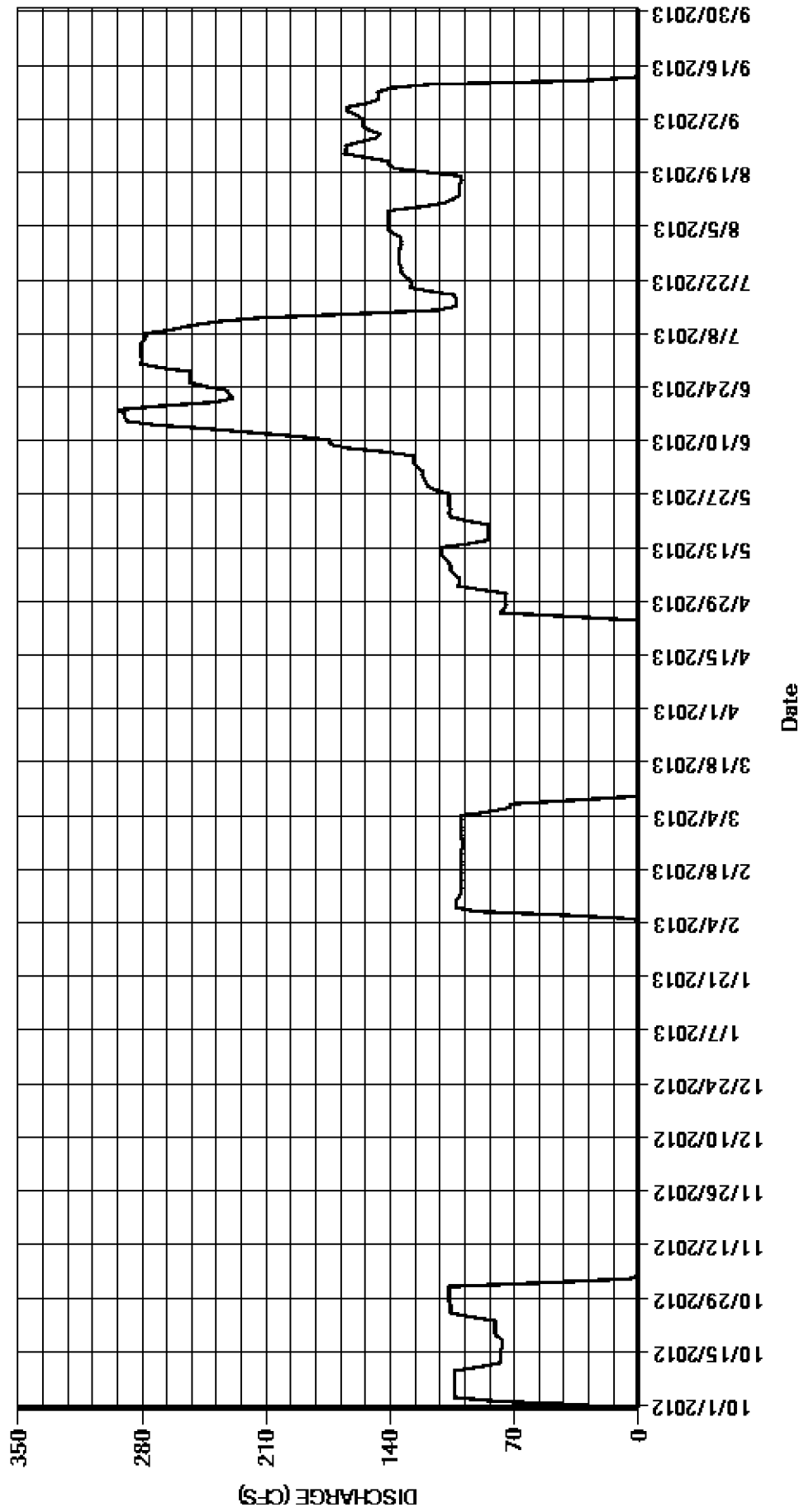
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	28	107	0.00	0.00	0.00	100	0.00	75	122	280	134	156
2	80	53	0.00	0.00	0.00	100	0.00	90	122	281	134	156
3	104	5.0	0.00	0.00	0.00	100	0.00	102	125	281	138	159
4	104	0.00	0.00	0.00	0.00	100	0.00	101	127	281	141	164
5	104	0.00	0.00	0.00	2.4	84	0.00	101	127	281	141	165
6	104	0.00	0.00	0.00	40	73	0.00	104	127	279	141	154
7	104	0.00	0.00	0.00	92	72	0.00	106	142	278	141	147
8	104	0.00	0.00	0.00	103	35	0.00	106	164	278	141	147
9	104	0.00	0.00	0.00	103	0.00	0.00	107	174	263	141	147
10	104	0.00	0.00	0.00	103	0.00	0.00	109	174	253	124	140
11	90	0.00	0.00	0.00	101	0.00	0.00	111	191	239	110	119
12	78	0.00	0.00	0.00	100	0.00	0.00	111	218	215	105	32
13	78	0.00	0.00	0.00	100	0.00	0.00	111	242	163	101	0.00
14	78	0.00	0.00	0.00	100	0.00	0.00	96	273	114	101	0.00
15	78	0.00	0.00	0.00	100	0.00	0.00	85	289	103	101	0.00
16	77	0.00	0.00	0.00	100	0.00	0.00	85	290	103	101	0.00
17	77	0.00	0.00	0.00	100	0.00	0.00	85	290	103	100	0.00
18	77	0.00	0.00	0.00	100	0.00	0.00	85	294	104	100	0.00
19	80	0.00	0.00	0.00	100	0.00	0.00	85	270	118	119	0.00
20	81	0.00	0.00	0.00	100	0.00	0.00	97	239	129	137	0.00
21	81	0.00	0.00	0.00	100	0.00	0.00	106	229	128	141	0.00
22	81	0.00	0.00	0.00	100	0.00	0.00	107	231	129	141	0.00
23	81	0.00	0.00	0.00	100	0.00	0.00	106	232	132	155	0.00
24	94	0.00	0.00	0.00	99	0.00	0.00	107	244	134	166	0.00
25	106	0.00	0.00	0.00	99	0.00	37	107	253	134	165	0.00
26	106	0.00	0.00	0.00	100	0.00	78	107	253	135	165	0.00
27	106	0.00	0.00	0.00	100	0.00	76	107	253	135	157	0.00
28	107	0.00	0.00	0.00	100	0.00	75	114	253	135	148	0.00
29	107	0.00	0.00	0.00	---	0.00	75	119	269	135	146	0.00
30	107	0.00	0.00	0.00	---	0.00	75	120	281	135	152	0.00
31	107	---	0.00	0.00	---	0.00	---	121	---	134	156	---
TOTAL	2817	165.00	0.00	0.00	2242.40	664.00	416.00	3173	6498	5612	4143	1686.00
MEAN	90.9	5.50	0.000	0.000	80.1	21.4	13.9	102	217	181	134	56.2
AC-FT	5590	327	0	0	4450	1320	825	6290	12890	11130	8220	3340
MAX	107	107	0.00	0.00	103	100	78	121	294	281	166	165
MIN	28	0.00	0.00	0.00	0.00	0.00	0.00	75	122	103	100	0.00

CAL YR	2012	TOTAL	20344.46	MEAN	55.6	MAX	232	MIN	0.00	AC-FT	40350
WTR YR	2013	TOTAL	27416.40	MEAN	75.1	MAX	294	MIN	0.00	AC-FT	54380

MAX DISCH: 298 CFS AT 10:45 ON JUN 18, 2013 GH 3.17 FT SHIFT 0.01 FT  
 MAX GH: 3.17 FT AT 10:45 ON JUN 18, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**SOUTH BOULDER CREEK DIVERSION NEAR EL DORADO SPRINGS  
WY2013 HYDROGRAPH**





PLATTE RIVER BASIN  
SOUTH BOULDER CREEK NEAR ELDORADO SPRINGS

Water Year 2013

Location.-- Lat. N39° 55' 58.52", Long. W105° 18' 18.91" (NAD83) in Boulder County, CO. Gage is located on the left side of a placed boulder cross-vane control structure 1.25 miles upstream from the previous gage location, 0.5 miles downstream from the South Boulder Creek Diversion Near Eldorado Springs, CO (BOSDELCO) stream gage or approximately 6 miles southwest of Boulder, CO and approximately 4 miles downstream of Gross Reservoir.

Drainage Area and Period of Record.-- 107 sq mi (USGS Colorado StreamStats utility). ; Daily record is available from 10/1/1896 to present.

Equipment.-- Sutron Constant Flow Bubbler (CFB) stage sensor and temperature sensor connected to a Sutron SatLink2 DCP in a 5 ft. by 5 ft. timber shelter at a placed boulder cross-vane control structure. A cantilever style chain gage located 15-ft. downstream of the shelter (overtop the CFB's orifice line) serves as the primary reference with no provision for a supplemental reference. A bank operated cableway is located 10 ft. downstream from the shelter.

Hydrologic Conditions.-- The drainage area is heavily forested terrain of varying topography. Stream is heavily regulated upstream of the gage since May 1, 1955. Moffat Tunnel, a transmountain diversion owned and operated by Denver Water intersects South Boulder Creek just after day lighting near Rollinsville, CO. Gross Reservoir (capacity 43,060 AF), an on-channel reservoir owned and operated by Denver Water intercepts and regulates all South Boulder Creek and tributary flows upstream of this gage. Releases made from Gross Reservoir (including spilled water) are recorded at the South Boulder Creek Below Gross Reservoir (BOCBGRCO) gage. Released water can then be subsequently diverted via the South Boulder Creek Diversion Near Eldorado Springs, CO (BOSDELCO) gage which routes water to Ralston Reservoir. The BOCBGRCO and BOSDELCO gages are both owned and operated by Denver Water. The channel is straight for approximately 200-ft. upstream and 300-ft. downstream of the gage. There is about 15 sq mi of drainage between Gross Reservoir and the gage. During conditions when there is low snow melting or storm runoff, significant flows can be seen at the gage when Gross release has been curtailed to minimum. The control will regulate flows at all anticipated stages.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute CFB log data as backup. The record is complete and reliable, except for November 11-13, and 27, December 9- March 15, and 23-26, and April 10, and 18, when the stage-discharge relation was affected by ice and September 11-13 when the stage exceeded the rating and damaged the control. Instrument calibration was maintained by frequent visits to the gage by DWR staff. One instrument calibration correction of +0.13 ft was made and applied to the record as defined by visits made to the gage. This large correction was caused by damage to the control during the September flood.

Datum Corrections.-- Levels were last run on December, 21, 2012 using RM 1 as base. The base reference was found to be within allowable tolerances. RM3 could not be located and is thought to have been buried during road construction sometime during the winter of 2011. Likewise, the boulder that RM4 is set into shifted stream-ward during road construction and was re-indexed after levels were last shot.

Rating.-- The control is a placed boulder cross-vane structure, established December 10, 2010. Rating BOCEL2CO01 subsequently renamed BOCELSCO24 was developed during the 2010 Water Year by correlating average day gage-height data recorded at the present gage location against average day discharge values computed at the old site during periods of stable flow when both gages were operating. The control was damaged during the September 2013 flood, but BOCELSCO24 was used for the entire 2013 Water Year. A new rating will need to be developed when better defined by measurements. Fifteen discharge measurements (Nos. 542-556) were made this year ranging in discharge from 7.11 to 329 cfs covering the range in stage experienced this year well. The peak flow and stage could not be determined because of the September 2013 flood event.

Discharge.-- Shifting control method was use for all periods of open record. Shifts are caused by accumulation of debris and material above the control. Stage dependent shifting was used from March 15, 2013 through September 11, 2013 using variable shift table BOCELSCOVST13-1 defined by measurement Nos. 548-555 made during the period of use. Msmt. 542-547 and 556 were applied by time. Open water measurements showed unadjusted shifts varying between -0.12 and 0.01 ft during the period in which the control was intact. After the control was damaged a shift of 0.16 was applied. All were given full weight except for Nos. 551, and 555 which were discounted -2.04, and -3.97 percent, respectively.

Special Computations.-- Discharge during periods of backwater due to ice was estimated on a basis of mass balance calculations and discharge measurements made during the periods. Because the channel is heavily regulated upstream of this point, the record can be determined within fair accuracy by mass balancing the release from Gross Reservoir minus diversions via the South Boulder Creek Diversion. Reasonable consistency is seen before and after periods of good record validating this methodology.

Remarks.-- The record is good, except for periods when the stage-discharge relation was affected by ice which is estimated and poor. The period when the stage exceeded the stage-discharge relationship remained undetermined and the period from September 14 through the end of the water year is rated rated fair due to damage to the control and sediment filling the gage pool. Station maintained and record developed by Matt Rusch.

Recommendations.-- A new rating should be established for the control which was damaged in the September flood and repaired in WY2014. Levels should be run again in the WY2014 to track stability of newly established reference marks.

STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

SOUTH BOULDER CREEK NEAR ELDORADO SPRINGS

RATING TABLE-- BOCELSCO24 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

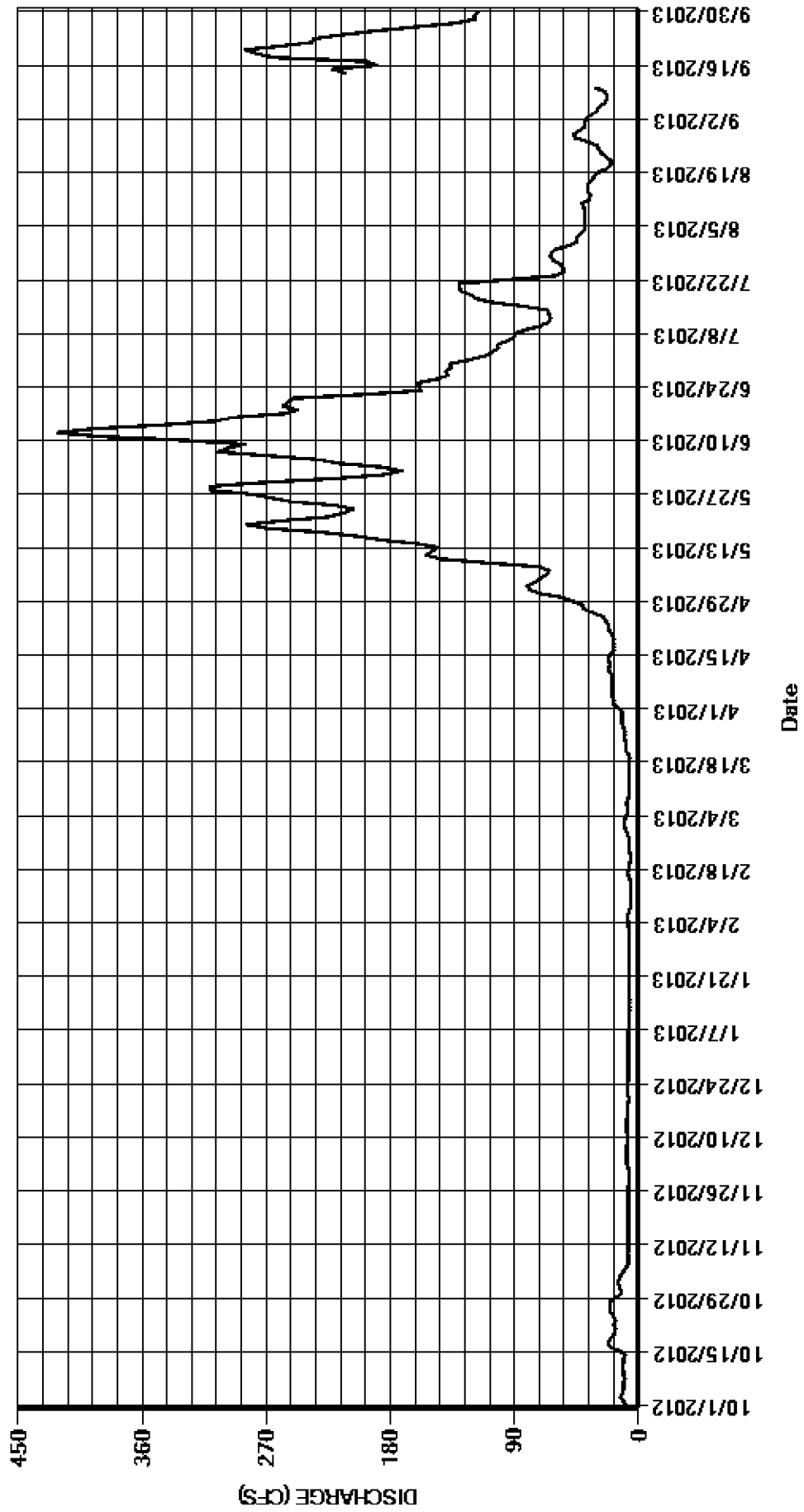
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.5	14	7.1	e7.5	e7.0	e10	14	72	185	124	45	39
2	11	15	7.4	e7.5	e7.0	e10	18	79	172	112	45	38
3	13	14	8.5	e7.5	e7.5	e10	18	81	187	107	42	35
4	12	13	8.5	e7.5	e7.5	e9.0	19	75	218	102	39	30
5	11	11	8.5	e7.5	e8.0	e8.0	19	71	232	102	39	29
6	11	9.0	8.5	e7.5	e8.0	e8.0	19	67	267	95	39	25
7	11	7.6	8.5	e7.5	e7.0	e9.0	19	65	305	90	39	23
8	10	7.6	8.5	e7.0	e6.0	e8.0	19	72	298	90	39	23
9	11	7.6	e8.0	e7.0	e6.0	e7.0	19	110	286	81	39	24
10	11	7.7	e8.0	e7.0	e6.0	e7.0	e20	143	327	71	40	31
11	12	e7.5	e8.5	e7.0	e6.0	e7.0	22	154	391	65	41	---
12	11	e7.5	e8.5	e6.5	e6.0	e7.0	21	150	421	64	36	---
13	11	e7.5	e8.5	e6.5	e6.0	e7.0	21	146	396	65	35	---
14	10	7.6	e8.5	e6.5	e6.0	e7.0	22	160	346	66	37	213
15	13	7.6	e8.5	e6.5	e6.0	e7.0	21	185	308	83	37	222
16	20	7.6	e8.0	e7.0	e7.0	7.1	18	204	294	106	37	190
17	22	7.6	e8.0	e7.0	e8.0	7.0	18	229	258	118	34	198
18	21	7.6	e8.0	e7.0	e7.0	6.9	e18	269	248	122	32	265
19	19	7.6	e7.5	e7.0	e7.0	6.7	18	284	258	129	29	277
20	17	7.6	e7.0	e7.0	e6.0	7.6	19	259	254	130	23	285
21	17	7.6	e8.0	e7.0	e6.0	9.1	21	225	251	130	20	259
22	18	7.6	e8.0	e7.0	e6.0	9.2	22	214	198	96	20	237
23	17	7.6	e8.0	e7.0	e7.0	e9.5	22	207	158	61	23	236
24	18	7.6	e8.0	e7.0	e7.0	e10	24	220	159	54	27	214
25	20	7.6	e7.5	e7.0	e7.0	e10	26	253	160	55	29	191
26	21	7.4	e7.5	e7.0	e7.0	e10	33	266	146	57	30	162
27	21	e7.5	e7.5	e7.0	e8.0	11	40	281	138	62	37	133
28	21	7.1	e7.5	e7.0	e9.0	12	41	310	140	64	46	119
29	17	7.1	e7.5	e7.0	---	12	48	311	136	63	47	119
30	13	7.1	e7.5	e7.0	---	12	56	273	137	60	42	116
31	13	---	e7.5	e7.0	---	12	---	222	---	50	39	---
TOTAL	461.5	256.4	247.0	218.5	192.0	273.1	715	5657	7274	2674	1107	3733
MEAN	14.9	8.55	7.97	7.05	6.86	8.81	23.8	182	242	86.3	35.7	138
AC-FT	915	509	490	433	381	542	1420	11220	14430	5300	2200	7400
MAX	22	15	8.5	7.5	9.0	12	56	311	421	130	47	285
MIN	8.5	7.1	7.0	6.5	6.0	6.7	14	65	136	50	20	23

CAL YR	2012	TOTAL	11283.8	MEAN	30.8	MAX	121	MIN	6.0	AC-FT	22380
WTR YR	2013	TOTAL	22808.5	MEAN	63.0	MAX	421	MIN	6.0	AC-FT	45240 (PARTIAL YEAR RECORD)

MAX DISCH: (Peak discharge not determined for this water year.)  
MAX GH: (Peak GH not determined for this water year.)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH BOULDER CREEK NEAR ELDORADO SPRINGS  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06730300 COAL CREEK NEAR PLAINVIEW  
Water Year 2013

Location.-- Lat. N.39°52'40", Long. W105°16'39" (NAD83). Gage is on the left bank of Coal Creek approximately 100 ft. upstream from a bridge on State Highway 72, 1.2 miles south of Plainview, CO or 6.5 miles southwest of the Gross Reservoir dam and 9 miles north of Golden, CO.

Drainage Area and Period of Record.-- 15.1 mi<sup>2</sup> (USGS Colorado StreamStats utility). ; 1959 to present.

Equipment.-- A digital incremental shaft encoder was replaced by a Sutron Stage Discharge Recorder (SDR) April 30, 2013, and is connected to a Sutron SatLink II Data Collection Platform (DCP) in a 42-inch corrugated metal pipe shelter adjacent to a grouted boulder control. A graphic water-stage recorder was also removed April 30, 2013. A metal drop table and adjustable reference point (RP) serve as the base reference with a supplemental cantilever style chain gage. The control is constructed with a pipe through the control to allow for bucket measurement during low flow conditions. The pipe is plugged when measurement by bucket is not occurring.

Hydrologic Conditions.-- Drainage area consists mainly of forested mountainous terrain. The gage is located at the mouth of Coal Creek Canyon which has several small developments along the banks of Coal Creek. Gage is subject to rapid increases in stage resulting from rain events and runoff from hardened areas through the canyon. The channel is straight for approximately 100 feet upstream and approximately 100 feet downstream of the station. The stream is constrained to one channel at all stages. During high flows, small cobble and gravel migrate through the channel, causing approach condition changes.

Gage-Height Record.-- The primary record is 15-minute telemetered data with 15-minute logged DCP data and a partial year of chart record as backup. This water year, the period of record was Oct. 1 to Nov. 13, 2012 and Mar. 30 to Sep. 10, 2013. The record is complete and reliable, except for: April 10, 2013 when the stage-discharge relationship was affected by ice or the stilling well was frozen, and September 11, 2013 through the end of the water year because the control was destroyed. Negative gage-height values are seen during periods of no flow, allowing the stilling well to drain. Once the channel is dry, the well will empty completely. These are real values that correspond to actual flow or dry conditions so values have not been zeroed out. The DCP was replaced April 30, 2013, missing data during this period was filled in from adjacent record without loss of accuracy. Two instrument calibration corrections were applied to the record as defined by visits made to the gage. The maximum gage-height in Water Year 2013, recorded September 11, 2013, exceeded the rating table. The control was destroyed sometime during this flood event and the peak of the event was most likely not recorded, the gage-height data during and after this time is inaccurate and unusable.

Two flush corrections (May 30 - June 11 and June 20 - June 27, 2013) were ran and data for this period should be considered fair.

Datum Corrections.-- Levels were last run on September 1, 2011 using RM 4 as base. No correction was necessary at that time. RM's 1 and 5 did not close within allowable tolerances. Shot distance and shot obstruction were contributing factors.

Rating.-- The control is a rock and concrete dam eleven feet below the gage. Rating Number 10, developed in WY2010, was used the entire year. It is defined by measurements from 0.01 to 62 cfs. Eight measurements (Nos. 924 – 931) were made this water year ranging in discharge from 0.03 to 19.8 cfs. The peak discharge could not be determined because of unprecedented flows which destroyed the gage. Measurements 929, and 930 were not used in the development of the record. These measurements were made through the pipe in the center of the control using a bucket and stopwatch and were very poor. The stage was too high for a successful bucket measurement.

Discharge.-- Shifting control method was used all year. Shifts were applied by time as defined by measurements 924-926. Shifts were also applied by time with consideration to stage. Measurements 926 and 927 were used to develop COCREPCOVST13-2 and measurements 927, 928, and 930 were used to develop COCREPCOVST13-1. Shifts are principally caused by the accumulation of material on the control or in the gage pool. Open water measurements showed unadjusted shifts ranging from -0.07 to 0.07 feet. Measurements 929 and 930 were not used in the development of the record due to poor quality; flows exceeded the capacity of the pipe used to make bucket measurements. All other measurements were given full weight.

Special Computations.-- Discharges for periods of ice effect and the frozen stilling were estimated from adjacent periods of good record with consideration of temperature trends and measurements made during the affected periods.

Remarks.-- Record is good during the period of record except for day when ice affected the gage which was estimated and should be considered poor. The days (Nov. 13, 2012 and Mar. 30, 2013) when the station was closed and opened for the season were partial days of record and estimated. They should be considered fair. The period when flush corrections were applied (May 30 to Jun. 11 and Jun. 20 to Jun. 27, 2013) should be considered fair. No record is available after Sep. 10, 2013 due to the flood destroying the control. Station maintained and record developed by Matt Rusch.

Recommendations.-- High water measurements should be pursued, as most of the year's flow will occur during the peak event periods. Channel conditions should be noted with every visit, as this gage is susceptible to filling in with gravel and cobble. A cleanout is recommended every 3 to 5 years. Levels should be run again this coming water year. PZF on the control should be verified, and the MSL elevation from the temporary RM established by the 2008 pipeline contractor should be transferred to one of our RM's.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06730300 COAL CREEK NEAR PLAINVIEW

RATING TABLE-- COCREPCO10 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.08	---	---	---	---	2.8	21	2.6	0.22	0.14	0.34
2	0.00	0.10	---	---	---	---	2.6	19	2.1	0.18	0.11	0.33
3	0.00	0.11	---	---	---	---	2.6	20	1.8	0.13	0.09	0.22
4	0.00	0.11	---	---	---	---	3.0	21	1.8	0.10	0.06	0.16
5	0.00	0.11	---	---	---	---	3.3	21	1.9	0.08	0.05	0.14
6	0.00	0.10	---	---	---	---	3.5	20	1.6	0.06	0.04	0.12
7	0.00	0.10	---	---	---	---	3.4	20	1.6	0.05	0.04	0.11
8	0.00	0.10	---	---	---	---	3.4	24	1.7	0.04	0.04	0.08
9	0.00	0.11	---	---	---	---	3.1	66	1.7	0.03	0.04	0.22
10	0.00	0.12	---	---	---	---	e3.0	74	1.4	0.02	0.03	5.7
11	0.00	0.14	---	---	---	---	3.2	57	1.3	0.02	0.02	---
12	0.00	0.17	---	---	---	---	3.4	45	1.1	0.02	0.06	---
13	0.00	e0.12	---	---	---	---	3.5	38	0.99	0.02	0.38	---
14	0.00	---	---	---	---	---	3.8	35	0.96	0.01	0.41	---
15	0.00	---	---	---	---	---	3.4	30	0.87	2.6	0.16	---
16	0.00	---	---	---	---	---	3.8	24	0.78	0.65	0.11	---
17	0.00	---	---	---	---	---	3.9	20	0.66	0.27	0.10	---
18	0.00	---	---	---	---	---	3.8	16	0.61	0.16	0.08	---
19	0.00	---	---	---	---	---	4.0	13	0.50	0.23	0.07	---
20	0.00	---	---	---	---	---	4.7	12	0.36	0.15	0.05	---
21	0.00	---	---	---	---	---	8.0	10	0.31	0.10	0.06	---
22	0.00	---	---	---	---	---	11	8.6	0.36	0.07	0.37	---
23	0.00	---	---	---	---	---	9.9	8.0	0.40	0.05	0.28	---
24	0.01	---	---	---	---	---	11	6.7	0.38	0.05	1.3	---
25	0.02	---	---	---	---	---	13	5.8	0.29	0.05	2.5	---
26	0.02	---	---	---	---	---	14	5.1	0.21	0.04	1.2	---
27	0.03	---	---	---	---	---	15	4.0	0.15	0.06	1.1	---
28	0.03	---	---	---	---	---	18	3.4	0.11	0.77	0.72	---
29	0.03	---	---	---	---	---	21	3.8	0.14	0.67	0.50	---
30	0.05	---	---	---	---	e3.0	22	3.3	0.21	0.50	0.37	---
31	0.06	---	---	---	---	2.9	---	3.0	---	0.22	0.32	---
TOTAL	0.25	1.47	---	---	---	5.9	211.1	657.7	28.89	7.62	10.80	7.42
MEAN	0.008	0.11	---	---	---	2.95	7.04	21.2	0.96	0.25	0.35	0.74
AC-FT	0.5	2.9	---	---	---	12	419	1300	57	15	21	15
MAX	0.06	0.17	---	---	---	3.0	22	74	2.6	2.6	2.5	5.7
MIN	0.00	0.08	---	---	---	2.9	2.6	3.0	0.11	0.01	0.02	0.08

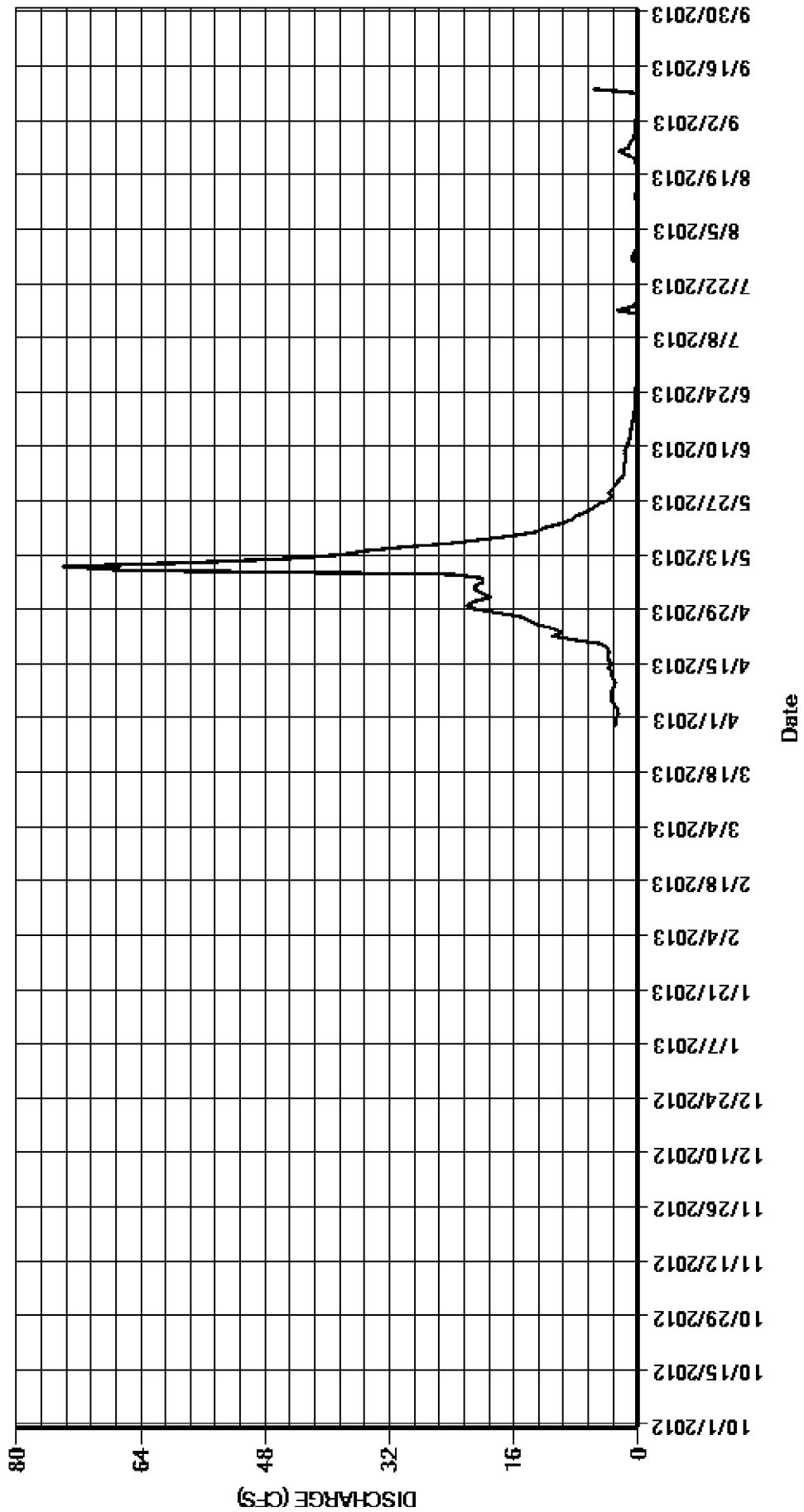
CAL YR	2012	TOTAL	340.02	MEAN	1.07	MAX	5.5	MIN	0.00	AC-FT	674 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	931.15	MEAN	4.46	MAX	74	MIN	0.00	AC-FT	1850 (PARTIAL YEAR RECORD)

MAX DISCH: (Peak discharge not determined for this water year.)

MAX GH: (Peak discharge not determined for this water year.)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06730300 COAL CREEK NEAR PLAINVIEW  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06731000 SAINT VRAIN CREEK AT MOUTH NEAR PLATTEVILLE, CO  
Water Year 2013

Location.-- Lat. N40°15'28.88"; Long. W104°52'47.16' (NAD83), Hydrologic Unit 10190005, Weld County, CO. Gage is located on the right bank of the channel 125 ft. downstream of Weld County Road 19.5, 1.3 mi. from the confluence with the South Platte River, 1 mi. north of the Fort Saint Vrain power plant and 4 mi. northwest of Platteville, CO.

Drainage Area and Period of Record.-- 979 mi<sup>2</sup> (USGS Colorado StreamStats utility).; Daily values are available from February 24, 1927 to present.

Equipment.-- Digital incremental Sutron Stage Discharge Recorder (SDR) and a Sutron Constant Flow Bubbler (CFB) connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly in a 54-inch metal pipe shelter. An electric tape index placed on the instrument shelf is the primary and only reference. On June 24, 2013 the CFB unit was removed and a Campbell Scientific CS476 radar unit was installed on the downstream side of the WCR 19.5 bridge. A USGS style Wire Weight Gage (WWG) was also installed.

Hydrologic Conditions.-- Gage is below the confluence of the Saint Vrain Creek and Boulder Creek. Flows are heavily regulated upstream by numerous diversions from and deliveries to the creek including transbasin deliveries via the Colorado-Big Thompson (C-BT) project. Channel control at all stages, substrate is composed primarily of sands and clays and is subject to fill and scour. The upstream bridge affects flows at all stages and has fostered the development of a sand bar at the gage location.

Gage-Height Record.-- The primary record is 15-minute telemetered SDR data from October 1, 2012 to 12:00 on May 21, 2013 and 12:00 on June 4, 2014 through September 13, 2013. The primary record from 12:15 on May 21, 2013 to 11:45 on June 4, 2014 is telemetered CFB data and the primary record from September 24, 2013 through the end of the water year is telemetered radar data.

Instrument calibration was maintained by thirty-four visits to the gage. No instrument corrections were made nor were deemed necessary during the respective uses of the SDR and radar units. Gage-height data from the CFB unit, May 21-June 4, 2013, required on correction of -0.14 ft. which was applied to the entire period of use. Two flush corrections ranging from -0.06 to +0.07 ft occurred this year. They were applied to the record as defined by visits made to the gage with respect to the hydrograph.

The record is complete and reliable except for: December 19-20, and 24-31, 2012; January 1-19; February 20-28, and March 24, 2013, when the stage-discharge relation was affected by ice, and March 30- 31, April 2- 3, 2013 and August 20-24, 2013, when the SDR float beached several times. No gage-height data is available from 02:00 on September 13 to 10:15 on September 24, 2013 when flood waters destroyed the SDR unit installed in the gage shelter and also severed the connection to the radar unit. The radar unit was reconnected and a replacement SDR unit was installed on September 24, 2013.

Datum Corrections.-- Levels were last run on June 24, 2013 using RM3 as base. No correction was indicated to the base reference. A supplemental WWG was also installed near the radar unit on this date.

Rating.-- Rating SVCPLACO30, defined by measurements from 33 to 2180 cfs was continued in used this year. The channel has well defined banks. Primarily composed of sands, silts and clays; the channel is subject to considerable fill and scour. The bridge above the gage straightens flow and causes sand bars at the gage and downstream from the center pier. Twenty-six discharge measurements (Nos. 1000-1025) were made during the year ranging in discharge from 88.8 - 2680 cfs covering the range in stage well, except for the September flood period and the lower daily flows when the SDR float was beaching (March 30- April 3, 2013 and August 20- 24, 2013). Peak discharge was not determined this year. Flows were well outside the confines of the banks and were flowing outside of the channel confines upstream of the gage location.

Discharge.-- Shifting control method was used for all periods of open water. Shifts are caused by fill and scour of the channel and are typically event driven. The left bank across from the gage is continually being eroded by high flows. Shifts were distributed as follows: October 1 - 30 , 2012: stage dependant shifting using variable shift table SVCPLACOVST13-1, defined by measurement Nos. 1000-1003 made during the period of use; October 30, 2012 - February 12, 2013, stage dependant shifting using variable shift table SVCPLACOVST13-2, defined by measurement Nos. 1003-1009 made during the period of use; February 12 - March 15, 2013 shifting by time as defined by measurements; March 15, - June 13, 2013, stage dependant shifting using variable shift table SVCPLACOVST13-3, defined by measurement Nos. 1011- 1017; June 20, 2013 - September 3, 2013, stage dependant shifting using variable shift table SVCPLACOVST13-4, defined by measurement Nos. 1018-1022, before the September flood event; September 3 - 13, 2013, stage dependant shifting using variable shift table SVCPLACOVST13-5, defined by measurement Nos. 1017 and 1022; September 24 - October 18, 2013, stage dependant shifting using variable shift table SVCPLACOVST13-6, defined by measurement Nos. 1023-1027 made during the period of use.

This year's measurements showed shifts varying from -0.06 to +0.76 ft. All were given full weight except for Nos. 1002, 1006, 1007, 1013, 1015, 1016, 1018, and 1020 which were discounted up to ±4.46% to smooth shift distributions.

Special Computations.-- Discharge for period of ice affect were estimated from adjacent good record, temperature trends recorded at the streamgage and precipitation events recorded at the Lyons (SVCLYOCO) and Henderson (PLAHENCO) streamgages respectively. Discharge for period when the SDR flow was beached were estimated from adjacent good record and recorded CFB and radar data respectively when available and reliable.

Remarks.--

The record is good except for: December 19-20, and 24-31, 2012, and January 1-19, February 20-28, and March 24, 2013 when the stage-discharge relation was affected by ice, which is estimated and poor; May 21 through June 3, 2013 when the stilling well intakes were sluggish or plugged, which is fair; March 30 through April 3, and August 19 - 22, 2013 when the SDR became beached for portions of each day, record is considered fair. No record was produced for September 12 - 24, 2013 due to the flood event. Station maintained by Matt Rusch. Record developed by Matt Rusch and R. Stroud.

Recommendations.--

Given the reconfiguration of the channel following the September 2013 flood event, frequent discharge measurements are needed to redefine the stage-discharge relation at this site. It is highly suggested that the radar unit and WWG be used as the primary reference and instrument for this development due to continual beaching and plugging problems seen in past years with the stilling well at this site. Consideration should also be given to abandoning the stilling well and shelter.



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
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06731000 SAINT VRAIN CREEK AT MOUTH NEAR PLATTEVILLE, CO

RATING TABLE-- SVCPLACO030 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

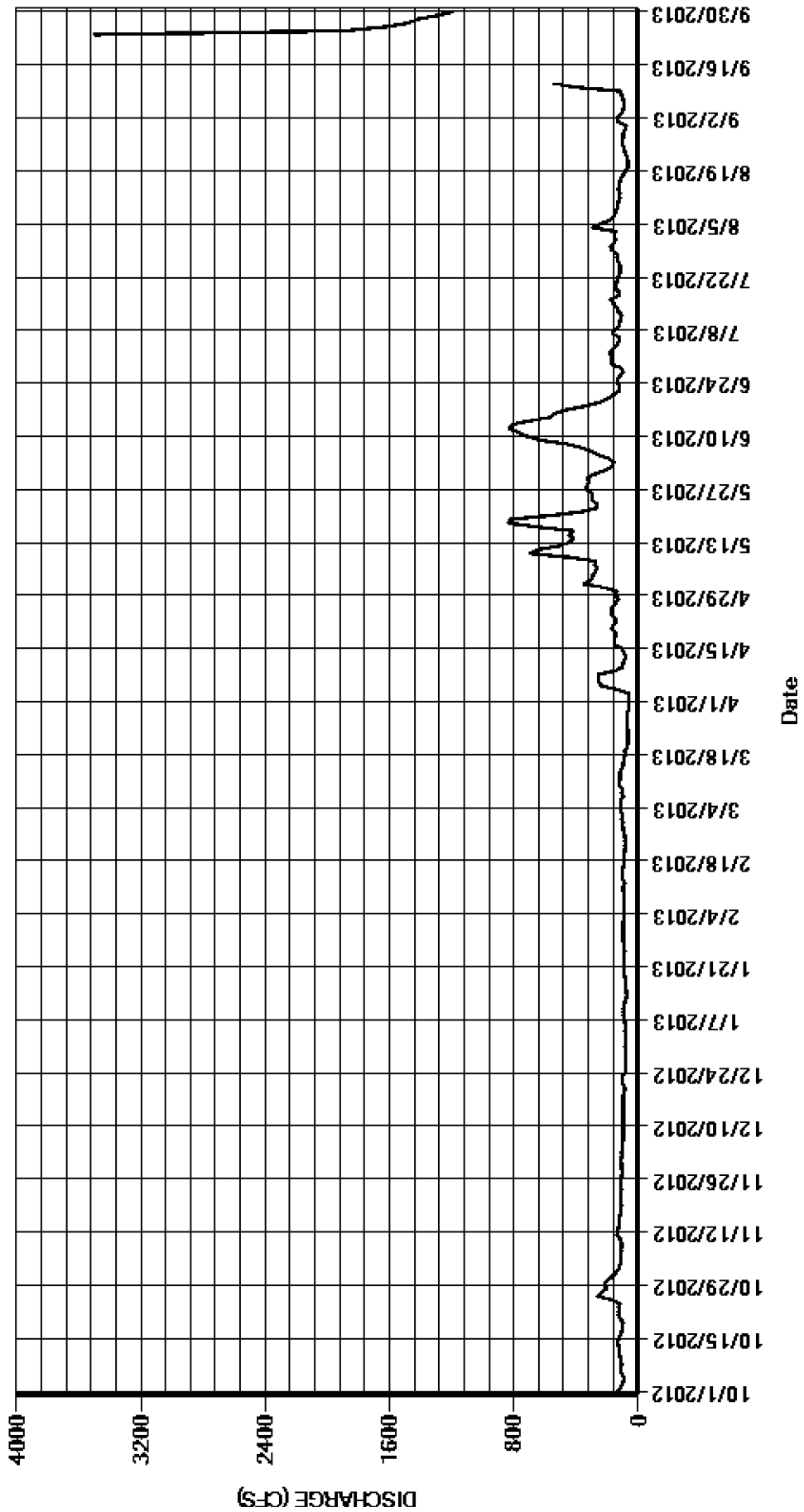
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	132	149	111	e80	98	106	61	217	208	175	149	135
2	114	130	106	e80	95	103	e60	349	170	181	154	137
3	103	120	107	e80	92	113	e60	307	158	163	148	111
4	90	113	103	e85	95	115	123	296	185	138	290	98
5	98	113	106	e85	93	112	236	280	254	126	243	93
6	111	113	98	e85	95	114	254	265	299	123	181	91
7	111	110	99	e90	91	97	253	279	371	164	155	100
8	109	109	98	e95	93	107	257	280	472	156	147	107
9	111	107	98	e95	93	100	155	450	646	124	138	115
10	117	114	96	e95	96	125	106	699	717	120	135	400
11	124	137	98	e90	96	121	99	641	776	115	125	541
12	121	132	98	e85	89	115	88	505	831	108	120	---
13	127	127	96	e75	101	120	82	447	811	131	119	---
14	133	121	97	e75	101	111	93	418	695	140	128	---
15	124	122	97	e80	100	98	106	445	567	160	124	---
16	115	120	96	e80	100	95	154	422	535	177	121	---
17	105	114	99	e85	93	91	154	643	461	129	111	---
18	101	111	98	e85	95	85	150	833	331	121	96	---
19	100	109	e90	e90	90	87	146	825	242	147	77	---
20	113	111	e85	93	e90	73	170	569	195	144	e67	---
21	126	114	101	91	e85	66	166	357	157	135	e66	---
22	126	112	102	94	e85	66	142	271	122	133	e68	---
23	127	109	101	92	e85	67	149	263	123	119	e76	---
24	118	114	e85	93	e85	e65	174	295	132	117	e87	e3500
25	167	110	e80	89	e90	74	174	297	135	119	92	1880
26	264	109	e80	92	e95	73	165	301	115	131	102	1630
27	237	105	e80	95	e100	72	146	342	98	136	100	1480
28	206	105	e80	97	e100	74	129	327	113	136	98	1420
29	214	108	e80	96	---	71	148	318	171	170	97	1290
30	208	107	e80	96	---	e60	138	328	175	179	80	1190
31	175	---	e85	98	---	e60	---	276	---	156	77	---
TOTAL	4227	3475	2930	2741	2621	2836	4338	12545	10265	4373	3771	14318
MEAN	136	116	94.5	88.4	93.6	91.5	145	405	342	141	122	795
AC-FT	8380	6890	5810	5440	5200	5630	8600	24880	20360	8670	7480	28400
MAX	264	149	111	98	101	125	257	833	831	181	290	3500
MIN	90	105	80	75	85	60	60	217	98	108	66	91

CAL YR	2012	TOTAL	43382	MEAN	119	MAX	823	MIN	55	AC-FT	86050 (PARTIAL YEAR RECORD)	
WTR YR	2013	TOTAL	68440	MEAN	194	MAX	3500	MIN	60	AC-FT	135800 (PARTIAL YEAR RECORD)	

MAX DISCH: (NOT DETERMINED)  
 MAX GH: (NOT DETERMINED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06731000 SAINT VRAIN CREEK AT MOUTH NEAR PLATTEVILLE, CO  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
WIND RIVER BYPASS  
Water Year 2013

Location.--	Lat. N40° 19' 41.47", Long. W105° 34' 35.86" (NAD83). Gage is located on the left side of a 3-foot Cipolletti weir below the Alva B. Adams Tunnel East Portal afterbay approximately 4.9 mi. southwest of the Town of Estes Park Visitors Center.
Drainage Area and Period of Record.--	4.35 sq mi (USGS Colorado StreamStats utility). Drainage area consists of forested lands of varying topography within the boundaries of Rocky Mountain National Park; Daily data available from October 1, 2000 to present.
Equipment.--	Sutron SDR-0001-1 shaft encoder in a steel corrugated metal pipe (CMP) shelter and stilling well at a 3-foot Cipolletti weir. A metal drop tape and nonadjustable reference point serve as the primary reference; a supplemental staff gage is placed in the stilling pool adjacent to the shelter. A buried data line connects the shaft encoder to a Sutron SatLink2 data collection platform at the Alva B. Adam's Tunnel at East Portal (ADATUNCO) gage shelter. The gage is operated cooperatively between the United States Bureau of Reclamation (USBR) and the Colorado Division of Water Resources (CDWR) as a component of the Colorado Big Thompson (C-BT) system.
Hydrologic Conditions.--	Drainage area consists of forested lands of varying topography within the boundaries of Rocky Mountain Nation Park. A small diversion upstream of the WINDESCO gages diverts approximately 300 Acre Feet (AF) of domestic water a year. A gated pipeline below the WINDESCO gage can convey water undiminished under the Adam's Tunnel afterbay / Aspen Creek Siphon facility. The WINBYPCO gage sits below the terminus of this pipeline. However, when Wind River flows are in excess of 2 cfs, routinely from May to July, the excess may be skimmed into the Adams Tunnel afterbay and used for subsequent power generation purposes at the Mary's Lake and Estes power generation facilities. See the Special Computations section below for complete description. Adam's Tunnel can also release water to the Wind River Below Adams Tunnel channel as required for maintenance or safety concerns. The ADATUNCO stilling basin is equipped with a head gate and spillway; which, when in use, places water upstream of the WINBYPCO control structure.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and 5-minute logged SDR data as backup. Instrument calibration was supported by frequent visits by USBR and CDWR personnel. Three instrument corrections $\pm$ 0.01 ft. were made throughout the year and were applied to the record as defined by observations and corrections made to the instrument with exception of the September 5, 2013 correction which was deemed insignificant and was therefore not applied. The record is complete and reliable with exception of: November 11-12, 2012, when the stilling well was frozen; November 13, 2012 and May 6, 2013, partial day records corresponding to shutdown and startup days; May 10-13 and September 23-30, 2013 when the intakes were either partially or fully plugged. This is a partial year record; the period of record for the 2013 water year is October 1 through November 13, 2012 and May 6 through September 30, 2013.
Datum Corrections.--	Levels were last run on October 10, 2012 using the average weir crest (RM1) as base. The inside gage was found to be reading 0.027 low and the supplemental staff gage was found to be 0.098 ft. low. Neither reference was adjusted. Levels were scheduled to be run again in the spring to verify the correction and to track further movement during winter months; however, this winter the weir was found to have significantly heaved, creating a void allowing water to flow under the control. The void was filled with hydraulic cement prior to opening the gage for the season. The control is slated to be replaced in the near future.
Rating.--	The control is a 3-foot Cipolletti weir. A standard 3-foot Cipolletti weir rating (STD03FTCIP) was continued in use for all of WY2013. Four discharge measurements (Nos. 18-21) were made this year, ranging in discharge from 1.40 and 4.38 cubic feet per second (cfs). The peak flow of 20.1 cfs occurred at 0115 on September 12, 2013 exceeding Measurement No. 18, made May 10, 2013, by 15.7 cfs. Measurements made this year as well as the winter time heaving event indicate that the control is not stable and is exhibiting permanent variable shift conditions.
Discharge.--	Shifting control method was used of all periods of record. Shifts were distributed by time with consideration given to operational events from October 1 through November 13, 2012. From May 6 through May 13, 2013 shifts were distributed by time as defined by measurements and from May 13 through September 30, 2013 the mean calculated shift from measurement Nos. 19-21 was applied to the gage-height record. Measurement Nos. 18 and 20 were given full weight and Nos. 19 and 21 were discounted up to $\pm$ 6.6%.
Special Computations.--	Discharge for the ice affected periods were estimated from adjacent good record with consideration given to temperature trends recorded at the BTABESCO streamgage. Discharge for days of partial record were estimated from adjacent good record and hydrographic trends recorded following opening the gage for the season. Discharge the periods when the intakes were plugged were estimated graphically from the point of gage-height inflection to the point the of the flush correction event.  The WINBYPCO gage is used in the ADANETCO computation process to determine the amount of Wind River Water that is "skimmed" into the C-BT system each year. This is done by subtracting the amount of water recorded at the Wind River Near Estes Park (WINDESCO) from the amount of water recorded at the WINBYPCO gage. The difference is then subtracted from the Alav B Adams Tunnel at East Portal (ADATUNCO) record to determine the ADANETCO (Alva B. Adams Tunnel, Net (West Slope only)) delivery. Differences in discharge values between the WINDESCO and WINBYPCO records occurring outside the "skim" period are presumed to be either in part of aggregate, slight drainage accruing to the stream from the ADATUNCO gage basin, or slight daily rounding differences and transit time allowances.
Remarks.--	This is a partial year record. The period of record for the 2013 water year is October 1 to November 13, 2012 and May 6 to September 30, 2013. The record is fair except for periods of ice affected record, periods of partial or fully plugged intakes and partial day records which are estimated and poor. The station was closed for the winter period, November 14, 2012 through May 5, 2013, no record was maintained. Station maintained by USBR and CDWR staff. Record developed by Russell V. Stroud.
Recommendations.--	

Levels should be run in the spring to track further movement of the control. Because the control has been deemed unstable, measurements should be made throughout the year to track its performance.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

WIND RIVER BYPASS

RATING TABLE-- STD03FTCIP USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

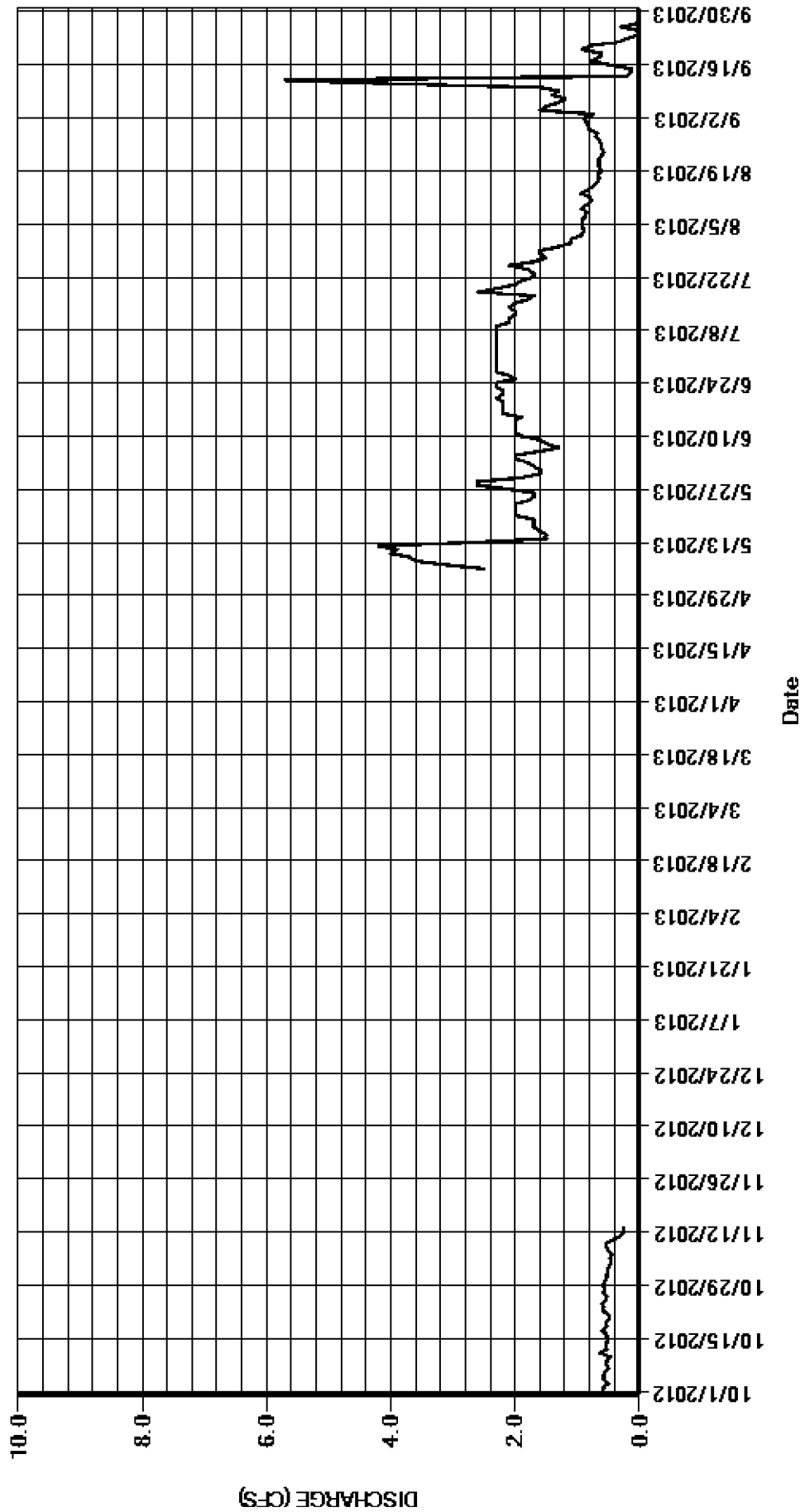
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.60	0.52	---	---	---	---	---	---	1.6	2.3	1.1	0.86
2	0.57	0.51	---	---	---	---	---	---	1.7	2.3	0.93	0.89
3	0.50	0.48	---	---	---	---	---	---	1.8	2.3	0.90	0.74
4	0.57	0.46	---	---	---	---	---	---	2.0	2.3	0.91	1.6
5	0.58	0.47	---	---	---	---	---	---	2.0	2.3	0.93	1.5
6	0.56	0.44	---	---	---	---	---	e2.5	1.6	2.3	0.92	1.3
7	0.50	0.50	---	---	---	---	---	3.1	1.3	2.3	0.87	1.2
8	0.54	0.53	---	---	---	---	---	3.6	1.5	2.3	0.85	1.4
9	0.52	0.54	---	---	---	---	---	3.7	1.6	2.3	0.93	1.3
10	0.47	0.40	---	---	---	---	---	e4.0	1.9	2.1	0.86	1.6
11	0.64	e0.30	---	---	---	---	---	e3.9	2.0	2.1	0.78	4.0
12	0.53	e0.25	---	---	---	---	---	e4.2	2.0	2.0	0.79	5.7
13	0.54	e0.25	---	---	---	---	---	e2.6	2.0	2.0	0.94	0.20
14	0.52	---	---	---	---	---	---	1.5	2.0	2.1	0.83	0.14
15	0.52	---	---	---	---	---	---	1.5	1.9	2.0	0.74	0.14
16	0.53	---	---	---	---	---	---	1.6	2.2	1.8	0.68	0.51
17	0.60	---	---	---	---	---	---	1.7	2.2	1.7	0.65	0.78
18	0.53	---	---	---	---	---	---	1.7	2.2	2.6	0.67	0.63
19	0.54	---	---	---	---	---	---	1.7	2.2	2.3	0.61	0.62
20	0.49	---	---	---	---	---	---	2.0	2.3	2.0	0.65	0.93
21	0.49	---	---	---	---	---	---	2.0	2.2	1.9	0.65	0.79
22	0.58	---	---	---	---	---	---	2.0	2.2	1.7	0.66	0.33
23	0.58	---	---	---	---	---	---	2.0	2.3	1.7	0.61	e0.19
24	0.60	---	---	---	---	---	---	1.8	2.3	1.8	0.58	e0.00
25	0.53	---	---	---	---	---	---	1.7	2.0	2.1	0.62	e0.00
26	0.53	---	---	---	---	---	---	1.7	2.1	1.7	0.61	e0.29
27	0.59	---	---	---	---	---	---	2.1	2.3	1.5	0.64	e0.00
28	0.56	---	---	---	---	---	---	2.6	2.3	1.6	0.70	e0.00
29	0.59	---	---	---	---	---	---	2.6	2.3	1.6	0.68	e0.00
30	0.56	---	---	---	---	---	---	1.9	2.3	1.3	0.82	e0.00
31	0.53	---	---	---	---	---	---	1.6	---	1.1	0.83	---
TOTAL	16.99	5.65	---	---	---	---	---	61.3	60.3	61.4	23.94	27.64
MEAN	0.55	0.43	---	---	---	---	---	2.36	2.01	1.98	0.77	0.92
AC-FT	34	11	---	---	---	---	---	122	120	122	47	55
MAX	0.64	0.54	---	---	---	---	---	4.2	2.3	2.6	1.1	5.7
MIN	0.47	0.25	---	---	---	---	---	1.5	1.3	1.1	0.58	0.00

CAL YR	2012	TOTAL	172.83	MEAN	0.84	MAX	1.9	MIN	0.25	AC-FT	343 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	257.22	MEAN	1.34	MAX	5.7	MIN	0.00	AC-FT	510 (PARTIAL YEAR RECORD)

MAX DISCH: 20.1 CFS AT 01:15 ON SEP 12, 2013 GH 1.65 FT SHIFT -0.07 FT  
 MAX GH: 1.65 FT AT 01:15 ON SEP 12, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**WIND RIVER BYPASS  
WY2013 HYDROGRAPH**



PLATTE RIVER BASIN  
WIND RIVER NEAR ESTES PARK

Water Year 2013

Location.-- Lat. N40° 19' 37", Long. W105° 34' 52" (NAD83). Gage is located on the left side of a 4-foot Parshall flume located upstream of the Alva B. Adam's tunnel afterbay; 1,330 ft. west of the ADATUNCO gage shelter and 5 mi. SW of the Town of Estes Park Visitors Center.

Drainage Area and Period of Record.-- 4.35 sqmi (from the USGS's Colorado StreamStats utility). Daily values are available from May 17, 1950 to present. ;

Equipment.-- Sutron SDR-0001-4 shaft encoder connected to a satellite monitored Sutron SatLink2 data collection platform (DCP) in a 4-foot by 4-foot wooden shelter overtop a 36-inch corrugated metal pipe stilling well at a 4-foot steel Parshall flume. An electric tape gage (ETG) located on the instrument shelf is the primary reference and a supplemental staff gage is located at the flume's left Ha location. The gage is operated cooperatively between the United States Bureau of Reclamation (USBR) and the Colorado Division of Water Resources (CDWR) to determine east slope diversions in to the Colorado Big Thompson (C-BT) system from Wind River.

Hydrologic Conditions.-- Drainage area consisting of forested lands of varying topography within the boundaries of Rocky Mountain National Park. A small diversion is located upstream of the gage diverts approximately 300 Acre Feet (AF) of domestic water a year. The gage is used to compute the amount of native East Slope (Wind River) water diverted or "skimmed" into the Colorado-Big Thompson system at Adams Tunnel for power generation purposes during peak runoff periods of the summer when Wind River is in excess of 2 cubic feet per second (cfs). Skimmed water is determined from the difference of Wind River Above Adam's Tunnel (WINDESCO) and Wind River Below Adam's Tunnel (WINDBYPCO). Intentional skimming of Wind River water occurred from May 13 through July 8, 2013 and unintentional skimming occurred September 12 through 30, 2013 of this year diverting 1410 acre feet (AF) of east slope water into the C-BT system.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged DCP data and 5-minute logged SDR data as backup. Instrument calibration was supported by frequent visits by USBR and CDWR personnel. Four instrument corrections of ±0.01 ft. were made throughout the year and were applied to the record as defined by observations and corrections made to the gage. The record is complete and reliable except for the following periods: October 26, 27 and November 11, 12, 2012 when the stage-discharge relation was affected by ice; November 13, 2012 and May 10, 2013 which are partial day records corresponding to shutdown and startup days of the gage and September 12, 2013 when flood waters exceeded the capacity of the channel, overtopping the flume walls and breaching the channel banks upstream of the gage. This is a partial year record. The period of record for the 2013 water year is October 1 through November 13, 2012 and May 10 through September 30, 2013.

Datum Corrections.-- Levels were last run on October 24, 2011 using the average flume crest (R.M.0) as base. The inside gage was found to be reading within allowable tolerances. The supplemental staff gage was not shot.

Rating.-- The control is a 4-foot metal Parshall flume. A standard 4-foot Parshall flume rating (STD04FTPF) was continued in used for all of Water Year 2013. Two discharge measurements (Nos. 133-134) were made during the year at discharge rates of 3.89 and 5.30 cfs. The peak flow rate of 117 cfs occurred at 23:15 on September 12, 2013 as recorded at the ADATUNCO site when west slope diversions to the east slope were not occurring and Wind River was out of its banks at the gage location. All waters were flowing into the C-BT system at the Alva B. Adams Tunnel stream gage site.

Discharge.-- Shifting control method was used for all periods of record. Shifts were applied by time with consideration given to gage operation and flume cleaning events. Measurements made this year may indicate the possible presence of a permanent shift condition. All measurements were given full weight.

Special Computations.-- Discharges for October 26, 27 and November 11-13, 2012 when the gage was ice affected as well as May 10, 2013, partial day record, were estimated from adjacent record. At some point on September 12, 2013 the channel bank breached upstream of the WINDESCO flume. Around this time west slope deliveries to the east slope were discontinued. Following these events and up to September 30, 2013, when the USBR repaired the stream bank, all flows developed from the Wind River basin were recorded at the ADATUNCO gage. Discharges from September 12 through 30, 2013 were taken from the ADATUNCO gage.

The WINDESCO gage is used in the ADANETCO computation process to determine the amount of Wind River water that is "skimmed" into the C-BT system each year. This is done by subtracting the amount of water recorded at the WINDESCO from the amount of water recorded at the Wind River Below Adams Tunnel (WINBYPCO) gage. The difference is then subtracted from the Alva B. Adam's Tunnel at East Portal (ADATUNCO) record and is used to determine the ADANETCO (Alva B. Adam's Tunnel New (West Slope)) delivery during skimming periods. Differences in discharge values between the WINDESCO and WINBYPCO records occurring outside the "skim" period are presumed to be either in part or in aggregate, slight drainage accruing to the stream from the ADATUNCO gage basin, or slight daily rounding differences and transit time allowances.

Remarks.-- This is a partial year record. Period of record for Water Year 2013 is October 1 to November 13, 2012 and May 10 to September 30, 2013. The record is good, except for periods of ice affected record and partial day records, which are estimated and poor, and September 12, 2013 when flow determination at the ADATUNCO gage due to overtopping of the Wind River bank was muddled by the diversion of west slope waters, discharge is estimated and fair. September 13 through September 30 2013 there was no flow from the west slope, all flows through Adams Tunnel were from Wind River, this period is flagged as an estimate and rated good. The station was closed for winter for the period; November 14, 2012 through May 9, 2013, no record was maintained. Station maintained by USBR and CDWR staff. Record developed by Russell V. Stroud.

Recommendations.--

More discharge measurements should be made as flows permit. Levels should be run again following the 2013 flood event and the ETG tape should be replaced at that time as it has several splices in its medial section.



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

WIND RIVER NEAR ESTES PARK

RATING TABLE-- STD04FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

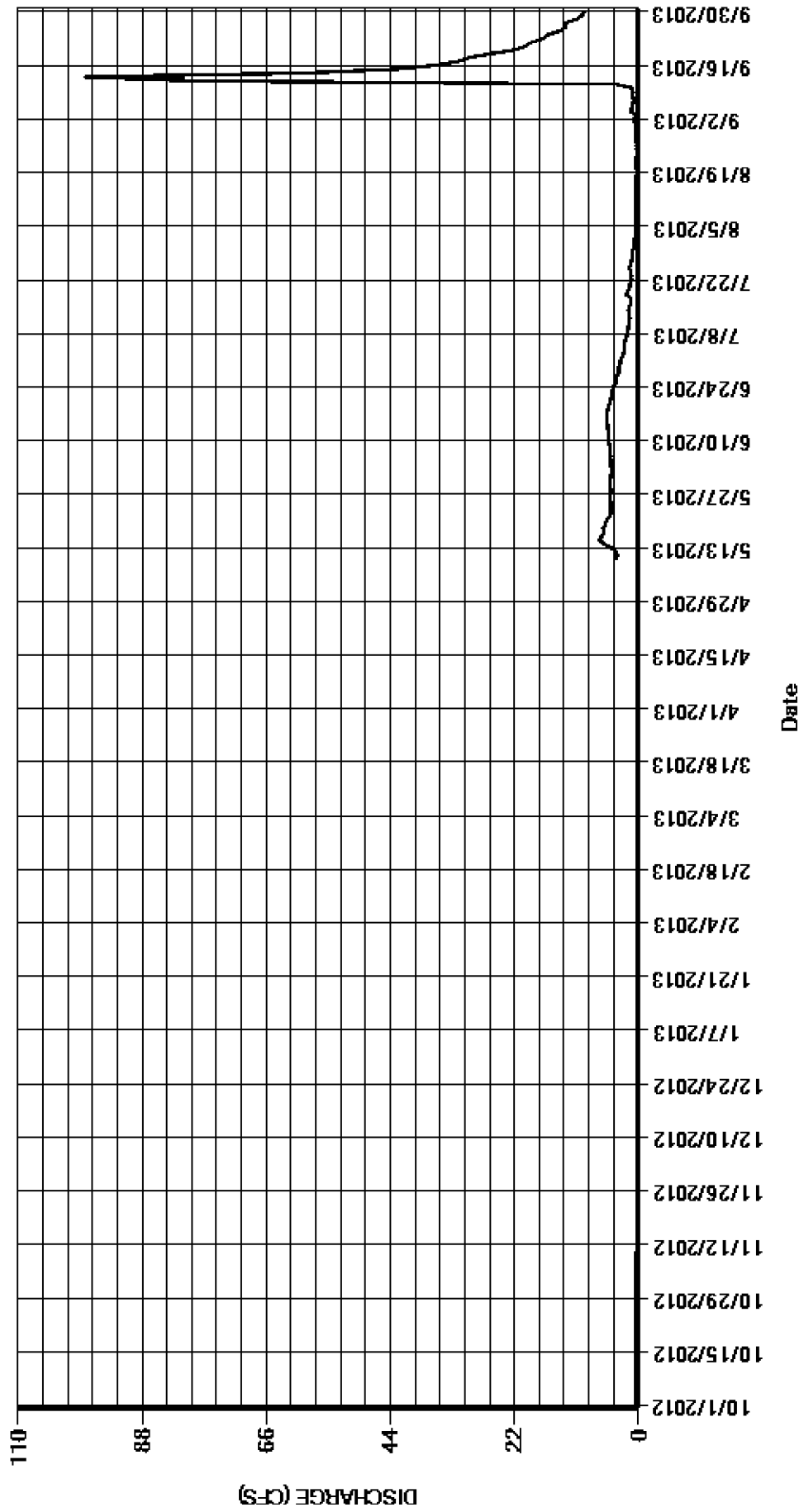
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.43	0.40	---	---	---	---	---	---	4.9	3.2	0.79	0.66
2	0.43	0.41	---	---	---	---	---	---	4.8	2.9	0.63	0.69
3	0.37	0.39	---	---	---	---	---	---	4.9	2.6	0.61	0.57
4	0.45	0.39	---	---	---	---	---	---	4.9	2.6	0.62	1.4
5	0.45	0.40	---	---	---	---	---	---	5.0	2.5	0.63	1.2
6	0.48	0.39	---	---	---	---	---	---	5.0	2.4	0.63	1.0
7	0.43	0.43	---	---	---	---	---	---	5.1	2.2	0.58	0.91
8	0.46	0.45	---	---	---	---	---	---	5.1	2.0	0.56	1.1
9	0.46	0.46	---	---	---	---	---	---	5.2	1.9	0.63	1.0
10	0.42	0.37	---	---	---	---	---	e4.0	5.3	1.8	0.57	1.3
11	0.63	e0.30	---	---	---	---	---	3.7	5.4	1.7	0.51	3.8
12	0.53	e0.25	---	---	---	---	---	4.1	5.4	1.6	0.51	e79
13	0.53	e0.25	---	---	---	---	---	5.0	5.5	1.7	0.64	e98
14	0.52	---	---	---	---	---	---	6.2	5.5	1.8	0.54	e59
15	0.53	---	---	---	---	---	---	6.9	5.6	1.6	0.48	e43
16	0.54	---	---	---	---	---	---	6.6	5.6	1.4	0.42	e36
17	0.63	---	---	---	---	---	---	6.2	5.6	1.4	0.40	e32
18	0.43	---	---	---	---	---	---	6.3	5.5	2.2	0.42	e30
19	0.42	---	---	---	---	---	---	5.9	5.3	2.0	0.36	e26
20	0.40	---	---	---	---	---	---	5.7	5.1	1.6	0.40	e22
21	0.40	---	---	---	---	---	---	5.2	4.9	1.5	0.40	e20
22	0.44	---	---	---	---	---	---	4.9	4.8	1.3	0.42	e19
23	0.42	---	---	---	---	---	---	4.9	4.6	1.3	0.39	e17
24	0.45	---	---	---	---	---	---	4.9	4.4	1.4	0.35	e16
25	0.41	---	---	---	---	---	---	4.9	4.1	1.7	0.39	e14
26	e0.40	---	---	---	---	---	---	5.1	3.9	1.4	0.38	e13
27	e0.40	---	---	---	---	---	---	5.0	3.8	1.2	0.42	e13
28	0.44	---	---	---	---	---	---	4.9	3.5	1.2	0.46	e11
29	0.45	---	---	---	---	---	---	5.1	3.6	1.2	0.47	e10
30	0.43	---	---	---	---	---	---	5.1	3.3	0.96	0.63	e9.6
31	0.41	---	---	---	---	---	---	5.0	---	0.80	0.63	---
TOTAL	14.19	4.89	---	---	---	---	---	115.6	145.6	55.06	15.87	581.23
MEAN	0.46	0.38	---	---	---	---	---	5.25	4.85	1.78	0.51	19.4
AC-FT	28	9.7	---	---	---	---	---	229	289	109	31	1150
MAX	0.63	0.46	---	---	---	---	---	6.9	5.6	3.2	0.79	98
MIN	0.37	0.25	---	---	---	---	---	3.7	3.3	0.80	0.35	0.57

CAL YR	2012	TOTAL	169.27	MEAN	0.83	MAX	1.9	MIN	0.25	AC-FT	336 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	932.44	MEAN	4.96	MAX	98	MIN	0.25	AC-FT	1850 (PARTIAL YEAR RECORD)

MAX DISCH: 117 CFS AT 23:15 ON SEP 12, 2013 (RECORDED AT ADATUNCO)  
 MAX GH: 3.07 FT AT 04:30 ON SEP 13, 2013 (OUT OF BANK)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**WIND RIVER NEAR ESTES PARK  
WY2013 HYDROGRAPH**



PLATTE RIVER BASIN  
06733000 BIG THOMPSON RIVER ABOVE LAKE ESTES

Water Year 2013

Location.--	Lat. N.40°22'42", Long. W. 105°30'50" (NAD 83), Larimer County Hydrologic Unit 10190006. Gage is located on the right bank 630 ft. downstream from the Hwy 36 bridge and 2,400 ft. upstream from Lake Estes, adjacent to the Estes Park Visitor's Center. Gage is also know as Big Thompson River at Estes Park, CO
Drainage Area and Period of Record.--	137 mi <sup>2</sup> (USGS Colorado StreamStats utility).; Daily values are available from October 1, 1946 to present.
Equipment.--	Digital incremental Sutron SDR-0001-4 shaft encoder, tipping bucket rain gage and temperature sensor connected to a Sutron SatLink2 Data Collection Platform (DCP) in a four ft. by four ft. concrete shelter and stilling well at a 15-ft. Parshall flume with ogee crested overflow bays flanking the flume. The well is attached to the channel via one two-inch and three three-inch valved inlets. One inlet connects the well to the flume at its Ha location with the other three inlets connect the channel to the well at the shelter location. The primary reference is an electric tape gage located in the shelter with two supplemental outside staff gages; one at the Ha location of the flume and the other located on the stream-ward side of the shelter. The second staff is utilized when the upstream inlets are active. The gage is maintained in cooperation of the United States Bureau of Reclamation and the Colorado Division of Water Resources.
Hydrologic Conditions.--	Drainage area mainly comprised of forested lands of varying topography within Rocky Mountain National Park and the bulk of Estes Park, CO. There are no storage projects or diversions of significant magnitude upstream of this site. The gage is susceptible to rapid increases in stage due to storm runoff events from hardened surfaces. Spring runoff displays strong diurnal characteristics associated with snowmelt, peaking early in the morning. On May 18, 2011 the flash boards over top the ogee crest overflow bays were removed to increase channel conveyance. The gage was switched to the upstream configuration on that date.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data as well as 5-minute logged SDR data as backup. The record is complete and reliable except for: November 11 - 13, 2012 when the stage-discharge relation was affect by ice; November 14, 2012 - April 4, 2013 when the gage was off for winter and April 5, 2013 which is a partial day record when the gage was turned on for the season. Missing stage values occurring on October 1 ,2012 were interpolated from adjacent record with no loss of accuracy. Instrument calibration was maintained by frequent visits made to the gage by USBR and DWR staff. Two instrument corrections of +0.01 and -0.01 ft. were made this year and were applied to the record as defined by observations made to the gage.
Datum Corrections.--	Levels were last run on October 20, 2010 to the ETG and Ha staff gage using the average flume crest (BM0) elevation of 0.00 feet as base. The tape length was increased 0.014 ft. at the time levels were run. The Ha staff gage was found at an elevation of 0.008 feet with respect to the average crest elevation. No adjustment could be made due to the anchoring method utilized.
Rating.--	The control is a 15-ft. Parshall flume with ogee crest overflow bays flanking the flume. Rating 10 (BTABESCO10), developed in the 2011 Water Year, was continued this year. It was developed following removal of the flashboards from the overflow bays on May 18, 2011 and stilling well inlet reorientation from the Ha inlet location to the upstream weir pool location. The rating was developed using a Std. 15 Parshall flume rating from 0.00 ft to approximately 2.43 ft. with a theoretical water surface drawdown curve from the stilling well to the Ha location in the flume; and a theoretical average weir flow for gage heights above 2.43 ft (using the Francis weir equation and the WES short crested weir equation) and Msmts. Nos. 640-647 made during Water Year 2011, ranging from 2.35 to 4.49 ft. of stage and 171 to 933 cfs, respectively.  Fifteen discharge measurements (Nos. 671-685) were made this year ranging from 15.2 to 760 cfs covering the range in stage experienced this year well with exception of the the September flood event. The peak discharge of 2,980 cfs occurred at 05:30 on September 13, 2013 at a gage-height of 7.76 ft. following several days of continuous heavy rain. The peak event exceeded this year's high Msmt. (No. 679) by 2,220 cfs and 3.65 ft. of stage respectively. This peak event exceeds 200% of all Msmts. made on control in the current configuration. It also nearly exceeds 200% of the high Msmt. of record (No. 627, 1,540 cfs) made in the 2010 water year. Evidence available following the event indicates that all flow was contained in the confines of the channel, no overbank flow at the streamgage location.
Discharge.--	Shifting control method was used for all periods of open water. Stage dependant shifting was applied for all periods of record. Shift table BTABESCOVST12-A, defined by measurement Nos. 657-671 made during the period of use, was applied from March 26, 2012 - to winterization of the gage on November 13, 2012. BTABESCOVST13-A, defined by measurement Nos. 672-677 made during the period of use, was applied from April 5 - May 22, 2013. BTABESCOVST13-A was prorated by time to BTABESCOVST13-B as defined by measurement Nos. 677 and 678. BTABESCOVST13-B, defined by measurement Nos. 678-685 made during the period of use, was applied from June 6 to the peak of the September flood event, (September 13, 2013 at 05:30). BTABESCOVST13-C, Defined by the peak of the flood event and measurement No. 686, was applied from the peak event to measurement 686.  Open water measurements made this year showed unadjusted shifts varying between -0.05 and +0.10 ft. All were given full weight except for Nos. 671, 674, 681, 683 and 685 which were discounted up to ±6% to smooth stage-shift distributions.
Special Computations.--	Discharge for periods of ice affect, winter operation and partial day records were taken from USBR computed inflow values with consideration to adjacent good record and temperature trends recorded at the streamgage facility. The USBR computes the native inflow to Lake Estes based on gaged outflows (BTBLESOCO and OLYTUNCO) correlating the net outflow to reservoir elevation changes at Lake Estes. The computed flow is the summation of all sources of unaccounted-for water into Lake Estes, including other ungaged tributaries and local runoff. Note: The USBR requested that no winter measurements be performed in the flume due to concerns of damaging the newly placed concrete. As such, no measurements were made during ice conditions.

Remarks.--

The record is good, except for period of ice affect, winter operation and partial day record which are estimated and fair. September 12 and 13, 2013 are rated as fair due to lack of confirmatory measurements in this portion of the theoretical determined and extrapolated rating. Station maintained by USBR and DWR staff. Record developed by Russell V. Stroud.

Recommendations.--

Following the September 2013 flood event, a lot of sediment has been and continues to be deposited in the gage pool. Care needs to be taken to ensure communication between the channel and the stilling well and efforts need to be taken to continue to remove accumulated sediment out of the approach basin. The new rating needs to be verified throughout the full range of flow.

STATE OF COLORADO  
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 OFFICE OF STATE ENGINEER

06733000 BIG THOMPSON RIVER ABOVE LAKE ESTES

RATING TABLE-- BTABESCO10 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

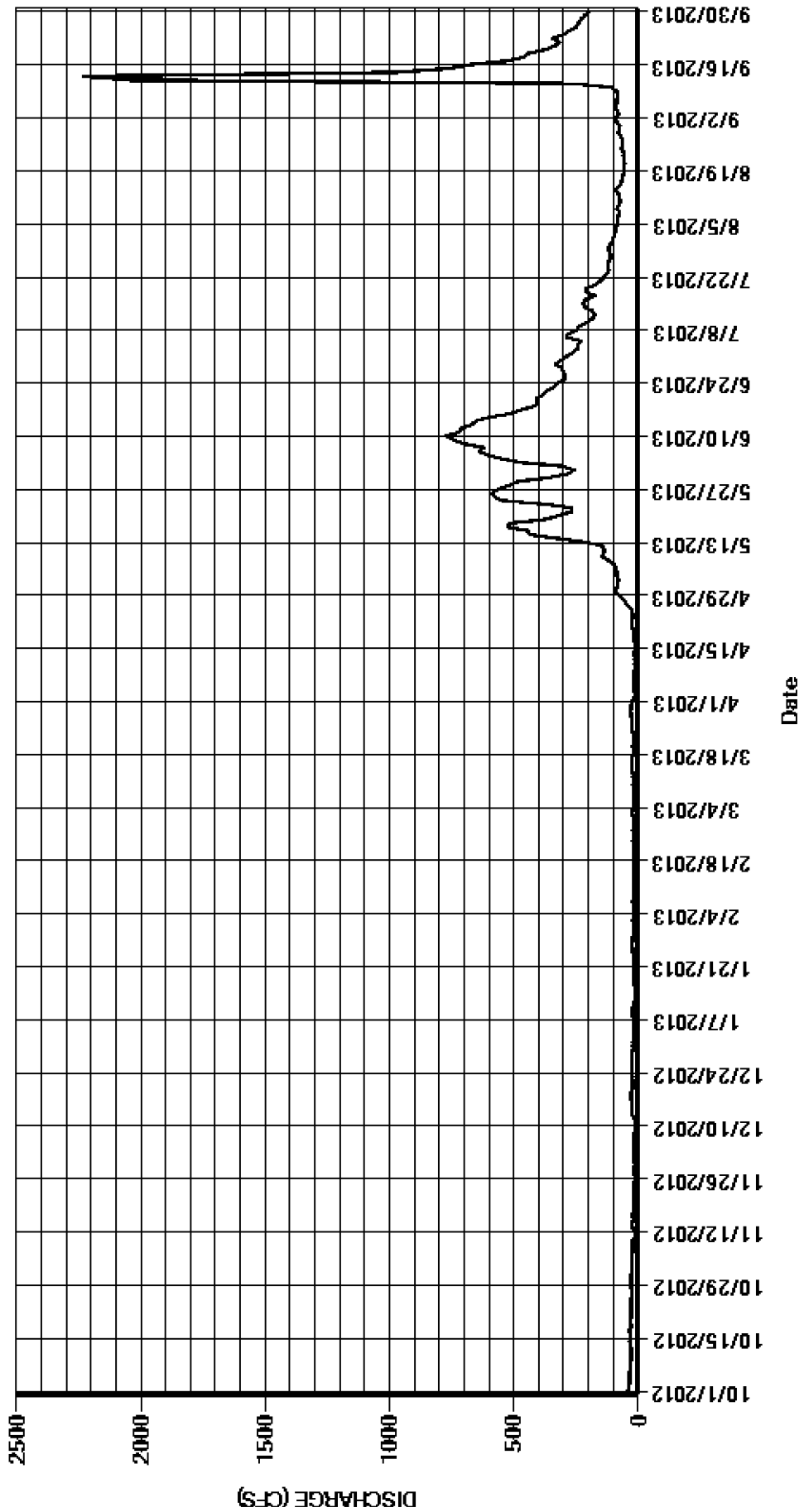
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	42	28	e19	e21	e20	e19	e25	85	259	289	102	87
2	39	27	e16	e20	e22	e24	e18	83	304	263	95	90
3	36	25	e15	e19	e21	e24	e12	79	467	246	92	77
4	35	25	e18	e20	e21	e15	e18	86	546	243	89	86
5	36	24	e20	e20	e19	e18	e16	86	606	230	85	94
6	35	24	e19	e18	e20	e18	17	90	641	289	82	86
7	31	23	e18	e17	e22	e20	16	96	621	284	80	86
8	31	23	e16	e23	e21	e21	16	115	702	246	75	83
9	30	22	e12	e22	e20	e20	17	145	742	240	85	87
10	29	23	e10	e22	e18	e22	14	140	774	208	79	109
11	28	e8.0	e12	e20	e18	e17	15	136	721	184	73	257
12	28	e10	e17	e15	e18	e21	15	147	711	176	77	2040
13	32	e23	e26	e12	e18	e21	15	207	670	185	81	2230
14	34	e25	e27	e10	e18	e27	17	322	652	216	91	980
15	33	e21	e26	e12	e18	e26	13	434	601	224	75	764
16	33	e22	e25	e16	e17	e25	14	443	511	212	68	677
17	37	e22	e29	e19	e17	e26	17	525	469	171	64	530
18	27	e20	e28	e20	e18	e20	16	519	415	208	60	459
19	32	e21	e28	e19	e16	e19	16	373	407	209	58	441
20	30	e20	e22	e21	e19	e22	22	321	408	170	57	370
21	29	e20	e22	e21	e19	e21	26	269	381	153	56	333
22	29	e19	e23	e21	e20	e18	27	268	367	136	57	317
23	28	e18	e24	e21	e22	e21	23	377	338	124	60	346
24	28	e18	e26	e21	e20	e22	23	547	325	119	59	301
25	30	e17	e26	e22	e17	e26	25	576	295	122	68	276
26	27	e14	e25	e24	e21	e25	38	586	294	120	65	250
27	27	e15	e25	e24	e16	e25	51	564	301	112	65	241
28	28	e19	e26	e23	e17	e29	62	518	308	113	69	231
29	29	e17	e26	e22	---	e30	76	486	334	118	80	215
30	29	e14	e21	e20	---	e30	93	362	312	118	78	198
31	28	---	e22	e19	---	e29	---	283	---	109	74	---
TOTAL	970	607.0	669	604	533	701	773	9268	14482	5837	2299	12341
MEAN	31.3	20.2	21.6	19.5	19.0	22.6	25.8	299	483	188	74.2	411
AC-FT	1920	1200	1330	1200	1060	1390	1530	18380	28730	11580	4560	24480
MAX	42	28	29	24	22	30	93	586	774	289	102	2230
MIN	27	8.0	10	10	16	15	12	79	259	109	56	77

CAL YR	2012	TOTAL	25710.0	MEAN	70.2	MAX	348	MIN	8.0	AC-FT	51000
WTR YR	2013	TOTAL	49084.0	MEAN	134	MAX	2230	MIN	8.0	AC-FT	97360

MAX DISCH: 2980 CFS AT 05:30 ON SEP 13, 2013 GH 7.76 FT SHIFT 0.00 FT  
 MAX GH: 7.76 FT AT 05:30 ON SEP 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06733000 BIG THOMPSON RIVER ABOVE LAKE ESTES  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06735500 BIG THOMPSON RIVER BELOW LAKE ESTES  
Water Year 2013

Location.-- Lat. N40° 22' 34.58"; Long. W105° 29' 7.80" (NAD83). Gage is located on the right side of a 15-ft. Parshall Flume with overflow bays flanking the flume, 620 ft. below Olympus Dam or 1.5 miles east of the Town of Estes Park Visitors Center.

Drainage Area and Period of Record.-- 155 sq mi. (USGS Colorado StreamStats utility). ; Daily values are available from July 1, 1930 to present.

Equipment.-- Digital incremental Sutron SDR-0001-4 shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) transmitting hourly in a 4-ft by 4-ft. concrete shelter and stilling well at a 15-ft. Parshall Flume with overflow bays flanking the flume. The primary reference is an electric tape gage (ETG) in the shelter. There is currently no Ha staff. The well is attached to the flume via one valved inlet; and to the channel upstream of the flume and overflow bays via three valved inlets. When in overflow conditions the flume's inlet can be closed and the channel inlets opened. A supplementary (Non-Ha) staff gage, located above the flume, can be used during these periods. Stage readings will be higher than in the flume and would require a separate rating. The channel inlets have not been operated for record purposes since the early 1950's, before the installation of the overflow flash boards. Gage is operated cooperatively between the United States Bureau of Reclamation (USBR) and the Colorado Division of Water Resources (CDWR).

Hydrologic Conditions.-- Controlled release from Olympus Dam. Channel is has a slight curve to the left from the base of the dam to the flume location. Approach conditions are generally good but with occasionally require cleaning of accumulated materials upstream of the flume.

Gage-Height Record.-- The primary record is 15-minute telemetered satellite data with 15-minute logged DCP and 5-minute logged SDR data as backup. The record is complete except for: September 28 – October 1, 2012 when the instrument's float was set in reverse orientation following reinstallation of the instrument; October 2, 2012, when USBR staff removed the float from the instrument for calibration of the instrumentation and October 6-7 and 9-10, 2011 when the instrument suffered hardware failures and recorded erroneous data. Gage-height record for reversal period was developed using a spreadsheet which used the base stage set value and added or subtracted subsequent recorded values accordingly. Gage-heights for the float removal and hardware failure periods were interpolated from adjacent record. One bad valued recorded on April 22, 2013 was interpolated from adjacent record without loss of resolution.

Instrument calibration was maintained by frequent visits to the gage by CDWR and USBR staff. Three instrument corrections of 0.01 ft. were made during the year. Gage-height corrections were applied to the record as defined by observations made to the gage and corrections made to the instrument.

Datum Corrections.-- Levels were last run on February 27, 2008 using R.M.3 as base. The base reference was found to be 0.01 low. The correction was made at the time levels were run.

Rating.-- The control is a 15-foot Parshall flume with overflow bays flanking the flume. Rating BTBLESCO10, in used since October 1, 1997, was continued in use for all of Water Year 2013. The rating is a standard 15-foot Parshall flume rating from 0.00 to 5.00 ft. of stage and custom above this point to account for water flowing over the overflow bays flanking the flume. A site visit on July 6, 2011 identified 5.32 ft. (as indicated on the Ha inlet operation) as being the exact stage at which the overflow bays become active. Because of the rarity of the overflow bays being active, this portion of the rating is poorly defined. The rating has been confirmed by measurements from 6.8 to 1000 cfs. Fourteen discharge measurements (Nos. 242 - 255) were made this year ranging in discharge from 16.1 to 1100 cfs, covering the range in stage experienced this year well with exception to September 12 -13, 2013 when emergency releases were made from Olympus Dam, overtopping the channel banks and the control structure itself.

Discharge.-- Shifting control method was used all year. Shifts are principally caused by vegetal growth in the flume. Shifts this year were applied as follows: September 17, 2012 – August 23, 2013, by time as defined by measurements with some consideration given to change in stage as well as cleaning corrections of the flume; August 23 – September 12, 2013, stage dependant shifting using variable shift table BTBLESCOVST13-A, defined by measurement No. 254, made this water year, Nos. 210, 219 made in the 2010 and 2011 water years' respectively and the July 6, 2011 gage-height observation indicating the stage at which the overflow bays become active; September 13 – 16, 2013 by time with consideration given to change in stage and September 16 - October 8, 2013 by time as defined by measurements. Open water measurements made this year showed unadjusted shifts varying between -0.10 and +0.46 ft. All were given full weight except for No. 248 which was discounted 2.84% to smooth the shift distribution.

Special Computations.-- A spreadsheet was used to develop the gage-height record from September 28 to October 1, 2012 when the instrument's float was placed in the reverse orientation. Gage-heights and discharges for the periods of instrument hardware failure were interpolated from adjacent data, observations made to the gage and hydrologic trends.

Remarks.-- The record is good except for: October 2, 6-7 and 9-10, 2012 which is estimated and fair; September 12 - 13, 2013 which could not be computed because water was outside the confines of the channel and September 14 - October 8, 2013 which is poor due to rapidly changing channel conditions. Station maintained and record developed by Russell V. Stroud.

Recommendations.--

Levels must be run in the 2014 Water Year. Fabrication of the necessary brackets and fasteners to properly and securely mount the Ha staff should be undertaken prior to running of levels. Measurements need to be made through the full range of stage to track stability of the channel as well as performance of the flume following the flood event.



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06735500 BIG THOMPSON RIVER BELOW LAKE ESTES

RATING TABLE-- BTBLESCO10 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

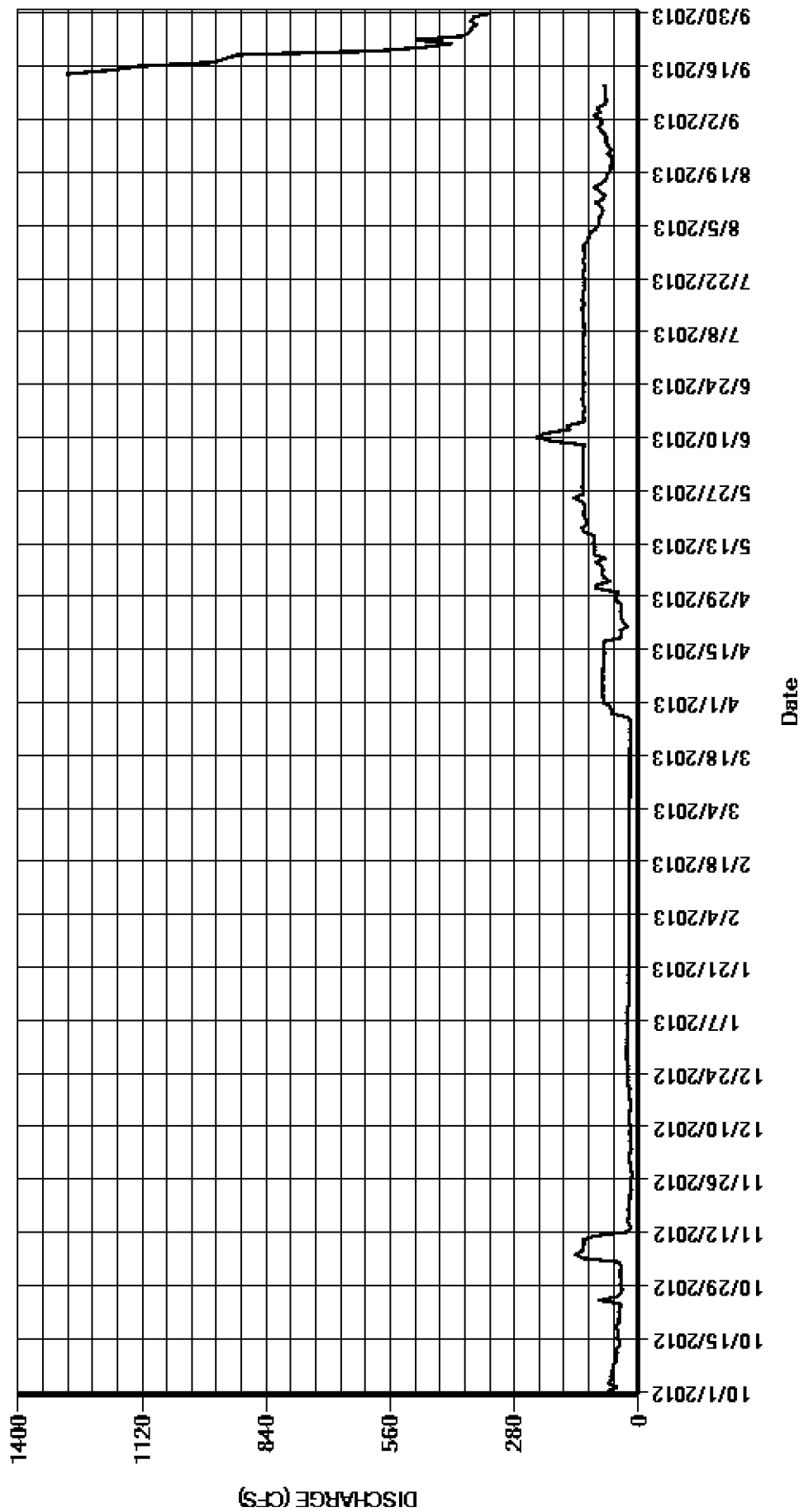
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	69	41	21	26	21	22	79	95	126	124	115	83
2	e50	41	22	26	21	22	80	96	126	126	112	86
3	69	40	19	26	21	22	81	65	125	126	110	101
4	62	43	17	26	21	21	81	78	126	124	97	87
5	62	122	18	26	21	21	80	83	126	125	90	94
6	e60	143	19	26	21	21	82	80	126	125	90	76
7	e58	128	18	25	21	20	80	84	125	124	89	73
8	57	125	20	26	21	20	81	97	123	123	82	75
9	e50	123	19	26	21	20	81	75	196	123	81	75
10	e50	125	19	25	21	20	80	101	230	124	85	76
11	49	99	21	22	21	20	79	99	212	125	97	77
12	52	27	21	22	21	20	79	99	156	125	80	---
13	42	18	21	22	22	20	79	102	161	126	76	---
14	43	21	20	22	22	20	77	100	124	128	89	1290
15	49	25	18	22	22	20	78	101	123	122	100	1190
16	47	22	18	22	22	20	79	124	126	127	85	1130
17	47	21	20	23	22	20	78	128	123	126	74	962
18	51	23	21	22	22	20	41	118	123	126	72	932
19	44	21	21	23	21	20	39	118	125	123	66	905
20	45	21	19	22	21	19	41	123	127	123	63	590
21	43	20	25	22	21	19	26	124	125	123	62	482
22	44	19	24	22	21	19	33	122	124	123	59	422
23	42	17	24	22	22	19	38	122	125	125	60	502
24	41	18	24	22	21	19	39	127	123	124	70	398
25	89	17	24	22	22	19	41	145	125	122	62	382
26	48	17	24	22	22	19	39	125	125	124	69	377
27	41	14	26	21	22	19	41	125	123	124	75	367
28	37	17	27	21	22	26	53	127	125	122	72	379
29	41	18	27	21	---	61	50	126	125	123	77	372
30	40	19	27	21	---	61	46	125	126	124	85	334
31	41	---	27	21	---	66	---	126	---	123	91	---
TOTAL	1563	1405	671	717	599	755	1881	3360	4075	3852	2535	11917
MEAN	50.4	46.8	21.6	23.1	21.4	24.4	62.7	108	136	124	81.8	426
AC-FT	3100	2790	1330	1420	1190	1500	3730	6660	8080	7640	5030	23640
MAX	89	143	27	26	22	66	82	145	230	128	115	1290
MIN	37	14	17	21	21	19	26	65	123	122	59	73

CAL YR	2012	TOTAL	27641	MEAN	75.5	MAX	447	MIN	14	AC-FT	54830 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	33330	MEAN	91.8	MAX	1290	MIN	14	AC-FT	66110 (PARTIAL YEAR RECORD)

MAX DISCH: (NOT DETERMINED)  
 MAX GH: 9.05 FT AT 23:45 ON SEP 12, 2013 (OVERBANK)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06735500 BIG THOMPSON RIVER BELOW LAKE ESTES  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06734900 OLYMPUS TUNNEL (ESTES FOOTHILLS CANAL)

Water Year 2013

Location.-- Lat. N40° 22' 25.82", Long. W105° 28' 25.64" (NAD83). Gage is located on the right side of a tunnel at a covered rectangular concrete section 0.75 mi east of Olympus Dam or 2.20 mi east of the Town of Estes Park Visitors Center.

Drainage Area and Period of Record.-- Controlled release from Olympus Dam. Olympus Tunnel, a component of the Colorado-Big Thompson system conveys water from Olympus Dam (Lake Estes) to Pinewood Reservoir for subsequent diversion to other C-BT facilities. ; Daily values are available from the DWR from: April 1, 1953 to September 30, 1969; and October 1, 1979 to present.

Equipment.-- Digital incremental Sutron SDR-0001-4 shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly in a 4-ft. by 4-ft. concrete shelter and stilling well at a rectangular concrete canal section. An electric tape gage on the instrument bench serves as the primary reference with a supplemental staff gage located on the left wall at the canal's hatch opening. The gage is operated cooperatively between the United States Bureau of Reclamation (USBR) and the Colorado Division of Water Resources (CDWR).

A SonTek IQ Acoustic Doppler Velocity Meter (ADVM) was placed in the center of the canal approximately 20-feet upstream from the shelter on November 6, 2012.

Hydrologic Conditions.-- Controlled release from Olympus Dam. Upstream of the measurement location the tunnel is a circular concrete conduit at a lower elevation than the rectangular section. From here the canal transitions to a rectangular concrete section for approximately 100 ft. before returning to a circular concrete conduit and changing slope again. Because of these transitions and the absence of stilling areas in this reach, the channel does not present a typical velocity distribution. Starting last year, the 5-point measurement technique (Rantz et al, 1983) has been employed. The 5-point measurement technique tends to return lower calculated discharges than the 3-point and 2-point measurement techniques and tend to agree closer to USBR mass balance figures and generation figures taken from the Pole Hill power generation facility.

Gage-Height Record.-- The primary record is 15-minute logged DCP data with 5-minute logged SDR data as backup. The record is complete and reliable except for several hours on May 17 and again on June 10, 2013 when the instrument's tape got hung-up on the pulley during gate changes. The float tape was replaced on June 10, 2013 to correct this issue. No further instances have occurred. Instrument calibration was maintained by 50 logged visits to the gage by USBR and CDWR staff. Five instrument corrections, aside from corrections associated with the above events, were made this year ranging from -0.07 to +0.01 ft. All but one were applied to the record as defined by observations made to the gage and corrections made to the instrument.

Datum Corrections.-- Levels were run to the ETI on October 10, 2012 using BM1 as base. The ETI was found to be reading 0.009 ft. low and the staff gage was found to be 0.017 ft. high. No correction was made to the ETI as it was within allowable tolerances and no correction was possible to the staff gage as the Bureau was moving a full tunnel at the time of levels. RM 2, the top of the north most bolt on the hatch cover bracket, was also established on this date.

Rating.-- The control is a rectangular concrete canal section. Rating No. 7 in use since October 2005 was continued again this year. Rating No. 7 was created using Rating No. 6 (defined by measurements) up to about 4.30 feet of stage and 272 cfs. Above this point Rating No. 7 is not based on measurements, but instead is based on USBR estimates of flow released into Olympus Tunnel. These estimates assumed that the Adams Tunnel rating was computing discharge correctly. However since 2011, shifts have been applied to the Adams Tunnel structure refuting this assumption. Rating No. 7 still remains a temporary solution until more resolution of noted discrepancies can be fully documented. Olympus Tunnel does not present a typical velocity distribution, and as such conventional measurement techniques will mismeasure this structure. On March 27, 2008 a SonTek SW ADVM was installed in the center section of Olympus Tunnel approximately 20-feet upstream from the gage shelter. This ADVM was found inadequate in collection of velocities. A SonTek IQ ADVM was placed on November 16, 2012 and a indexed velocity rating is currently being developed and evaluated. Six discharge measurements (Nos. 478-483) were made this year ranging in discharge from 47.3 to 559 cfs covering most of the operational range of this structure. Measurements made this year and two observations of no flow cover the range in stage experienced this year well. The peak discharge of 606 cfs occurred at 08:30 on October 4, 2012 at a gage-height of 8.50 ft. with a shift of +0.18 ft. exceeding this year's high flow measurement (No. 483) made September 9, 2013 by 47 cfs and 0.66 ft. of stage respectively.

Discharge.-- Shifts are principally caused by ambiguity in the rating. From October 28, 2011 through October 3, 2012 stage dependent shifting using variable shift table OLYTUNCOVS\_12-A was used. OLYTUNCOVS\_12-A is defined by twelve measurements (Nos. 468 - 479) made during and adjacent to the period of application. From October 3, 2012 through November 7, 2013 stage dependent shifting using variable shift table OLYTUNCOVST13-A was used. It is defined by seven measurements (Nos. 478-484) made during the period of application. All measurements were given full weight except for Nos. 478, 480 and 482 which were discounted -0.37%, 0.36% and 1.26% respectively to smooth the stage-shift relation.

Special Computations.-- Zero flow is determined operationally. Residual gage-heights of 0.24 ft. and below were recorded with accompanying observations of no flow this year. Zero flow was determined to occur on part of the day of the whole day on the following days: November 5 - December 12, 2012; August 12 - September 3 and September 13 - November 4, 2013.

Discharge for the days when the instrument's float tape got hung-up on the pulley were estimated on a basis of USBR water orders, adjacent gage-height record and observations made to the gage upon correction of the tape stick issue.

Remarks.--

The record is good except for May 17 and June 10, 2013 which are rated as poor and fair respectively. Gage maintained and record developed by Russell V. Stroud.

Recommendations.--

Levels should be run again in the 2014 water year to verify findings of the most recent levels. Although within allowable tolerances; if the base reference is found to be out of calibration again in the same direction and magnitude it should be corrected. Discharge measurements should be crosschecked with power generation figures. This method could also be used to better refine a future stage-discharge relationship or a velocity-indexed rating. A brief inspection of the OLYTUNCO05 rating showed better agreement with measurements made this year than rating Nos. 6 and 7. Rating No. 5's history and application should be further investigated. Reinstatement or refining of this rating may be applicable. Five point current meter measurements need to be continued and made at targeted stages for development of a velocity indexed rating. Every effort should be made to perform these measurements and develop the rating in an expeditious manner, requiring close coordination with USBR Water Scheduling staff.

STATE OF COLORADO  
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06734900 OLYMPUS TUNNEL (ESTES FOOTHILLS CANAL)

RATING TABLE-- OLYTUNCO07 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

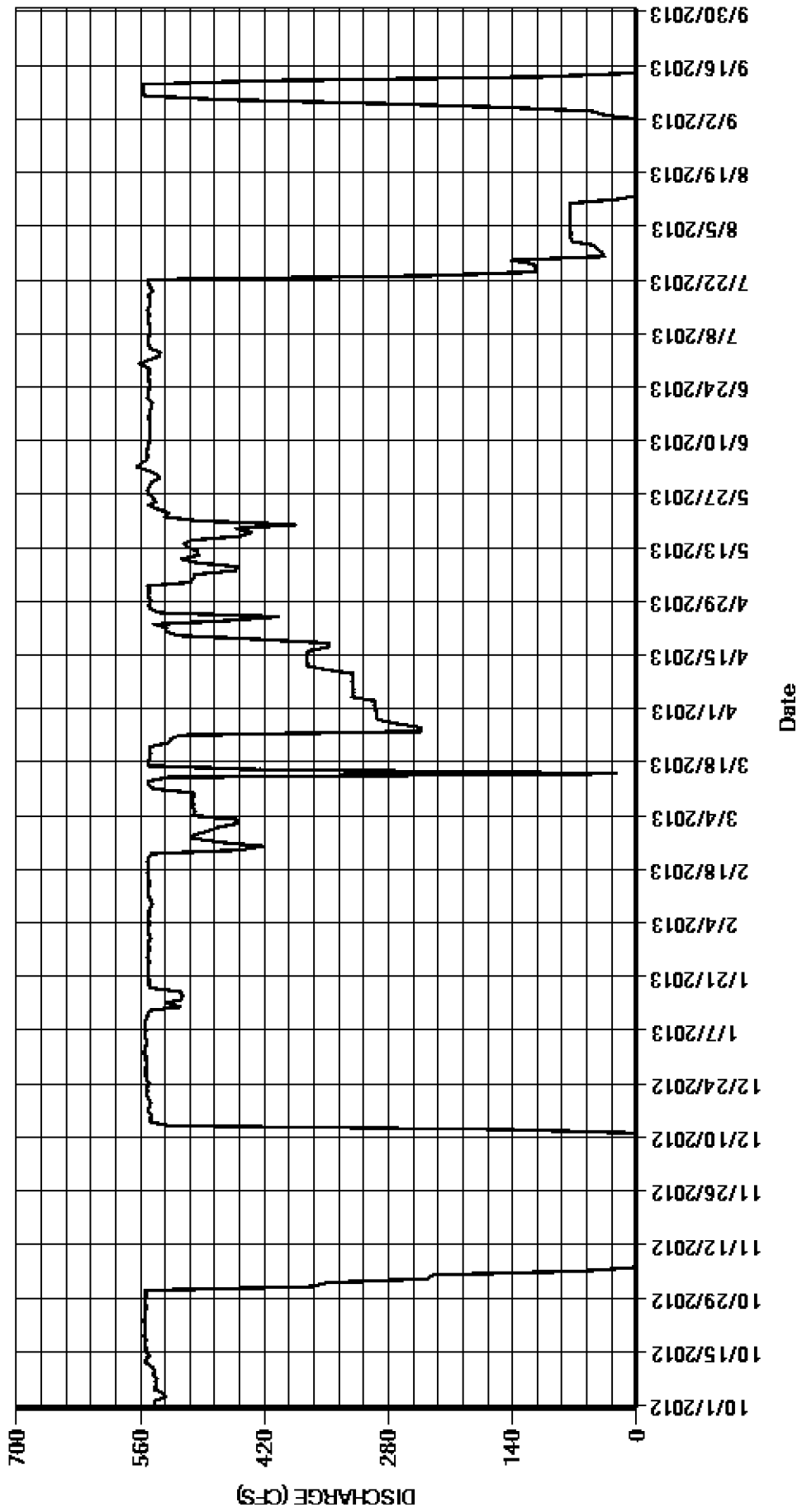
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	544	366	0.00	556	551	473	295	551	541	551	73	0.00
2	545	350	0.00	555	551	449	296	550	551	539	75	0.00
3	532	236	0.00	554	551	452	296	552	564	538	74	36
4	534	230	0.00	553	550	501	321	504	559	549	75	50
5	544	62	0.00	555	552	499	320	500	553	551	75	149
6	543	0.00	0.00	555	550	501	320	499	552	551	75	293
7	543	0.00	0.00	554	551	500	321	453	553	551	75	470
8	542	0.00	0.00	555	549	502	321	450	552	550	75	556
9	546	0.00	0.00	555	547	500	320	496	551	550	75	558
10	544	0.00	0.00	553	549	500	320	514	e550	550	75	557
11	547	0.00	0.00	552	551	545	348	495	550	551	75	557
12	554	0.00	152	550	551	551	371	496	550	551	22	425
13	554	0.00	527	516	551	551	372	506	550	550	0.00	111
14	550	0.00	549	532	550	529	372	511	550	552	0.00	0.00
15	554	0.00	549	514	551	24	372	503	550	550	0.00	0.00
16	554	0.00	548	513	551	425	371	448	551	550	0.00	0.00
17	555	0.00	552	515	552	551	348	e435	550	550	0.00	0.00
18	554	0.00	550	549	552	551	348	452	549	551	0.00	0.00
19	556	0.00	549	551	551	550	426	386	548	546	0.00	0.00
20	555	0.00	551	550	552	549	519	496	547	549	0.00	0.00
21	555	0.00	553	552	551	550	531	533	552	551	0.00	0.00
22	555	0.00	552	551	548	550	531	528	551	551	0.00	0.00
23	556	0.00	553	551	446	529	545	540	551	240	0.00	0.00
24	555	0.00	550	551	423	526	460	551	550	115	0.00	0.00
25	555	0.00	553	550	471	516	405	543	550	115	0.00	0.00
26	554	0.00	554	552	501	244	538	546	551	116	0.00	0.00
27	554	0.00	554	552	500	244	549	551	551	142	0.00	0.00
28	555	0.00	554	550	483	270	551	552	550	37	0.00	0.00
29	554	0.00	553	551	---	292	548	550	551	39	0.00	0.00
30	554	0.00	554	551	---	294	551	548	561	44	0.00	0.00
31	555	---	554	549	---	294	---	539	---	48	0.00	---
TOTAL	17052	1244.00	10611.00	16947	14936	14012	12186	15778	16539	12978	844.00	3762.00
MEAN	550	41.5	342	547	533	452	406	509	551	419	27.2	125
AC-FT	33820	2470	21050	33610	29630	27790	24170	31300	32810	25740	1670	7460
MAX	556	366	554	556	552	551	551	552	564	552	75	558
MIN	532	0.00	0.00	513	423	24	295	386	541	37	0.00	0.00

CAL YR	2012	TOTAL	152805.00	MEAN	418	MAX	564	MIN	0.00	AC-FT	303100
WTR YR	2013	TOTAL	136889.00	MEAN	375	MAX	564	MIN	0.00	AC-FT	271500

MAX DISCH: 606 CFS AT 08:30 ON OCT 04, 2012 GH 8.50 FT SHIFT 0.18 FT  
MAX GH: 8.50 FT AT 08:30 ON OCT 04, 2012

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06734900 OLYMPUS TUNNEL (ESTES FOOTHILLS CANAL)  
 WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06736000 NORTH FORK BIG THOMPSON RIVER AT DRAKE  
Water Year 2013

Location.-- Lat. N40°25'59.77"; Long. W105°20' 23.04" (NAD83) Larimer County, CO. Gage is located on the right bank of channel approximately 400 ft. upstream from the confluence with the Big Thompson River in Drake, CO. On September 12, 2013, flow reached a historic level which buried the gage in 3 ft. of silt, gravel and debris.

Drainage Area and Period of Record.-- 85.1 mi<sup>2</sup> (USGS Colorado StreamStats utility).; Daily values are available from May 14, 1947 to September 30, 1955 and October 1, 1978 to present. Gage was shut down by the flood on September 12, 2013. Reconstruction is planned for sometime in Water Year 2014

Equipment.-- Digital incremental Sutron 8500 shaft encoder connected to a Sutron SatLink1 Data Collection Platform (DCP) transmitting hourly, and a graphical chart recorder in a 42-inch Corrugated Metal Pipe (CMP) shelter and stilling well. The stilling well is connected to the stream via three 2-inch inlets equipped with gate valves, street keys and a flushing tank (exterior). An Electric Tape Gage (ETG) located on the instrument shelf is the primary reference with a supplemental cantilever chain gage located 10-feet upstream of the shelter. On September 12, 2013, historic flows buried the gage in silt, gravel and debris. The gage is planned for reconstruction in Water Year 2014.

Hydrologic Conditions.-- Drainage area consisting of mainly forested lands and canyons of varying topography. The town of Glen Haven, other residential properties and a state highway are built along the side of much of the north fork channel.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged DCP data and chart record as backup. Instrument calibration was supported by nineteen visits to the gage. One instrument correction of -0.01 ft. was made and applied to the record as defined by visits made to the gage. The record is complete and reliable, except as follows: November 11-16, 20, 22-28, 2012 and March 23 -27; April 9 - 11, 15 - 19, 23-24; May 1 - 2, 2013 when the stage-discharge relation was affected by ice; November 29, 2012 through March 21, 2013 when the station was shutdown for the winter; November 28, 2012 and March 22, 2012 which are partial record days corresponding to reactivation of the gage for the season. Five flushing corrections ranging from +0.03 to +0.15 were made this year. Flush corrections were applied to the record from the last stage inflection to the point of correction. Similarly, three debris removal corrections of -0.01 ft. and -0.02 occurred this year. Debris removal corrections were applied to the record as shifts. Finally, from July 7 to 9, 2013, campers piled rocks on the control to deepen the pool thus raising the elevation of the control. The correction was applied as an instrument correction as it was a stable +0.14 going up as it was -0.14 after being torn down. No Gage Height data is available from September 12 through 30, 2013 as the gage is inoperable due to flood damage.

Datum Corrections.-- Levels were last run on September 9, 2010 to verify RM establishment. No correction was required to the primary reference. All reference points were buried in the flood of September 12, 2013. Until the gage is re-furbished, it is unclear which points may remain.

Rating.-- The control for low to moderate stages is a low head concrete dam located approximately 8-feet downstream of the shelter. The channel is the control at higher stages. There is little freeboard in this channel and the controlling feature for flood level stages has not been determined. Rating BTNFDRCO11, in use since October 1, 2002 was continued in use for all of WY2013. It is defined by measurements from the Point of Zero Flow (PZF) occurring at 3.41 ft. to 232 cfs. Twenty-three discharge measurements (Nos. 375-397) were made this year, ranging in discharge from 1.88 to 100 cfs covering the range in stage experienced this year well. Due to the flood of September 12, 2013 and the burying of the station, the peak discharge will not be determined for Water Year 2013. The peak GH however was recorded at 10.55 ft. occurring at 00:30 on September 13, 2013. Peak GH exceeded this year's high flow Measurement's GH by 6.05 ft. of stage.

Discharge.-- Shifting control method was used for all periods of open water. Shifts are caused by accumulation of debris on the control, fill and scour of material in the gage pool and noted accelerated deterioration of the control. Shifts were distributed by time as defined by measurements from October 1, 2012 to Winter shutdown on November 28, 2012. Stage dependent shifting using Variable Shift Curve BTNFDRCOVSC13-A was applied from Spring opening on March 22, 2013 through the end of the water year, September 30, 2013. Open water measurements showed shifts varying between -0.13 and 0.06 ft. All were given full weight except for Nos. 390, 392, 394, and 397 which were discounted up to 5% to smooth the shift distribution and Measurement No. 376 which was a training measurement and was discounted 11%.

Special Computations.-- Discharge for ice affected periods and winter periods were estimated from adjacent good record, temperature trends and discharge measurements made during the winter period. Shifts for debris removal events were applied on a basis of the magnitude of the debris removal correction aggregated with the measurement shift made immediately following the debris removal.

Remarks.-- The record is good, except for periods of ice affect and no gage-height record, which are estimated and poor. No record is available for September 12-30, 2013 and no estimations will be made. Station operated and record developed by Patrick Tyler.

Recommendations.-- The gage is currently not functional. Re-construction and design of the new gage should consider any problems had in the past such as flush, debris and possible drawdown issues.

STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

06736000 NORTH FORK BIG THOMPSON RIVER AT DRAKE

RATING TABLE-- BTNFDRCO11 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	8.6	e6.5	e4.0	e4.0	e3.5	5.3	e47	66	42	18	26
2	11	8.3	e6.5	e4.0	e4.0	e4.0	5.2	e44	69	40	17	25
3	9.8	7.8	e6.0	e4.0	e4.0	e4.5	5.0	43	75	37	17	23
4	10	7.9	e6.0	e4.5	e4.5	e4.0	5.9	58	74	36	17	21
5	9.9	7.7	e6.5	e4.5	e4.5	e4.0	6.1	60	79	36	16	22
6	10	7.7	e6.0	e4.5	e4.5	e4.5	5.8	66	82	36	16	22
7	9.3	7.6	e5.5	e5.0	e4.0	e5.0	6.1	73	76	36	16	21
8	10	7.4	e5.0	e5.0	e4.0	e4.5	6.3	78	80	35	18	19
9	9.2	7.2	e4.0	e5.0	e3.5	e4.5	e5.5	95	86	34	19	28
10	9.0	7.7	e4.0	e4.5	e3.5	e4.5	e5.0	102	84	33	18	33
11	8.2	e6.0	e5.0	e4.0	e3.0	e4.5	e5.5	95	82	31	18	79
12	8.8	e6.0	e5.0	e4.0	e3.5	e4.0	5.9	77	83	29	25	---
13	10	e5.8	e5.5	e3.5	e3.5	e4.5	5.4	75	84	31	22	---
14	11	e7.0	e5.0	e3.0	e3.5	e5.0	6.6	76	80	40	23	---
15	11	e6.0	e5.0	e3.5	e3.5	e5.0	e5.0	80	79	39	20	---
16	10	e6.0	e5.0	e3.5	e4.0	e4.5	e2.4	98	73	34	17	---
17	10	7.7	e5.0	e4.0	e4.0	e4.5	e4.9	119	70	30	16	---
18	8.3	7.2	e4.5	e4.0	e3.5	e4.0	e6.0	113	66	32	16	---
19	10	7.0	e4.0	e4.5	e4.0	e4.0	e7.0	94	61	33	16	---
20	9.3	e6.5	e4.0	e4.5	e4.0	e4.0	7.7	84	59	30	15	---
21	8.7	6.8	e5.0	e4.5	e3.5	e4.5	7.9	73	56	27	15	---
22	8.6	e6.5	e5.5	e4.5	e3.5	e4.0	8.0	70	54	25	18	---
23	8.5	e6.5	e5.0	e5.0	e3.5	e3.5	e7.0	78	52	22	21	---
24	7.7	e7.0	e5.0	e5.0	e3.0	e3.0	e9.0	80	50	22	17	---
25	8.6	e6.0	e4.0	e4.5	e3.0	e3.5	9.2	73	46	24	17	---
26	7.6	e6.0	e4.0	e4.5	e3.5	e4.0	13	72	43	23	16	---
27	8.1	e6.0	e4.5	e4.5	e3.5	e4.8	19	68	43	21	16	---
28	9.0	e6.5	e4.0	e4.5	e3.5	e5.1	31	84	44	23	18	---
29	9.0	e6.5	e4.0	e4.0	---	5.1	43	88	45	23	17	---
30	8.7	e6.5	e4.0	e4.0	---	5.2	47	78	44	21	18	---
31	8.5	---	e4.0	e4.0	---	5.2	---	71	---	19	24	---
TOTAL	288.8	207.4	153.0	132.5	104.0	134.9	306.7	2412	1985	944	557	319
MEAN	9.32	6.91	4.94	4.27	3.71	4.35	10.2	77.8	66.2	30.5	18.0	29.0
AC-FT	573	411	303	263	206	268	608	4780	3940	1870	1100	633
MAX	11	8.6	6.5	5.0	4.5	5.2	47	119	86	42	25	79
MIN	7.6	5.8	4.0	3.0	3.0	3.0	2.4	43	43	19	15	19

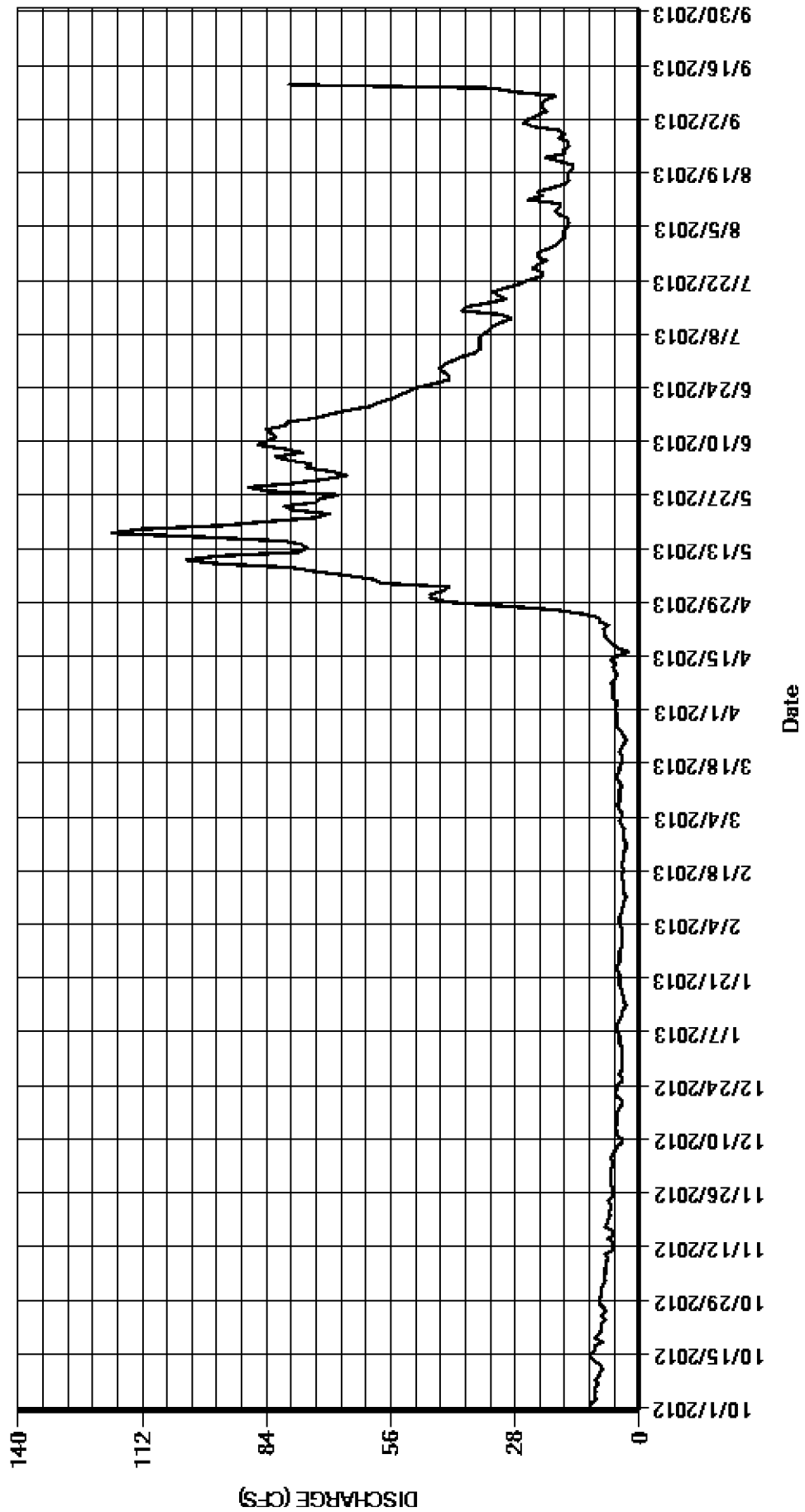
CAL YR	2012	TOTAL	4155.9	MEAN	11.4	MAX	38	MIN	4.0	AC-FT	8240
WTR YR	2013	TOTAL	7544.3	MEAN	21.8	MAX	119	MIN	2.4	AC-FT	14960 (PARTIAL YEAR RECORD)

MAX DISCH: (Peak discharge not determined for Water Year 2013)  
MAX GH: 10.55 FT AT 00:30 ON SEP 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



06736000 NORTH FORK BIG THOMPSON RIVER AT DRAKE  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
DILLE TUNNEL NEAR DRAKE

Water Year 2013

Location.-- Lat. N40° 25' 6.16", Long. W105° 14' 36.10" (NAD83, Spotted from topographic map). Gage is located at the West portal of Dille Tunnel.

Drainage Area and Period of Record.-- Controlled diversion. ; Daily values are available from 1950 to present.

Equipment.-- Digital incremental Sutron SDR-0001-1 shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly in a rectangular concrete shelter over top a concrete stilling well near an 8-ft. Parshall Flume. The gage is equipped with an electric tape gage located on the instrument shelf serving as the primary and only active reference. A staff gage is located at the flume's Ha location but cannot be observed when the flume is operational as the flume is located approximately 80-feet downstream in the tunnel. The gage is operated cooperatively between the United States Bureau of Reclamation (USBR), the Northern Colorado Water Conservancy District (NCWCD) and the Colorado Division of Water Resources (CDWR) as a component of the Colorado Big Thompson (C-BT) project.

Hydrologic Conditions.-- Controlled diversion. Flow is regulated by a check structure and radial gate diverting water from the Big Thompson River to the Charles Hansen Feeder Canal several miles downstream. Waters delivered to the feeder canal can then be subsequently conveyed to terminal storage at Horsetooth Reservoir or used for power generation at the Big Thompson Power Plant (BTPPMCCO) with subsequent delivery back to the Big Thompson River or directly returned to the river via the Charles Hansen Feeder Canal Wasteway (HFCWASCO) structure. A large stilling basin and energy dissipation devices are located downstream from the radial gate and upstream from the flume's converging section. Direct observation of the flume's performance is not possible.

Flood waters this year destroyed the left abutment of the diversion structure on or about September 12, 2013. Around this time the shelter enclosure and telemetry antenna were lost as raging waters overtopped the entire structure. Performance of the structure from this point up to the first site visit inspection of the structure on September 25, 2013 is largely unknown but can be inferred from mass balance computations.

Gage-Height Record.-- The primary record from October 1, 2012 through 23:30 on September 12, 2013 is 15-minute telemetered data with 15-minute logged DCP and SDR data as backup. From 23:45 on September 12, 2013 through the end of the water year, no gage-height data is available. Frequent visits by NCWCD and CDWR personnel showed good agreement between the sensor and base gage. The record is complete and reliable except for September 12 - 24, 2013.

Instrument calibration was supported by numerous visits made to the gage by NCWCD and DWR staff. Two instrument corrections of +0.01 to -0.01 ft. were made and were applied to the record as defined by observations made to the gage. The SDR's float does not completely go to zero when the tunnel is not in use but the forebay is still charged. Levels and flume inspection on October 9, 2007 and again on November 20, 2012 found the inlet invert approximately 0.09 feet above the flume floor and crest. This observation is consistent with notations of positive stage readings occurring at zero flow as well as previous years point of zero flow (PZF) stage assumptions. Note: Flume entry for cleaning or any other purpose is strictly prohibited without prior authorization and lock-out tag-out procedures as per USBR Hazardous Energy Control Program (HECP) policy (document on file).

Datum Corrections.-- Levels were last run on November 20, 2012 using the flume's crest as base. The base reference was found to be 0.003 ft. high. No corrections were made as the reference is within allowable tolerances.

Rating.-- Rating table STD08FTPFXP, implemented on October 1, 2007, was continued again this year. It is a standard 8-ft. Parshall Flume rating expanded formulaically to 5.35 feet of stage using a standard 8-ft. Parshall flume formula. In previous years, the gage had been directly measured infrequently due to considerable safety hazards. More recently, per USBR HEPC policies, the structure has not been measured or observed directly as the measurement structure cannot be entered when water is actively being diverted. Mass balance computations and indirect measurement techniques (when conditions allow) are now used to track this structure's performance. One indirect measurement was made this year on April 12, 2013 at a discharge rate of 46.8 cubic feet per second (cfs) returning an unadjusted shift of -0.01 ft. which was discounted - 1.68% to the rating. This year's peak for of 202 cfs occurred at 06:15 on May 16, 2013 at a gage-height of 3.15 ft. using a zero shift.

Discharge.-- Per agreement with the USBR, NCWCD and Water Commissioner the rating is directly applied to the gage-height record. Mass balance computations made periodically throughout the year showed reliable performance.

Special Computations.-- Zero flow is determined operationally with consideration given to operational constraints and observations made to the gage by CDWR and NCWCD personnel. Zero flow was determined to occur part of the day of the entire day on the following days: October 1-10, 27 through November 5, 13 through March 29, 2013, April 18 through May 15 and September 13-30, 2013. Operations at the Big Thompson River Below Lake Estes (BTBLESCO) and mass balance computations on the Charles Hansen Feeder Canal confirm zero flow operation.

Remarks.--

The record is good except for September 12 through September 24, 2013 during and immediately following the flood event which is estimated from mass balance computations. Following the loss of instrumentation to the first visit to the site following of flood (September 25, 2013) no gage-height record was recorded but mass balance computations indicate no diversions into the Hansen Feeder Canal from Dille Tunnel were occurring. Flow at this station is intermittent; dependent on river flows, C-BT water orders, and other regulations. Station maintained and record developed by Russell V. Stroud.

Discharge measurements are not made in the flume or tunnel for safety reasons. Measurement opportunities are limited at the tunnel's east portal due to backwater from Hansen Feeder Canal. Performing measurements upstream of the tunnel diversion is not possible due to swift water conditions and excessive depth issues. Likewise, cable and Acoustic Doppler Current Profiler measurements are not possible at or near the DILTUNCO diversion. Mass balance computations and indirect measurements (when conditions allow) are the only mechanism used to track this structure's performance.

Recommendations.--

Mass balance computations should be continued to monitor the gage's performance. Measurement opportunities similar to those seen in November 2010 and briefly this year should be watched and planned for.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

DILLE TUNNEL NEAR DRAKE

RATING TABLE-- STD08FTPFXP USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

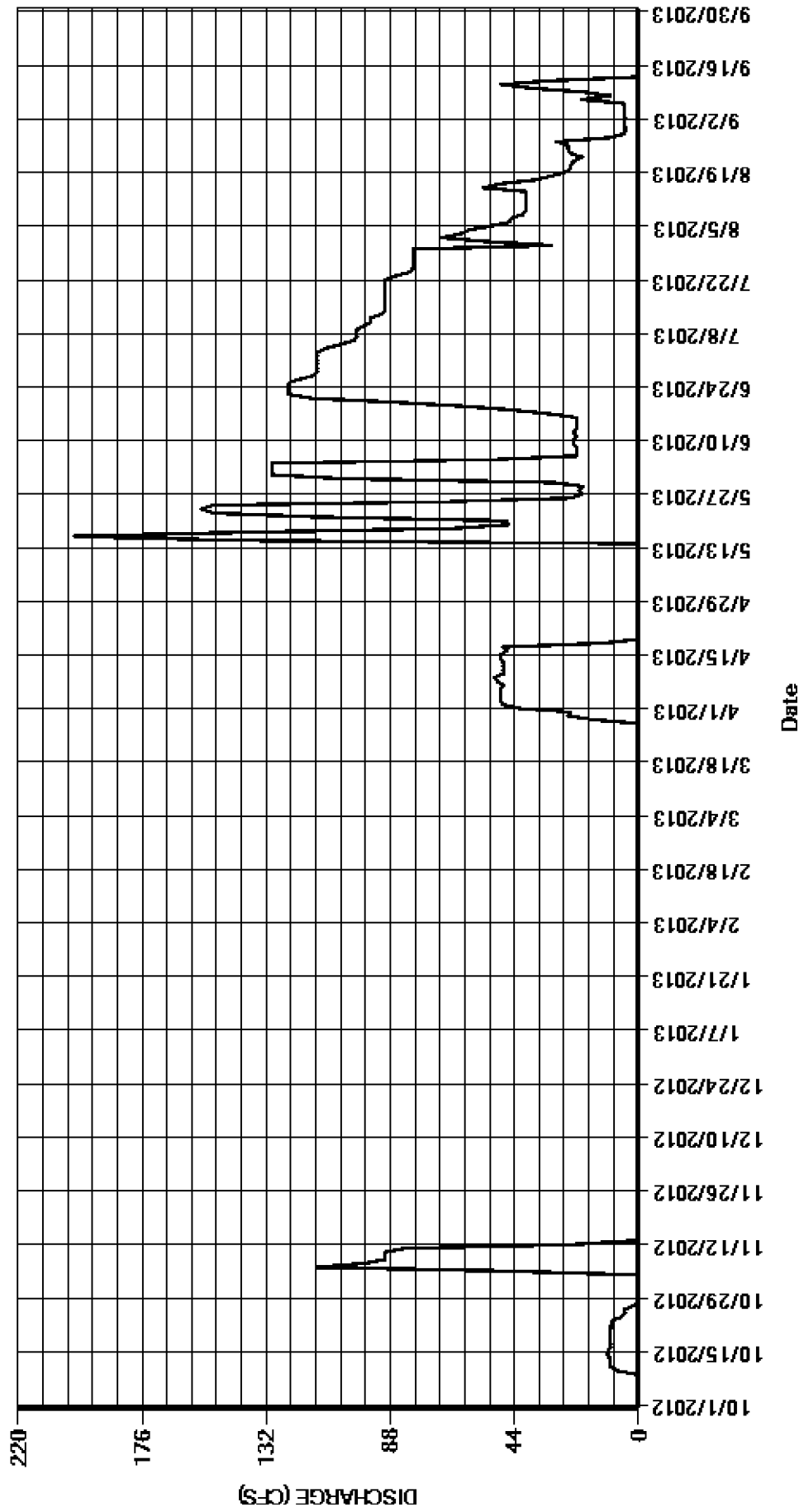
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	42	0.00	130	114	54	5.0
2	0.00	0.00	0.00	0.00	0.00	0.00	48	0.00	130	114	70	4.8
3	0.00	0.00	0.00	0.00	0.00	0.00	49	0.00	130	114	63	5.0
4	0.00	0.00	0.00	0.00	0.00	0.00	49	0.00	130	111	60	5.2
5	0.00	46	0.00	0.00	0.00	0.00	49	0.00	52	106	52	5.1
6	0.00	114	0.00	0.00	0.00	0.00	49	0.00	22	101	46	5.2
7	0.00	97	0.00	0.00	0.00	0.00	48	0.00	22	100	45	20
8	0.00	90	0.00	0.00	0.00	0.00	50	0.00	22	100	41	10
9	0.00	90	0.00	0.00	0.00	0.00	51	0.00	23	100	40	20
10	7.5	90	0.00	0.00	0.00	0.00	48	0.00	23	97	40	39
11	10	83	0.00	0.00	0.00	0.00	48	0.00	22	95	40	49
12	10	23	0.00	0.00	0.00	0.00	48	0.00	23	95	40	e32
13	10	1.4	0.00	0.00	0.00	0.00	48	0.00	22	91	40	e0.00
14	11	0.00	0.00	0.00	0.00	0.00	49	0.00	22	90	40	e0.00
15	11	0.00	0.00	0.00	0.00	0.00	49	146	22	90	55	e0.00
16	10	0.00	0.00	0.00	0.00	0.00	47	200	22	90	49	e0.00
17	10	0.00	0.00	0.00	0.00	0.00	48	141	32	90	37	e0.00
18	10	0.00	0.00	0.00	0.00	0.00	13	66	45	90	31	e0.00
19	10	0.00	0.00	0.00	0.00	0.00	0.00	46	63	90	26	e0.00
20	10	0.00	0.00	0.00	0.00	0.00	0.00	47	87	90	24	e0.00
21	10	0.00	0.00	0.00	0.00	0.00	0.00	115	116	90	24	e0.00
22	9.7	0.00	0.00	0.00	0.00	0.00	0.00	151	124	90	23	e0.00
23	9.5	0.00	0.00	0.00	0.00	0.00	0.00	155	124	86	20	e0.00
24	6.1	0.00	0.00	0.00	0.00	0.00	0.00	151	124	81	24	e0.00
25	4.9	0.00	0.00	0.00	0.00	0.00	0.00	67	124	80	25	0.00
26	5.1	0.00	0.00	0.00	0.00	0.00	0.00	24	120	80	25	0.00
27	1.4	0.00	0.00	0.00	0.00	0.00	0.00	20	115	80	29	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21	114	80	11	0.00
29	0.00	0.00	0.00	0.00	---	16	0.00	20	114	80	5.0	0.00
30	0.00	0.00	0.00	0.00	---	25	0.00	30	114	80	4.8	0.00
31	0.00	---	0.00	0.00	---	24	---	105	---	31	4.9	---
TOTAL	156.20	634.40	0.00	0.00	0.00	65.00	833.00	1505.00	2233	2826	1088.7	200.30
MEAN	5.04	21.1	0.000	0.000	0.000	2.10	27.8	48.5	74.4	91.2	35.1	6.68
AC-FT	310	1260	0	0	0	129	1650	2990	4430	5610	2160	397
MAX	11	114	0.00	0.00	0.00	25	51	200	130	114	70	49
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22	31	4.8	0.00

CAL YR	2012	TOTAL	11171.60	MEAN	30.5	MAX	315	MIN	0.00	AC-FT	22160
WTR YR	2013	TOTAL	9541.60	MEAN	26.1	MAX	200	MIN	0.00	AC-FT	18930

MAX DISCH: 202 CFS AT 06:15 ON MAY 16, 2013 GH 3.15 FT SHIFT 0 FT  
 MAX GH: 3.15 FT AT 06:15 ON MAY 16, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**DILLE TUNNEL NEAR DRAKE  
WY2013 HYDROGRAPH**



PLATTE RIVER BASIN  
06738000 BIG THOMPSON RIVER AT MOUTH OF CANYON NEAR DRAKE  
Water Year 2013

Location.-- Lat. 40°25'18", Long. 105°13'34" (NAD 83) , in Larimer County, CO; Hydrologic Unit 10190006. Gage is on the right bank at mouth of canyon, 400 ft upstream from Handy Ditch diversion dam, and 6.0 mi east of Drake. On September 12, 2013, the entire gage house, stilling well, and most of Highway 34 were destroyed by historic flood waters. Reconstruction of the gage at this date will depend on finished highway construction. A supplemental gage was constructed approximately 1 mile downstream (BTBLCMCO).

Drainage Area and Period of Record.-- 305 mi<sup>2</sup>; 1927-1933, 1938 to September 11, 2013, gage destroyed in historic flood. Reconstruction is planned but not as yet scheduled.

Equipment.-- Sutron Constant Flow Bubbler (CFB) in 6-foot by 6-foot pre-cast concrete shelter at a low head concrete dam control. A cantilever style wire weight gage located on the right edge of water near the shelter is the primary reference with no provisions for a supplemental reference. The CFB is connected to a Sutron Satlink II Data Collection Platform (DCP) at the Hansen Feeder Canal Wasteway to the Big Thompson River (HFCWASCO) via a Design Analysis H-423 (SDI-12 to RS-485 converter unit) carried by buried copper wire placed by the United States Bureau of Reclamation (USBR). A Design Analysis H-416 (SDI-12 to 4-20mA converter) is also connected to the CFB unit to provide a Supervisory Control and Data Acquisition (SCADA) output to the USBR's control center. A Tacoma style bank operated cableway was placed approximately 120-ft. upstream from the gage shelter in April 2010. Cableway installation will allow for measurement of flows that were not captured in previous years due to condemnation and subsequent removal of the manned cableway. This gage is operated and maintained by the Colorado Division of Water Resources (DWR) and is simultaneously used by the DWR, USBR, Northern Colorado Water Conservancy District (NCWCD) and the Handy Ditch Company.

All equipment associated with the gage was washed away on September 12, 2013 by flood waters.

Hydrologic Conditions.-- Drainage area consisting of widely varying terrain, vegetative types, hardened surfaces and one substantial diversion, Dille Tunnel Near Drake, CO (DILTUNCO). Flow patterns are largely regulated by Colorado Big Thompson (C-BT) Project operations occurring upstream from this gage from Lake Estes to the DILTUNCO site. Bank inflow into the channel below the control continues to be an issue and is suspected to have increased in the past several years. Water traveling around the gage and control structures may contribute to differences seen in mass balance computations within the Big Thompson Canyon system.

Gage-Height Record.-- The primary record is 15-minute telemetered CFB data with the CFB's independent log and logged DCP values as backup. The record is complete and reliable except for: November 26 and 27, 2012; March 23-27, 2013; and April 18 and 19, 2013 when the stage-discharge relation was affected by ice; November 28, 2012 partial day records corresponding to instrument deactivation for Winter shutdown and November 29, 2012 – March 22, 2013, gage was shut down for winter, no gage-height information available. The DCP failed to record single values on the following days: November 14, 2012; March 29, 2013; April 5, 13, and 19, 2013; and August 5 and 12, 2013. All values were filled in using CFB log as backup without loss of accuracy. No data is available for the period directly following the flood due to gage destruction, September 12 through 30, 2013.

Datum Corrections.-- Levels were run on October 10, 2012, verifying level results from the October 30, 2008 and October 15, 2009 level runs (-0.051 and -0.044 feet respectively). The correction was made at the time of levels and was applied to the gage-heights of discharge measurements as well as the record from October 1, 2011 through the time of correction.

Rating.-- The control is a concrete dam approximately 20 feet below the gage shelter. Rating No. 16 in use since October 1, 2000 was continued this year. It is defined by measurements from 4 to 2100 cfs. Flows up to about 150 cfs can be waded near the gage. Flows above the wadeable limit are measured using the Tacoma style bank operated cableway. Sixteen discharge measurements (No's 373-388) were performed this year ranging in discharge from 19.1 to 257 cfs. The September 12, 2013 flood event destroyed the stream gage and the peak discharge and gage height was undetermined for Water Year 2013.

Discharge.-- Shifting control method was used all year. Shifts were distributed by time as defined by measurements from October 1 through November 28, 2012. Stage dependent shift proration using variable shift table BTCANYCOVSC13-A, defined by Measurement Nos. 377-383, was applied from March 22 through May 28, 2013; and, using variable shift table BTCANYCOVSC13-B defined by Measurement Nos. 381, 383 and 385-388 was applied from May 28 through September 11, 2013. Open water measurements made this year showed unadjusted shifts varying between -0.05 and +0.02 ft. All were given full weight except for Nos. 374 and 387 which were discounted up to 5.5% to smooth shift distributions. Measurement No. 384 was not used in the development of the Water Year 2013 record. No discharge calculated or estimated for September 12 through 30, 2013.

Special Computations.-- Winter measurements are not made at this gage due to extremely heavy ice conditions. Discharge for the ice affected period was estimated from adjacent periods of good record and correlated to a mass balance calculation [BTBLESICO + BTNFDRCO – DILTUNCO = BTCANYCO (spreadsheet included in digital file)]. Likewise discharge for the winter period was computed from the mass balance calculation with respect to temperature data logged at the HFCWASCO. Reasonable agreement is illustrated from the computed BTCANYCO record and actual BTCANYCO record prior to as well as following winter operations.

Remarks.-- The record is good, except for periods of ice effect and the winter estimation period, which are estimated and poor. Station maintained and record developed by Patrick Tyler.

Recommendations.--

Care should be taken in the location and construction of a new gage to possibly limit any problems that were present at the old site.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06738000 BIG THOMPSON RIVER AT MOUTH OF CANYON NEAR DRAKE

RATING TABLE-- BTCANYCO16 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	72	45	e23	e26	e21	e23	39	157	68	58	79	98
2	54	45	e24	e26	e21	e23	35	167	70	56	57	98
3	66	45	e20	e26	e21	e24	35	153	76	53	64	108
4	67	45	e18	e26	e22	e22	35	196	74	53	57	100
5	66	53	e20	e26	e22	e22	35	202	154	56	54	100
6	66	41	e20	e26	e22	e23	35	193	188	60	58	92
7	62	42	e19	e26	e22	e22	35	196	181	63	56	70
8	62	43	e20	e27	e22	e22	35	219	183	58	59	77
9	56	41	e18	e27	e21	e22	35	294	246	54	57	78
10	48	41	e18	e25	e21	e22	35	328	293	58	60	70
11	44	37	e21	e22	e21	e22	35	294	304	58	67	117
12	46	26	e21	e22	e21	e21	35	266	231	55	67	---
13	44	25	e22	e21	e22	e22	35	258	224	64	58	---
14	40	26	e20	e21	e22	e22	35	255	191	74	63	---
15	42	30	e18	e22	e22	e22	36	105	180	76	62	---
16	44	28	e18	e22	e23	e22	34	52	175	65	56	---
17	43	28	e20	e23	e23	e22	35	120	159	61	55	---
18	44	28	e21	e22	e22	e21	e40	188	141	67	55	---
19	44	28	e20	e24	e22	e21	e42	187	124	65	56	---
20	42	26	e18	e23	e22	e20	46	177	100	62	52	---
21	41	26	e25	e23	e21	e21	41	102	67	59	51	---
22	40	25	e25	e23	e21	e20	41	56	57	55	52	---
23	40	22	e25	e23	e22	e20	46	61	55	57	58	---
24	40	25	e25	e23	e21	e20	48	77	53	63	58	---
25	74	23	e24	e23	e22	e20	54	189	49	65	55	---
26	63	e20	e24	e23	e22	e20	58	207	50	63	55	---
27	46	e15	e26	e22	e22	e20	63	207	55	65	59	---
28	46	e18	e27	e22	e22	23	82	201	58	63	72	---
29	45	e20	e27	e21	---	34	92	203	61	64	81	---
30	45	e21	e27	e21	---	38	97	180	60	63	87	---
31	45	---	e27	e21	---	38	---	99	---	103	101	---
TOTAL	1577	938	681	728	608	714	1349	5589	3927	1936	1921	1008
MEAN	50.9	31.3	22.0	23.5	21.7	23.0	45.0	180	131	62.5	62.0	91.6
AC-FT	3130	1860	1350	1440	1210	1420	2680	11090	7790	3840	3810	2000
MAX	74	53	27	27	23	38	97	328	304	103	101	117
MIN	40	15	18	21	21	20	34	52	49	53	51	70

CAL YR	2012	TOTAL	19565	MEAN	53.5	MAX	409	MIN	15	AC-FT	38810
WTR YR	2013	TOTAL	20976	MEAN	60.6	MAX	328	MIN	15	AC-FT	41610 (PARTIAL YEAR RECORD)

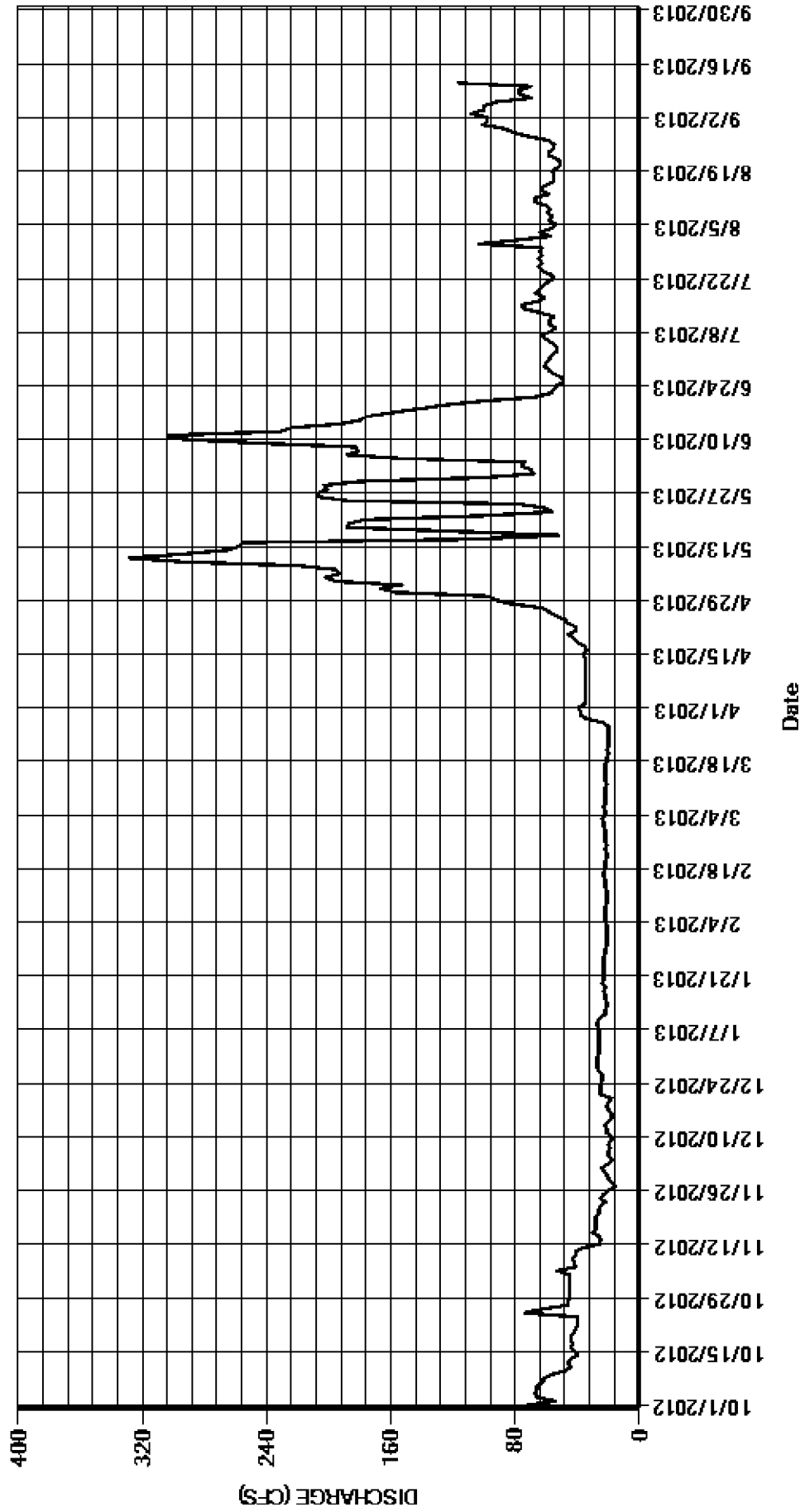
MAX DISCH: (Peak discharge not determined for Water Year 2013)

MAX GH: (Peak not determined for Water Year 2013)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



06738000 BIG THOMPSON RIVER AT MOUTH OF CANYON NEAR DRAKE  
 WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
CHARLES HANSEN FEEDER CANAL BELOW BIG THOMPSON SIPHON

Water Year 2013

Location.-- Lat. N40° 25'24.38", Long. W105° 13'35.81" (NAD83). Gage is located on the left side of a trapezoidal concrete canal approximately 300 ft. down canal from the Big Thompson Siphon and 4.5 mi south of Masonville, CO or 8 mi. west of Loveland, CO.

Drainage Area and Period of Record.-- N/A.; Daily values are available from January 1, 1951 to present.

Equipment.-- Digital incremental Sutron SDR-0001-4 shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly in a 4-ft. by 4-ft. concrete shelter and stilling well at a trapezoidal concrete canal section. The stilling well is connected to the canal by two 3-in. inlets with flushing equipment. An electric tape gage placed on the instrument shelf is the primary reference with no provisions for a supplemental reference. AC power is available at the gage and heaters are used to keep the stilling well from freezing in winter months. The gage is operated cooperatively between the United States Bureau of Reclamation (USBR), the Northern Colorado Water Conservancy District (NCWCD) and the Colorado Division of Water Resources (CDWR) as a component of the Colorado Big Thompson (C-BT) project.

Hydrologic Conditions.-- Trapezoidal concrete canal with regulated releases from Flatiron Reservoir (HFCFLTCO) and Dille Tunnel (DILTUNCO). The Charles Hansen Feeder Canal conveys water released from Flatiron Reservoir and occasionally diverted water from the Big Thompson River via Dille Tunnel to terminal storage at Green Ridge Glade and Horsetooth Reservoirs. Several diversions occur throughout the Charles Hansen Feeder Canal from its release point at Flatiron Reservoir to its final delivery point at Horsetooth Reservoir with one inflow, Dille Tunnel.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged DCP data and 5-minute logged SDR data as backup. The record is complete and reliable. Missing 15-minute gage-height values on October 30, 2012, June 14 and August 5, 2013 were interpolated from adjacent good record without loss of accuracy. Instrument calibration was supported by 258 documented visits to the gage by NCWCD and DWR personnel. Several instrument corrections of  $\pm 0.01$  ft. were made throughout the year. Instrument corrections were distributed by time as defined by observations made to the gage.

Datum Corrections.-- Levels were last run on November 20, 2012 using RM 1 as base. The primary reference was found to be within allowable tolerances, no corrections were necessary.

Rating.-- The low flow control is the first fire protection check structure in the canal downstream from the gage. The control for mid to high flows is the canal itself. Rating No. 17, in use since 2005, was continued this year and is defined by measurement from 13 to 503 cubic feet per second (cfs). Twelve discharge measurements (Nos. 836-847) were made during the year, ranging in discharge from 23.8 to 487 cfs. The peak flow of 526 cfs occurred at 2345 on February 26, 2013 at a gage-height of 6.63 ft. with a time distributed shift of -0.12 ft.; exceeding this year's high flow measurement (No. 839), made 14 hours prior to the peak, by 39 cfs and 0.20 ft. of stage.

Discharge.-- Shifts are principally caused by algal growth within the canal system. Shifts can also be caused by obstructions in downstream siphons. Shifting control method was use all year. Shifts were distributed mainly by time with consideration given to change in stage, operational events and mass balance computations of the Charles Hansen Feeder Canal system. Open water measurements showed unadjusted shifts varying between -0.32 and +0.03 ft. All were given full weight except for Nos.: 836, 837, 839, 841 and 843-846 which were adjusted up to  $\pm 4.98\%$  to smooth shift distributions. Measurement Nos. 836, 837 and 844 were adjusted less than 1%.

Special Computations.-- Zero flow is determined operationally. Residual gage-heights of 0.10 ft. remain in the well when there is no active diversion occurring. Sustained gage-height of 0.10 ft. and below occurring on: November 5, 2012; March 28, 29 and April 18 and 19, 2013 were adjusted to zero discharge computations. The discharge record for this site was compared to the HFCFLTCO site and Charles Hansen Feeder Canal mass balance computations to determine the period that algal growth began to affect the stage-discharge relationship.

Remarks.-- The record is good. Station maintained and record developed by Russell V. Stroud.

Recommendations.-- The USBR has procured a Acoustic Doppler Velocity Meter (ADVM) for this site to better quantify flows at this site and to help in mass balance computations of the system. Opportunities are being watched for installation of this instrument. The gage should be watched for algal growth accumulating in the canal system. If algal growth is noted the USBR and NCWCD should be notified immediately. Discharge measurements throughout the entire range of flows throughout the year should be made. Successful use of the ADCP indicates that it should be used here when conditions allow. The electric tape gage is beginning to fall into disrepair. Replacement should be considered in the next water year.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

CHARLES HANSEN FEEDER CANAL BELOW BIG THOMPSON SIPHON

RATING TABLE-- HFCBBSCO17 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

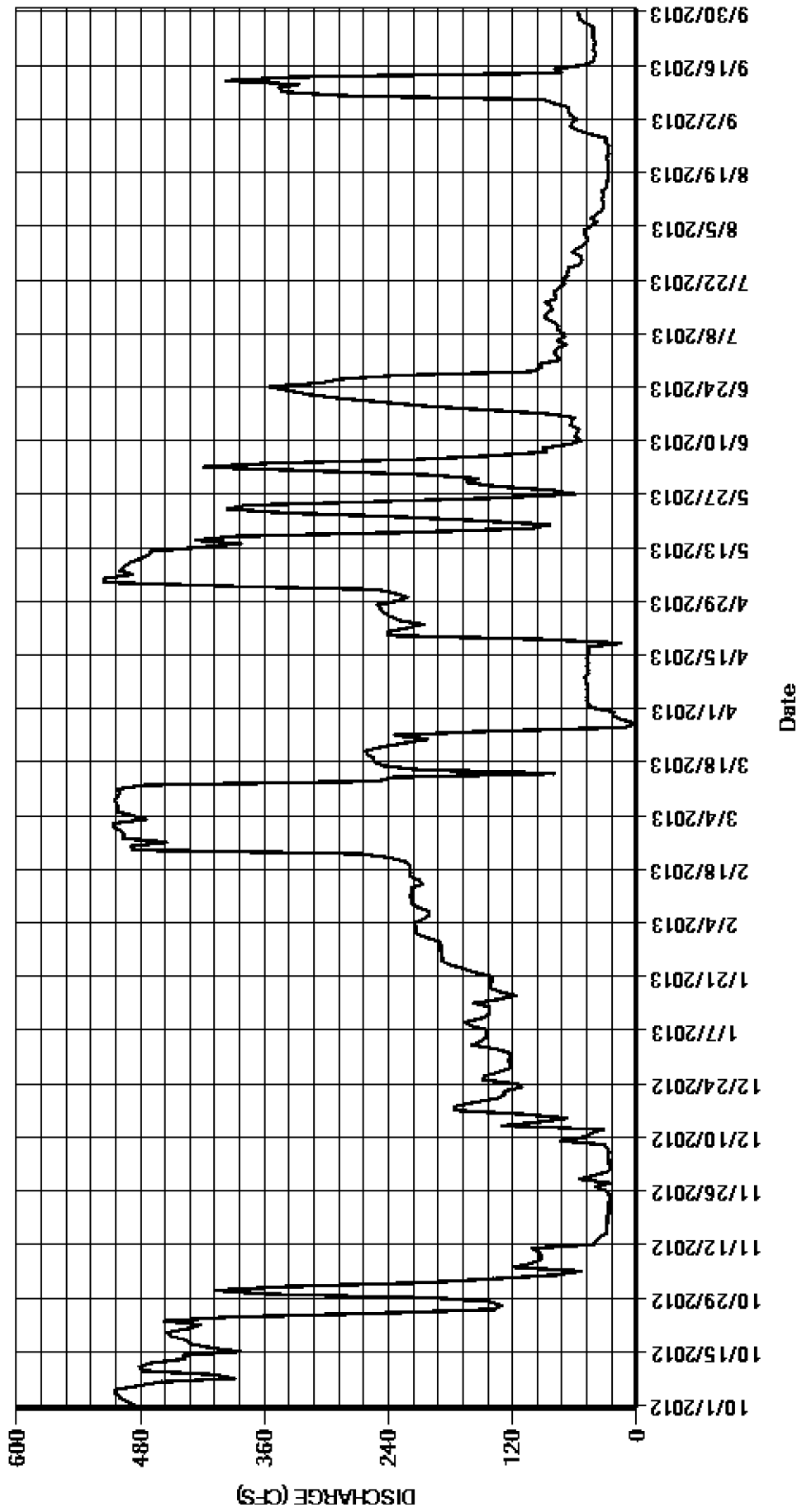
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	485	339	28	123	212	506	40	234	203	75	48	63
2	494	207	25	137	214	506	47	251	312	77	48	58
3	500	139	27	160	214	475	48	405	419	80	51	64
4	504	78	27	152	215	488	48	516	355	77	50	66
5	504	54	28	146	206	503	48	515	218	68	44	66
6	482	118	27	145	201	502	48	488	143	77	39	80
7	460	102	28	144	201	503	48	500	87	70	44	90
8	389	93	31	159	211	505	49	496	91	71	39	283
9	408	93	74	167	218	502	50	491	65	77	34	343
10	478	94	50	150	218	500	47	481	54	76	32	346
11	481	101	44	143	219	502	47	472	60	81	32	327
12	470	42	32	143	218	475	48	470	58	89	34	398
13	438	39	131	143	218	251	47	423	56	88	32	329
14	438	35	94	158	207	235	48	383	64	82	34	73
15	384	29	67	135	210	80	48	426	63	83	29	79
16	414	29	109	117	219	212	46	388	60	88	29	53
17	432	29	176	132	219	246	47	220	86	78	28	42
18	436	28	176	143	220	254	15	102	146	79	28	41
19	451	29	159	141	219	255	92	84	205	80	28	40
20	454	27	136	140	224	261	241	152	246	74	28	42
21	435	27	128	141	239	262	240	229	288	70	28	41
22	422	27	128	157	268	246	222	338	317	72	28	40
23	457	27	111	168	488	224	206	396	337	67	29	42
24	393	26	116	181	489	203	229	378	355	67	27	42
25	247	27	149	188	455	234	238	254	305	66	28	42
26	137	30	147	188	497	146	245	137	285	55	27	42
27	131	40	134	189	496	12	248	60	231	53	30	49
28	143	26	123	190	499	0.10	251	81	102	54	30	55
29	200	55	122	189	---	14	233	136	93	62	46	56
30	355	40	124	191	---	23	222	164	93	59	57	57
31	407	---	123	202	---	22	---	153	---	52	64	---
TOTAL	12429	2030	2874	4862	7714	9147.10	3486	9823	5397	2247	1125	3349
MEAN	401	67.7	92.7	157	276	295	116	317	180	72.5	36.3	112
AC-FT	24650	4030	5700	9640	15300	18140	6910	19480	10700	4460	2230	6640
MAX	504	339	176	202	499	506	251	516	419	89	64	398
MIN	131	26	25	117	201	0.10	15	60	54	52	27	40

CAL YR	2012	TOTAL	60849.00	MEAN	166	MAX	510	MIN	25	AC-FT	120700
WTR YR	2013	TOTAL	64483.10	MEAN	177	MAX	516	MIN	0.10	AC-FT	127900

MAX DISCH: 526 CFS AT 23:45 ON FEB 26, 2013 GH 6.63 FT SHIFT -0.12 FT  
 MAX GH: 6.63 FT AT 23:45 ON FEB 26, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CHARLES HANSEN FEEDER CANAL BELOW BIG THOMPSON SIPHON  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN

06738100 CHARLES HANSEN FEEDER CANAL WASTEWAY TO BIG THOMPSON

Water Year 2013

Location.--	Lat. N40° 25'14.24", Long. W105° 13'32.15" (NAD83). Gage is located on the right side of a modified 15-ft. Parshall Flume 4.6 mi. south of Masonville, CO and 8 mi. west of Loveland, CO.
Drainage Area and Period of Record.--	N/A.; Daily values are available from October 1, 1953 to September 30, 1979 and October 1, 1990 to present.
Equipment.--	Digital incremental Sutron SDR-0001-4 shaft encoder and a Vaisala WXT520 multi-parameter weather sensor connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly in a 4-ft. by 4-ft. concrete shelter and stilling well at a modified concrete 15-ft. Parshall flume. An electric tape gage placed on the instrument shelf is the primary reference with a supplemental staff gage located on the flume's left wing wall at the Ha location. The well is connected to the flume by two 2 -in. inlets with flushing equipment. A timber measurement bridge is located upstream of the Ha location in the converging section of the flume. The gage is operated in cooperation with the United States Bureau of Reclamation (USBR), the Northern Colorado Water Conservancy District (NCWCD) and the Colorado Division of Water Resources (CDWR) as a component of the Colorado Big Thompson (C-BT) project.
Hydrologic Conditions.--	Semi controlled release often experiencing rapid changes and transient flow. The Charles Hansen Feeder Canal conveys water from Flatiron Reservoir to Horsetooth Reservoir. Several diversions occur throughout the Charles Hansen Feeder Canal from its release point at Flatiron Reservoir to its final delivery point at Horsetooth Reservoir with one inflow, Dille Tunnel. The HFCWASCO structure serves double duty as both a delivery structure as well as a safety feature for the Hansen Feeder Canal System within the C-BT system. As a delivery structure, due to the placement of the Big Thompson Power Plant (BTPPMCCO) and the Handy Ditch company's diversion structure, water cannot be routed through the BTPPMCCO structure and then subsequently delivered to the Handy Ditch. Additionally, when the BTPPMCCO plant is unavailable for power generation water can be routed through the HFCWASCO structure for subsequent diversion downstream of the HFCWASCO and Big Thompson River's confluence point. In addition to performing as a water delivery structure, the HFCWASCO structure is used as a safety mechanism. In the event that the BTPPMCCO plant were to trip offline, water intended to pass through the BTPPMCCO plant would quickly overtop the Hansen Feeder Canal upstream from the plant. Therefore, the Supervisor Control and Data Acquisition (SCADA) system will open three slide gates located in the Hansen Feeder Canal conveying water into the wasteway. The same event would occur if a blockage was detected in the Big Thompson Siphon located immediately downstream from the HFCWASCO diversion point. In the event that the SCADA procedure were to fail or be delayed in slide gate activation, a siphonic spillway also located immediately upstream of the Big Thompson Siphon radial gate can convey water into the wasteway structure. However, water introduced via the siphonic spillway comes in below the flume's crest and therefore cannot be quantified by this structure.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and 5-minute SDR data as backup. Frequent visits by NCWCD and DWR show good agreement between sensor and base gages. The record is complete and reliable. Instrument calibration was maintained by 76 visit to the gage by USBR, NCWCD and CDWR staff. No instrument corrections were necessary this year. Note. Flume entry for cleaning or any other purpose is strictly prohibited without prior authorization and lock-out tag-out procedures per USBR Hazardous Energy Control Program (HECP) policy (document on file).
Datum Corrections.--	Levels were last run on January 30, 2013 using the flume's crest as base. The electric tape index was within allowable tolerances and the out side staff gages was found to be 0.034 ft. high with respect to the average crest elevation. Reference mark No. 1 was reestablished and mark No. 3 was established on this date. The gage and control are both stable and do not require frequent level validation.
Rating.--	The control is a modified 15-ft. Parshall Flume with an upstream baffle box. Rating HFCWASCO02, continued in use this year, is a standard 15-ft. Parshall Flume rating up to a gage-height of 2.10 ft. and customized upward based on measurement made prior to 1972. Three discharge measurements (Nos. 114-116) were made this year ranging in discharge from 40.0 to 138 cfs. Measurements made this year and numerous observations of no flow cover the range in stage experienced this year well. The peak flow of 396 cfs occurred at 0830 on May 21, 2013 at a gage height of 3.15 ft. using a stage distributed shift of +0.06 ft. exceeding this year's high measurement by 258 cfs and 1.45 ft. of stage respectively.
Discharge.--	Measurements made in the last several years indicate some degree of permanent shifting condition. This year's measurements returned computed shifts ranging from 0.01 to 0.02 ft. all in the positive direction. All were given full weight and shifts were distributed as follows: shifts were distributed by time with consideration to canal operations from October 1, 2013 to April 22, 2013 and by stage from April 22 through the end of the water year using variable shift curve HFCWASCOVSC13-A, defined by measurement Nos. 107 and 114-116 made in the 2007 and 2013 water years respectively.
Special Computations.--	Zero flow is determined operationally. Due to the placement of the inlets of the structure, residual water remains in the stilling well thereby recording false positive stage values following dewatering of the structure. In previous years, it had been determined that sustained stages of 0.05 feet and below is a resultant of residual water in the stilling well. This hypothesis was confirmed by an in-flume inspection on April 3, 2008. Stages of 0.05 ft. and below were adjusted to zero computed discharges.
Remarks.--	The record is good. Any flows introduced to this structure via the siphonic spillway were not and could not be recorded by this structure. The siphonic spillway was known to be active from October 25 through October 29, 2012 delivering an estimated 1400 AF of water to the Big Thompson River. The siphon was broken by USBR staff on October 29, 2012 at approximately 11:40 by raising the radial gate immediately downstream of the spillway. Station maintained and record developed by Russell V. Stroud.
Recommendations.--	

Mass balance computations of the Hansen Feeder Canal System may be able to identify and quantify siphonic spillway usage. This has not been evaluated by CDWR as of yet. Plans have been developed to replace the timber measurement bridge in the flume. Measurement by three wheeled crane should not be done until this is completed. Measurement by sectional rod is permissible but should be done cautiously. Continue to perform targeted measurements to better define permanent shifting conditions and develop a new rating when applicable.

STATE OF COLORADO  
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06738100 CHARLES HANSEN FEEDER CANAL WASTEWAY TO BIG THOMPSON

RATING TABLE-- HFCWASCO02 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

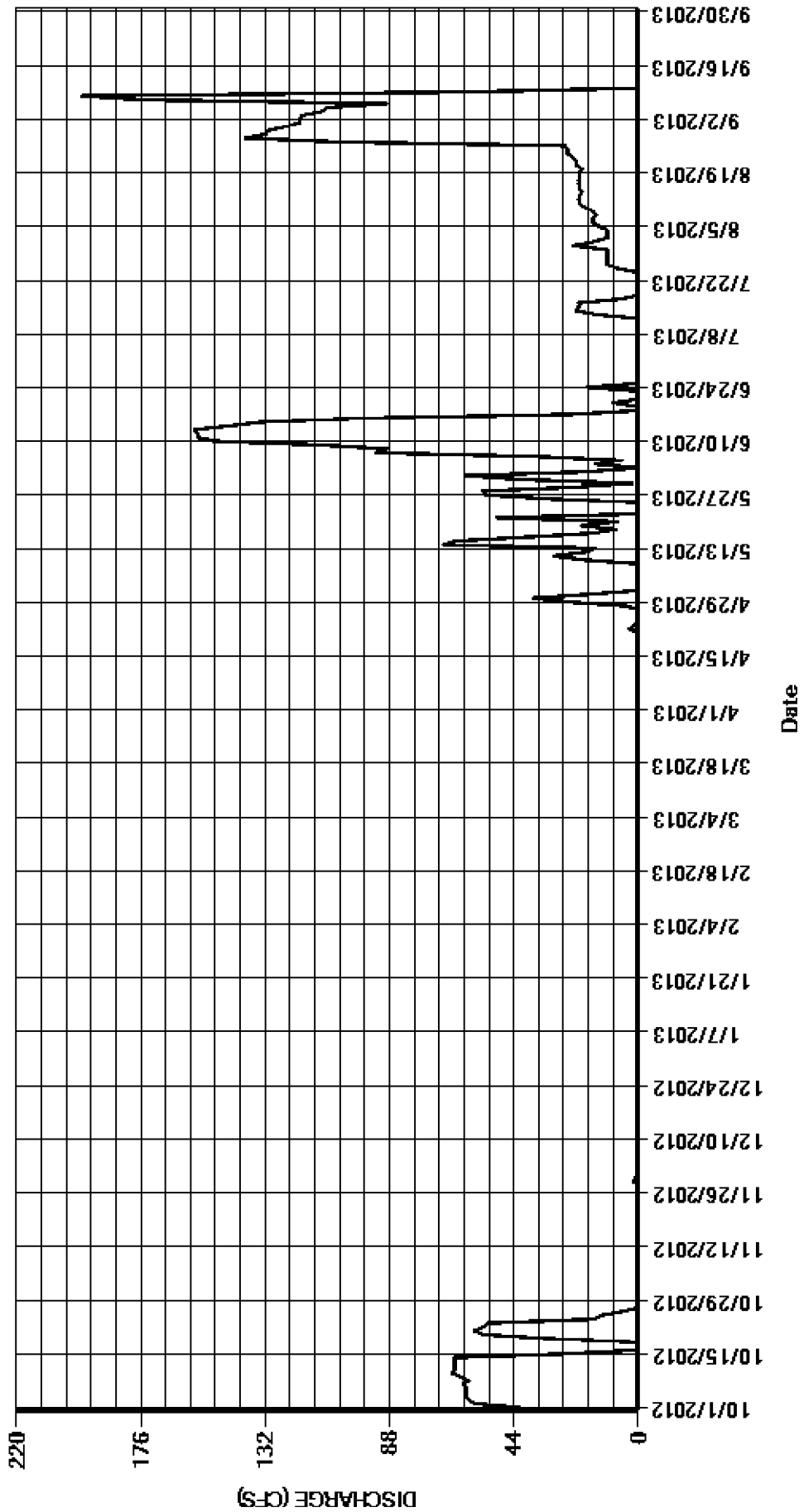
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	42	0.00	0.00	0.00	0.00	0.00	0.00	18	61	0.00	16	120
2	58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18	0.00	11	120
3	60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	119
4	61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15	0.00	11	112
5	61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.0	0.00	14	110
6	61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35	0.00	16	89
7	62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	93	0.00	16	176
8	60	0.00	0.00	0.00	0.00	0.00	0.00	0.05	89	0.00	15	197
9	63	0.00	0.00	0.00	0.00	0.00	0.00	0.30	112	0.00	16	63
10	66	0.00	0.00	0.00	0.00	0.00	0.00	19	150	0.00	19	0.00
11	65	0.00	0.00	0.00	0.00	0.00	0.00	30	156	0.00	21	0.00
12	65	0.00	0.00	0.00	0.00	0.00	0.00	19	156	0.00	21	0.00
13	65	0.00	0.00	0.00	0.00	0.00	0.00	15	157	15	21	0.00
14	65	0.00	0.00	0.00	0.00	0.00	0.00	69	144	22	20	0.00
15	24	0.00	0.00	0.00	0.00	0.00	0.00	65	133	21	21	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40	96	21	21	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16	24	6.3	21	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.1	0.00	0.00	21	0.00
19	33	0.00	0.00	0.00	0.00	0.00	0.00	20	0.00	0.00	21	0.00
20	55	0.00	0.00	0.00	0.00	0.00	0.00	7.5	8.9	0.00	20	0.00
21	58	0.00	0.00	0.00	0.00	0.00	0.00	50	0.00	0.00	22	0.00
22	55	0.00	0.00	0.00	0.00	0.00	3.3	0.00	0.00	0.00	22	0.00
23	53	0.00	0.00	0.00	0.00	0.00	1.6	0.00	0.00	0.00	23	0.00
24	16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18	0.00	25	0.00
25	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.2	25	0.00
26	5.6	0.00	0.00	0.00	0.00	0.00	0.00	32	0.00	11	26	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	54	0.00	11	106	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	4.2	55	0.00	11	139	0.00
29	0.00	1.9	0.00	0.00	---	0.00	24	22	0.00	11	132	0.00
30	0.00	0.82	0.00	0.00	---	0.00	37	2.3	0.00	11	131	0.00
31	0.00	---	0.00	0.00	---	0.00	---	42	---	23	125	---
TOTAL	1166.60	2.72	0.00	0.00	0.00	0.00	70.10	584.25	1471.90	170.50	1129	1106.00
MEAN	37.6	0.091	0.000	0.000	0.000	0.000	2.34	18.8	49.1	5.50	36.4	36.9
AC-FT	2310	5.4	0	0	0	0	139	1160	2920	338	2240	2190
MAX	66	1.9	0.00	0.00	0.00	0.00	37	69	157	23	139	197
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	0.00

CAL YR	2012	TOTAL	6193.07	MEAN	16.9	MAX	173	MIN	0.00	AC-FT	12280
WTR YR	2013	TOTAL	5701.07	MEAN	15.6	MAX	197	MIN	0.00	AC-FT	11310

MAX DISCH: 396 CFS AT 08:30 ON MAY 21, 2013 GH 3.15 FT SHIFT 0.06 FT  
MAX GH: 3.15 FT AT 08:30 ON MAY 21, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06738100 CHARLES HANSEN FEEDER CANAL WASTEWAY TO BIG THOMPSON  
 WY2013 HYDROGRAPH





PLATTE RIVER BASIN  
USBR POWER PLANT AT BIG THOMPSON CANYON MOUTH  
Water Year 2013

Location.-- Lat. N40° 25'15.44", Long. W105° 13'23.43" (NAD83). Power plant facility is located on the right bank of the Big Thompson River 4.5 mi. south of Masonville, CO and 8 mi. west of Loveland, CO.

Drainage Area and Period of Record.-- N/A.; Daily values are available from October 1, 1997 to present.

Equipment.-- Sutron SatLink 2 Data Collection Platform (DCP) connected to an ultrasonic flow meter placed on the upper scroll casing of the Big Thompson Power Plant power turbine. Power plant facilities are owned, operated and maintained by the United States Bureau of Reclamation (USBR) with the satellite telemetry equipment being maintained by the Colorado Division of Water Resources.

Hydrologic Conditions.-- Controlled release from the Charles Hansen Feeder Canal to the Big Thompson River. Waters transmitted via the Power Plant facility originated at or in part from either Flatiron Reservoir or the Dille Tunnel (DILTUNCO) diversion, both of which convey water to the Hansen Feeder Canal upstream from the Power Plant. Waters passed through the Power Plant facility enter the Big Thompson River downstream from the Big Thompson at Canyon Mouth (BTCANYCO) gage, Charles Hansen Feeder Canal Wasteway to Big Thompson River (HFCWASCO) delivery point, and the Handy Ditch diversion structure (WDID: 0400521).

Gage-Height Record.-- Flow meter. No gage height record.

Datum Corrections.-- Not applicable.

Rating.-- The primary record is telemetered 15-minute flow meter values with 15-minute logged flow meter values as backup. A Seimans SITRANS ultrasonic flow meter is installed on the turbine's upper scroll casing. The meter was last calibrated on June 6, 2012 by USBR staff. The power plant discharges directly into the river; water can also be diverted and delivered to the river by either the HFCWASCO or Handy Ditch structures immediately upstream from the power plant. Thus, there are no opportunities to perform comparison measurements. This year's peak discharge, as recorded by the flow meter, was 407 cfs occurring at 22:00 on May 25, 2013.

Discharge.-- Discharge is determined from the Siemens SYSTRANS ultrasonic flow meter unit and reported to the DCP.

Special Computations.-- Zero flow is determined operationally. Zero flow was determined to occur on part of the day or the entire day on the following days: October 1 - 15, 2012; October 19 - 24; October 31 - May 15; May 21; June 20, 24; July 31, August 1; August 27 - September 9 and September 12 - 30, 2013. During portions of these periods, the ultrasonic flow meter registered discharge rates ranging from 1.5 to 6 cfs. These values are assumed to be accurate but do not represent an intentional delivery to the stream and were therefore zeroed.

Indirect validation method of the power plant record began in WY 2006, when a mass balance calculator was developed to help quantify the individual gage accuracies and to monitor diversions to and deliveries from the Charles Hansen Feeder Canal system. The calculations indicated that some submergence and variable backwater issues existed at Hansen Feeder Canal below Flatiron Reservoir (HFCFLTCO) gage.

In the 2008 water year the USBR purchased and installed a SonTek SW Acoustic Doppler Velocity Meter (ADVM) for the HFCFLTCO gage. Under certain flow regimes, mass balance computations made after the installation of the ADVM unit have shown good agreement with the gages in the Hansen Feeder Canal system, including the power plant. To further on this effort, a SonTek IQ ADVM was procured and installed in the 2012 water year. It is located downstream from the HFCFLTCO gage but upstream of the trifurcation. Data from this device is still being evaluated to determine this new site's efficacy in helping with mass balance computations within the system.

Remarks.-- The record is good. Discharge for September 12, 2013 was estimated from adjacent good record with consideration given for operational decisions made during the flood event and USBR operations logs. Although estimated, the day is considered good.

Despite the inability for direct confirmatory discharge measurements, indirect measurement methods show the instrument to be accurate. Record developed by Russell V. Stroud.

Due to the damage this power plant facility suffered during the 2013 Big Thompson flood; the plant may not be available for generation for quite some time if at all. No decision has been made as of yet as to the long term fate of this facility as the USBR continues to evaluate if this plant will be rehabilitated or not.

Recommendations.--

Mass balance computations need to be continued to ensure operational accuracy. Efforts should be continued to improve the accuracy of all gages within the Charles Hansen Feeder Canal system. Velocity indexed ratings need to be created for the upstream sites discussed above. Once complete, a more robust mass balance analysis should be performed on the Charles Hansen Feeder Canal system.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

USBR POWER PLANT AT BIG THOMPSON CANYON MOUTH

RATING TABLE.--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

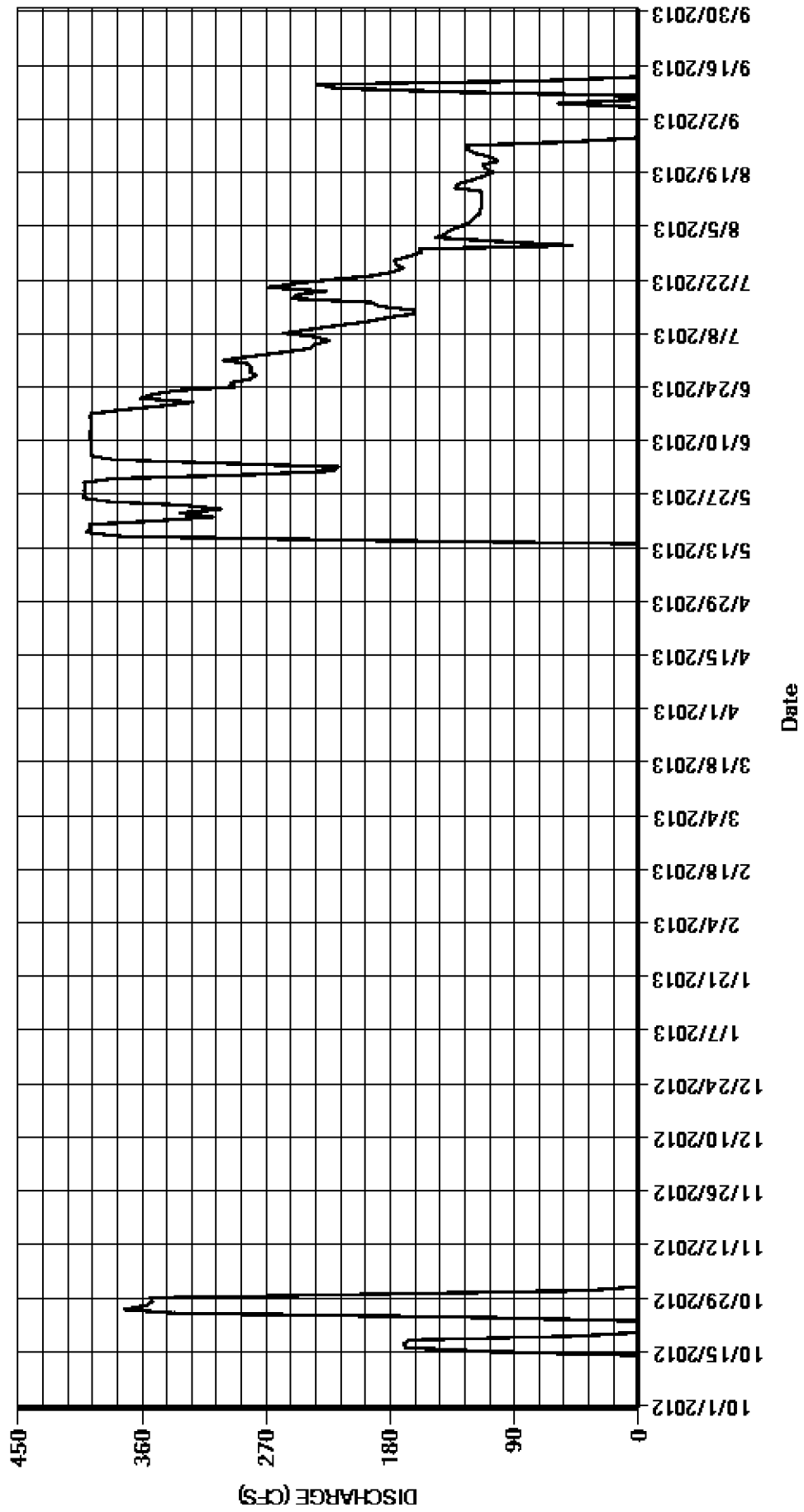
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	283	301	101	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	221	280	147	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	218	259	140	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	302	238	136	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	381	235	128	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	397	224	122	58
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	397	235	120	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	397	258	116	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	397	239	115	138
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	397	220	114	221
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	398	197	114	233
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	398	184	114	e70
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	397	164	114	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	397	162	114	0.00
15	113	0.00	0.00	0.00	0.00	0.00	0.00	207	397	188	133	0.00
16	169	0.00	0.00	0.00	0.00	0.00	0.00	376	398	194	131	0.00
17	170	0.00	0.00	0.00	0.00	0.00	0.00	400	397	252	121	0.00
18	167	0.00	0.00	0.00	0.00	0.00	0.00	398	375	247	112	0.00
19	49	0.00	0.00	0.00	0.00	0.00	0.00	398	346	227	106	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	349	324	268	111	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	309	361	250	113	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	332	353	224	102	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	303	335	194	107	0.00
24	129	0.00	0.00	0.00	0.00	0.00	0.00	329	293	178	118	0.00
25	337	0.00	0.00	0.00	0.00	0.00	0.00	384	296	171	125	0.00
26	373	0.00	0.00	0.00	0.00	0.00	0.00	403	282	176	124	0.00
27	357	0.00	0.00	0.00	0.00	0.00	0.00	402	277	177	47	0.00
28	353	0.00	0.00	0.00	0.00	0.00	0.00	402	282	167	0.00	0.00
29	354	0.00	0.00	0.00	---	0.00	0.00	402	281	158	0.00	0.00
30	191	0.00	0.00	0.00	---	0.00	0.00	402	283	159	0.00	0.00
31	36	---	0.00	0.00	---	0.00	---	381	---	48	0.00	---
TOTAL	2798.00	0.00	0.00	0.00	0.00	0.00	0.00	6177.00	10260	6474	3145.00	720.00
MEAN	90.3	0.000	0.000	0.000	0.000	0.000	0.000	199	342	209	101	24.0
AC-FT	5550	0	0	0	0	0	0	12250	20350	12840	6240	1430
MAX	373	0.00	0.00	0.00	0.00	0.00	0.00	403	398	301	147	233
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	218	48	0.00	0.00

CAL YR	2012	TOTAL	19411.70	MEAN	53.0	MAX	373	MIN	0.00	AC-FT	38500
WTR YR	2013	TOTAL	29574.00	MEAN	81.0	MAX	403	MIN	0.00	AC-FT	58660

MAX DISCH: 407 CFS AT 22:00 ON MAY 25, 2013 GH 407.00 FT  
 MAX GH: 407.00 FT AT 22:00 ON MAY 25, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**USBR POWER PLANT AT BIG THOMPSON CANYON MOUTH  
WY2013 HYDROGRAPH**



PLATTE RIVER BASIN  
BOULDER CREEK FEEDER CANAL NEAR LYONS

Water Year 2013

Location.--	Lat N. 40°12'58", long 105°15'28" (NAD83). Boulder County, CO. Gage is on the left side of the Boulder Feeder Canal at a 10 ft. concrete Parshall flume, approximately 355 ft downstream from its daylight point and 0.72 miles southeast from the Town of Lyons Fire Station.
Drainage Area and Period of Record.--	Transmountain water released from Carter Lake for distribution to St. Vrain and Boulder Creek drainages. Various small diversionary points from the canals conveyance point to the measurement point at the Saint Vrain Supply Canal (SVSLYOCO) gage. Flow splits below the SVSLYOCO gage whereby water can be delivered directly to the St. Vrain Creek and/or delivered to the Boulder Feeder Canal to a terminal storage facilities (Boulder, Coal Ridge Reservoirs).; 1954 to Present
Equipment.--	Sutron Stage Discharge Recorder (SDR) connected to a Sutron Satlink 1 Data Collection Platform (DCP) in a rectangular 6 ft by 8 ft precast concrete shelter at a 10 foot concrete Parshall flume with Ha stilling well. Northern Colorado Water Conservancy District (NCWCD) operates a Sutron 56-0540 incremental shaft encoder (record may be available upon request of the NCWCD) at the gage. The primary reference is an electric tape gage (ETG) located in the shelter with a supplemental staff located at the Ha location on the right wing wall of the flume. The gage is operated in cooperation with the NCWCD and the State of Colorado Division of Water Resources (CDWR).
Hydrologic Conditions.--	The Boulder Feeder Canal is a component of the water delivery system of the Colorado Big Thompson (C-BT) system and is owned and operated by the NCWCD. The Saint Vrain Supply Canal conveys water from Carter Reservoir to the Saint Vrain and Boulder Creek drainages. Water is measured at the Saint Vrain Supply Canal (15-foot Parshall flume) at Lyons, CO (SVSLYOCO) before bifurcating. Water bifurcated can be delivered to either the Saint Vrain Creek downstream from the Saint Vrain Creek at Lyons CO (SVCLYOCO) gage and/or can be delivered to the Boulder Feeder Canal (BFCLYOCO) via an inverted siphon under Hwy 66. Water delivered into the BFCLYOCO daylights approximately 200-feet upstream in a linear fashion (allowing sufficient stilling) from the 10-foot Parshall flume. After passing through the Parshall flume water again enters an inverted siphon before being conveyed to terminal storage in Boulder and Coal Ridge Reservoirs through both open and buried sections of canal. During normal operation, back water from the downstream siphon is not an issue, however, the Saint Vrain Creek topped it's banks on September 12, 2013 and flooded the area. A backwater effect took place as the shelter was even isolated in water. The flood destroyed the ditch and stilling pool to the flume. The channel was repaired and ready for flow as recorded by visit from DWR staff on October 3, 2013.
Gage-Height Record.--	The primary record is 15-minute telemetered SDR data with 15-minute logged DCP data and 5-minute logged SDR data as backup. Data from NCWCD 's encoder could be used as backup if necessary. The record is complete and reliable, except for September 12 - 30, 2013 where flood waters submerged the gage and destroyed the ditch. No data available for this period. Instrument calibration was supported by 135 visits made by NCWCD and CDWR staff to the gage this year. One instrument correction of 0.01 ft. was made this year, applied to the record as defined by correction made to the instrument. Another instrument correction of 0.17 ft. was made as the flume came back on in the Spring. The encoder had been set to an estimated start-up condition and required calibration as flow began. This structure is not operated in winter months. Diversions were discontinued on November 1, 2012 and resumed again on April 2, 2013. The DCP was winterized on November 9, 2012 and reactivated on March 22, 2013. In preparation of the winter the NCWCD removes the instrument floats from the stilling well prior to pumping the stilling well out.
Datum Corrections.--	Levels were last run on March 29, 2012 using RM0 as base. The ETI was found to be 0.013 ft. low but was not corrected as it is within allowable tolerances. RM's 2 and 3 were established on this date.
Rating.--	The control is a 10 foot Parshall flume. Rating No. 2, a non-standard rating, in use since October 1, 1977, compensates for abnormal approach conditions and was continued this year. Moss growth upstream of the flume does occur in late July through September which can cause velocity loss in the approach section and may cause negative shifting. Eight discharge measurements (Nos. 178-185) were made this water year ranging in discharge from 10.3 to 121 cfs. Discharge measurements made this year as well as two observations of zero flow cover the range in stage experienced this year until the flood on September 12, 2013, when the ditch was destroyed. Due to the flood, a peak flow was not determined for the Water Year 2013 record. Peak GH was recorded during the flood at 4.38 ft. at 07:15 on September 12, 2013.
Discharge.--	Discharge measurements within 5% of the rating have historically been adjusted to the rating, however, the shifts have been moving more negative over the past couple years. From October 1, 2012 to shutdown on November 1, 2012, shifts were adjusted to the rating and run by time. From April 2, 2013 (Start of flow) through September 11, 2013, shifts were run with consideration to stage using BFCLYOCOVSC13-A Variable Shift Curve. No data was collected from September 12 to 30, 2013 due to flood damage to the ditch. Measurements made this water year showed unadjusted shifts varying between -0.06 and -0.01 feet. All measurements were given full weight except Nos. 178, 181, and 182 which were adjusted up to 5% to better fit the Variable Shift Curve distribution.
Special Computations.--	Zero flow is determined operationally. Zero flow was determined to occur part of the day or the entire day on the following days: November 1, 2012 through April 2, 2013. BFCLYOCO computed discharge values are directly compared to those at the SVSLYOCO structure. Computed discharge at the BFCLYOCO gage should never exceed those at the SVSLYOCO gage.
Remarks.--	The record is good from October 1, 2012 to September 11, 2013. From September 12 to 30, 2013, no data is available due to flood damage. Station maintained and record developed by Patrick Tyler.
Recommendations.--	

Levels should be run before the flume turns on in the Spring to verify any movement the flood may have caused. If any discrepancy is found in the ETG, correction should be made. Since the entire canal was destroyed by flood and then rebuilt by the ditch company, approach conditions may have changed. A full range of measurements should be made to confirm that the rating is still valid. Every attempt should be made to perform discharge measurements at the low and high stage extremes. An Acoustic Doppler Current Profiler (ADCP) vs. current meter measurement validation exercise could be attempted. NCWCD gage-height backup data can be obtained from NCWCD if necessary.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

BOULDER CREEK FEEDER CANAL NEAR LYONS

RATING TABLE-- BFCLYOCO02 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

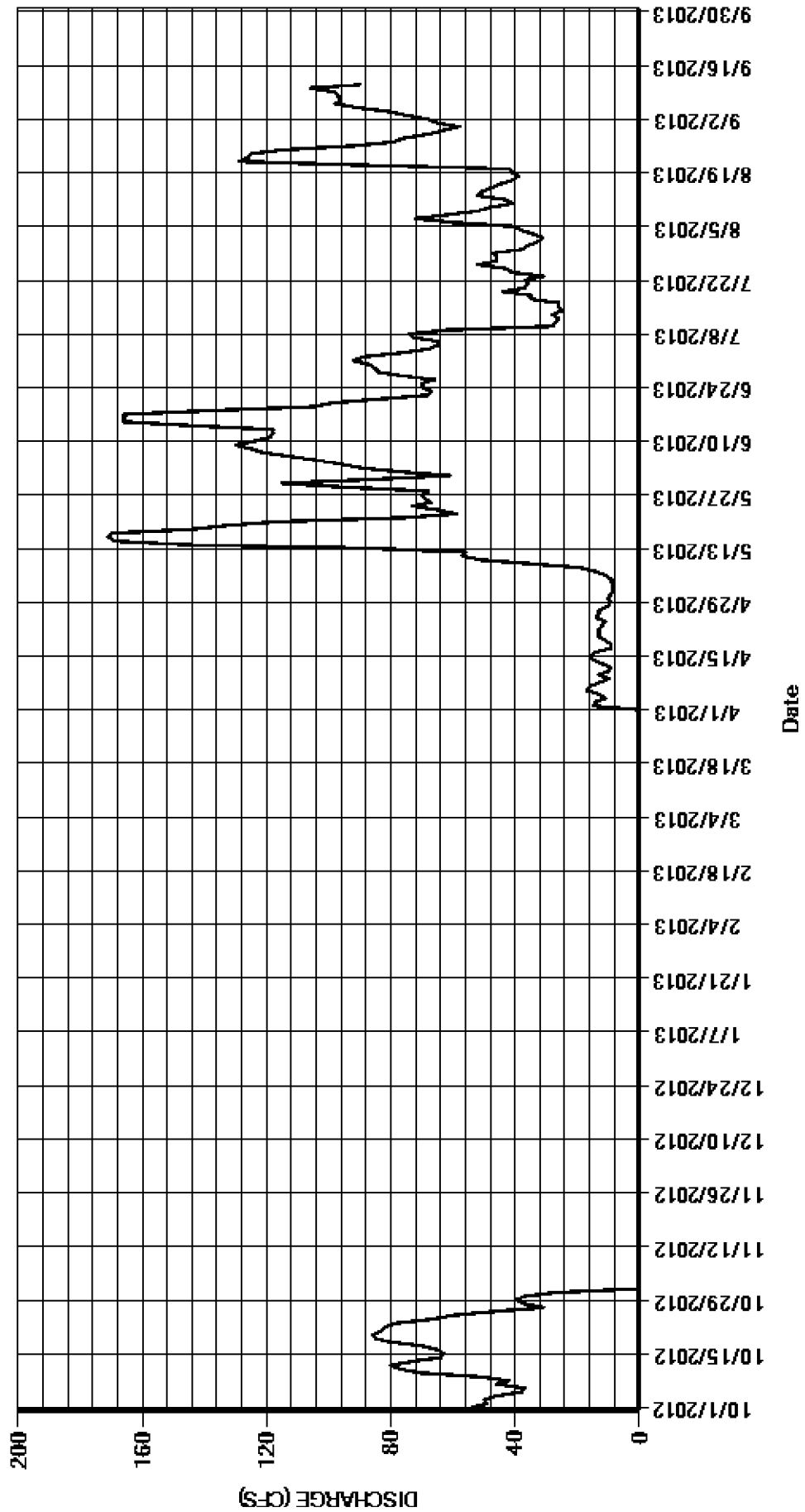
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	54	0.20	0.00	0.00	0.00	0.00	0.00	9.3	61	92	33	65
2	49	0.00	0.00	0.00	0.00	0.00	15	8.2	77	89	31	68
3	50	0.00	0.00	0.00	0.00	0.00	14	8.8	90	77	34	75
4	46	0.00	0.00	0.00	0.00	0.00	11	8.9	96	68	38	81
5	38	0.00	0.00	0.00	0.00	0.00	13	8.9	104	65	41	91
6	37	0.00	0.00	0.00	0.00	0.00	17	11	112	65	60	98
7	46	0.00	0.00	0.00	0.00	0.00	16	14	121	73	72	96
8	42	0.00	0.00	0.00	0.00	0.00	13	19	125	74	62	97
9	51	0.00	0.00	0.00	0.00	0.00	10	35	130	62	52	98
10	70	0.00	0.00	0.00	0.00	0.00	13	51	124	28	48	106
11	77	0.00	0.00	0.00	0.00	0.00	10	57	119	27	41	90
12	80	0.00	0.00	0.00	0.00	0.00	9.3	56	118	26	43	---
13	73	0.00	0.00	0.00	0.00	0.00	12	87	118	28	52	---
14	64	0.00	0.00	0.00	0.00	0.00	15	147	144	25	51	---
15	63	0.00	0.00	0.00	0.00	0.00	16	169	166	26	48	---
16	65	0.00	0.00	0.00	0.00	0.00	14	171	166	26	45	---
17	70	0.00	0.00	0.00	0.00	0.00	9.1	170	166	35	41	---
18	80	0.00	0.00	0.00	0.00	0.00	9.2	144	138	35	39	---
19	85	0.00	0.00	0.00	0.00	0.00	11	133	105	44	41	---
20	86	0.00	0.00	0.00	0.00	0.00	13	116	99	37	42	---
21	83	0.00	0.00	0.00	0.00	0.00	13	76	83	36	88	---
22	82	0.00	0.00	0.00	0.00	0.00	13	59	68	37	129	---
23	78	0.00	0.00	0.00	0.00	0.00	12	65	67	31	126	---
24	67	0.00	0.00	0.00	0.00	0.00	11	73	70	41	125	---
25	60	0.00	0.00	0.00	0.00	0.00	14	67	70	43	114	---
26	47	0.00	0.00	0.00	0.00	0.00	13	69	66	52	92	---
27	31	0.00	0.00	0.00	0.00	0.00	13	70	76	46	79	---
28	37	0.00	0.00	0.00	0.00	0.00	10	68	84	46	76	---
29	40	0.00	0.00	0.00	---	0.00	9.4	95	85	47	68	---
30	37	0.00	0.00	0.00	---	0.00	10	115	87	38	63	---
31	27	---	0.00	0.00	---	0.00	---	86	---	36	58	---
TOTAL	1815	0.20	0.00	0.00	0.00	0.00	359.00	2267.1	3135	1455	1932	965
MEAN	58.5	0.007	0.000	0.000	0.000	0.000	12.0	73.1	104	46.9	62.3	87.7
AC-FT	3600	0.4	0	0	0	0	712	4500	6220	2890	3830	1910
MAX	86	0.20	0.00	0.00	0.00	0.00	17	171	166	92	129	106
MIN	27	0.00	0.00	0.00	0.00	0.00	0.00	8.2	61	25	31	65

CAL YR	2012	TOTAL	26180.20	MEAN	71.5	MAX	200	MIN	0.00	AC-FT	51930 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	11928.30	MEAN	34.5	MAX	171	MIN	0.00	AC-FT	23660 (PARTIAL YEAR RECORD)

MAX DISCH: (Peak flow not determined Water Year 2013)  
 MAX GH: 4.38 FT AT 07:15 ON SEP 12, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**BOULDER CREEK FEEDER CANAL NEAR LYONS  
WY2013 HYDROGRAPH**





PLATTE RIVER BASIN  
SAINT VRAIN SUPPLY CANAL NEAR LYONS, CO  
Water Year 2013

Location.-- Lat 40°13'05", long 105°15'35", Boulder County, about 0.2 miles east of Lyons,CO.

Drainage Area and Period of Record.-- N/A.; Daily values are available from October 1, 1953 to present.

Equipment.-- Sutron Stage Discharge Recorder (SDR) connected to a Sutron Satlink Data Collection Platform (DCP) in a 36-inch corrugated metal pipe shelter overtop a 3-foot square concrete stilling well at a 15-foot concrete Parshall flume. Northern Colorado Water Conservancy District (NCWCD) operates a Sutron incremental shaft encoder and Stevens Type A continuous chart recorder (record may be available upon request of the NCWCD) at the gage. The primary reference is an electric tape gage (ETG) located on the instrument shelf with a supplemental staff gage located at the Ha location on the right wing wall of the flume. A foot bridge spans the flume with its upstream edge placed at the Ha location. The gage is operated in cooperation of the NCWCD and the State of Colorado Division of Water Resources (CDWR).

Hydrologic Conditions.-- The Saint Vrain Supply Canal is a component of the water delivery system of the Colorado Big Thompson (C-BT) system and is owned and operated by the NCWCD. The Saint Vrain Supply Canal conveys water from Carter Reservoir to the Saint Vrain and Boulder Creek basins. Releases are measured at the Saint Vrain Supply Canal at Lyons CO (SVSLYOCO) gage before bifurcation. Bifurcated water can be delivered to either the Saint Vrain Creek downstream from the Saint Vrain Creek at Lyons, CO (SVCLYOCO) gage and/or delivered to the Boulder Feeder Canal (BFCLYOCO) for terminal storage in Boulder Reservoir. The diversionary point is located downstream from the SVSLYOCO gage below an inverted siphon under Hwy 66. There are several minor diversions along the Saint Vrain Supply Canal before the SVSLYOCO gage (15-foot Parshall flume) location. Water conveyed from Carter Reservoir daylight approximately 0.25 miles upstream from the flume on a hillside due north of the gage. From this point the canal drops down a steep gradient chute into the flume's forebay resulting in high velocity surging flow and unsteady stage at the gage. A small diversionary point for water deliveries to the Supply Ditch is also located in the SVSLYOCO forebay. Backwater from the inverted siphon immediately downstream from the flume has not been observed.

Gage-Height Record.-- The primary record is 15-minute telemetered SDR data with 15-minute logged DCP and NCWCD logged data as backup. The record is complete and reliable for the period of record. Diversions were discontinued on November 1, 2012 and resumed again on April 2, 2013. The DCP was winterized on November 9, 2012 and reactivated on March 22, 2013. Instrument calibration was supported by 154 visits made by NCWCD and DWR staff to the gage this year. NCWCD readings on the DWR instrument were not used for calibration, but the DWR and NCWCD data sets were compared directly. Three encoder corrections were made to the Data Logger this year. They were applied to the record as they were applied to the equipment based on visits. One other correction of 0.14 ft. was made as the estimated start-up value was off at the beginning of the season. Primary (DWR) and back-up (NCWCD) data agreed to within +/-0.02 ft. The record has high reliability. This structure is not operated in winter months.

Datum Corrections.-- Levels were last run on March 29, 2012 using RM 0 as base. No corrections were required. Although no correction to the base reference was necessary, the metal drop tape was replaced. RM 1 and RM 2 were also established on this date using RM 0 as base.

Rating.-- The control is a 15 foot Parshall flume. Rating No.5 was used to finish out the 2012 irrigation year. Rating No. 6, a non-standard rating, in use since December 24, 2012, was used this year. Rating No. 6 compensates for abnormal high approach velocities resulting from the steep gradient concrete canal chute above the flume. Nine discharge measurements (Nos. 185 - 193) were made this year ranging in discharge from 11.7 to 186 cfs. Measurements made this year along with two observations of zero flow cover the flow experienced this Water Year. The peak flow of 236 cfs occurred at 15:00 on April 4, 2013 at a gage height of 2.43 feet with a shift of -0.06 ft. It exceeded Msmt. No. 193 made September 10, 2013 by 50 cfs and 0.33 feet of stage respectively.

Discharge.-- Shifting control method was used for all periods of record. Stage dependent shifting using variable shift table SVSLYOCOVST12-1 defined by Measurement Nos. 178 - 185 was applied from October 1 to November 1, 2012. Stage dependent shifting using variable shift table SVSLYOCOVSC13-A defined by Measurement Nos. 187 - 193 was applied from April 2 to October 1, 2013. This year's measurements showed unadjusted shifts varying between -0.06 and 0.00 ft. All were given full weight except for Nos. 188, 189, 191, 192 which were discounted up to 4% to smooth the stage-shift relationship.

Special Computations.-- Zero flow is determined operationally. Observations of stages of 0.07 ft. and below have been made during periods of zero flow. As such, residual stages of 0.07 ft. and below occurring on November 1, 2012 and September 13 and 15, 2013 were adjusted to zero.

Remarks.-- The record is good. Station maintained and record developed by Patrick Tyler.

Recommendations.-- Levels need to be run again in the 2014 water year to monitor stability of the newly placed RM's.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

SAINT VRAIN SUPPLY CANAL NEAR LYONS, CO

RATING TABLE-- SVSLYOCO05 USED FROM 01-OCT-2012 TO 06-DEC-2012  
 SVSLYOCO06 USED FROM 06-DEC-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

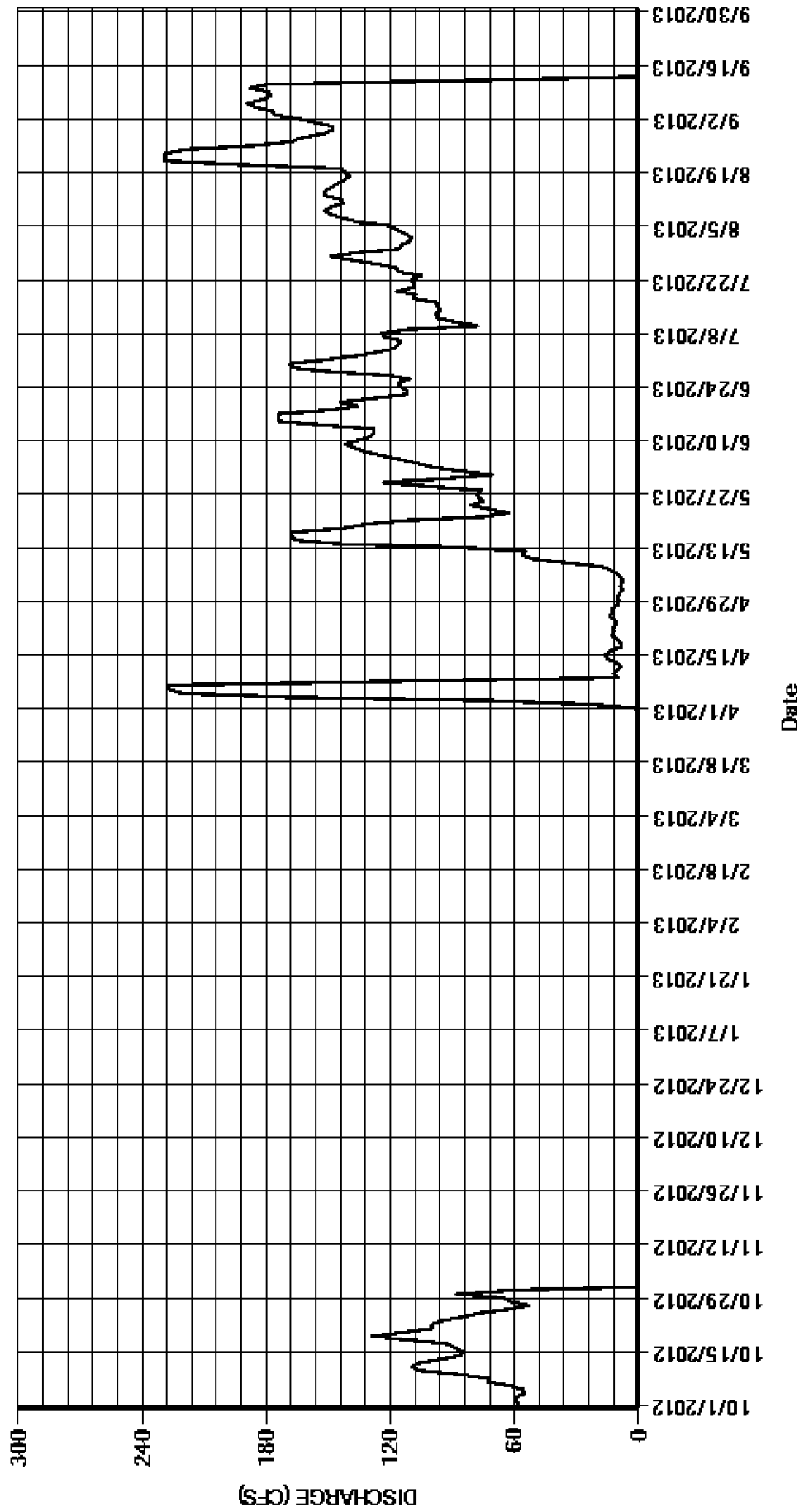
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	58	0.08	0.00	0.00	0.00	0.00	0.00	9.2	71	153	111	156
2	59	0.00	0.00	0.00	0.00	0.00	21	8.1	86	138	110	164
3	60	0.00	0.00	0.00	0.00	0.00	67	8.7	100	127	113	176
4	55	0.00	0.00	0.00	0.00	0.00	171	8.1	107	118	117	177
5	56	0.00	0.00	0.00	0.00	0.00	221	8.0	115	116	120	185
6	62	0.00	0.00	0.00	0.00	0.00	227	10	123	115	135	189
7	73	0.00	0.00	0.00	0.00	0.00	227	13	132	123	143	182
8	73	0.00	0.00	0.00	0.00	0.00	123	18	137	124	149	178
9	86	0.00	0.00	0.00	0.00	0.00	9.8	35	142	112	152	179
10	105	0.00	0.00	0.00	0.00	0.00	12	51	136	78	149	188
11	110	0.00	0.00	0.00	0.00	0.00	9.8	56	130	89	143	180
12	106	0.00	0.00	0.00	0.00	0.00	8.7	55	128	97	144	91
13	95	0.00	0.00	0.00	0.00	0.00	11	87	128	98	152	1.2
14	86	0.00	0.00	0.00	0.00	0.00	15	146	154	96	152	0.00
15	85	0.00	0.00	0.00	0.00	0.00	16	166	174	97	149	0.14
16	89	0.00	0.00	0.00	0.00	0.00	14	168	174	98	146	0.00
17	93	0.00	0.00	0.00	0.00	0.00	8.5	168	174	109	142	0.00
18	113	0.00	0.00	0.00	0.00	0.00	8.6	143	148	108	140	0.00
19	129	0.00	0.00	0.00	0.00	0.00	10	133	136	117	142	0.00
20	114	0.00	0.00	0.00	0.00	0.00	13	115	144	109	144	0.00
21	100	0.00	0.00	0.00	0.00	0.00	12	75	128	109	189	0.00
22	100	0.00	0.00	0.00	0.00	0.00	12	63	112	110	229	0.00
23	96	0.00	0.00	0.00	0.00	0.00	11	73	112	105	229	0.00
24	85	0.00	0.00	0.00	0.00	0.00	11	81	115	116	229	0.00
25	77	0.00	0.00	0.00	0.00	0.00	14	75	116	117	219	0.00
26	63	0.00	0.00	0.00	0.00	0.00	13	77	111	126	186	0.00
27	53	0.00	0.00	0.00	0.00	0.00	13	78	121	138	168	0.00
28	62	0.00	0.00	0.00	0.00	0.00	10	76	150	149	163	0.00
29	66	0.00	0.00	0.00	---	0.00	9.5	102	167	136	153	0.00
30	88	0.00	0.00	0.00	---	0.00	10	123	169	116	148	0.00
31	62	---	0.00	0.00	---	0.00	---	95	---	115	148	---
TOTAL	2559	0.08	0.00	0.00	0.00	0.00	1308.90	2324.1	3940	3559	4814	2046.34
MEAN	82.5	0.003	0.000	0.000	0.000	0.000	43.6	75.0	131	115	155	68.2
AC-FT	5080	0.2	0	0	0	0	2600	4610	7810	7060	9550	4060
MAX	129	0.08	0.00	0.00	0.00	0.00	227	168	174	153	229	189
MIN	53	0.00	0.00	0.00	0.00	0.00	0.00	8.0	71	78	110	0.00

CAL YR	2012	TOTAL	42174.08	MEAN	115	MAX	382	MIN	0.00	AC-FT	83650
WTR YR	2013	TOTAL	20551.42	MEAN	56.3	MAX	229	MIN	0.00	AC-FT	40760

MAX DISCH: 236 CFS AT 15:00 ON APR 04, 2013 GH 2.43 FT SHIFT -0.06 FT  
 MAX GH: 2.43 FT AT 15:00 ON APR 04, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SAINT VRAIN SUPPLY CANAL NEAR LYONS, CO  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06744000 BIG THOMPSON RIVER AT MOUTH NEAR LA SALLE  
Water Year 2013

Location.-- Lat. N40° 21'2.27", Long. W104° 47'1.15" (NAD83). Gage is located on the left bank of the Big Thompson River approximately 1.6 mi upstream from the mouth and 4 mi west of LaSalle, CO.

Drainage Area and Period of Record.-- 830 sq mi (USGS Colorado StreamStats utility). ; Daily values are available from April 1, 1914 to October 31, 1915 and March 1, 1927 to present.

Equipment.-- Digital incremental Sutron SDR digital shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) in a wooden shelter ovetop a galvanized stilling well at a smooth concrete control. The well is connected to the stream by two 2 -in. intakes with flushing provisions. An electric tape index on the instrument shelf is the primary reference.

Hydrologic Conditions.-- Drainage area consists of high mountain terrain, municipal and agricultural areas. Gage is located downstream from many agricultural diversions which attempt to divert all available water. Flow is mostly seepage, return flows from agriculture, local runoff and municipal runoff and wastewater. The Colorado-Big Thompson (C-BT) project historically releases 'carry-over' water at the end of October every year to downstream users that have rights to that water. Both north and south sides of the control were refurbished May 3, 2012 and riprap was installed to prevent future erosion, however the control was damaged during the September 2013 flood event.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged DCP and 5-minute logged SDR data as backup. The record is complete and reliable, except for the following days: November 11, 12, 2012; December 20, 2012, through January 7, 2013; January 11-16, 18, 21, 22, 2013; and February 9-12, 24-27, 2013 when the gage was ice affected and/or the well was frozen; and September 13-16, 2013 when the shaft encoder was submerged and destroyed. Five instrument corrections were made this year. All were applied to the record as defined by observation and correction in the field.

Datum Corrections.-- Levels were run September 2, 2011 using R.M.2 as base. The gage was found to be reading accurately and no adjustments were made.

Rating.-- The control is a 50-60 foot smooth concrete control on bedrock, about 2 feet high with rounded crest, located about 20 feet below the gage. At around 1000 cfs, the control submerges due to downstream channel conditions and flood flows will go over-bank on the right side.

Rating 27 was used for the entire water year and is defined by measurements from 1.14 to 6000 cfs. Twenty discharge measurements (Nos. 614- 633) were made this year ranging from 16 to 810 cfs. Measurements made this year cover the range in stage experienced well except for the flood in September 2013. The peak flow could not be determined but is believed to have occurred on September 13 or 14, 2013. The peak gage height was not recorded, as water was higher than the shaft encoder elevation inside the station.

Discharge.-- Shifting control method was used all year. Shifts are caused by material scouring and filling the pool in front of the control. Open water measurements made this year showed unadjusted shifts varying between -0.29 ft. and +0.07 ft. Shifts were applied as follows: September 13, 2012 - October 1, 2012, by time as defined by measurements; October 1 - October 31, 2012, stage dependent shifting using variable shift table BIGLASCOVST13-A, defined by Msmt. Nos. 614-617 made during the period of use; October 31, 2012 - May 21, 2013, by time as defined by measurements made during the period of use; May 21, 2013 - September 13, 2013, stage dependent shift using variable shift table BIGLASCOVST13-B defined by Msmt. Nos. 626-630 made during the period of use and September 16, 2013 - October 15, 2013, stage dependent shifting using variable shift table BIGLASCOVST13-C defined by Msmt. Nos. 631-636 made during and immediately following the period of use. All measurements were given full weight except for Nos. 614, 620, 625 and 634, which were discounted up to 5.9% to better fit the respective shift distributions.

Special Computations.-- Discharge for ice affected periods were estimated by interpolation between periods of good record and temperature trends.

Remarks.-- The record is good, except for periods of ice effect, which are estimated and poor, and the period following the September flood from September 17- 24, 2013, which is considered fair due to the damage sustained by the control , continual changes in the channel configuration following the flood event as well as variability in results of discharge measurements made during the period. Station maintained and record developed by Matt Rusch.

Recommendations.-- The control is in need of repair and special attention should be paid to large changes in stage. Until repairs are made high and low flows should be monitored and measured more frequently,

STATE OF COLORADO  
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06744000 BIG THOMPSON RIVER AT MOUTH NEAR LA SALLE

RATING TABLE-- BIGLASCO27 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

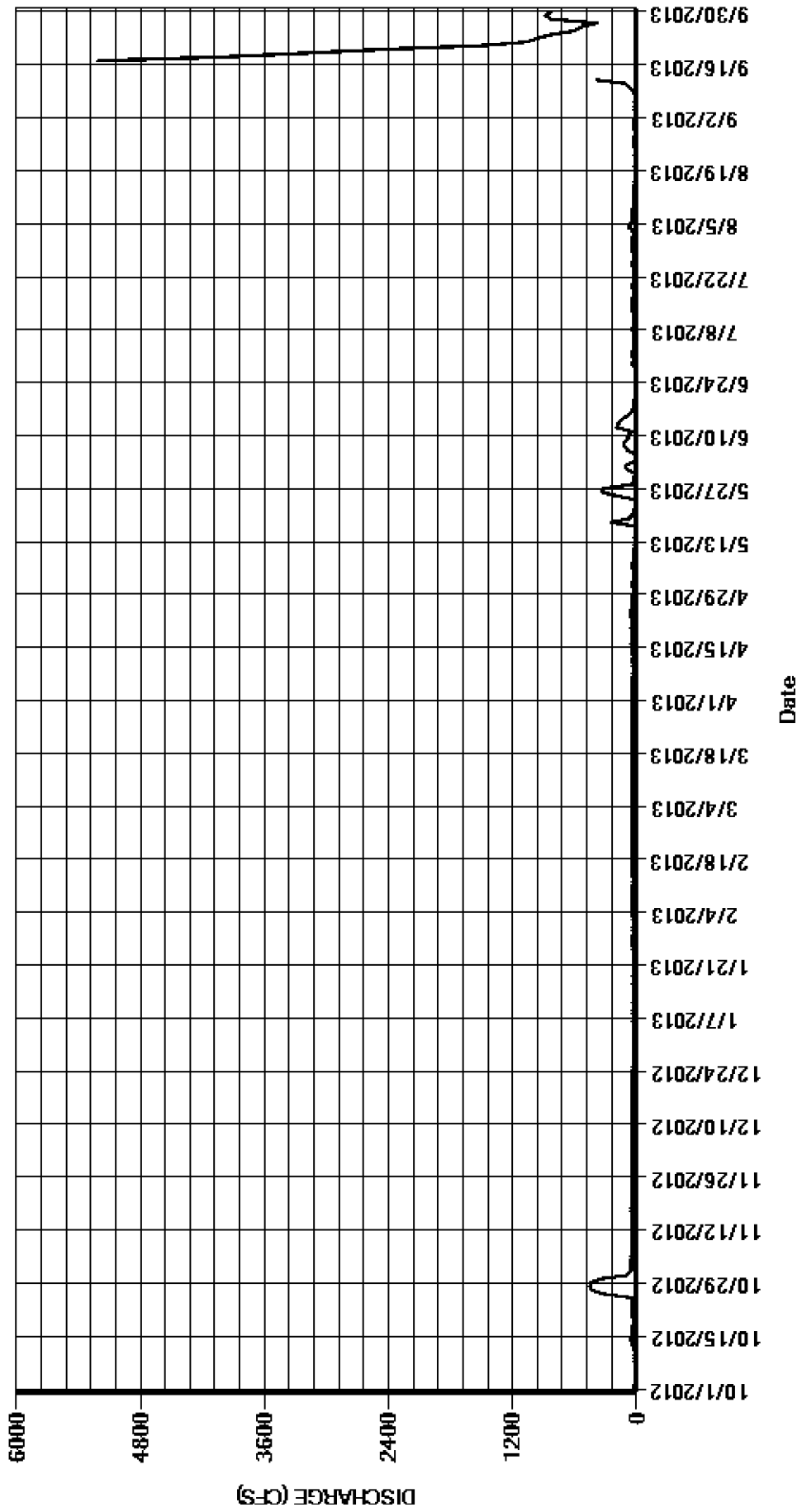
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	24	56	45	e30	36	38	37	46	98	40	43	23
2	22	55	44	e30	36	39	37	50	109	40	31	21
3	18	54	44	e32	37	40	39	27	35	28	34	20
4	19	52	42	e35	38	42	39	23	10	29	75	21
5	18	51	42	e35	37	41	37	21	20	23	53	21
6	16	50	42	e35	37	40	37	40	82	27	49	21
7	17	49	42	e35	37	41	37	49	117	32	48	18
8	21	49	41	36	37	42	36	29	126	42	51	19
9	20	49	40	35	e37	43	36	25	87	30	39	37
10	22	49	39	36	e37	44	36	26	81	35	25	77
11	20	e49	40	e35	e37	44	37	22	48	31	24	107
12	33	e49	40	e32	e36	44	37	20	191	33	28	383
13	48	49	40	e30	37	43	36	19	180	43	29	---
14	56	49	40	e30	37	43	41	21	154	48	23	---
15	43	49	39	e32	37	43	44	20	102	44	22	---
16	41	49	40	e35	37	43	51	16	55	41	21	---
17	44	51	40	36	38	42	47	14	36	30	19	5210
18	34	52	40	e35	38	41	48	242	32	30	18	4010
19	32	49	39	35	38	39	48	75	24	42	19	3210
20	38	48	e40	35	38	38	52	41	18	37	21	2430
21	48	47	e40	e35	39	39	50	29	17	29	19	1490
22	44	47	e38	e35	38	37	44	12	16	28	21	1060
23	39	46	e38	35	38	39	51	5.3	14	23	21	963
24	42	46	e38	35	e38	39	55	4.6	14	29	20	819
25	46	46	e35	36	e38	39	52	184	13	40	21	597
26	302	45	e32	37	e38	38	48	328	14	35	24	535
27	429	45	e30	38	e38	40	45	328	17	28	24	391
28	449	44	e30	38	e38	42	43	53	15	31	20	831
29	452	44	e30	37	---	40	35	21	47	43	19	884
30	357	45	e30	36	---	39	28	23	31	46	23	820
31	96	---	e30	36	---	38	---	13	---	41	22	---
TOTAL	2890	1463	1190	1072	1047	1260	1263	1826.9	1803	1078	906	24018
MEAN	93.2	48.8	38.4	34.6	37.4	40.6	42.1	58.9	60.1	34.8	29.2	924
AC-FT	5730	2900	2360	2130	2080	2500	2510	3620	3580	2140	1800	47640
MAX	452	56	45	38	39	44	55	328	191	48	75	5210
MIN	16	44	30	30	36	37	28	4.6	10	23	18	18

CAL YR	2012	TOTAL	18752.2	MEAN	51.2	MAX	452	MIN	0.70	AC-FT	37190
WTR YR	2013	TOTAL	39816.9	MEAN	110	MAX	5210	MIN	4.6	AC-FT	78980 (PARTIAL YEAR RECORD)

MAX DISCH: (Undetermined)  
 MAX GH: (Undetermined)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06744000 BIG THOMPSON RIVER AT MOUTH NEAR LA SALLE  
 WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06752000 CACHE LA POUDBRE AT CANYON MOUTH NEAR FORT COLLINS  
Water Year 2013

Location.-- Lat. 40°39'52", Long. 105°13'27" (WGS84), Larimer County, Hydrologic Unit 10190007. Gage is located on the left bank at mouth of canyon, 0.5 mi downstream from headgate of Poudre Valley Canal, 1.2 mi upstream from Lewistone Creek, and 9.3 mi northwest of courthouse in Fort Collins, CO.

Drainage Area and Period of Record.-- 1,055 mi<sup>2</sup>. (USGS Colorado StreamStats utility).; Sporadic and somewhat unreliable data from June 1881 to Aug. 1883. Reliable data from Oct. 1883 to current year. Periodic water-quality data from 1962 to 1995.

Equipment.-- Sutron SDR-0001-4 digital incremental shaft encoder and a temperature sensor connected to a Sutron SatLink 2 Data Collection Platform (DCP) and a Steven's Type F weekly water-stage recorder in a concrete shelter overtop a concrete stilling well on the left bank of the channel near the canyon mouth. An Electric Tape Gage (ETG) index on the instrument shelf is the primary reference with a supplemental outside cantilever chain gage.

Hydrologic Conditions.-- Drainage area consists of high mountain forested areas of varying largely uninhabited terrain. Flows are partially controlled by upstream diversions and releases from Seaman Reservoir and several small transmountain diversions diverting water from the Colorado and North Platte River Basins into the South Platte Basin upstream of this gage. The High Park Fire of 2012 burned approximately 87,284 acres. A large portion of the burn area is tributary to the gage. Runoff in the Cache la Poudre basin was about average this water year until the flood event in September. The flood event somewhat cleansed the river from sooty sediment accumulation from the 2012 burn areas.

Gage-Height Record.-- The primary record is telemetered 15-minute data with logged DCP data and chart record as back up. The record is complete and reliable, except for the following periods: November 13-22, 25-28, 2012 and March 23-27, 2013 when the stage-discharge relation was affected by ice and November 28, 2012 - March 7, 2013 when the station was shutdown for winter. The gage was visited at least weekly by CDWR staff to monitor chart and encoder calibration. Four instrumentation corrections ranging between -0.02 and +0.03 ft. were applied to the record as defined by corrections made to the instrument.

The flood of September 2013 did minor damage to parts of the road in the Poudre Canyon and minor damage around the gage house. The gage never stopped transmitting and the data all appears to be good.

Datum Corrections.-- Levels were last run August 23, 2012 using RM3 as base. The gage was found to read correctly.

Rating.-- The control is a rock and gravel riffle about 100 ft. below the gage. Fill and scour will cause minor shifting. Rating, CLAFTRCO15 was continued to August 26, 2013. CLAFTRCO16 was applied from August 26, 2013 through the end of the 2013 Water Year.

Nineteen discharge measurements (Nos. 543 - 561) were made this year ranging in discharge from 5.81 to 3,890 cfs covering the range in stage experienced this year well with exception of the higher daily discharge of September 13, 2013. The peak flow of 9,730 cfs occurred at 03:15 on September 13, 2013 at a gage-height of 10.29 ft. using a time distributed shift of +0.01 ft. The peak exceeded this year's high flow measurement (No. 559) made September 14, 2013 by 3.99 ft. of stage and 5,840 cfs respectively. The peak is considered estimated and fair due to lack of confirming measurements in the range.

Discharge.-- Shifts are caused by material moving through the control section as well as vegetal growth in the channel. Shifting control method was used all year. Shifts were distributed by time as defined by measurements from September 28, 2013 through March 7, 2013 and August 26 through September 14, 2013. Stage dependant shifting using variable shift curve CLAFTRCOVSC13-A, defined by Measurement Nos. 547-558, made during the period of use, was applied from March 20 through August 26, 2013. Variable shift curve CLAFTRCOVSC13-B, defined by Measurement Nos. 559-564, made during the period of use, was applied from September 14 through October 24, 2013. Open water measurements made this year showed unadjusted shifts varying between +0.01 and -0.13 ft. All were given full weight with exception of Nos. 544, 551 and 557 which were adjusted -1.97%, -3.14% and 1.99% respectively to smooth shift distributions.

Special Computations.-- Discharge for periods of ice affect as well as the winter period were estimated from adjacent good record and a mass balance computation using downstream diversions and gages with respect given to temperature trends recorded at the gage.

Remarks.-- The record is good, except for the periods of ice affect and the winter period, which are estimated and poor. The peak is rated fair due to a lack of confirming measurements in the range. The station is maintained and record developed by Lee Cunning. Water quality instrumentation used to monitor water quality following the High Park fire was installed by Colorado State University staff and students at the end of the 2012 water year.

Recommendations.-- Continued diligence to perform discharge measurements throughout the full range of flows experienced is recommended. Cooperative efforts to address water quality concerns following the High Park Fire should be continued.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06752000 CACHE LA POUFRE AT CANYON MOUTH NEAR FORT COLLINS

RATING TABLE-- CLAF TCCO15 USED FROM 01-OCT-2012 TO 26-AUG-2013  
 CLAF TCCO16 USED FROM 26-AUG-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	106	53	e18	e29	e27	e25	36	96	1200	857	280	125
2	101	56	e17	e28	e27	e25	36	61	1330	575	193	105
3	85	53	e18	e28	e28	e20	30	57	1550	456	166	57
4	58	48	e13	e27	e29	e20	23	105	1500	451	311	41
5	50	40	e11	e29	e29	e20	26	167	1750	445	282	75
6	50	42	e18	e24	e29	e25	26	171	1840	645	240	159
7	46	41	e17	e24	e40	e21	28	118	1710	718	267	133
8	43	36	e10	e26	e44	29	27	112	1840	603	276	141
9	45	35	e11	e27	e42	24	33	168	1840	378	244	175
10	48	35	e15	e30	e36	31	22	199	1760	462	234	187
11	45	32	e19	e26	e34	25	21	195	1660	477	235	258
12	45	16	e18	e26	e33	24	24	172	1720	504	188	3040
13	48	e15	e20	e26	e30	24	25	380	1790	481	165	7530
14	51	e20	e21	e26	e29	30	25	551	1780	487	200	3780
15	55	e25	e21	e28	e29	36	29	723	1690	553	229	3390
16	57	e25	e25	e35	e30	43	35	610	1570	528	251	3390
17	56	e25	e30	e30	e29	37	26	809	1430	483	252	2330
18	58	e25	e34	e27	e28	21	30	909	1260	467	251	1770
19	47	e25	e33	e32	e27	23	26	662	1130	428	243	1390
20	46	e25	e35	e30	e25	27	55	554	1090	377	184	1100
21	48	e30	e37	e31	e25	30	49	488	1040	386	138	919
22	48	e30	e35	e28	e25	25	56	649	1000	409	138	728
23	48	29	e32	e28	e25	e28	54	778	960	366	178	753
24	51	27	e31	e29	e24	e30	50	1160	923	311	192	671
25	58	e25	e28	e29	e26	e30	62	1370	857	308	212	538
26	57	e20	e26	e31	e25	e30	70	1490	835	284	275	457
27	50	e15	e29	e30	e25	e30	93	1450	799	222	215	e350
28	53	e10	e31	e30	e21	29	140	1360	799	337	185	e300
29	58	e10	e27	e27	---	33	127	1300	874	382	196	e250
30	55	e15	e29	e25	---	35	113	1250	867	351	151	208
31	53	---	e28	e24	---	37	---	1230	---	351	118	---
TOTAL	1719	883	737	870	821	867	1397	19344	40394	14082	6689	34350
MEAN	55.5	29.4	23.8	28.1	29.3	28.0	46.6	624	1346	454	216	1145
AC-FT	3410	1750	1460	1730	1630	1720	2770	38370	80120	27930	13270	68130
MAX	106	56	37	35	44	43	140	1490	1840	857	311	7530
MIN	43	10	10	24	21	20	21	57	799	222	118	41

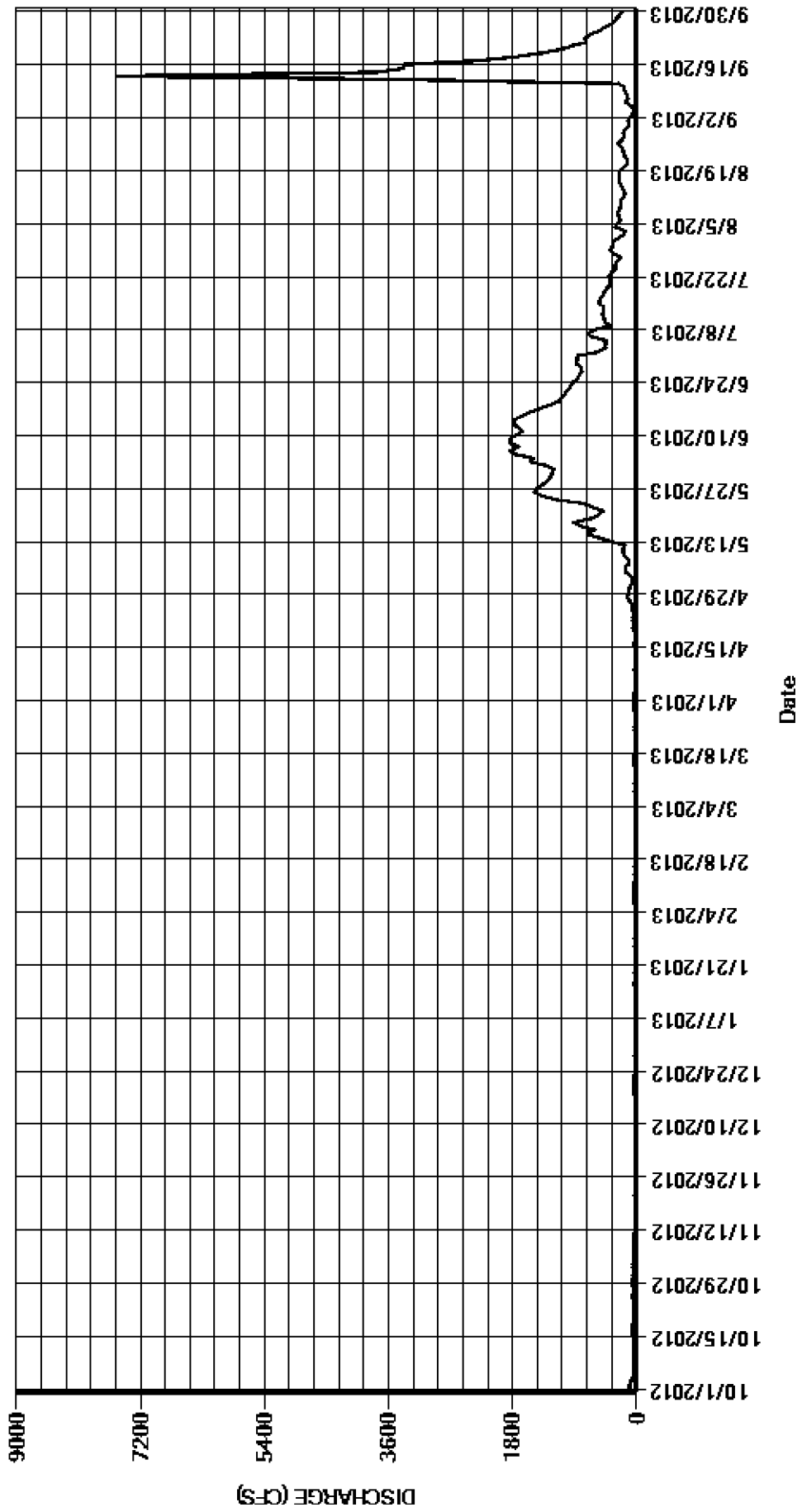
CAL YR	2012	TOTAL	53287	MEAN	146	MAX	828	MIN	10	AC-FT	105700
WTR YR	2013	TOTAL	122153	MEAN	335	MAX	7530	MIN	10	AC-FT	242300

MAX DISCH: 9730 CFS AT 03:15 ON SEP 13, 2013 GH 10.29 FT SHIFT 0.01 FT  
 MAX GH: 10.29 FT AT 03:15 ON SEP 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



06752000 CACHE LA POUUDRE AT CANYON MOUTH NEAR FORT COLLINS  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06752500 CACHE LA POUUDRE NEAR GREELEY

Water Year 2013

Location.-- Lat. 40°25'04", Long. 104°38'24", in NW¼ sec. 11, T.5 N., R.65 W., Weld County, Hydrologic Unit 10190007, on right bank 15 ft. downstream from Fern Ave. bridge, 2.9 miles east of courthouse in Greeley, and 3.0 miles upstream from mouth of the South Platte River.

Drainage Area and Period of Record.-- 1890 sq mi. (USGS Colorado StreamStats utility). Sporadic values available from April 1, 1903 to 1905. Daily values are available from January 1, 1914 to December 31, 1920 and June 1, 1924 to present. ; March 1903 - Present.

Equipment.-- Sutron Stage Discharge Recorder (SDR) connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly data in a 48-inch corrugated metal pipe shelter and stilling well. The well is connected to the channel with three 2-inch intakes. Two intakes are equipped with flushing provisions. An electric tape gage placed on the instrument shelf of the shelter serves as the primary reference with a supplemental wire weight gage located on the downstream side of the Fern Ave. bridge.

Hydrologic Conditions.-- Gage is located downstream of the City of Greeley wastewater treatment facility and can show small diurnals from the effluent. Storm runoff events from hardened surfaces in the City of Greeley can result in rapid stage increases at the gage. Colorado-Big Thompson project deliveries of several hundred cfs for a few days duration also pass the gage, generally in October. A flooding event in mid September produced the peaks for the year in the Cache la Poudre River Basin. Although these flows were substantial, they were not as damaging in this basin as in other basins.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged DCP and 5-minute logged SDR data as backup. Instrument calibration was supported by 30 visits made to the gage by DWR personnel this year. Four instrumentation corrections were required to the shaft encoder this year and were applied to the record as defined by observations and correction of the instrument. Missing values were filled in using adjacent data without loss in accuracy. The record is complete and reliable.

Datum Corrections.-- Levels were last run on October 4, 2011 using RM 4 as base.

Rating.-- The low to mid level control is a downstream riffle in a gravel and sand channel which is subject to scour and fill. Channel control prevails at higher stages. At extreme stages the Fern Avenue bridge becomes the primary regulating feature. Flow can bypass the gage at these stages.

Following the 2010 Weld County cleanout of the channel, large gravel bars have again formed downstream of the bridge and adjacent to the gage effectively dividing the flow into two channels. Sustained low flows in WY2012 allowed vegetative growth to establish on these gravel bars. The sustained high flows of WY2013 did very little to change the gravel bars.

The channel adjacent to the gage is the main channel up to about 60 cfs. Above this point flows will start to flow in a smaller channel on the north side of the river. The rating above a gage-height of about 2.45 ft. should be much different than original or stage-shifted rating 27. However, the higher flows seemed to follow pre-cleanout stage-shift relationships showing that the bridge may not be the control backing water upstream, causing minor flooding. Rating CLAGRECO27, dated January 4, 2010, in use since 2009 was continued in use for all of this year. It is defined by measurements from 50 to 4500 cfs. Twenty-three discharge measurements (Nos. 1102-1124) were made this year, ranging in discharge from 22.6 to 3,040 cfs. The peak flow of 3770 cfs occurred at 05:45 on September 15, 2013 at a gage-height of 9.25 ft. with a shift of -0.63 ft. exceeding this year's high flow measurement, No. 1123 made on September 16, 2013 by 730 cfs and 0.39 ft of stage.

Discharge.-- Shifting control method was used for all period of open water. Shifts are principally caused by fill and scour of the channel and in-channel and bank vegetal growth. Shifts were distributed by time as defined by measurements from September 13, 2012 through May, 2 and from May 27 through July 11, 2013. Stage dependant shifting using variable shift tables CLAGRECOVSC13-A - CLAGRECOVSC13-E was applied from May 2 to May 27 and July 11 through October 10, 2013. Shift tables A-E are defined by measurements made during their respective periods of use. Open water measurements made this year showed unadjusted shifts varying between -0.80 and +0.31 ft. All were given full weight except for No. 1122 which was discounted -4.84% to smooth the stage-shift distribution.

Special Computations.-- None.

Remarks.-- The record is good except for: May 15-19, 25-29; June 6, 9-11, 30; August 3-4, 23 and September 12-15, 2013 which is rated as fair due to the lack of definition in the stage-shift relation experienced on days of higher stages. Station maintained by Lee Cunning, record developed by Lee Cunning and Russell Stroud.

Recommendations.-- Due to the lack of stability in the stage-shift relation, measurements should be made on higher flow events and immediately following such events. A new rating should be evaluated as the channel continues to stabilize.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06752500 CACHE LA POUFRE NEAR GREELEY

RATING TABLE-- CLAGRECO27 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

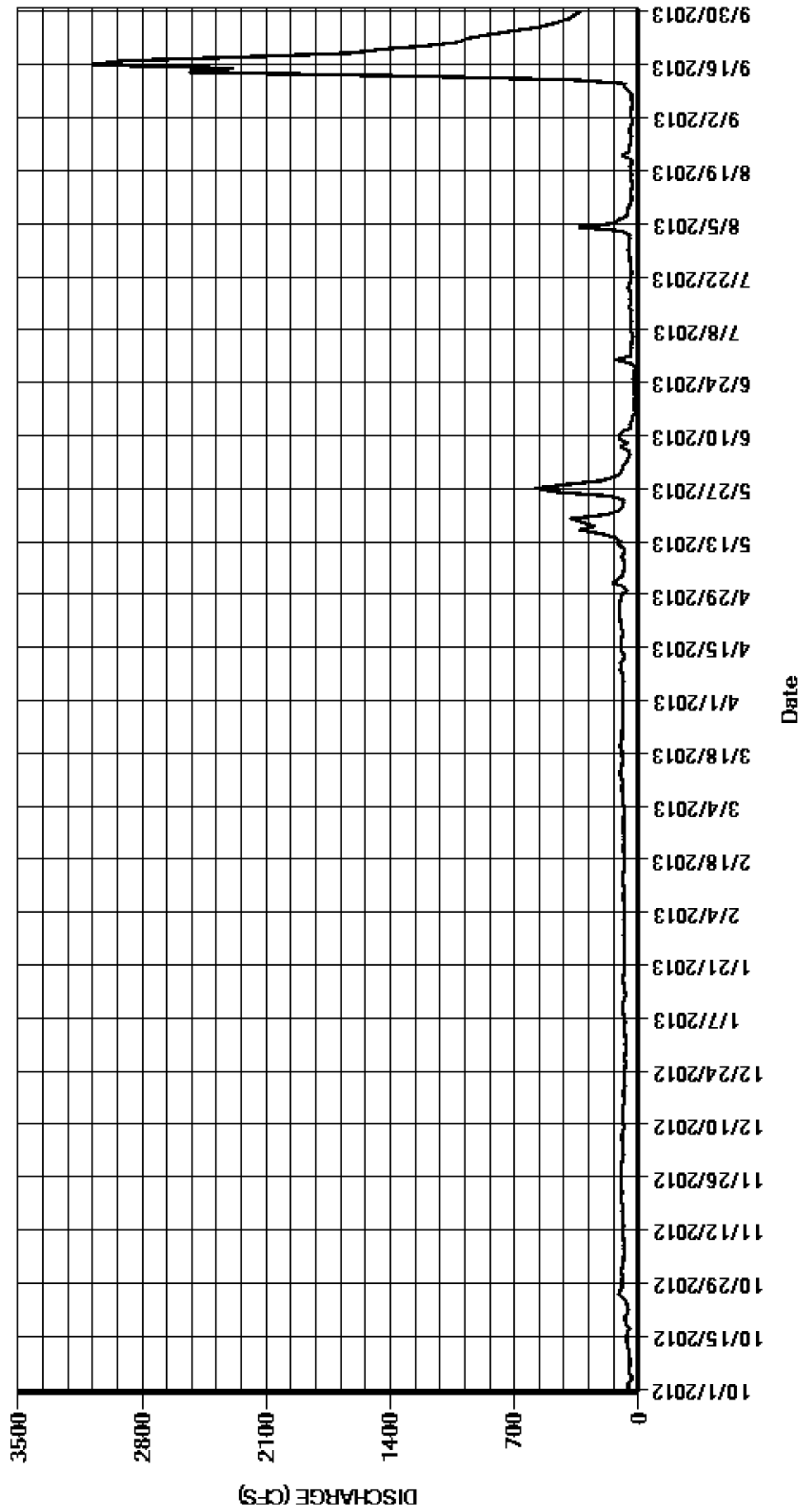
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	56	101	88	73	82	86	92	87	90	47	51	33
2	63	93	87	74	83	82	89	144	86	46	52	41
3	44	88	90	78	80	81	90	116	68	42	99	47
4	37	85	92	80	81	86	89	90	62	43	333	43
5	52	84	90	80	83	90	89	85	50	38	147	38
6	56	82	95	77	83	90	87	83	59	32	109	37
7	50	83	95	81	84	91	87	82	100	37	68	41
8	48	84	90	87	84	93	92	85	63	45	63	38
9	50	83	81	88	84	97	103	97	106	46	59	59
10	52	87	85	90	82	91	99	80	105	42	50	81
11	55	92	91	90	85	92	101	80	89	47	41	78
12	62	87	92	81	89	101	85	115	44	46	41	367
13	66	86	91	72	88	103	83	104	48	42	43	1250
14	67	91	90	77	89	99	97	129	36	54	41	2530
15	67	90	86	81	83	94	102	209	36	44	35	2290
16	64	90	82	84	81	92	100	333	13	48	38	3080
17	51	93	84	91	79	93	100	253	26	45	45	2910
18	74	90	84	86	81	93	92	319	25	46	41	2240
19	75	94	84	82	82	96	89	382	29	63	46	1630
20	77	99	78	80	84	105	98	182	20	52	48	1450
21	62	97	82	81	85	98	101	114	22	46	38	1180
22	60	94	81	82	84	93	103	92	27	47	43	1010
23	65	97	80	82	83	95	106	87	20	39	92	963
24	72	97	80	81	83	93	105	87	25	44	55	845
25	92	97	77	82	85	91	109	158	30	47	53	697
26	110	96	73	82	85	90	109	451	27	49	48	553
27	104	97	80	82	85	90	104	580	22	51	44	470
28	92	97	78	82	85	88	97	410	19	53	42	398
29	95	97	75	84	---	89	94	214	42	57	50	364
30	95	94	73	81	---	90	67	136	125	53	48	332
31	91	---	76	80	---	91	---	102	---	53	43	---
TOTAL	2104	2745	2610	2531	2342	2863	2859	5486	1514	1444	2006	25095
MEAN	67.9	91.5	84.2	81.6	83.6	92.4	95.3	177	50.5	46.6	64.7	836
AC-FT	4170	5440	5180	5020	4650	5680	5670	10880	3000	2860	3980	49780
MAX	110	101	95	91	89	105	109	580	125	63	333	3080
MIN	37	82	73	72	79	81	67	80	13	32	35	33

CAL YR	2012	TOTAL	30232	MEAN	82.6	MAX	287	MIN	22	AC-FT	59970
WTR YR	2013	TOTAL	53599	MEAN	147	MAX	3080	MIN	13	AC-FT	106300

MAX DISCH: 3770 CFS AT 05:45 ON SEP 15, 2013 GH 9.25 FT SHIFT -0.63 FT  
 MAX GH: 9.25 FT AT 05:45 ON SEP 15, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06752500 CACHE LA POUUDRE NEAR GREELEY  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
CACHE LA POUFRE RIVER AT GREELEY WASTEWATER PLANT  
Water Year 2013

Location.-- Lat 40°25'21", Long 104°40'37" in SW ¼ section 4, T5N, R65W, Weld County. Just east of Greeley, on right bank, approximately 400 feet east of Highway 85, river mile 5.5.

Drainage Area and Period of Record.-- 1,870 sq mi. (USGS StreamStats utility). 2007 to present. ; 2002 - Present

Equipment.-- Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly in a 7-ft. by 7-ft. precast concrete shelter overtop a 48-in diameter concrete stilling well. The City of Greeley's effluent flow meter (GREWASCO) is also connected to and transmitted by the DCP. The stilling well is connected to the channel by three 2-inch intakes equipped with flushing apparatuses. The primary reference is an electric tape gage located on the instrument shelf in the shelter. There are no provisions for a supplemental reference presently. A bank operated cable way is located near to the shelter. Gage is owned and maintained by the City of Greeley in cooperation with the Colorado Division of Water Resources.

Hydrologic Conditions.-- Drainage area of varying topography. Stream is heavily regulated upstream by numerous diversions from and deliveries to the stream. Due to its proximity to the City of Greeley, the gage is subject to rapid changes in stage from hardened surfaces within the City of Greeley. This gage cross-section is typically subject to heavy Sago pond weed growth during late spring and summer.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged DCP data as backup. Instrument calibration was maintained by 120 visits made to the gage. Three flush corrections were made this water year: October 8, 2012, +0.07 ft. July 10, 2013, +0.34 ft. and July 19, 2013, +0.09 ft.

The record is complete and reliable except as follows: September 27 - October 8, 2012, July 2-9, 19 and August 19-20, 2013 when the intakes were partially to fully plugged; January 1-2, March 25, 27-28 and April 17, 2013 which had numerous hours of missing data. Data for days when the intakes were partially or fully plugged were interpolated from adjacent record with consideration given to the magnitude of the flush correction and the hydrograph of the downstream gage (CLAGRECO). Data for the periods of missing record were similarly interpolated from adjacent record with consideration given to the hydrograph of the downstream gage.

Datum Corrections.-- Levels have not been run since the gage was repurposed and put into use in the 2007 Water Year.

Rating.-- The control for low to moderate flow is a 60 ft. by 7 ft. hinged-crest gage with concrete abutments approximately 50 ft. downstream from the shelter. The channel is primarily comprised of sands and gravels. Channel control prevails at all stages. Shifts are principally caused by the movement of materials in to and out of the control section. Large shifts seen at this gage are typically caused by thick vegetal growth along the left side of the channel.

CLAWASCO07, developed in WY2010 was continued in use for all of this year. Eighteen discharge measurements (Nos. 101 - 118) were made during the year, ranging in discharge from 32.9 to 3,160 cfs covering the range in stage experienced this year well. The peak flow of 4230 cfs occurred on September 15, 2013 at 0545 at a gage-height of 8.65 ft. with a shift of -0.17 ft. exceeding this year's high flow measurement, No. 117 made September 16, 2013, by 1,070 cfs and 1.10 ft. of stage.

Discharge.-- Open water measurements showed shifts varying between -0.19 and +0.20 ft. All measurements were given full weight. Shifting control method was used all year. Shift were distributed by time as defined by measurements from September 18, 2012 - April 29, 2013 and July 12 - August 9, 2013. Stage dependent shifting using variable shift tables CLAWASCOVSC13 -A, B, D, E were applied as follows: April 29 - May 27, 2013, CLAWASCOVSC13-A, defined by Msmt. Nos. 108-111; May 27 - July 12, 2013, CLAWASCOVSC13-B, defined by Msmt. Nos. 112-113; August 9 - September 16, 2013, CLAWASCOVSC13-D, defined by Msmt. Nos. 115-117 and September 16 - 30, 2013, CLAWASCOVST13-E, defined by Msmt. Nos. 117 and 118.

Special Computations.-- None.

Remarks.-- The record is good except as for the period when the intakes were partially to fully plugged and when numerous hours of gage-height record were missing, which were estimated and should be considered poor. Station maintained by the City of Greeley Water Pollution Control Facility in cooperation with Colorado Division of Water Resources staff. Record developed and reviewed by Division One staff.

Recommendations.-- Establishment of reference marks and running of levels should be done as soon as possible. Additional measurements should be made as warranted by flow conditions. Additionally, measurements at the beginning and end of the water years should be taken close to their respective date to better distribute shift distributions across the water year.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

CACHE LA POUDDRE RIVER AT GREELEY WASTEWATER PLANT

RATING TABLE-- CLAWASCO07 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

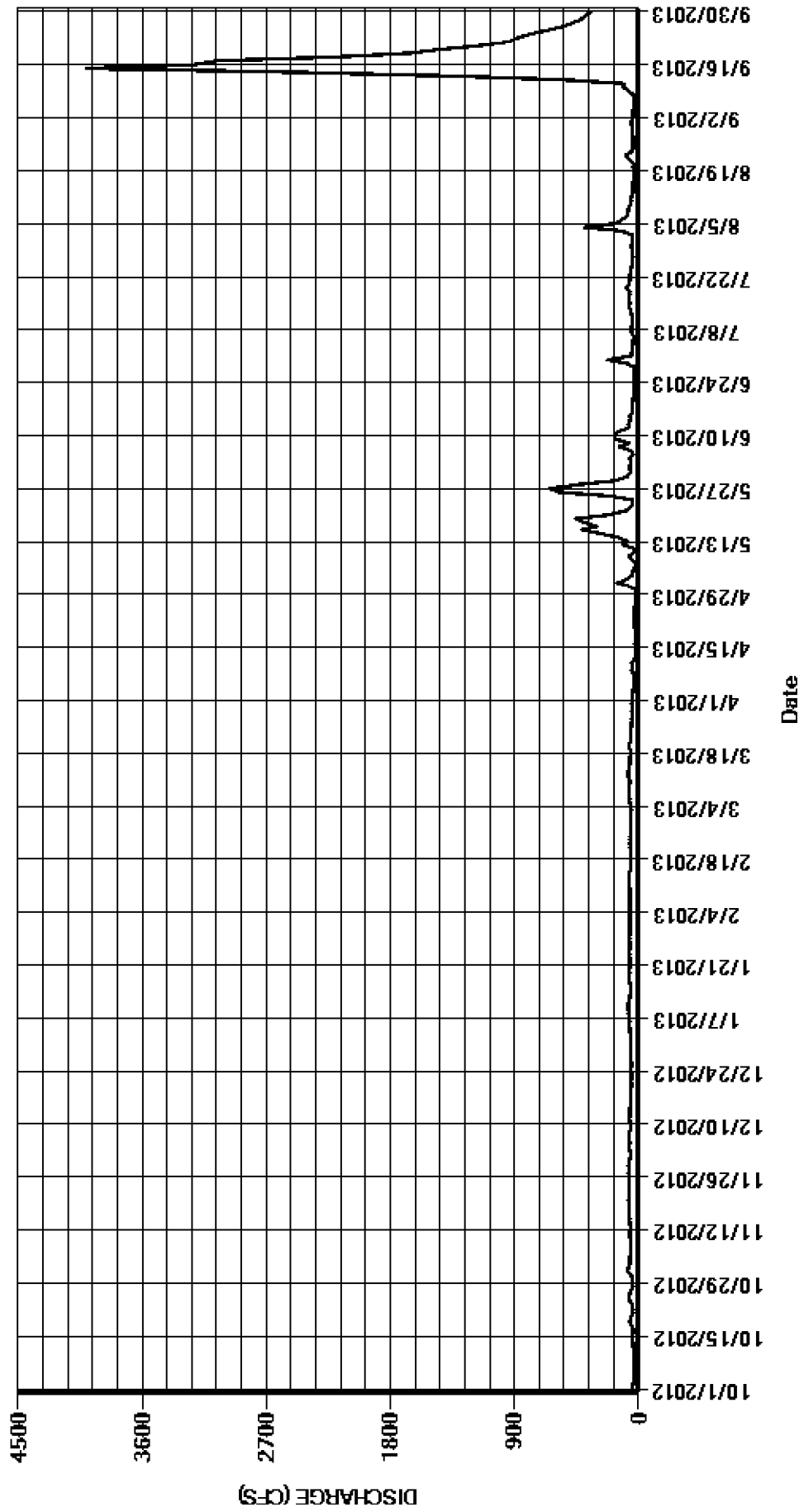
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e51	84	62	e60	63	60	48	57	63	55	49	53
2	e44	73	60	e60	65	56	44	153	65	e50	49	40
3	e35	66	64	62	62	54	42	91	55	e50	121	41
4	e31	63	67	64	62	60	39	50	65	e40	390	42
5	e34	62	63	67	62	65	37	41	43	e40	167	34
6	e34	58	69	65	64	65	37	31	57	e35	121	31
7	e30	59	70	67	64	67	35	23	139	e50	80	32
8	e29	61	65	73	65	70	38	44	69	e55	78	38
9	32	60	57	74	64	73	51	72	169	e50	73	72
10	32	63	57	76	63	63	49	36	172	45	60	117
11	36	66	65	76	68	65	50	32	146	47	54	101
12	41	61	65	67	71	75	29	113	73	52	54	520
13	41	61	64	61	71	75	20	81	74	57	42	1320
14	44	66	65	60	71	70	25	141	60	70	40	2480
15	43	66	60	56	61	64	28	265	64	64	39	4000
16	41	67	55	61	59	63	27	407	46	70	39	3220
17	41	69	55	71	60	63	e25	305	48	66	36	3060
18	61	66	56	68	59	59	20	399	45	65	36	2200
19	63	69	56	65	59	61	20	458	43	e90	e35	1660
20	58	73	52	65	61	70	27	207	38	70	e40	1440
21	42	72	55	63	61	61	30	97	34	64	38	1150
22	43	69	53	63	63	57	29	55	36	68	67	949
23	45	71	52	66	61	55	31	47	33	59	92	884
24	62	71	54	65	62	56	34	45	32	55	54	797
25	67	70	54	65	61	e55	31	203	30	48	41	672
26	65	72	51	64	60	51	28	572	29	45	39	555
27	58	73	59	65	60	e50	25	646	28	42	40	475
28	43	73	56	66	59	e50	25	433	29	44	43	418
29	43	73	55	64	---	49	27	176	82	45	43	382
30	44	69	57	62	---	47	19	88	224	53	44	347
31	55	---	57	62	---	50	---	61	---	47	51	---
TOTAL	1388	2026	1830	2023	1761	1879	970	5429	2091	1691	2155	27130
MEAN	44.8	67.5	59.0	65.3	62.9	60.6	32.3	175	69.7	54.5	69.5	904
AC-FT	2750	4020	3630	4010	3490	3730	1920	10770	4150	3350	4270	53810
MAX	67	84	70	76	71	75	51	646	224	90	390	4000
MIN	29	58	51	56	59	47	19	23	28	35	35	31

CAL YR	2012	TOTAL	25185	MEAN	68.8	MAX	267	MIN	28	AC-FT	49950
WTR YR	2013	TOTAL	50373	MEAN	138	MAX	4000	MIN	19	AC-FT	99910

MAX DISCH: 4240 CFS AT 05:45 ON SEP 15, 2013 GH 8.65 FT SHIFT -0.17 FT  
 MAX GH: 8.65 FT AT 05:45 ON SEP 15, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CACHE LA POUUDRE RIVER AT GREELEY WASTEWATER PLANT  
 WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06754000 SOUTH PLATTE RIVER NEAR KERSEY

Water Year 2013

Location.-- Lat. N.40°24'45", Long. W.104°33'47" (NAD83). Gage is located on the downstream side of the Weld County Road 53 bridge, 1.90 miles north of Kersey, CO and 2.50 miles downstream from the Cache la Poudre River mouth. The street address used by the phone company was 28474 US Highway 37, Kersey, CO.

Drainage Area and Period of Record.-- 9,659 mi<sup>2</sup> from topographic maps. ; April 27, 1901 to Present.

Equipment.-- From October 1 to October 31, 2012, a Sutron AccuBubble and a Sutron Constant Flow Bubbler (CFB) stage sensors connected to a Sutron SatLink2 Data Collection Platform (DCP) in a concrete block shelter on the downstream left edge of water side of the State Highway 37 bridge near Kersey, CO. On October 31, 2012 a Campbell Scientific CS-476 radar sensor was installed and the Sutron CFB unit was removed. The primary reference is a wire weight gage located midspan between the first and second bridge pier as referenced from the left bank. A supplemental (0-6.66 ft.) staff gage is installed on the bridge pier closest to the shelter.

Hydrologic Conditions.-- The Kersey gage reflects general trends of drought or abundance throughout the South Platte basin. It is the first gage below the confluences of all major mountain tributaries of the South Platte Basin. In a low to average year this native water supply is largely captured for agricultural and municipal uses before it reaches Kersey. In this full use scenario, the Kersey gage records return flows and water passed downstream for senior users. In a year with above average snowmelt, the Kersey gage will see high water during runoff. The 25-year average for 1976-2000 was a yearly total of 914,000 acre-feet. This year saw a total of 410,700 acre-ft. The Kersey peak flow and a significant portion of the total flow in dry years often comes from front range rainstorms. These storms are often seen as sharply rising stage events.

September of this water year saw an unprecedented flooding event which culminated from nearly all upstream drainage basins which drain into the South Platte River. This event washed out approximately 200 yards of road to the North of the Kersey bridge and the South abutment. This caused flows to divert to the South and North and were not contained within the confines of under the bridge itself. This caused the stage-discharge relationship to be completely erroneous. At this time, an actual peak discharge cannot be determined.

Gage-Height Record.-- From October 1, 2012 - January 3, 2013 the primary record was telemetered bubbler data with logged bubbler and CFB data as backup. From January 3, 2013 through September 30, 2013 the primary record is telemetered radar data with logged radar and bubbler data as backup.

The record is complete and reliable except for: February 10 - 19, and August 17- 20, 2013 when a small sand bar developed causing the radar unit to beach and September 12 - 20, 2013 when instrumentation was removed in advance of the flood crest. Instrument calibration was maintained by over 90 wire weight readings made during measurements and visits to the gage. There were two instrument corrections when an incorrect correction was implemented and one where the radar had beached. Instrumentation corrections were applied to the record per observations made and corrections applied in the field.

Datum Corrections.-- Levels were last run to the wire weight gage on October 22, 2013 using RM6 as base. The upstream wire weight had been removed prior to the September 2013 flood and re-installed. The reference was re-established at the original elevation of 15.521. Any corrections associated with this re-established reference were not applied to the gage-heights of measurement nor the gage-height record. Rather, shifting was used to compensate for this error for the 2012 and first part of the 2013 water year.

Rating.-- The low water control is a channel constriction and sand channel bed about 150 ft downstream from the gage, where pilings exist on the left bank for an old bridge. During very low flow the channel bed is stable. Channel bed changes occur by time for sustained low and medium flows. Large peaks will change the channel and result in a new pattern of shifts for lower flows. Brush and trees in the overflow areas cause backwater at high stages. The channel at the gage appears to be widening over time. Review of the measurement history indicates that the GH for 10,000 cfs has been gaining a foot every 10-15 years. Rating No. 24 was used again this year. It is defined by measurements from 281 to 11,000 cfs. Historic measurements run higher and lower and were used for trends.

A 'flood event' extension of Rating 24 was attempted (PLAKERCO25) but was deemed inaccurate due to erroneous gage height data during the flood event.

A new rating will need to be established for new river conditions.

Twenty-four discharge measurements (Nos. 1104-1127) were made this year ranging in discharge from 138 to 1,120 cfs. They cover the range in daily discharge experienced this year well except for the higher daily flows on October 27-30, 2012; May 10-12, 17-20, 27-28 and June 13-14, 2013 and of course the flood event of September 12-30, 2013. The peak discharge could not be determined this water year. The peak gage height of 15.09 feet was determined by levels to the high water mark on the inside side of the gage house door.

Discharge.--



Shifts are caused by the movement of sand through the gaging area, vegetative growth and the variable effects of the bridge piers. Open water measurements made this year showed unadjusted shifts varying between -0.06 - +0.22 ft. All measurements were given full weight except for Nos. 1109, 1120 and 1124 which were discounted 0.87%, -1.37%, and 4.94% respectively to smooth respective shift distributions.

Shifting control method was applied all year. Shifts were distributed by time as defined by measurements made to the gage with consideration given to change in stage from: October 4, 2012 - May 16, 2013, June 17 - 29; August 20 - September 5, 2013. From May 16 - June 17, 2013 shifts were distributed by stage using variable shift table PLAKERCOVSC13-A, defined by measurement Nos. 1119 - 1121 made during the period of use. From June 29 - August 20, 2013 shifts were distributed by stage using variable shift table PLAKERCOVSC13-B, defined by measurement Nos. 1121 - 1126 made during the period of use. From September 5 - 30, 2013 shifts were distributed by stage using variable shift table PLAKERCOVSC13-C, defined by measurement Nos. 1127 and 1072 to define the rising and falling limbs of the flood event. Because no direct measurements could be made during this period, due to the devastation in the immediate vicinity of the gage, this period is poorly defined and significantly downgraded.

Special Computations.-- For safety reasons, higher flow measurements are made at the WCR58 bridge crossing of the South Platte, approximately 3.75 miles upstream of the gage. Flows entering the South Platte between this measurement location and the Kersey gage were added to the total flow measured considering the lag time for travel distance. The mean gage height for the measurement was determined by inspection of the PLAKERCO stage record against assumed travel times based on measurement velocities at the WCR58 bridge vs. those made at the PLAKERCO bridge, inspection of the stage record and assumed travel time from the CLAGRECO gage and spot observations made at Wildcat Creek. This method has seemed to be fairly accurate, especially when flows at CLAGRECO are low. Its practice is being evaluated as a surrogate due to poor and dangerous measurement conditions at the Kersey Bridge.

Remarks.-- The record is rated as good except for September 13-19, 2013 which is missing and therefore not rated, September 12 and 20, 2013 which are partial day records and considered estimated and poor and September 21 - 30, 2013 which could not be directly observed and is poorly related. Station operated and maintained by Lee Cuning. Record developed by Division One Hydrographic staff.

Recommendations.-- The radar unit is now the sole sensor at this site and is referenced from the upstream wire weight. The downstream wire weight will now need to be removed.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06754000 SOUTH PLATTE RIVER NEAR KERSEY

RATING TABLE-- PLAKERCO24 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

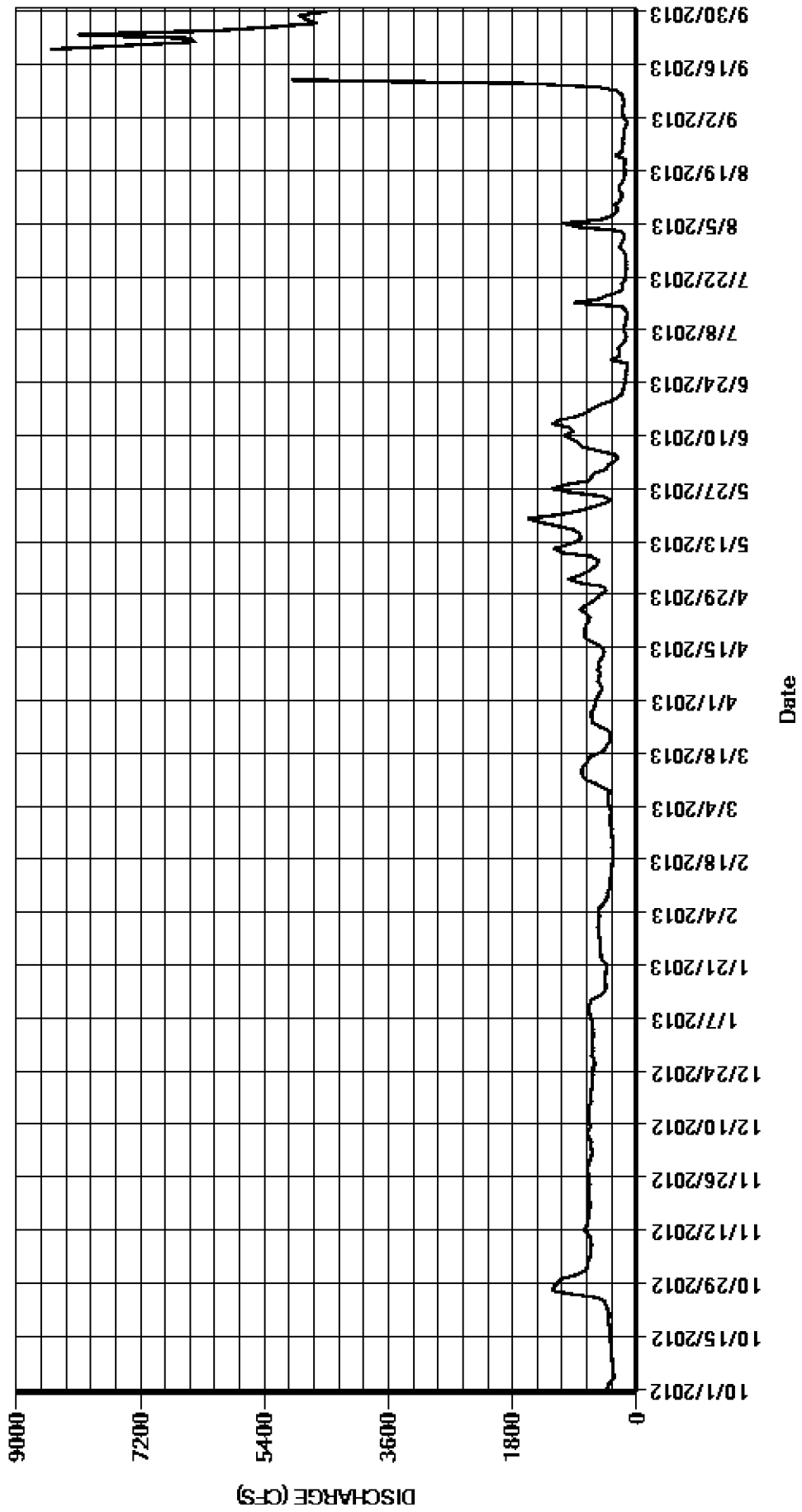
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	431	764	667	644	558	385	589	477	441	257	186	140
2	412	718	649	633	552	374	566	816	419	260	180	184
3	367	715	649	636	542	378	535	985	330	266	225	204
4	332	692	666	636	548	400	504	824	270	211	829	210
5	338	677	659	644	549	411	525	711	323	175	1060	197
6	343	668	685	641	492	410	562	631	565	155	523	187
7	349	669	710	666	453	406	546	570	795	162	351	201
8	353	655	709	685	425	397	531	563	845	197	295	216
9	360	663	674	696	422	498	566	663	947	173	279	281
10	365	678	679	690	e395	601	540	1100	1040	156	329	559
11	370	706	703	673	e390	737	557	1190	917	151	247	1540
12	372	758	700	657	e385	779	518	1020	976	141	220	e5000
13	373	727	691	529	e380	802	480	862	1220	159	221	---
14	385	719	694	466	e370	790	474	812	1120	214	254	---
15	390	702	683	451	e365	742	512	829	872	897	252	---
16	390	706	661	453	e360	712	592	909	742	535	204	---
17	374	695	660	464	e355	677	715	1140	651	420	e180	---
18	406	681	673	456	e350	543	760	1400	551	247	e170	---
19	418	676	660	449	e350	461	756	1570	380	202	e170	---
20	406	688	640	444	344	437	745	1130	276	217	e180	e8500
21	404	696	645	439	352	396	743	833	212	177	173	7420
22	424	689	647	483	352	375	690	644	196	166	171	6410
23	444	685	637	517	352	384	684	457	186	156	305	6480
24	467	684	640	523	359	413	745	368	164	151	220	8090
25	551	692	629	529	363	543	813	510	170	156	207	6110
26	937	702	601	532	361	633	746	978	156	155	197	5250
27	1230	707	623	531	388	648	647	1220	151	161	203	4650
28	1200	721	651	536	383	661	570	1020	141	169	189	4800
29	1150	704	636	555	---	654	517	697	137	208	184	4890
30	1100	689	636	553	---	617	452	655	376	247	177	4510
31	893	---	649	562	---	605	---	618	---	213	153	---
TOTAL	16334	20926	20506	17373	11495	16869	18180	26202	15569	7154	8534	76029
MEAN	527	698	661	560	411	544	606	845	519	231	275	3306
AC-FT	32400	41510	40670	34460	22800	33460	36060	51970	30880	14190	16930	150800
MAX	1230	764	710	696	558	802	813	1570	1220	897	1060	8500
MIN	332	655	601	439	344	374	452	368	137	141	153	140

CAL YR	2012	TOTAL	178287	MEAN	487	MAX	1560	MIN	134	AC-FT	353600
WTR YR	2013	TOTAL	255171	MEAN	713	MAX	8500	MIN	137	AC-FT	506100 (PARTIAL YEAR RECORD)

MAX DISCH: (Peak not determined)  
 MAX GH: 15.09 FT AT 03:15 ON SEP 14, 2013 (Peak GH per levels to HWM)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06754000 SOUTH PLATTE RIVER NEAR KERSEY  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06758500 SOUTH PLATTE RIVER NEAR WELDONA  
Water Year 2013

Location.-- Lat N 40° 19'15.7", Long. W. 103° 55'22.1" (NAD83) in Morgan County, CO Hydrologic Unit 10190003. Gage is located on the left bank 660 ft. downstream from the Hwy. 144 bridge, 3.1 miles southeast of Weldona, CO.

Drainage Area and Period of Record.-- 13,200 mi<sup>2</sup> (USGS Colorado StreamStats Utility). ; Daily values are available from October 1, 1952 to present.

Equipment.-- Campbell Scientific CS476 radar unit connected to SatLink 2 DCP, installed April 16th 2012 as a supplementary gage (PLAWE2CO), was changed to the primary gage (PLAWELCO) at the start of water year 2013. The primary reference is a wire weight attached to the Narrows Bridge on Hwy. 144. The shelter is a NEMA box located on the south upstream side of the bridge.

Hydrologic Conditions.-- Drainage area is heavily regulated upstream by numerous reservoirs, diversions from and deliveries to the stream.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged DCP data and as backup. The record is complete and reliable except for May 9, 2013, when there was missing or bad data, and September 14 thru the 17, when the radar unit was removed due to the flood event. Gage height data for May 9 was interpolated and is considered good. Three instrument corrections were made during the year which were defined by visits to the station. Instrument calibration was supported by 51 visits made to the gage. Large daily fluctuations in late December and early April were caused by Ft. Morgan Canal opening and closing their diversion gates for construction.

Datum Corrections.-- Levels were run on April 26, 2012. A small levels loop was completed at the old gage and then used to establish datum at the bridge for calibration of the wire weight gage and radar sensor. Three new reference marks were placed at the bridge RM7, RM8, and RM9.

Rating.-- The predominant control is channel constriction with a moving sand bed over shale. High flows will spread out into relatively flat areas where vegetation has taken over in recent years. Three ratings were used in compiling the record for Water Year 2013. Rating No. 19 was used to transition the 2012 and 2013 water years, and was in effect on October 1, 2012 until 10:45. It was created in 2006 and is defined by measurements from 78 to 16300 cfs. Below 650 cfs, Rating 19 was created with 2006 measurements. The high water end was taken from an equation fit through historic points. Rating No. 20 was in effect from October 1, 2012 at 11:00 thru September 14, 2013 when the radar unit was removed due to the 2013 flood event. It is defined by measurements from 47.2 to 25,200 cfs (Measurement Nos. 362 thru 397) taken after the gage was moved upstream to the bridge, as well as select lower and higher flow measurements. Rating No. 21 was in effect following the flood event through the end of the water year. It is defined by nine flow measurements ranging from 281 to 25,200 cfs made after the flood event through December 16, 2013 (Measurement Nos. 397 thru 405). The rating has been extrapolated 1.5 times upward linearly to 37,800 cfs. Twenty-six discharge measurements (Nos. 374 - 399) were made this year ranging in discharge from 115 cfs to 25,200 cfs covering the range of stage experienced during this year well, except for the lower daily flows on April 18, 19, 21, July 20, and August 19 and 20. The peak flow was not determined having occurred when the radar unit was removed during the 2013 flood event.

Discharge.-- Shifting control method was used all year. Measurements showed unadjusted shifts ranging from -0.33 to -0.35 using rating PLAWELCO19, -0.10 to 0.02 using rating PLAWELCO20, and -0.08 to 0.00 using rating PLAWELCO21. Shifts were applied by time (with consideration to stage) from 00:00 on October. 1, 2012 to 10:00 on March 19, 2013. Stage dependent shifting was applied, using variable shift curve PLAWELCOVST13-A, from 10:15 March 19, 2013 thru 10:00 June 10. This shift table is defined by Measurement Nos. 385 thru 390 made during the period of use. Measurement No. 385 and 386 were discounted up to 4.39% to smooth the shift distributions. Variable shift table PLAWELCOVST13-B was used to distribute shifts by stage for the period of time starting 10:15 June 6, 2013 thru 10:30 August 19, 2013. Measurements Nos. 390 thru 395 made during this period were used in building this table. Measurement Nos. 391 thru 394 were discounted up to 3.42% to better fit curve distribution. Stage shifting was then used from 10:45 August 19, 2013 thru 17:45 September 14, 2013 using variable shift table PLAWELCOVST13-C. Measurements Nos. 395 thru 396 were used to build this table and were made during the period of use. Shifts were then applied by time (with consideration to stage) from 10:45 September 17, 2013 thru the end of the water year. Measurement Nos. 398 and 399 were discounted 1.38% and -0.71% respectively to smooth the shift distribution.

Special Computations.-- None.

Remarks.-- The record is good, except for the following: September 14 thru the 17 when the radar unit was removed due to the September 2013 flood event. The gage was replaced on Oct. 2, 2012 with the station formerly named PLAWE2CO. Station maintained and record developed by Division One Hydrographic Staff.

Recommendations.-- Levels need to be run in WY2014. The present rating, PLAWELCO21, should be reexamined as more measurement are made.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06758500 SOUTH PLATTE RIVER NEAR WELDONA

RATING TABLE-- PLAWELCO19 USED FROM 01-OCT-2012 TO 01-OCT-2012  
 PLAWELCO20 USED FROM 01-OCT-2012 TO 14-SEP-2013  
 PLAWELCO21 USED FROM 17-SEP-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

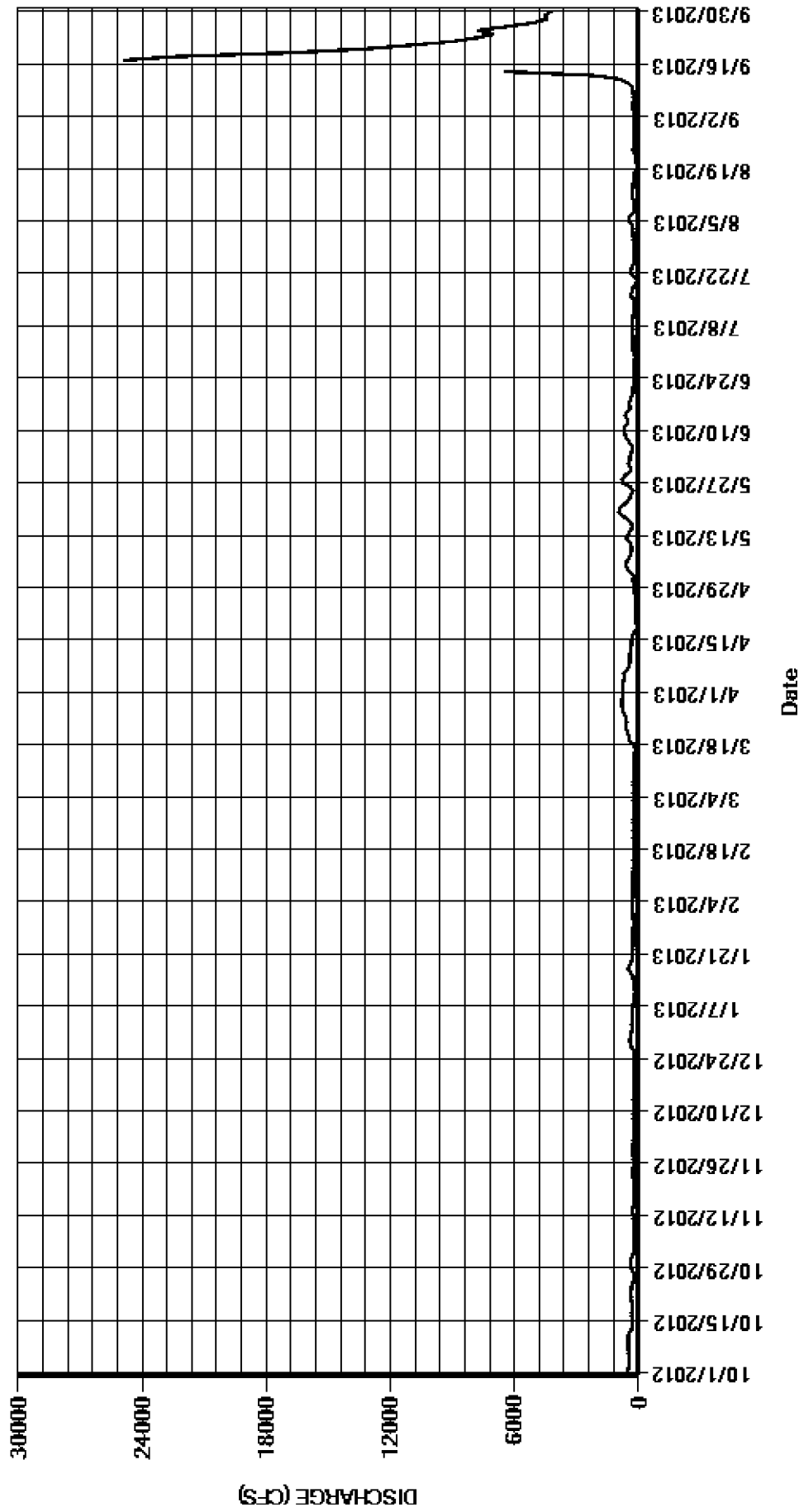
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	558	319	266	323	284	249	790	276	497	259	271	211
2	502	238	258	333	296	250	771	236	432	282	281	239
3	470	218	242	314	302	255	756	394	417	260	283	233
4	472	212	228	316	303	256	732	556	354	268	294	267
5	457	214	233	322	273	254	707	627	310	267	472	275
6	485	216	232	299	274	252	716	579	334	302	464	261
7	487	227	241	275	269	255	543	452	468	286	280	252
8	500	215	263	236	268	257	460	368	622	301	217	266
9	495	214	257	215	268	258	431	346	675	307	205	281
10	499	227	251	195	266	250	432	365	679	291	181	347
11	505	252	241	169	263	190	423	409	668	261	282	513
12	394	258	245	225	259	232	401	573	522	222	323	898
13	306	292	253	243	253	240	368	544	548	234	291	2240
14	290	273	226	261	255	251	346	426	647	245	275	e6470
15	294	238	233	274	250	231	332	308	557	221	256	---
16	330	240	234	395	248	185	315	338	402	406	246	---
17	337	244	233	524	250	170	190	526	464	321	215	e24900
18	328	239	221	427	246	218	53	736	410	288	189	22200
19	319	235	220	345	246	469	90	952	369	182	107	16700
20	346	227	216	313	250	445	149	939	246	83	85	13200
21	367	241	209	297	256	539	110	712	280	165	136	11000
22	372	264	202	283	252	592	124	542	247	406	169	9070
23	368	268	204	279	256	600	123	422	213	356	171	7880
24	329	263	210	274	255	592	123	347	221	288	264	7070
25	281	260	210	268	251	610	134	280	215	233	251	7760
26	230	257	235	270	252	689	127	410	223	221	242	6420
27	201	256	363	266	256	764	174	770	223	247	223	5110
28	275	262	399	260	249	793	230	798	205	245	206	4470
29	366	268	434	256	---	806	232	638	190	251	196	4500
30	390	269	374	260	---	797	231	402	167	252	187	4230
31	391	---	344	269	---	777	---	397	---	251	210	---
TOTAL	11944	7406	7977	8986	7350	12726	10613	15668	11805	8201	7472	157263
MEAN	385	247	257	290	262	411	354	505	394	265	241	5617
AC-FT	23690	14690	15820	17820	14580	25240	21050	31080	23420	16270	14820	311900
MAX	558	319	434	524	303	806	790	952	679	406	472	24900
MIN	201	212	202	169	246	170	53	236	167	83	85	211

CAL YR	2012	TOTAL	121096	MEAN	331	MAX	1040	MIN	58	AC-FT	240200 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	267411	MEAN	737	MAX	24900	MIN	53	AC-FT	530400 (PARTIAL YEAR RECORD)

MAX DISCH: (not determined)  
 MAX GH: (not determined)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06758500 SOUTH PLATTE RIVER NEAR WELDONA  
WY2013 HYDROGRAPH



## PLATTE RIVER BASIN

### 06759910 SOUTH PLATTE RIVER AT COOPER BRIDGE NEAR BALZAC

Water Year 2013

Location.-- Lat. N.40° 21'27.5", Long. W.103° 31'43" (NAD83) in Morgan County, CO, Hydrologic Unit 10190012. Gage is located on the left bank 4.1 miles NE of Snyder, CO and 0.7 miles downstream from the North Sterling Canal diversion structure.

Drainage Area and Period of Record.-- 16,600 mi<sup>2</sup> (USGS Colorado Streamstats utility); 1916 to October 1, 1987. Various sites and datums at a location approximately 5 miles downstream from the present location at a bridge near the Balzac beet dump near the Washington-Morgan County line. This bridge was locally known as the Balzac Bridge. October 1, 1987 to present: Present site and datum also known as the Cooper Bridge. Diversions from Prewitt Reservoir and a few small irrigation ditches occur between the old Balzac Bridge and Cooper Bridge locations.

Equipment.-- A Campbell Scientific CS476 Radar Unit connected to a Sutron high data rate SatLink 2 (DCP) in a 6 ft. by 6 ft. concrete shelter. The wire weight located on the upstream side of the bridge is the primary reference. The inlets to the stilling well were capped at the end of WY 2011, and all other referencing equipment removed.

Hydrologic Conditions.-- Channel is braided with heavily vegetated islands and banks. The channel is currently divided by an island extending above and below the bridge. Flows are generally regulated heavily upstream of the gage by numerous reservoirs, diversions from and deliveries to the channel. Operations of the North Sterling Canal diversion structure 0.7 miles upstream of the gage will affect flows and operations at the gage. The gage marks the upper extremity of the South Platte River Compact reach. Compact compliance is such that the gage is visited 2 to 3 times a week, or as stream flows dictate.

Gage-Height Record.-- The primary record is 15-minute satellite data taken from the radar unit. The gage typically stays open due to its proximity to the North Sterling diversion dam but will freeze occasionally. The record tends to have spikes and dips due to the activities of the North Sterling Canal. The record is complete and reliable. Four equipment corrections were required at the gage ranging from -0.02 ft. to 0.03 ft. and were applied as defined by visits to the station. Missing or bad values were filled in with data downloaded from the DCP on Aug. 3 and 4. Missing or bad data was interpolated on Oct. 6, 24, 25, March 3, 10, 11, 15, 26, April 8, Sept. 13 and Sept. 14.

Datum Corrections.-- Levels were last run on October 3, 2011 when the wire weight was moved to the upstream side of the bridge. The wire weight check bar was re-established at an elevation of 17.41 ft., however, a 0.06 ft adjustment was made to the wire weight dial to achieve a corresponding wire weight reading of the check bar.

Rating.-- The control is a rapidly shifting sand channel with flow in several braids at low stages. At very high stages, the flow spreads into heavily vegetated areas. Rating PLABALCO04, put into use on October 1, 2009, was continued in use the entire water year. PLABALCO04 was originally developed from measurements made in WY2009 but was subsequently extended on Jun 15, 2010 using measurement Nos. 593 (6560 cfs) and 594 (7940 cfs). The high water end was taken from an equation fit through historic points. Twenty-nine discharge measurements (Nos. 661 - 689) were made this year ranging in discharge from 10.8 to 7,280 cfs covering the range in stage experienced this year well except for the higher daily flows on September 15 through September 23. There is no reliable data from September 15 through September 20 as the stage was above the defined rating. The water was out of the banks and the gage was not accessible. The peak stage of 13.71 ft. occurred on September 15, 2013 at 06:00. A peak discharge was not obtainable due to the stage being above the defined rating. The peak flow and stage, occurred during the September 2013 flood which was comprised of water from the South Platte River and its tributaries.

Discharge.-- Shifting control method was used all year. Shifts are caused by the movement of sand into and out of the section as well as vegetal growth on the banks and islands in the channel. Diversion practices from the North Sterling Canal can dramatically affect the amount of sand moving through the section on almost an instantaneous basis. Measurements made this year showed shifts ranging from -0.89 ft to 0.48 ft. All measurements were given full weight except for Measurements 682 through 688 which were adjusted from -4.38% to 3.06% to smooth shift distributions. Shifts were distributed as follows: October 1 - April 3 were distributed by time. Stage dependent shifting using variable shift table PLABALCOVSC13a was used for the period of April 3 through May 2. This table is defined using Measurements 676, 677, 678 and 679 made during this period. Variable shift table PLABALCOVSC13b was put in effect on May 2 and used through June 26. This table is defined using Measurements 679, 680, 681, 682 and 683 made during this period. Measurement 676 made on April 3 was used to better define the upper end of the table. Stage dependent shifting using variable shift table PLABALCOVSC13c was used for the period of June 26 through August 23. This table is defined using Measurements 683, 684, 685, 686, and 687 made during this period. Measurement 679 made May 2 was used to better define the lower end of the table, and Measurement 676 made April 3 was used to better define the higher end of the table. Time distribution, using Measurements 687 and 688, was used for the period August 23 through September 5. Stage dependent shifting using variable shift table PLABALCOVSC 13d was used for the period of September 5 through September 30. This table is defined using measurements 688 and 689 made during this period, as well as Measurement 676 made April 3 and Measurement 690 made on October 1, 2013. The high end of the table was extrapolated to a gage height of 10.70 ft., the highest stages on the rating, using Measurements 689 and 690 as a guide.

Special Computations.--

Remarks.-- The record is good except for the periods of December 26 through January 8 which is rated fair due to a lack of shift definition, and September 15 through September 20 which were not defined by the rating and remained undetermined. Although channel and rating instability will always be an issue at this gage, the change to using the radar unit as the primary sensor has made for a more complete and accurate record. Station maintained and record developed by Robert D. Erosky.

Recommendations.--

Visitation every few days is required due to channel instability. Levels need to be run in WY2014.



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06759910 SOUTH PLATTE RIVER AT COOPER BRIDGE NEAR BALZAC

RATING TABLE-- PLABALCO04 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

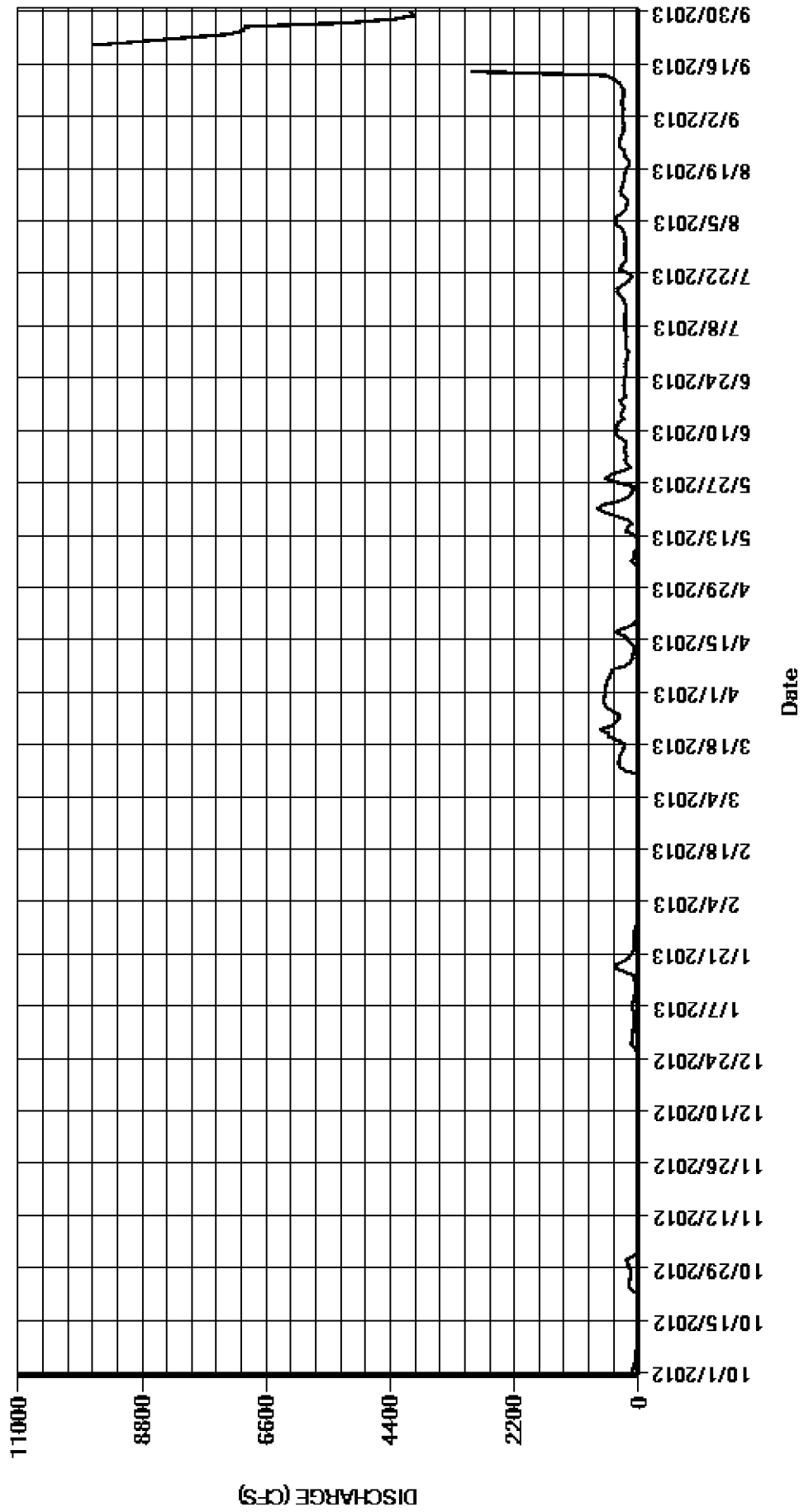
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	106	99	12	91	14	10	588	13	215	174	243	279
2	100	20	12	70	14	10	592	13	246	222	268	279
3	83	19	12	73	14	10	575	13	216	227	301	287
4	62	18	11	70	13	10	554	18	238	219	398	269
5	44	18	11	84	13	10	516	53	248	215	388	290
6	41	18	11	107	13	10	488	124	228	228	407	305
7	38	17	11	125	13	10	479	83	234	241	302	275
8	35	18	11	103	12	11	236	95	326	242	236	264
9	33	17	11	78	12	11	148	25	421	241	216	268
10	31	18	11	67	12	11	106	24	378	241	203	310
11	29	18	11	55	12	257	103	23	390	240	212	351
12	27	18	11	46	11	333	81	23	366	229	303	435
13	25	18	11	41	11	353	60	68	263	221	319	600
14	23	18	11	70	11	337	139	223	307	246	295	2950
15	22	18	11	70	11	333	192	194	293	271	281	---
16	21	17	11	222	11	295	256	124	251	327	255	---
17	21	17	11	397	11	264	421	186	295	377	247	---
18	21	16	11	403	11	248	263	387	329	375	241	---
19	21	16	11	272	11	350	105	598	226	263	214	---
20	21	16	11	175	11	527	46	735	258	175	171	---
21	21	15	19	122	11	541	32	619	245	114	168	9670
22	21	15	28	87	11	677	29	372	268	186	232	8850
23	111	15	31	77	11	459	19	214	245	343	249	8100
24	170	14	35	80	11	403	13	136	251	300	266	7260
25	163	14	31	76	11	342	13	104	225	243	345	7000
26	157	14	39	73	10	357	18	92	225	223	342	6980
27	144	14	96	74	10	483	17	360	237	236	327	5170
28	134	13	136	50	10	569	13	583	232	243	297	4320
29	160	13	114	27	---	610	13	508	211	240	272	3980
30	191	13	118	15	---	616	13	314	203	237	263	4060
31	218	---	106	15	---	598	---	141	---	234	264	---
TOTAL	2294	574	976	3315	326	9055	6128	6465	8070	7573	8525	72552
MEAN	74.0	19.1	31.5	107	11.6	292	204	209	269	244	275	3023
AC-FT	4550	1140	1940	6580	647	17960	12150	12820	16010	15020	16910	143900
MAX	218	99	136	403	14	677	592	735	421	377	407	9670
MIN	21	13	11	15	10	10	13	13	203	114	168	264

CAL YR	2012	TOTAL	100478	MEAN	275	MAX	1200	MIN	11	AC-FT	199300
WTR YR	2013	TOTAL	125853	MEAN	351	MAX	9670	MIN	10	AC-FT	249600 (PARTIAL YEAR RECORD)

MAX DISCH: (not determined)  
 MAX GH: 13.71 FT AT 06:00 ON SEP 15, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06759910 SOUTH PLATTE RIVER AT COOPER BRIDGE NEAR BALZAC  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
SOUTH PLATTE RIVER AT JULESBURG (CHANNEL #1)

Water Year 2013

Location.-- Lat. N. 40°58'24"; Long. W. 102°15'04" (NAD83). Gage is located on the east side of the southern most bridge of Highway 385 crossing the South Platte River south of Julesburg CO in Sedgwick County, 9 miles southeast of the Town of Julesburg, 3.0 miles upstream from Colorado-Nebraska State line, and 7 miles downstream from Lodgepole Creek. The street address used by the phone company is 15277 US 385, Julesburg, Colorado.

Drainage Area and Period of Record.-- 23,821 mi<sup>2</sup> (USGS Colorado StreamStats utility). ; Daily values are available from October 1, 1995 to present.

Equipment.-- Campbell Scientific CS476 radar unit and a Sutron Constant Flow Bubbler (CFB) unit connected to a Sutron SatLink 2 Data Collection Platform (DCP) in a NEMA4 enclosure on the north bank of the south most channel near Julesburg, CO. A wire weight gage mid-span on the bridge is the primary reference with a supplemental staff gage on the north most bridge pier. The staff is set 1.17 ft. lower than the wire weight, which can lead to confusion. The CFB unit was removed on July 10, 2013.

Hydrologic Conditions.-- The South Platte channel at Julesburg, CO is a braided sand channel. Channel 1 is one of four channels, which can contain flow. The river is gaged on Channels 1 and 2 and a combined flow record is published for South Platte River at Julesburg (PLAJUCCO) which includes flows from channels 1-4 as well as waters delivered to the South Platte River from the Stateline Ditch (STLINECO). Channels 1 and 2 split apart about 1/3 mile upstream from the gage and the proportion of water in Channel 1 has been steadily increasing in recent years. At low flows, 90-100% of the total flow is carried in Channel 1, with Channels 2 and 3 being dry with local irrigation and storm runoff showing up in Channel 4. Channels 2 and 3 will carry water only at high flows. Generally the river is dried by numerous diversions upstream. Flows at Julesburg are largely comprised of return flows or water passed to the State of Nebraska to meet compact requirements (April 1- October 15, CRS: 37-65-101).

Gage-Height Record.-- The primary record is 15-minute telemetered radar data with telemetered CFB data as well as logged DCP data as backup. The record is complete and reliable except for: Backwater conditions due to ice on December 27, 2012 – January 8, January 13 -19 and February 22, 2013. Missing gage-height values occurring on April 17, May 29, July 10 and September 16, 2013 were interpolated from adjacent record without loss of accuracy with exception of April 17, 2013. Instrument calibration was supported by approximately 59 visits to the gage by Colorado Division of Water Resources (CDWR) and State of Nebraska Department of Natural Resources (NDNR) personnel. Instrument calibration corrections were applied to the record as defined by observations made to the gage.

Datum Corrections.-- Levels were last run on August 24, 2011 using RM 4 as base. No correction was necessary. The base reference was moved 45-ft. to the south at the time of levels. No change to gage datum.

Rating.-- The channel is comprised of shifting sands and gravels exhibiting fill and scour activity. Channel control prevails at all stages. Flow in the channel has been steadily increasing in recent years. Due to sustained lower flows an island has developed in the channel about 200-ft. downstream of the bridge and can collect debris. Rating No. 9 (ONEJURCO09), was continued in use for the entire year. Thirty-six (36) discharge measurements (Nos. 707-742) ranging in discharge from 15.9 to 7340 cubic feet per second (cfs) were made this year by CDWR and NDNR personnel. Measurements made this year cover the range in stage experienced well. The peak discharge of 7620 cfs occurred at 11:00 on September 18, 2013 at an instrument corrected gage-height of 11.36 ft. with a shift of -0.92 ft., exceeding the high flow measurement (No. 741) made the same day by 280 cfs and 0.15 ft. of stage respectively.

Discharge.-- Shifts are mainly caused by movement of materials in and through the gage pool. Shifting control method was used for all periods of open water. Shifts were distributed as follows: September 25 – October 11, 2012, by time as defined by measurements made to the gage; October 11 – December 27, 2012, stage dependant shifting using variable shift table ONEJURCOVST13-1, defined by measurement Nos. 707-713 made during the period of use. All were given full weight except for Nos. 709-713 which were discounted up to 6% to smooth the stage-shift relation; January 8 – September 18, 2013, by time as defined by measurements made to the gage with consideration given to change in stage. Nos. 718, 721, 722, 724, 726, 729, 733, 734, 737 and 739 were discounted up to 12% to smooth shift distributions; September 18 – October 16, 2013, stage dependant shifting using variable shift table ONEJURCOVST13-2, defined by measurement Nos. 741-746 made during the period of use. All were given full weight.

Special Computations.-- Discharge for periods of backwater due to ice were estimated from adjacent good record with consideration given to temperature trends and data collected from the South Platte River At Crook, CO (PLACROCO) streamgage.

Remarks.-- This record is added to the channel 2 (PLAJURCO) record, the Town of Julesburg effluent record and the State Line Ditch near Julesburg, CO (STLINECO) record to form the South Platte River at Julesburg, CO Combined Flow (PLAJUCCO) record.

Remarks.-- The record is good except for December 27, 2012 - January 8, January 13-19 and February 22, 2013, when the stage-discharge relation was affected by ice and April 17, 2013, which had numerous hours of interpolated data. The ice affected period is estimated and poor and the interpolated period is rated as fair. Station operated, maintained and record developed by Division One Hydrographic staff.

Recommendations.-- Continue making regular discharge measurements and when needed on an event driven basis to tack the full range in stage experienced. Better coordination with NDNR personnel for conformity to standard measurement practices should be strived for. Levels should be run in the 2014 water year to demonstrate stability in the base reference.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

SOUTH PLATTE RIVER AT JULESBURG (CHANNEL #1)

RATING TABLE-- ONEJURCO09 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

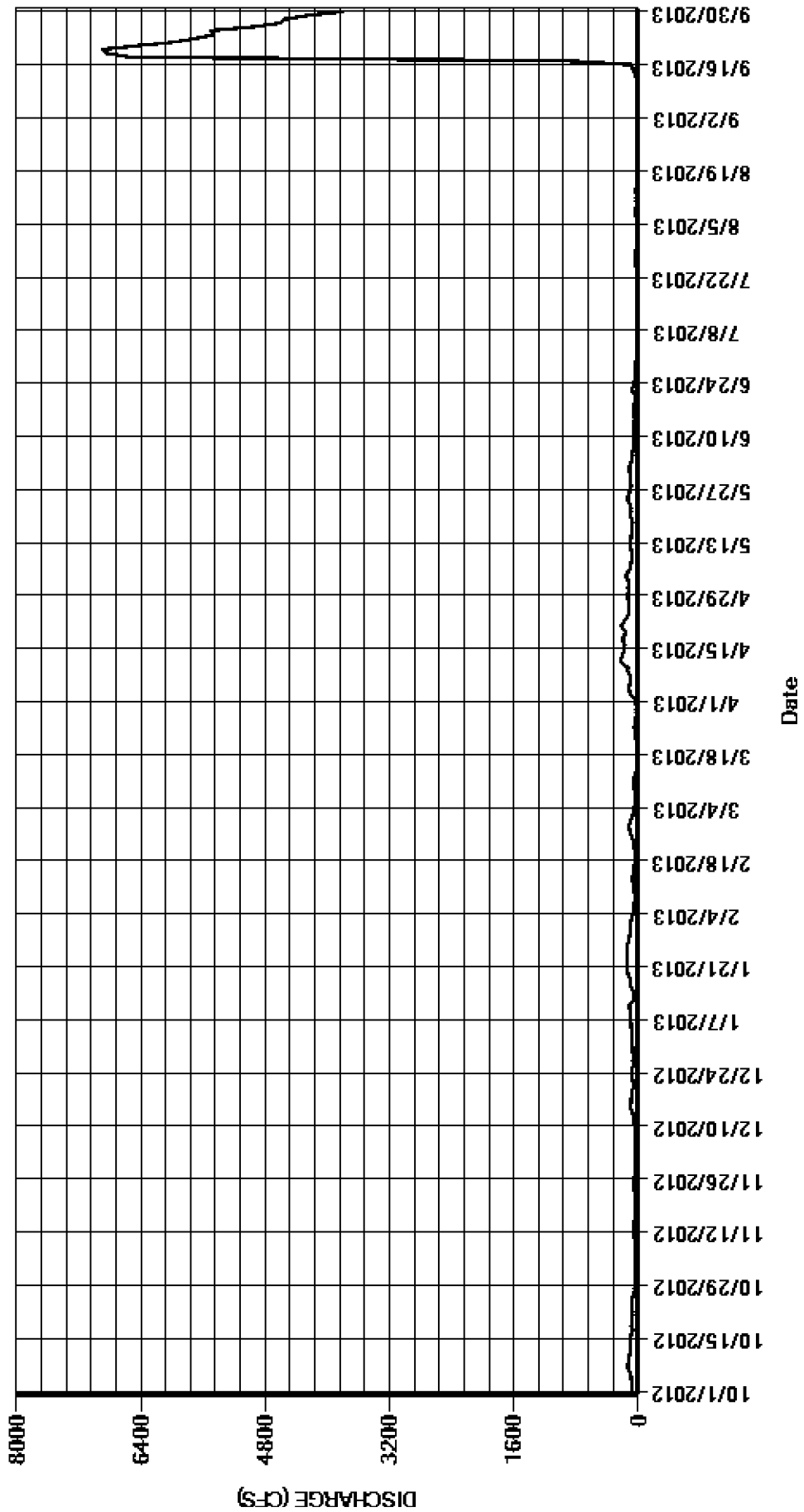
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	84	37	37	e80	101	90	34	131	116	24	20	20
2	83	38	38	e85	97	69	58	124	110	22	20	20
3	87	41	37	e85	85	56	106	127	94	21	20	19
4	88	41	36	e85	69	50	116	159	82	21	23	18
5	94	41	35	e90	59	43	116	138	77	22	26	19
6	108	39	35	e95	52	39	106	104	73	21	23	21
7	133	40	36	e100	48	35	103	98	64	19	31	20
8	133	40	36	e100	44	32	111	87	63	19	33	19
9	120	41	46	104	44	59	145	85	62	19	30	19
10	119	45	42	111	57	58	134	88	56	19	27	20
11	107	54	53	118	58	56	209	91	56	18	28	22
12	107	57	59	66	66	50	226	101	54	17	28	23
13	107	62	68	e60	75	33	208	107	50	17	27	33
14	105	62	86	e60	69	26	189	97	49	19	30	46
15	109	45	101	e80	61	25	177	90	48	18	25	74
16	88	41	96	e100	51	25	177	87	52	18	22	81
17	72	39	90	e105	48	25	e195	82	61	17	23	902
18	88	40	86	e110	45	25	194	74	62	16	24	6540
19	82	40	81	e130	43	25	158	80	44	17	25	6850
20	83	39	66	148	45	25	199	102	38	17	23	6890
21	76	38	63	146	44	25	216	95	37	17	22	6430
22	76	40	74	145	e65	26	188	97	85	16	22	5970
23	77	54	82	145	57	33	151	111	67	16	21	5690
24	80	61	86	145	79	39	126	136	59	21	21	5460
25	80	61	80	149	100	52	124	135	40	40	21	5510
26	68	56	63	146	109	43	122	118	45	39	20	4960
27	52	41	e70	137	126	34	121	102	39	35	19	4610
28	47	38	e65	125	106	28	131	90	33	38	18	4550
29	43	38	e70	115	---	28	138	107	30	32	19	4250
30	39	37	e70	102	---	27	126	102	28	23	21	3810
31	39	---	e75	101	---	27	---	107	---	20	20	---
TOTAL	2674	1346	1962	3368	1903	1208	4404	3252	1774	678	732	72896
MEAN	86.3	44.9	63.3	109	68.0	39.0	147	105	59.1	21.9	23.6	2430
AC-FT	5300	2670	3890	6680	3770	2400	8740	6450	3520	1340	1450	144600
MAX	133	62	101	149	126	90	226	159	116	40	33	6890
MIN	39	37	35	60	43	25	34	74	28	16	18	18

CAL YR	2012	TOTAL	93526	MEAN	256	MAX	1260	MIN	22	AC-FT	185500
WTR YR	2013	TOTAL	96197	MEAN	264	MAX	6890	MIN	16	AC-FT	190800

MAX DISCH: 7620 CFS AT 11:00 ON SEP 18, 2013 GH 11.36 FT SHIFT -0.92 FT  
 MAX GH: 11.36 FT AT 11:00 ON SEP 18, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH PLATTE RIVER AT JULESBURG (CHANNEL #1)  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06763990 SOUTH PLATTE RIVER AT JULESBURG (RIGHT CHAN. #2)  
Water Year 2013

Location.-- Lat. N40° 58.809', Long. W 102° 15.219' (NAD83). Gage is located on the right bank of the second channel crossing bridge of Highway 385, 0.9 miles south of Julesburg, CO and 3.0 miles upstream from the Colorado-Nebraska state line in Sedgwick County, CO.

Drainage Area and Period of Record.-- 23,821 mi<sup>2</sup> (USGS Colorado StreamStats utility).; Daily values are available from October 1, 1995 to present.

Equipment.-- Sutron AccuBubble stage sensor and a Campbell Scientific CS476 Radar (installed September 16, 2013) connected to a SatLink 2 Data Collection Platform (DCP) transmitting hourly in a precast concrete shelter on the right downstream bridge abutment of Channel No. 2 near Julesburg, CO. A wire weight gage on the downstream side of the bridge is the primary reference with no provisions for a supplemental reference. Starting on September 16, 2013 the AccuBubble sensor is only logged via the DCP. Gage and instrumentation is owned and operated by the Colorado Division of Water Resources (CDWR). The State of Nebraska Department of Natural Resources will visit and perform periodic discharge measurements at the gage.

Hydrologic Conditions.-- The South Platte River channel at Julesburg, CO is a braided sand channel. Channel No. 2 is one of four channels which can contain flow. The river is gaged on Channels 1 and 2. and a combined flow record is publish for the South Platte River at Julesburg, CO (PLAJUCCO). Channels 1 and 2 split apart about 1/3 of a mile upstream from the gage and the proportion of water in Channel No. 2 has been decreasing in recent years. Channel No. 1 generally will carry 90-100% of the total flow at lower stages with Channel No. 4 carrying local irrigation and storm run off. Channel Nos. 2 and 3 will have water only at higher flow rates. Measurements and observations made at channels 3 and 4 are added to channel 2 for record purposes.

The river is dried by multiple diversions upstream. Julesburg flows are mainly comprised of return flows and waters passed to the State of Nebraska to meet Compact requirements (April 1 - October 15, CRS 37-65-101). However, during the winter, periods of higher flow can be seen as upstream supply is diverted less heavily and fewer dry-up points occur. Upstream diversions do continue throughout the winter, except for periods of severe cold interrupting recharge and reservoir storage operations.

Gage-Height Record.-- The primary record from October 1, 2012 through September 16, 2013 is telemetered AccuBubble data with logged DCP data as backup. The record is complete and reliable. Missing values occurring on May 9 and July 10, 2013 were interpolated from adjacent data with no loss of accuracy. Numerous instrument calibration corrections ranging between - 0.23 and 0.43 ft. were required through this period. Instrument calibration was supported through this period by over 35 visits and observations of no flow made by CDWR and State of Nebraska staff.

From September 16, 2013 through the end of the 2013 water year the primary record is telemetered radar data with logged radar and AccuBubble data as backup. The record is complete and reliable.

Datum Corrections.-- Levels were last run on April 10, 2004.

Rating.-- The channel is comprised of shifting sands and gravels historically exhibiting fill and scour activity. Channel control prevails at all stages. Flow in the channel has been infrequent in recent years, resulting in marsh like conditions at the gage without visible flow. At lower flows the control is confounded by grooved tracks of 4-wheel drive vehicles in the semi-dry channel below the gage. Heavy vegetal growth in the channel has shown measurements plotting well to the left of older ratings. Rating No. 21, defined by measurements from 0.77 to 14100 cfs made in the 2011 Water Year was continued in use this year. Two discharge measurements (Nos. 429-430) were made this year at discharge rates of 14,100 and 5,790 cfs respectively. Measurements made this year and numerous observations of no flow cover the range in stage experienced this year well. The peak discharge of 14200 cfs occurred at 12:00 on September 18, 2013 at a stage of 10.74 ft. using a shift of +0.49 ft. exceeding measurement No. 429 made during the peak event by 100 cfs.

Note: Discharges from channels 3 and 4 are added to measurements made at channel No. 2. Total measurement discharges (channels 2-4) are numbered in whole numbers and individual channel discharge measurements are numbered using the parent measurement number followed by a dash and the individual channel number the measurement was made at. Gage-heights for the parent measurement are determined by analyzing the stage recorded at the channel No. 2 gage through the total duration of all measurements made at channels 2-4.

Discharge.-- Shifts are caused by the movement of sand across the channel and backwatering of the gage from constant and abundant vegetal growth in the channel. Shifting control method was used all year. Shifts were distributed by time as defined by measurements with consideration given to change in stage. All measurements were given full weight.

Special Computations.-- Numerous observations of no flow were made this year from October 2012 through September, 2013. The only flow occurring in channels 2-4 stemmed from the historic 2013 flood event. This record includes observations and discharge measurements made at channels 3 and 4. This record is added to the records from Channel No. 1 (ONEJURCO), and the State Line Ditch (STLINECO) to form the South Platte River at Julesburg, CO Combined Flow (PLAJUCCO).

Remarks.--

The record is good. Station maintained and record developed by Division One Hydrographic Staff.

Recommendations.-- Levels must be run in the 2014 Water Year. If persistent flows are observed in channels 3 and 4 in future years, consideration must be given to establish instrumentation on those channels.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06763990 SOUTH PLATTE RIVER AT JULESBURG (RIGHT CHAN. #2)

RATING TABLE-- PLA JURCO21 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	159
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10900
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12300
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13300
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11200
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8200
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6340
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5410
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5540
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3730
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2460
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2030
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	1490
30	0.00	0.00	0.04	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	1030
31	0.00	---	0.04	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.08	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	84089.00
MEAN	0.000	0.000	0.003	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2803
AC-FT	0	0	0.2	0.5	0	0	0	0	0	0	0	166800
MAX	0.00	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13300
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

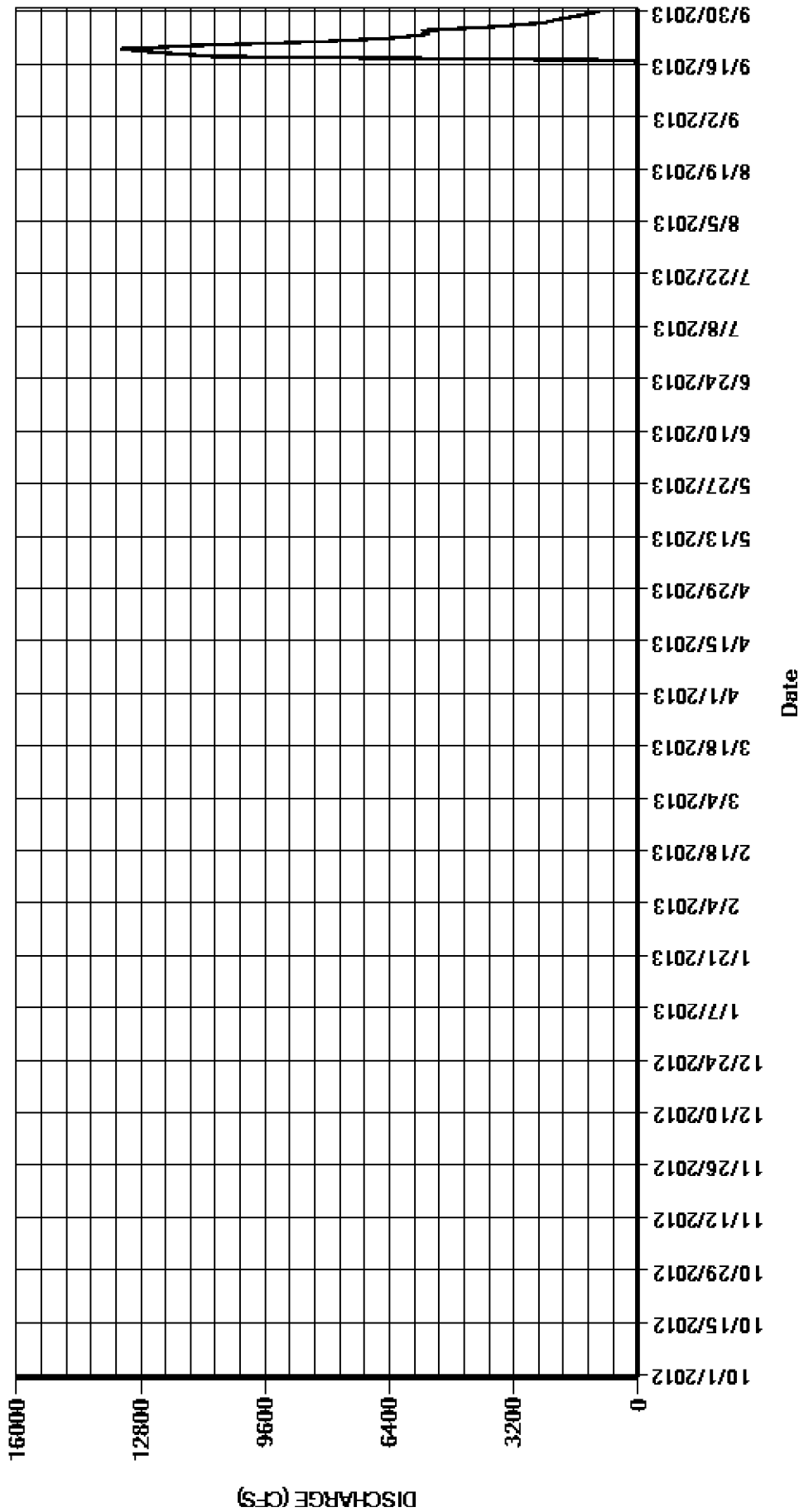
CAL YR	2012	TOTAL	1393.58	MEAN	3.81	MAX	52	MIN	0.00	AC-FT	2760
WTR YR	2013	TOTAL	84089.32	MEAN	230	MAX	13300	MIN	0.00	AC-FT	166800

MAX DISCH: 14200 CFS AT 12:00 ON SEP 18, 2013 GH 10.74 FT SHIFT 0.49 FT  
 MAX GH: 10.74 FT AT 12:00 ON SEP 18, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



06763990 SOUTH PLATTE RIVER AT JULESBURG (RIGHT CHAN. #2)  
 WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
STATELINE DITCH AUG. RETURN TO SOUTH PLATTE  
Water Year 2013

Location.-- Lat. N40°59'58.3", Long. W102°14'54.9" (WGS84). The State Line Ditch parallels County Road 43. The gage is located on the left side of a 4-foot Parshall flume approximately 1.1 miles northeast of the Town of Julesburg and approximately 0.5 miles north of the Sedgwick County Fairgrounds in Sedgwick County, CO.

Drainage Area and Period of Record.-- The State Line Ditch conveys unused waters from the Settlers and Peterson ditch systems, as well as augmentation water added to the ditch systems for compact compliance purposes to the South Platte River above the Colorado-Nebraska state line. ; Diversion records are available from 2001 to present. From October 1, 2007 to present the Hydrographic and Satellite Monitoring Branch has also maintained a record.

Equipment.-- Campbell Scientific CS476 radar unit suspended over the flume at the Ha location and a Sutron SDR-0001-1 digital incremental shaft encoder connected to a Sutron SatLink 2 Satellite Monitoring Data Collection Platform (DCP) in NEMA4 metal box enclosure at a 4-foot Parshall flume. The SDR unit was removed on March 15, 2013. The primary reference is a staff gage on the right side of the flume at the Ha location. No provisions for a supplemental reference are present. The steel Parshall flume is installed in concrete at a former ditch check location. The ditch is earthen above and below this point. The ditch and flume are owned and operated by the Julesburg Irrigation District (JID), the gage is operated by the Colorado Division of Water Resources (CDWR) who also owns and maintains the satellite monitoring instrumentation.

Hydrologic Conditions.-- Flows above this gage are heavily regulated. The gage measures unused waters from the Settlers and Peterson ditch systems as well as water pumped into the ditches for compact compliance purposes. Dramatic changes in stage over short periods of time are regularly seen. These erratic stage changes stem from irrigation practices upstream of this point on the respective ditch systems.

Gage-Height Record.-- The primary record is 15-minute telemetered gage-height data taken from the radar unit with logged DCP data as backup. The stilling well accumulates sediment impairing accurate operation of any float operated sensor. Following removal of the SDR unit on March 15, 2013 the stilling well is no longer used. The record is complete and reliable. Missing 15-minute gage-height values on October 3, 2012, April 10 and May 1, 2013 were interpolated from adjacent record without loss of accuracy.

Datum Corrections.-- Levels were run on June 25, 2013 using RM1 as base. The primary reference was found to be 0.042 ft. low with respect to the average flume crest confirming levels run in 2010. No correction to the primary reference is possible due to the anchoring system used to affix the staff gage to the flume without causing significant damage to the flume itself.

Rating.-- The control is a 4-foot Parshall flume set in concrete in an earthen ditch. A standard 4-foot Parshall flume rating, STD04FTPF, was continued again this year. Six discharge measurements (Nos. 17-22) were made during the year ranging in discharge from 3.36 to 16.3 cfs. Measurements made this year as well as several observations of no flow cover the range in stage experienced this year well. The peak flow of 26.9 cfs occurred at 09:00 on September 14, 2013 at a gage-height of 1.40 ft. with a time distributed shift of -0.01 ft., exceeding this year's high measurement (No. 22) made September 5, 2013 by 10.6 cfs and 0.38 ft. of stage respectively.

Discharge.-- A resident shift of -0.04 ft. is present and is caused by the base reference being out of calibration with respect to the flume crest. Due to the mounting method used, the base reference cannot be adjusted without causing significant damage to the flume. Shifts outside those expected from the base reference issue are caused by changes in approach conditions. The channel upstream of the flume is earthen and pervasive vegetal growth upstream of the flume will influence the flume's performance.

Special Computations.-- Shifting control method was use all year. Shifts were distributed by time as defined by measurements. This year's measurements showed unadjusted shifts varying between -0.01 and -0.07 ft. All were given full weight except for Nos. 17, 20 and 21 which were discounted up to 3% to smooth shift distributions.

Remarks.-- Zero flow is determined operationally. Residual gage-heights of 0.05 ft. and below have been observed when no flow is occurring. Gage-heights of 0.05 ft. and below were adjusted to compute a zero discharge. Zero flow was determined to occur on part of the day or the entire day on the following days: October 8, 18-28, 30, 31; November 1, 3-27, 30; December 1, 3-5, 9-31, 2012; January 1 - March 18, 20-31; April 1-5, 9-22; May 3-4, 7; June 17-19, 22-24 and September 17-18 and 21, 2013.

Recommendations.-- Record and instantaneous peak flow are good. Gage reliability has been substantially improved since installation of the radar unit. Station maintained by CDWR staff. Record developed by Devin Ridnour and Division One hydrographic staff.

JID interactions with the gage need to be recorded. Remarks regarding changing channel conditions of the approach channel should be documented on the station visit log. Efforts should be continued to make discharge measurements throughout the year to track performance issues caused by vegetal growth should be continued.

An alternative site, downstream of this new diversion, is being considered and hopefully will be installed by next spring

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

STATELINE DITCH AUG. RETURN TO SOUTH PLATTE

RATING TABLE-- STD04FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

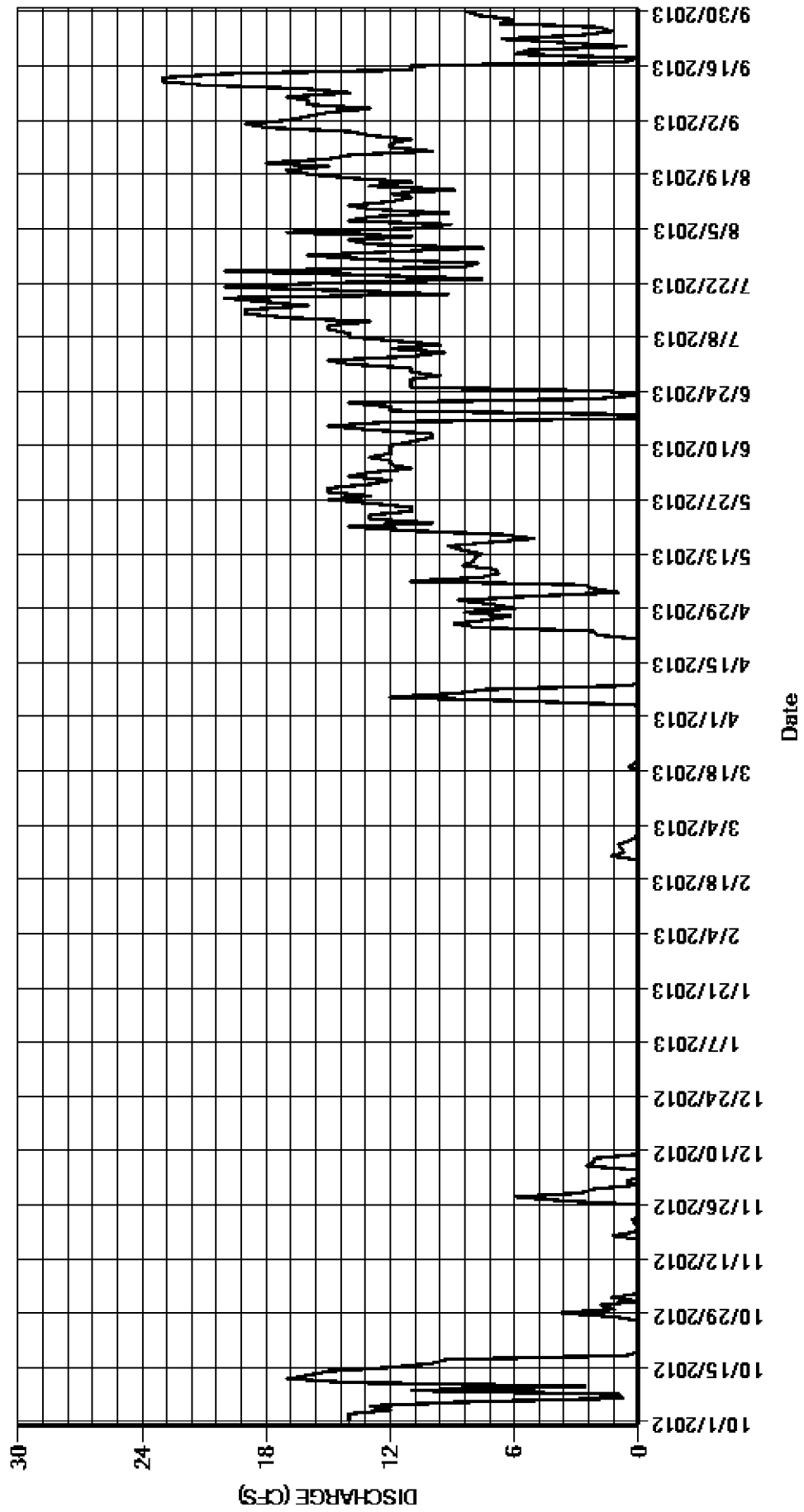
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	0.01	0.07	0.00	0.01	0.13	0.00	8.7	12	14	13	19
2	14	1.3	0.55	0.00	0.00	0.02	0.00	5.3	14	15	14	17
3	14	0.11	0.04	0.00	0.00	0.00	0.00	1.0	13	11	11	16
4	12	0.00	0.01	0.00	0.00	0.00	0.00	2.2	11	9.4	17	15
5	13	0.00	0.16	0.00	0.00	0.00	5.4	2.6	12	12	11	13
6	8.7	0.00	2.5	0.00	0.00	0.00	12	11	12	9.6	9.1	16
7	0.80	0.00	2.2	0.00	0.00	0.00	8.8	7.6	13	12	14	16
8	0.97	0.00	2.1	0.00	0.00	0.00	7.4	6.8	12	14	13	17
9	11	0.00	0.03	0.00	0.00	0.01	0.36	6.9	12	14	9.2	14
10	2.6	0.00	0.00	0.00	0.00	0.00	0.00	8.5	12	15	13	16
11	14	0.00	0.00	0.00	0.00	0.00	0.00	8.0	11	15	14	21
12	17	0.00	0.00	0.00	0.00	0.00	0.00	7.9	10	13	12	23
13	16	0.00	0.00	0.00	0.00	0.00	0.00	7.6	10	17	11	23
14	15	0.00	0.00	0.00	0.00	0.00	0.00	8.6	13	19	12	20
15	12	0.00	0.00	0.00	0.00	0.00	0.00	9.2	15	19	8.9	11
16	10	0.00	0.00	0.00	0.00	0.00	0.00	7.2	12	16	13	11
17	9.3	0.05	0.00	0.00	0.00	0.00	0.00	5.1	0.20	18	11	0.65
18	0.61	1.2	0.00	0.00	0.00	0.05	0.00	6.6	0.00	20	14	0.08
19	0.00	0.14	0.00	0.00	0.00	0.48	0.00	11	12	9.2	16	6.0
20	0.00	0.03	0.00	0.00	0.00	0.18	0.00	14	12	14	17	5.3
21	0.00	0.17	0.00	0.00	0.00	0.00	0.00	10	14	20	15	0.64
22	0.00	0.29	0.00	0.00	0.00	0.00	2.0	13	2.2	15	18	3.6
23	0.00	0.00	0.00	0.00	0.04	0.01	2.2	13	0.00	7.6	15	6.6
24	0.00	0.00	0.00	0.00	1.3	0.00	7.9	11	1.5	13	14	2.7
25	0.00	0.00	0.00	0.00	0.73	0.00	8.9	11	11	20	10	1.3
26	0.00	0.00	0.00	0.00	0.86	0.00	7.3	13	11	8.5	12	1.9
27	0.00	3.6	0.00	0.00	0.95	0.00	6.2	15	11	7.8	12	6.7
28	1.1	5.9	0.00	0.00	0.37	0.00	8.4	13	9.6	13	11	6.1
29	3.7	2.8	0.00	0.00	---	0.00	6.0	15	11	16	13	7.7
30	1.2	2.2	0.00	0.00	---	0.00	7.1	15	11	12	14	8.3
31	1.8	---	0.00	0.00	---	0.00	---	13	---	7.5	18	---
TOTAL	192.78	17.80	7.66	0.00	4.26	0.88	89.96	287.8	300.50	426.6	405.2	325.57
MEAN	6.22	0.59	0.25	0.000	0.15	0.028	3.00	9.28	10.0	13.8	13.1	10.9
AC-FT	382	35	15	0	8.4	1.7	178	571	596	846	804	646
MAX	17	5.9	2.5	0.00	1.3	0.48	12	15	15	20	18	23
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	0.00	7.5	8.9	0.08

CAL YR	2012	TOTAL	2694.19	MEAN	7.36	MAX	23	MIN	0.00	AC-FT	5340
WTR YR	2013	TOTAL	2059.01	MEAN	5.64	MAX	23	MIN	0.00	AC-FT	4080

MAX DISCH: 26.9 CFS AT 09:00 ON SEP 14, 2013 GH 1.40 FT SHIFT -0.01 FT  
 MAX GH: 1.40 FT AT 09:00 ON SEP 14, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

STATELINE DITCH AUG. RETURN TO SOUTHPLATTE  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06764000 SOUTH PLATTE RIVER AT JULESBURG (COMBINED)  
Water Year 2013

Location.-- Lat 40°58'37", long 102°14'52", in NE¼SE¼ sec. 33, T.12 N., R.44 W., on Highway 385 bridge south of Julesburg CO.

Drainage Area and Period of Record.-- 23,821 mi<sup>2</sup> (USGS Colorado StreamStats utility). ; April 1902 to present. Monthly discharge for some periods published in USGS WSP 1310.

Equipment.-- Computed record. See individual gage records for specific equipment used at respective gages.

Hydrologic Conditions.--  
The South Platte River at Julesburg is a braided sand channel. Four channels can contain flow with a majority of the flow occurring in Channel No. 1. The river is gaged on Channel Nos. 1 and 2. The combined flow record for the South Platte River at Julesburg (PLAJUCCO) is the combination of records from Channel No. 1 (ONEJURCO), Channel No. 2 (PLAJURCO), the Stateline Ditch (STLINECO) and the Town of Julesburg wastewater effluent release to the South Platte River, adjacent to Channel No. 4. Channel Nos. 1 and 2 split apart about 1/3rd of a mile upstream from the Highway 385 bridge and the proportion of water being carried in Channel No. 1 has been steadily increasing in recent years. At low flows approximately 90-100% of the total flow is carried in Channel No. 1 with Channel Nos. 2 and 3 being dry. Some local irrigation and storm runoff occurs in Channel No. 4 (ungaged) with unused irrigation and augmentation water being conveyed to the river by the Stateline Ditch. Channel Nos. 2 and 3 will have water only at higher flows.  
  
Generally the river is dried by numerous diversions upstream of the gage. Julesburg flows are usually comprised of return flows or waters passed to the State of Nebraska to meet compact requirements (April 1 – October 15 per CRS 37-65-101). During winter months, periods of higher flow can be seen as upstream supply is diverted less heavily and fewer dry up locations occur. Upstream diversions continue throughout the winter, except for periods of severe cold, interrupting recharge and reservoir storage operations.

Gage-Height Record.-- See individual records for analyses of gage height record.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- See Special Computation section.

Special Computations.--  
DAILY FLOWS: The calculated combined flow is computed by loading the day average discharge values calculated in the individual channel (ONEJURCO, PLAJURCO, STLINECO) streamflow records with provided Town of Julesburg effluent figures into a spreadsheet and adding the totals day-by-day. The spreadsheet is then used to generate a combined average daily flow file which is then imported into the State of Colorado's Hydrographic Management System (CoHMS) utility.  
  
PEAK DISCHARGE: Peak discharge occurs as a combined flow peak event. The combined peak event may or may not correspond to the peak discharges on the individual channel records. Finding the peak event at the unit value level across multiple channels is done by hand. Normally, the day of peak discharge can be determined from inspection of the hydrograph. Unit computed discharge values from each of the individual streamflow records for the identified daily peak are then loaded into a separate spreadsheet and then added unit value by unit value. The maximum computed discharge is the maximum of the unit discharges. The above procedure was carried out and the peak flow of 21,800 cfs was determined to occur at 12:00 on September 18, 2013.  
  
MAXIMUM GH: No longer determined. In previous years, the peak gage-height has been taken from the Channel No. 1 streamflow record since a majority of the flow has been carried in Channel No. 1. This procedure has been determined to be misleading and is no longer done.  
  
ESTIMATED DAYS: A spreadsheet is used to compute percentage of the total daily flow that is rated as good. If 90% of the total daily computed flow is rated as good then the day is rated good. If less than 90% of the total daily computed record is rated good then the record is rated per the record rating of highest percentage contributing streamflow record.

Remarks.--

This year Channel No. 1 contributed 53% of the total combined flow, Channel No. 2 contributed 46% and the Stateline Ditch and the Town of Julesburg effluent contributed 1.1% and 0.05% respectively. Before the high water event in September, Channel No. 1 contributed 93% of the total flow; as such, the record is rated per the Channel No. 1 streamflow record: "The record is good except for December 27, 2012 - January 8, 13 - 19 and February 22, 2013 when the stage-discharge relation was affected by ice and April 17, 2013 which had numerous hours of interpolated data. The ice affected period is estimated and poor and the interpolated period is rated as fair." Individual streamgages owned, operated, and maintained by the Colorado Division of Water Resources. Streamflow records, including the calculated combined record, are compiled and computed by Division One Hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06764000 SOUTH PLATTE RIVER AT JULESBURG (COMBINED)

RATING TABLE.--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

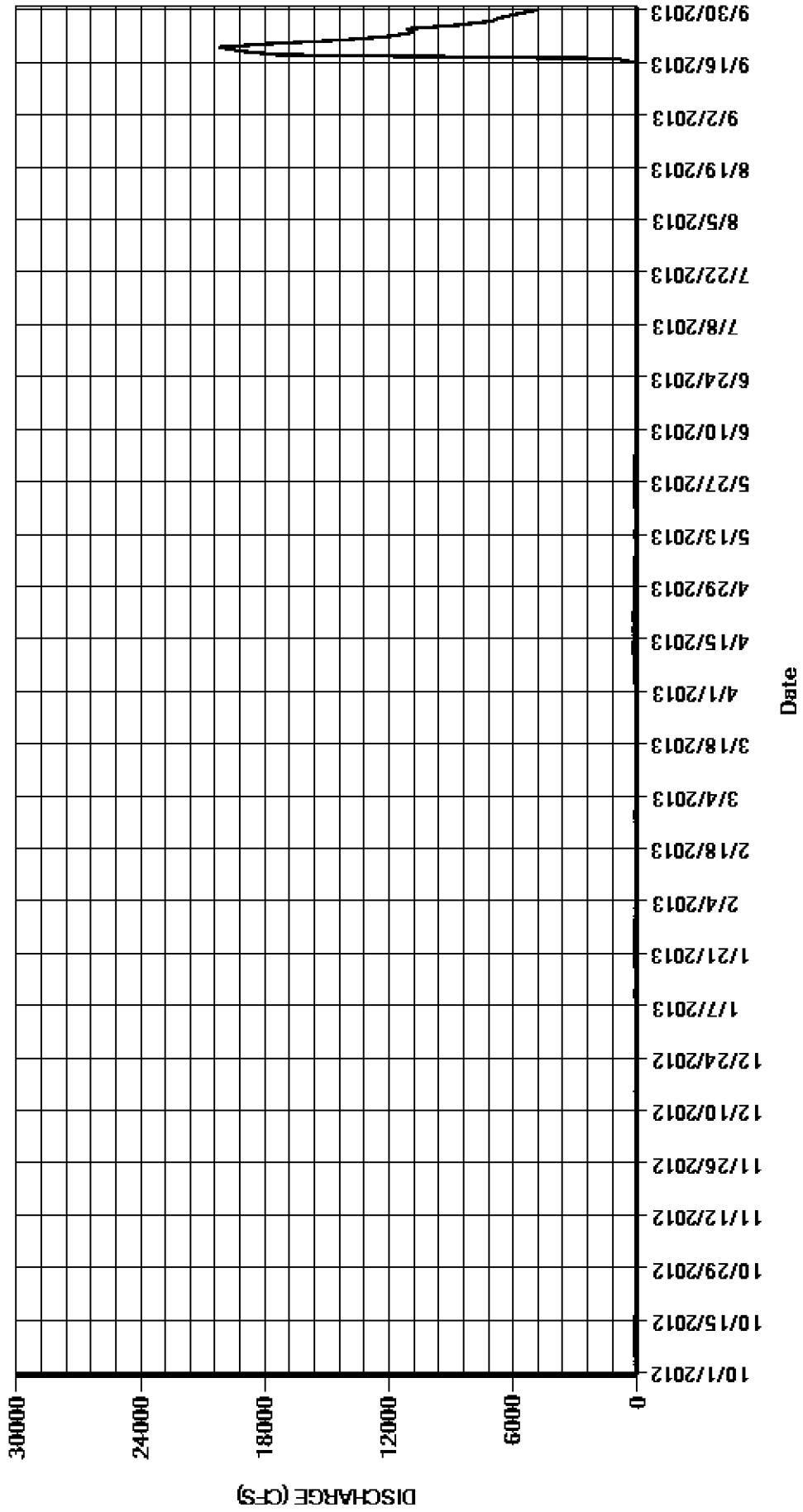
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	98	37	37	e80	101	90	34	140	128	38	33	39
2	97	40	39	e85	97	69	58	130	124	37	34	37
3	101	41	37	e85	85	56	106	128	107	32	31	35
4	100	41	36	e85	69	50	116	161	93	31	40	33
5	107	41	35	e90	59	43	122	141	89	34	37	32
6	117	39	38	e95	52	39	118	115	85	31	32	37
7	134	40	38	e100	48	35	112	106	77	31	45	36
8	134	40	38	e100	44	32	119	94	75	33	46	36
9	131	41	46	104	44	59	146	92	74	33	40	33
10	122	45	42	111	57	58	134	97	68	34	40	36
11	121	54	53	118	58	56	209	99	67	33	42	43
12	124	57	59	66	66	50	226	109	64	30	40	46
13	123	62	68	e60	75	33	208	115	60	34	38	56
14	120	62	86	e60	69	26	189	106	62	38	42	66
15	121	45	101	e80	61	25	177	100	63	37	34	85
16	98	41	96	e100	51	25	177	95	64	34	35	92
17	82	39	90	e105	48	25	e195	87	62	35	34	1060
18	89	41	86	e110	45	25	194	81	62	36	38	17400
19	82	40	81	e130	43	26	158	91	56	27	41	19200
20	83	39	66	148	45	25	199	116	50	31	40	20200
21	76	38	63	146	44	25	216	105	51	37	37	17600
22	76	41	74	145	e65	26	190	110	88	31	40	14200
23	77	54	82	145	57	33	153	124	67	24	36	12000
24	80	61	86	145	81	39	134	147	61	34	35	10900
25	80	61	80	149	101	52	133	146	51	60	31	11100
26	68	56	63	146	110	43	130	131	56	48	32	8690
27	52	45	e70	137	127	34	127	117	50	43	31	7080
28	48	44	e65	125	107	28	140	103	43	51	29	6590
29	47	41	e70	115	---	28	144	122	41	48	32	5750
30	40	39	e70	102	---	27	133	117	39	35	35	4850
31	41	---	e75	101	---	27	---	120	---	28	38	---
TOTAL	2869	1365	1970	3368	1909	1209	4497	3545	2077	1108	1138	157362
MEAN	92.5	45.5	63.5	109	68.2	39.0	150	114	69.2	35.7	36.7	5245
AC-FT	5690	2710	3910	6680	3790	2400	8920	7030	4120	2200	2260	312100
MAX	134	62	101	149	127	90	226	161	128	60	46	20200
MIN	40	37	35	60	43	25	34	81	39	24	29	32

CAL YR	2012	TOTAL	97782	MEAN	267	MAX	1310	MIN	30	AC-FT	194000
WTR YR	2013	TOTAL	182417	MEAN	500	MAX	20200	MIN	24	AC-FT	361800

MAX DISCH: 21800 CFS AT 12:00 ON SEP 18, 2013 (COMPUTED PEAK DISCHARGE)  
 MAX GH: (N/A COMPUTED STREAMFLOW RECORD)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06764000 SOUTH PLATTE RIVER AT JULESBURG (COMBINED)  
 WY2013 HYDROGRAPH





PLATTE RIVER BASIN  
AURORA HOMESTAKE PIPELINE TO SPINNEY RESERVOIR  
Water Year 2013

Location.--	Lat. N38° 54' 54.54", Long. W105° 41'03.34" (WGS84) as spotted from Google Earth). Flow meters in a vaulted turnout off the Homestake Pipeline approximately 5.25 mi. SW of the Spinney Mountain Reservoir Dam, in Park County, CO.
Drainage Area and Period of Record.--	The "Spinney Tap" is Aurora's delivery component of the Homestake pipeline project; delivering transbasin water to Spinney Mountain Reservoir. ; Daily values are available from October 1, 1998 to present.
Equipment.--	Two 30 inch Venturi meters off the Homestake Pipeline upstream of two sleeve type (Bailey) control valves with open discharge. One is the main discharge valve to Spinney Mountain Reservoir (Discharge No. 1) and the other (Discharge No. 2) serves as a pressure-relief valve for the pipeline. Both meters are monitored by a Sutron SatLink Data Collection Platform (DCP) and by Aurora and the City of Colorado Spring's Supervisory Control and Data Acquisition (SCADA) system. A Sutron Monitor 1 data logger is used as a back up to the DCP. The original tap on the Homestake Pipeline exists and can be utilized if the two sleeve type Bailey control valves fail, however no recording devices exist on this system. The Venturi meters, DCP, SCADA system and facilities are owned and maintained by the City of Aurora.
Hydrologic Conditions.--	Flow is comprised of transmountain water imported from a number of sources in the Colorado River Basin, Colorado River water stored on the eastern slope from previous years, and native Arkansas River water transferred from points downstream. All flow is diverted to Twin Lakes Reservoir and transported in the Homestake Pipeline to the Otero Pump Station. The pipeline delivers water to Aurora at Spinney Mountain Reservoir and continues to the City of Colorado Spring's Rampart Reservoir. Colorado River water is included in deliveries of Homestake Tunnel, Busk-Ivanhoe Tunnel and Twin-Lakes Tunnel. In general the total flow at this gage represents approximately 45% Colorado River Water, and 55% Arkansas basin water. Water deliveries are ordered to Spinney Reservoir through the main discharge (Discharge No.1). Spikes of water from the pressure relief valve (Discharge No. 2) are usually small and infrequent. Water delivered into Spinney through the relief valve can occur when water is not delivered through the main discharge valve.
Gage-Height Record.--	From October 1, 2012 to June 14, 2013 and from July 9 through September 30, 2013 the primary record is 15-minute telemetered discharge values recorded by the DCP from the two Venturi meters with logged DCP data as backup. The record for the above periods is complete and reliable.  Due to plugging issues of the two sleeve type Bailey control valves steaming from low water levels in Twin Lakes Reservoir, the original tap on the Homestake Pipeline had to be utilized from June 14 through July 9, 2013.
Datum Corrections.--	Not applicable.
Rating.--	A differential pressure versus rate of flow rating is used to convert inches of head to flow in cfs. The rating is provided by Primary Flow Signal, the Venturi meter manufacturer. The differential pressure transmitter on the Venturi meters was last calibrated by the City of Aurora Instrumentation division on September 18, 2013. The transmitters were found to be in tolerance and no adjustments were made. A mass balance spreadsheet is routinely used by Otero Pump Station personnel to check discharge at the Spinney Tap.  Three discharge measurements (Nos. 4-6). were made this year ranging in discharge from 49.6 to 80.5 cubic feet per second (cfs). All measurements made this year correlated within $\pm 1\%$ of the differential pressure versus rate of flow rating provided by the manufacture and were within $\pm 1\%$ of the reported DCP and SCADA discharge values. The peak discharge of 130 cfs was recorded a 2015 on July 20, 2013 and was the combined flow from both the Aurora Valve (Discharge No. 1) and the Relief valve (Discharge No. 2). The peak exceeded measurement No. 5 made June 19, 2013 by 49.5 cfs.
Discharge.--	Discharge is determined from the two Venturi meters and reported to the DCP on separate analog circuits. The two discharge records are worked independently and combined to create the total delivery to Spinney Mountain Reservoir via the Homestake Pipeline.
Special Computations.--	The two primary record parameters HOMSPACO (Aurora valve) and HOMSPRCO (Relief valve) are developed independently and combined to develop the HOMSPICO record. Data from June 14 through July 9, 2013 was taken from the City of Aurora's Spinney Mountain Reservoir mass balance computation and operation spreadsheets.
Remarks.--	The record is good except for the period taken from the Spinney Mountain Reservoir mass balance computation and operations spreadsheets which is estimated and fair. Record developed by Russell Stroud and Mike Wild.
Recommendations.--	Continue open channel measurements to validate meter readings as time allows.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

AURORA HOMESTAKE PIPELINE TO SPINNEY RESERVOIR

RATING TABLE.--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

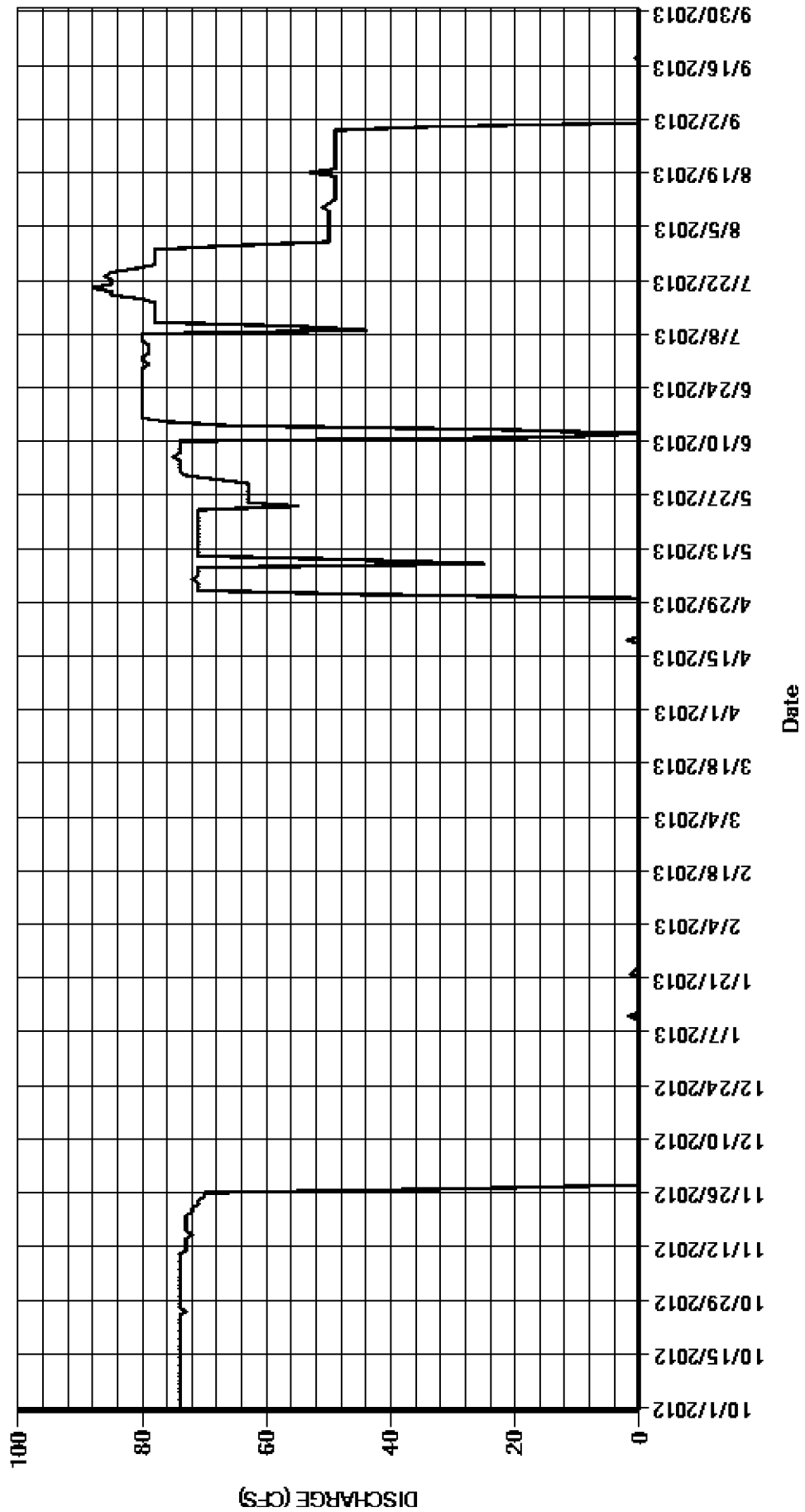
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	74	74	0.00	0.00	0.00	0.00	0.00	45	73	e80	50	0.00
2	74	74	0.00	0.00	0.00	0.00	0.00	71	74	e80	50	0.00
3	74	74	0.00	0.00	0.00	0.00	0.00	71	74	e79	50	0.00
4	74	74	0.00	0.00	0.00	0.00	0.00	71	74	e79	50	0.00
5	74	74	0.00	0.00	0.00	0.00	0.00	72	74	e79	50	0.00
6	74	74	0.00	0.00	0.00	0.00	0.00	71	75	e80	50	0.00
7	74	74	0.00	0.00	0.00	0.00	0.00	71	74	e80	50	0.00
8	74	74	0.00	0.00	0.00	0.00	0.00	71	74	e80	50	0.00
9	74	74	0.00	0.00	0.00	0.00	0.00	25	74	44	50	0.00
10	74	74	0.00	0.00	0.00	0.00	0.00	44	74	55	51	0.00
11	74	73	0.00	1.8	0.00	0.00	0.00	71	13	78	50	0.00
12	74	73	0.00	0.00	0.00	0.00	0.00	71	0.00	78	49	0.00
13	74	73	0.00	0.00	0.00	0.00	0.00	71	23	78	49	0.00
14	74	73	0.00	0.00	0.00	0.00	0.00	71	e66	78	49	0.00
15	74	72	0.00	0.00	0.00	0.00	0.00	71	e76	78	49	0.00
16	74	73	0.00	0.00	0.00	0.00	0.00	71	e80	78	49	0.00
17	74	73	0.00	0.00	0.00	0.00	0.00	71	e80	80	49	0.00
18	74	73	0.00	0.00	0.00	0.00	0.00	71	e80	85	49	0.64
19	74	73	0.00	0.00	0.00	0.00	1.9	71	e80	85	53	0.00
20	74	73	0.00	0.00	0.00	0.00	0.00	71	e80	88	49	0.00
21	74	72	0.00	0.00	0.00	0.00	0.00	71	e80	85	49	0.00
22	74	72	0.00	1.4	0.00	0.00	0.00	71	e80	85	49	0.00
23	74	71	0.00	0.57	0.00	0.00	0.00	71	e80	86	49	0.00
24	74	71	0.00	0.00	0.00	0.00	0.00	55	e80	85	49	0.00
25	74	70	0.00	0.00	0.00	0.00	0.00	63	e80	81	49	0.00
26	73	70	0.00	0.00	0.00	0.00	0.00	63	e80	78	49	0.00
27	74	29	0.00	0.00	0.00	0.00	0.00	63	e80	78	49	0.00
28	74	0.00	0.00	0.00	0.00	0.00	0.00	63	e80	78	49	0.00
29	74	0.00	0.00	0.00	---	0.00	0.00	63	e80	78	49	0.00
30	74	0.00	0.00	0.00	---	0.00	0.00	63	e79	78	49	0.00
31	74	---	0.00	0.00	---	0.00	---	68	---	66	33	---
TOTAL	2293	1924.00	0.00	3.77	0.00	0.00	1.90	2036	2117.00	2420	1519	0.64
MEAN	74.0	64.1	0.000	0.12	0.000	0.000	0.063	65.7	70.6	78.1	49.0	0.021
AC-FT	4550	3820	0	7.5	0	0	3.8	4040	4200	4800	3010	1.3
MAX	74	74	0.00	1.8	0.00	0.00	1.9	72	80	88	53	0.64
MIN	73	0.00	0.00	0.00	0.00	0.00	0.00	25	0.00	44	33	0.00

CAL YR	2012	TOTAL	22321.00	MEAN	61.0	MAX	78	MIN	0.00	AC-FT	44270
WTR YR	2013	TOTAL	12315.31	MEAN	33.7	MAX	88	MIN	0.00	AC-FT	24430

MAX DISCH: 130 CFS AT 20:15 ON JUL 20, 2013  
 MAX GH: 0.00 FT

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**AURORA HOMESTAKE PIPELINE TO SPINNEY RESERVOIR  
WY2013 HYDROGRAPH**



PLATTE RIVER BASIN  
HOOSIER PASS TUNNEL AT MONTGOMERY RESERVOIR NEAR ALMA  
Water Year 2013

Location.--	Lat. N39° 21' 36.39", Long. W106° 04' 39.15" (Spotted from Google Earth (NAD83)). Gage is located in a tunnel at the downstream end of Hoosier Pass Tunnel at Montgomery Reservoir 5.3 miles north of Alma, CO.
Drainage Area and Period of Record.--	Transmountain diversion diverting waters from tributaries of the Blue River in the Colorado River Basin to Montgomery Reservoir on the Middle fork of the South Platte River in the South Platte River Basin. ; Daily values are available from 1953 to present.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) transmitting hourly and a Sutron SDR-0001-1 (City of Colorado Springs Utilities (CSU)) at an 8-ft. Parshall Flume set in concrete located inside the tunnel. A reference point and metal drop tape are the primary reference with a supplemental staff gage located on the left wing wall of the flume at the Ha location. Facilities are owned and maintained by the City of Colorado Springs. Gage operated and satellite equipment owned and maintained by Division of Water Resources (DWR) staff.
Hydrologic Conditions.--	Transmountain diversion operating seasonally. Flows are intercepted from the headwaters of the Blue River and follow a diurnal pattern as snowpack melts. Diversion can be called out (shut off) by senior water rights on the Blue River and further downstream. The flow is controlled by numerous diversions into the tunnel inlet from the Blue River drainage.
Gage-Height Record.--	The primary record is 15-minute satellite data with logged 15-minute DCP and SDR data as backup. Periods of missing data were filled in with SDR data without loss of accuracy on the following day: April 11, 2013. The record is complete and reliable. Instrument calibration was ensured by fourteen visits by DWR employees. Logged SDR data agreed with telemetered data within $\pm 0.02$ ft.
Datum Corrections.--	Levels were last run on October 12, 2011 using the flume crest as base. The base reference gage was found to be within allowable tolerances.
Rating.--	The control is an 8-ft. Parshall flume. A standard 8-ft. Parshall rating, STD08FTPF, was continued for all of WY2013. Four discharge measurements (Nos. 148-151) were made this year, ranging in discharge from 18.2 to 86.7 cfs. Measurements Nos. 148-151 and an observation of no flow cover the majority of range in stage experienced this year. The peak discharge of 171 cfs occurred at 19:45 on June 14, 2013 at a gage-height of 2.84 ft. using a shift of 0.00 ft. The peak exceeded measurement No. 149, made on June 5, 2013 by 1.0 ft. of stage and 84.3 cfs respectively.
Discharge.--	<p>Per agreement with the City of Colorado Springs measurements within 5% of the rating are adjusted to the rating. As such, Measurements Nos. 148, 149, 150 and 151 were adjusted 0.92%, 2.23%, 4.85% and 3.41% respectively to the rating. The rating was directly applied to the gage-height record to compute discharge.</p> <p>Get-away conditions are good and submergence of the flume is not a problem. Since the flume is in the tunnel, moss and algae are also not a factor. Deformities in the vertical walls of the flume, may lead to permanent shifting conditions. A stage-shift relationship was recognized for gage-heights of 1.20 ft. and higher. The Parshall flume was painted in the fall of 2011 and this may have slightly affected the stage discharge relationship. However, the number of confirming measurements in this "upper stage range" do not support use of a stage-shift curve at this time.</p>
Special Computations.--	Zero flow is determined operationally. The stilling well has been observed to beach or loose hydraulic connectivity with the flume at gage-heights of 0.08 ft. and below. Flows at and below this point are assumed to be negligible and a 0 is assigned to them. Zero flow was determined to occur part of the day of the entire day on the following days: October 1, 2012 - April 1, 2013; August 9 - 14; August 19 - September 11 and September 30, 2013.
Remarks.--	The record is good. Station maintained and record developed by Michael Wild.
Recommendations.--	Continue to look for opportunities to perform discharge measurements at gage-heights of greater than 1.20 ft.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

HOOSIER PASS TUNNEL AT MONTGOMERY RESERVOIR NEAR ALMA

RATING TABLE-- STD08FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

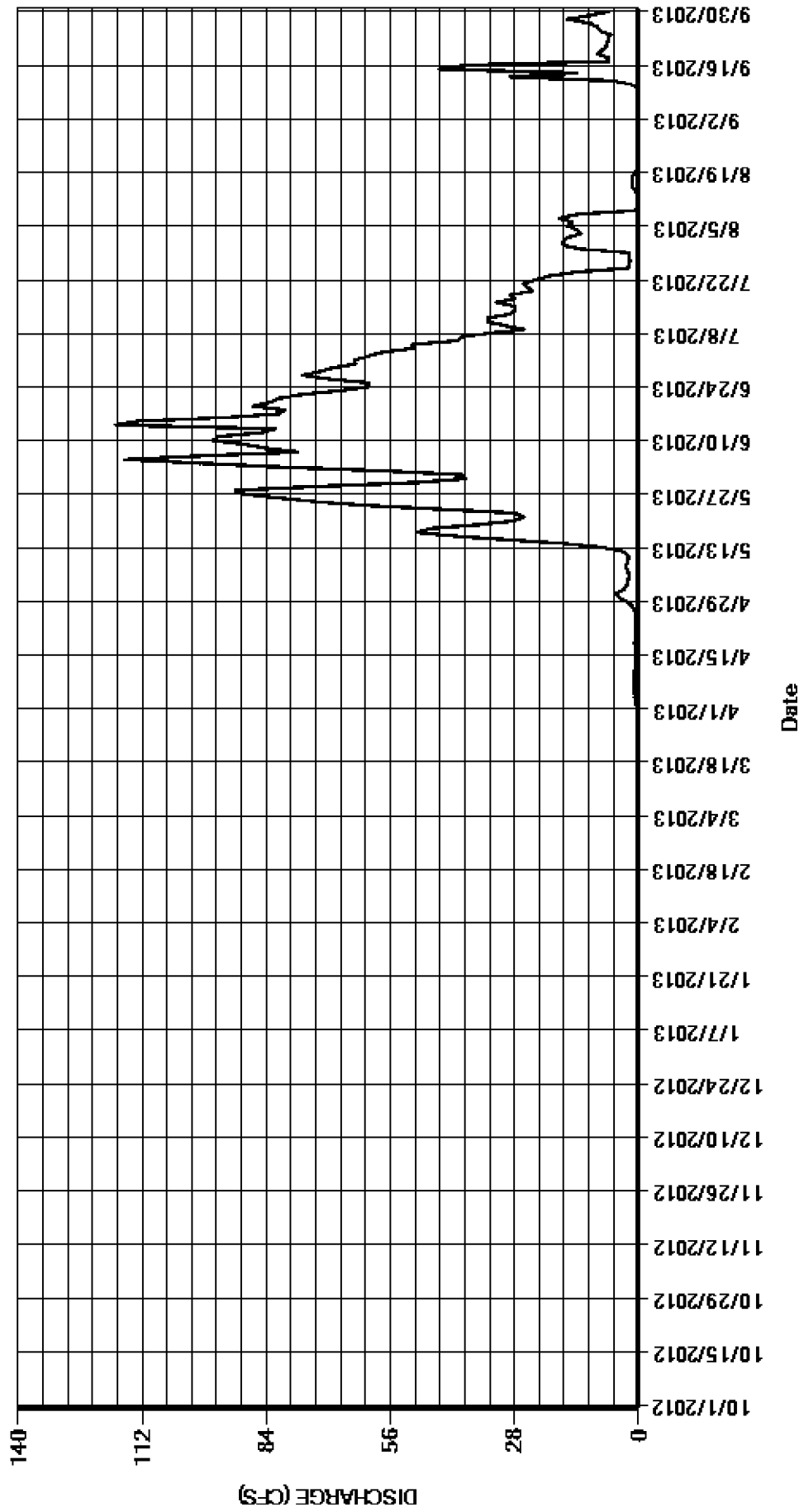
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.13	5.2	40	64	17	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.67	3.4	57	61	16	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.77	2.7	81	58	13	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.82	2.5	99	51	14	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.88	2.3	116	51	16	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.98	2.2	99	41	15	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	1.1	2.5	77	40	18	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	1.1	2.9	84	34	14	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	1.1	2.6	89	26	1.3	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	1.0	2.3	96	30	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.85	2.4	95	34	0.00	1.7
12	0.00	0.00	0.00	0.00	0.00	0.00	0.79	3.7	85	34	0.00	5.9
13	0.00	0.00	0.00	0.00	0.00	0.00	0.79	8.3	82	29	0.00	29
14	0.00	0.00	0.00	0.00	0.00	0.00	0.76	16	118	28	0.66	14
15	0.00	0.00	0.00	0.00	0.00	0.00	0.79	28	113	28	1.4	45
16	0.00	0.00	0.00	0.00	0.00	0.00	0.79	41	93	32	1.4	39
17	0.00	0.00	0.00	0.00	0.00	0.00	0.80	50	81	28	1.4	6.9
18	0.00	0.00	0.00	0.00	0.00	0.00	0.89	47	80	29	1.4	6.9
19	0.00	0.00	0.00	0.00	0.00	0.00	0.71	36	87	24	0.92	9.4
20	0.00	0.00	0.00	0.00	0.00	0.00	0.65	28	83	25	0.00	8.1
21	0.00	0.00	0.00	0.00	0.00	0.00	0.67	26	81	26	0.00	7.3
22	0.00	0.00	0.00	0.00	0.00	0.00	0.67	28	76	23	0.00	7.0
23	0.00	0.00	0.00	0.00	0.00	0.00	0.76	45	67	20	0.00	6.9
24	0.00	0.00	0.00	0.00	0.00	0.00	0.73	62	61	14	0.00	6.3
25	0.00	0.00	0.00	0.00	0.00	0.00	0.68	73	61	2.3	0.00	8.7
26	0.00	0.00	0.00	0.00	0.00	0.00	0.76	81	70	2.2	0.00	9.3
27	0.00	0.00	0.00	0.00	0.00	0.00	1.1	89	76	2.0	0.00	11
28	0.00	0.00	0.00	0.00	0.00	0.00	1.7	91	72	2.2	0.00	16
29	0.00	0.00	0.00	0.00	---	0.00	2.8	72	69	2.2	0.00	11
30	0.00	0.00	0.00	0.00	---	0.00	4.5	50	64	13	0.00	6.7
31	0.00	---	0.00	0.00	---	0.00	---	39	---	17	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	30.74	945.0	2452	870.9	131.48	256.10
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	1.02	30.5	81.7	28.1	4.24	8.54
AC-FT	0	0	0	0	0	0	61	1870	4860	1730	261	508
MAX	0.00	0.00	0.00	0.00	0.00	0.00	4.5	91	118	64	18	45
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.13	2.2	40	2.0	0.00	0.00

CAL YR	2012	TOTAL	1316.49	MEAN	3.60	MAX	43	MIN	0.00	AC-FT	2610
WTR YR	2013	TOTAL	4686.22	MEAN	12.8	MAX	118	MIN	0.00	AC-FT	9300

MAX DISCH: 171 CFS AT 19:45 ON JUN 14, 2013 GH 2.84 FT SHIFT 0 FT  
 MAX GH: 2.84 FT AT 19:45 ON JUN 14, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**HOOSIER PASS TUNNEL AT MONTGOMERY RESERVOIR NEAR ALMA  
WY2013 HYDROGRAPH**



PLATTE RIVER BASIN  
09046000 BOREAS PASS DITCH AT BOREAS PASS  
Water Year 2013

Location.-- Lat. N39° 24' 38.36", Long. W105° 58' 5.02" ((NAD83) spotted from Google Earth)). 1.50-ft. Parshall Flume in an underground vault near the summit of Boreas Pass.

Drainage Area and Period of Record.-- Transmountain diversion diverting water from the headwaters of Indiana Creek in the Colorado River Basin to Tarryall Creek in the South Platte River Basin. ; Daily values are available from the DWR for water years 1934 to 1940 and 1950 to present.

Equipment.-- Digital incremental Sutron SDR-0001-1 shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) transmitting hourly at a 1.5-ft. Parshall Flume. A second Sutron SDR-0001-1 incremental shaft encoder is co-located and serves as backup to the primary encoder. The ditch goes underground after collection, and the flume and equipment are housed inside a vault with a vertical manhole entrance. The flume is set into the concrete pipeline, approximately 14 ft. underground. A staff gage on REW in the flume is used as the primary reference gage. The gage and equipment are owned by the City of Englewood. The DCP and ditch gates are operated by an independent contractor under a contract arrangement with Englewood.

Hydrologic Conditions.-- Boreas Pass Ditch is a transmountain diversion diverting water from the headwaters of Indiana Creek to Tarryall Creek. The collection area is alpine tundra and talus slopes above timberline.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged DCP data and 15-minute logged SDR data as backup. The gage was operated and satellite data were collected from June 9, 2013 to July 23, 2013. The record for the period of operation is complete. Five visits were made during the period of operation ensuring instrument calibration. The primary record agreed well with the backup records.

Datum Corrections.-- Levels were run on July 2, 2013 and found to be within acceptable tolerances. The survey showed the flume is nearly level within <0.01" foot both laterality and longitudinally from the crest to Ha. Levels had not been run at this site since its installation in 1992.

Rating.-- The control is a 1.50 ft. Parshall flume. The rating is a standard 1.50 ft. (STD01HFPTF). This rating was continued this year. Two discharge measurements (Nos. 32, 33) were made this year ranging in discharge from 1.11 to 1.93 cfs. The peak discharge of 3.32 cfs occurred at 16:45 on June 11, 2013 at a gage-height of 0.72 ft. and a shift of -0.04 ft. exceeding measurement (No. 32) by 1.39 cfs and 0.20 ft. of stage respectively.

Discharge.-- Shifting control method was used for all periods of record. Negative shifting is most likely caused by the flume being slightly out of level longitudinally and by increased roughness caused by the presence of concrete residue stemming from the flume's installation. The weir pool was found to have filled with sediment and was removed before measurement number #33. No correction resulted from the flume cleaning. Shifts were applied as defined by measurements and were distributed by time. All measurements were given full weight and applied directly.

Special Computations.-- Zero flow is determined operationally. Communication between the flume and stilling well has been observed to isolate at an approximate stage of 0.09 ft. As such, sustained gage-height readings of 0.09 are adjusted to compute zero discharges. Gage heights remained above this threshold this water year with the exception of the day gage was shut down on July 23, 2013.

Remarks.-- This is a seasonal gage which typically runs from May or June through August. The record is good. The consistent shifting at this gage and nature of the flume installation suggests that some permanent level of shift is present. Station maintained and record developed by Mike Wild.

Recommendations.-- Levels should be run in the 2014 water year. If possible the intake invert elevation should be determined.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09046000 BOREAS PASS DITCH AT BOREAS PASS

RATING TABLE-- STD01HFTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.1	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.1	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.96	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.91	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.86	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.81	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.87	0.71	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.73	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.68	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	0.63	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.5	0.56	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.5	0.52	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.2	0.50	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.48	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	0.46	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	0.44	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.42	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.7	0.38	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.6	0.04	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	1.2	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	1.2	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34.37	16.13	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.15	0.52	0.000	0.000
AC-FT	0	0	0	0	0	0	0	0	68	32	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.5	1.2	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

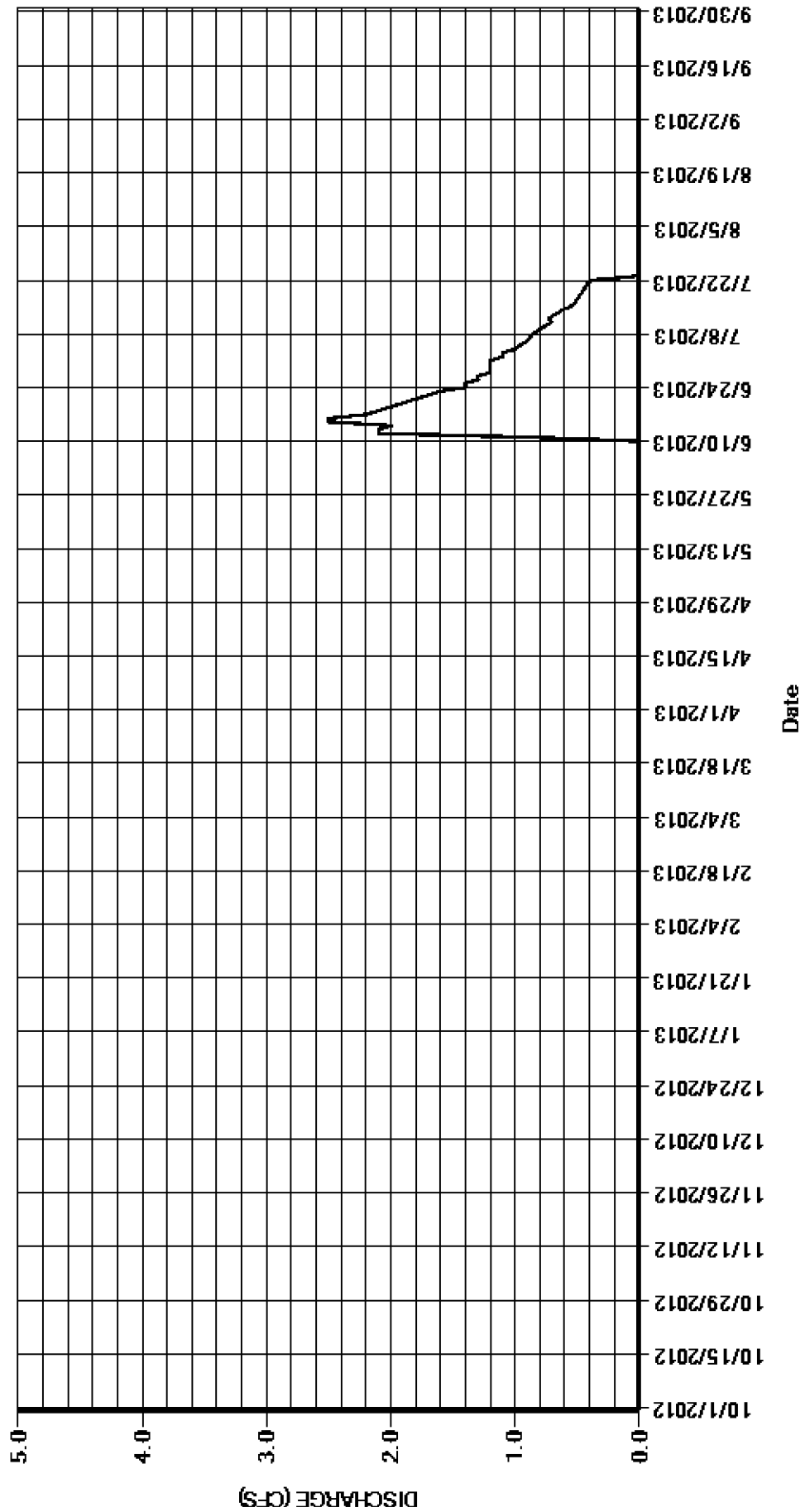
CAL YR	2012	TOTAL	2.35	MEAN	0.006	MAX	0.22	MIN	0.00	AC-FT	4.7
WTR YR	2013	TOTAL	50.50	MEAN	0.14	MAX	2.5	MIN	0.00	AC-FT	100

MAX DISCH: 3.32 CFS AT 16:45 ON JUN 11, 2013 GH 0.72 FT SHIFT -0.04 FT  
 MAX GH: 0.72 FT AT 16:45 ON JUN 11, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



09046000 BOREAS PASS DITCH AT BOREAS PASS  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
09050590 ROBERTS TUNNEL AT EAST PORTAL NEAR GRANT  
Water Year 2013

Location.-- Lat. N. 39°27'41.8", Lat. W. 105°40'36" (NAD83). Gage is located on the right side of a 20 ft. Parshall flume at the east portal of Harold D. Robert Tunnel on the north side of US 285, 0.75 miles west of Grant, CO.

Drainage Area and Period of Record.-- Roberts Tunnel diverts water from Dillon Reservoir in the Blue River Basin delivering it to the North Fork of the South Platte River, tributary to South Platte River. Potentially included in this record are small amounts of ground water inflow between Dillon Reservoir and the East Portal of the tunnel.; Diversions began officially on July 15, 1964, when the Parshall flume was completed. However, initial flows prior to this were recorded using a 7-ft. Cipolletti weir. Record from the Cipolletti was also used for some later periods.

Equipment.-- A digital incremental Sutron Stage Discharge Recorder SDR-0001-4 connected to a Sutron SatLink 2 Data Collection Platform (DCP) and a Steven's A-35 continuous chart recorder in a concrete shelter and well at a 20-ft. Parshall Flume. An electric tape gage on the instrument shelf is the primary reference with a supplemental staff gage located on the left wing wall of the flume at the Ha location. The station and graphic water-stage recorder is owned and maintained by Denver Water. Satellite instrumentation is owned and maintained by the Colorado Division of Water Resources.

Hydrologic Conditions.-- Roberts Tunnel is a transmountain diversion delivering water from Dillon Reservoir in the Colorado River Basin to the North Fork of the South Platte River near Grant, CO. Flow changes are generally stepwise and hydroelectric power is generated in the tunnel upstream of the Parshall Flume. The tunnel will shut down for extended periods of time for maintenance activities and on Denver's water delivery needs.

Gage-Height Record.-- The primary record is 15-minute telemetered satellite data with 15-minute logged DCP and 5-minute logged SDR data as backup. Denver Water did not make the chart record available this year. The record is complete and reliable. Instrument calibration was supported by 15 visits made to the gage this year. No corrections were needed.

When operated in winter months, heat lamps and electric heaters are used to keep the well open. Accuracy is not affected and ice accumulation is generally not an issue. Algal growth in the flume can affect the flume's performance. The flume was cleaned on May 3, 2013, however there was no active diversion at the time, therefore no cleaning correction could be determined.

Datum Corrections.-- Levels were last run on November 1, 2012 using average crest elevation (RM1) as base. The primary reference was found to be reading 0.018 ft. high confirming levels run in 2008. No correction was made at this time as the indicated correction was not immediately recognized. The correction should be made the next time levels are run.

Rating.-- The control is a 20 ft. Parshall flume. A standard 20 ft. Parshall flume rating, STD20FTPF, was continued in use. Twelve discharge measurements (Nos. 398-409) were made this year ranging in discharge from 59.4 to 295 cubic feet per second (cfs) covering the range in stage experienced this year. The peak flow of 378 cfs occurred at 12:30 on August 10, 2013 at a gage-height of 2.65 ft. with a time distributed shift of 0.07 ft. exceeding this year's high flow measurement (No. 405) made June 27, 2013 by 83 cfs and 0.40 ft. of stage respectively.

Discharge.-- Shifting control method was used all year. Shifts are principally caused by undesirable approach conditions which can be affected by vegetal growth in the approach section. Shifts are generally positive due to inadequate stilling of water entering the flume and vegetal growth will decrease the magnitude of these shifts, occasionally causing negative shifting under heavy growth conditions. Open water measurements made this year showed unadjusted shifts varying between 0.04 and 0.09 ft.all in the positive direction.

Stage dependent shifting using variable shift table ROBTUNCOVST12-A was continued from the end of Water Year 2012 to November 27, 2012. The shift table is defined by 13 measurements (Nos. 387-399) made during the period of application. Shifts were distributed by time as defined by measurements with consideration given to change in stage from November 27, 2012 through September 12, 2013 when Denver Water discontinued deliveries to the east slope. All measurements were given full weight except for Nos. 399, 407 and 408 which were discounted from -1.00% to 2.65% to smooth shift distributions.

Special Computations.-- Zero flow is determined operationally. Small residuals draining through the flume after the tunnel is turned off were considered to be zero. Zero flow was determined to occur on part of the day or all day on the following days: May 2, through June 3, 2013, June 11 to June 13, 2013, and September 12, 2013 through the end of the 2013 Water Year.

An important consideration in shift distribution is the relationship of computed discharges to the flows computed at the North Fork of the South Platte at Grant, 0.5 miles downstream. Flows at Roberts Tunnel should always be less than Grant as the Grant gage also records native flows from the North Fork of the South Platte River, Geneva Creek and Kenosha Creek. Shift effects of moss are sometimes worked backward to reconcile flows at Roberts and Grant. A spreadsheet of daily discharges for Roberts Tunnel and North Fork South Platte River at Grant (PLAGRACO) is used to insure that the difference between the two gages is reasonable.

Remarks.-- The record is rated as good. Station maintained by Tony Arnett. Record developed by Patrick Tyler and Division One staff.

Recommendations.--

Levels must be run again in the 2014 Water Year. If the indicated correction is again present, the primary reference should be adjusted. Measurements made at this gage should always be made in tandem with a measurement at the Grant (PLAGRACO) gage. This record should be worked on a monthly basis to insure that any bad balance of flows existing between Roberts Tunnel and the North Fork South Platte River at Grant gage is addressed promptly.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09050590 ROBERTS TUNNEL AT EAST PORTAL NEAR GRANT

RATING TABLE-- STD20FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

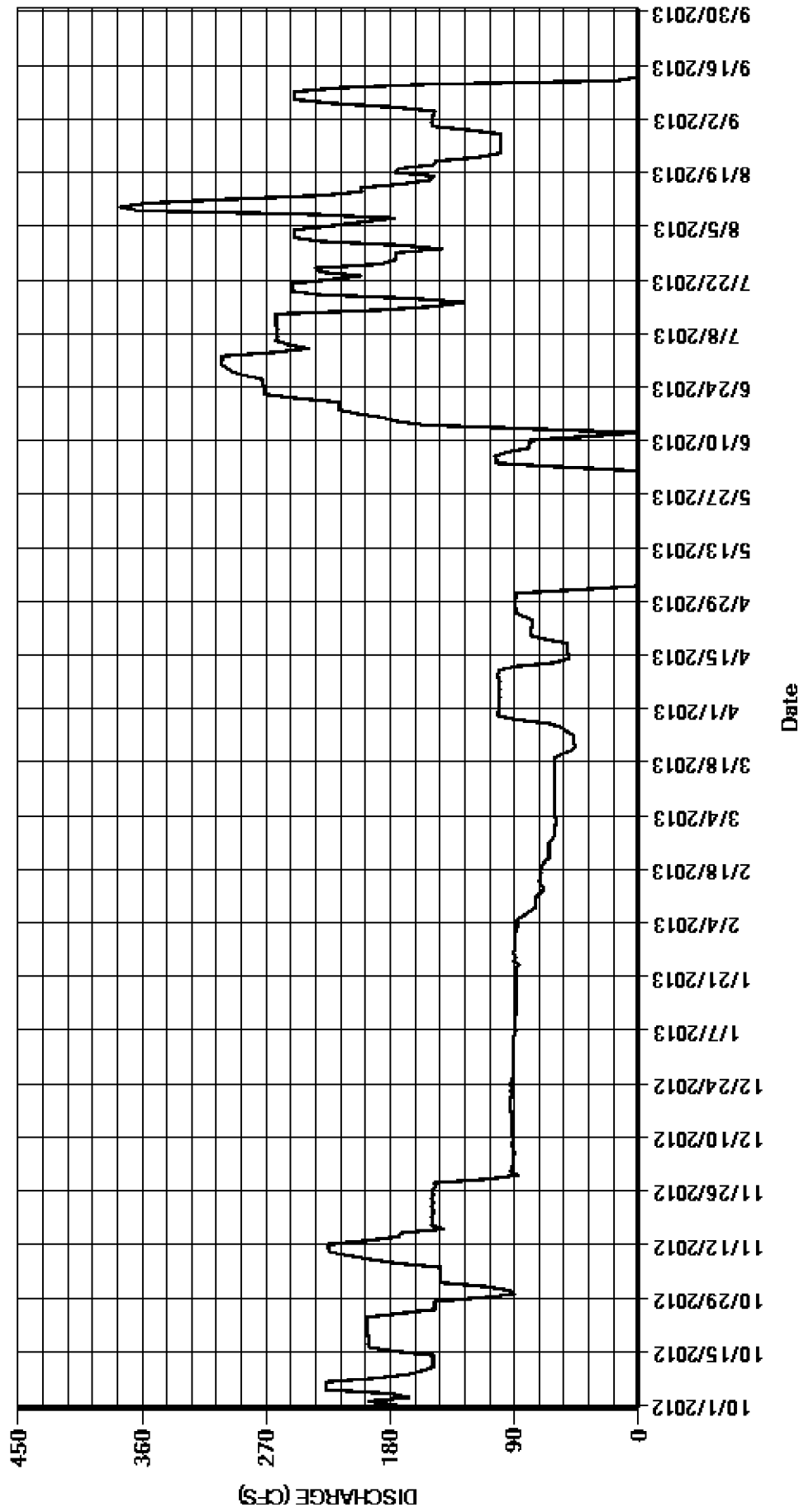
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	176	111	93	91	90	61	101	90	0.00	302	230	150
2	196	143	92	91	89	60	101	42	0.00	303	250	150
3	167	144	91	91	88	60	101	0.00	55	264	250	149
4	180	144	91	91	88	61	101	0.00	104	240	250	148
5	227	144	91	91	88	61	101	0.00	103	254	223	176
6	227	144	90	90	83	61	101	0.00	104	263	202	221
7	227	175	91	89	79	61	101	0.00	95	262	177	249
8	192	194	92	90	75	61	101	0.00	80	262	238	250
9	168	210	91	90	75	61	102	0.00	79	262	363	250
10	157	224	91	90	75	61	102	0.00	79	263	376	220
11	149	225	92	89	74	61	101	0.00	38	263	357	156
12	149	225	92	89	70	61	89	0.00	0.00	263	299	16
13	149	197	92	89	69	61	61	0.00	79	263	230	0.00
14	149	174	92	89	71	61	51	0.00	156	190	201	0.00
15	176	172	92	89	72	61	51	0.00	176	147	201	0.00
16	195	142	92	89	71	61	52	0.00	186	127	171	0.00
17	196	150	93	89	71	61	52	0.00	204	163	151	0.00
18	196	150	93	89	71	61	52	0.00	217	231	149	0.00
19	196	150	93	89	70	61	68	0.00	217	252	177	0.00
20	197	149	93	89	68	56	78	0.00	217	251	174	0.00
21	197	149	92	89	65	49	78	0.00	248	252	149	0.00
22	197	150	93	89	65	46	78	0.00	271	225	147	0.00
23	197	149	92	89	65	47	77	0.00	271	202	116	0.00
24	197	150	93	87	65	47	77	0.00	272	231	101	0.00
25	171	149	92	91	65	47	83	0.00	273	234	100	0.00
26	148	150	91	89	62	52	89	0.00	273	188	100	0.00
27	148	147	91	91	61	56	89	0.00	286	177	100	0.00
28	148	148	91	90	61	65	90	0.00	295	176	100	0.00
29	115	109	91	90	---	88	90	0.00	299	176	100	0.00
30	90	88	91	90	---	102	89	0.00	303	143	123	0.00
31	94	---	91	90	---	102	---	0.00	---	170	149	---
TOTAL	5371	4756	2845	2779	2046	1914	2507	132.00	4980.00	6999	5954	2135.00
MEAN	173	159	91.8	89.6	73.1	61.7	83.6	4.26	166	226	192	71.2
AC-FT	10650	9430	5640	5510	4060	3800	4970	262	9880	13880	11810	4230
MAX	227	225	93	91	90	102	102	90	303	303	376	250
MIN	90	88	90	87	61	46	51	0.00	0.00	127	100	0.00

CAL YR	2012	TOTAL	64279.30	MEAN	176	MAX	400	MIN	0.00	AC-FT	127500
WTR YR	2013	TOTAL	42418.00	MEAN	116	MAX	376	MIN	0.00	AC-FT	84140

MAX DISCH: 378 CFS AT 12:30 ON AUG 10, 2013 GH 2.65 FT SHIFT 0.07 FT  
 MAX GH: 2.65 FT AT 12:30 ON AUG 10, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09050590 ROBERTS TUNNEL AT EAST PORTAL NEAR GRANT  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
STRAIGHT CR. TUNNEL AT EAST PORTAL OF EISENHOWER  
Water Year 2013

Location.-- Lat 39°40'45.28"N, long 105°54'9.96"W, NE ¼, sec. 28, Twp. 4 S, Rng. 76 W, in Clear Creek county. Gage is located in a manhole in the east portal CDOT parking lot between the east and westbound lanes. Elevation of gage is 11,013 ft.

Drainage Area and Period of Record.-- Transmountain diversion. Tunnel is a drainage culvert constructed to carry snowmelt, wash water and treated effluent from the Eisenhower and Johnson tunnels. Water accruing from the tunnel was first adjudicated on 12/31/1970. ; Daily values are available from the DWR from October 1, 1994 to present.

Equipment.-- Digital incremental Sutron SDR-0001-1 shaft encoder in a NEMA4 enclosure located on the right side of a 1-ft. Parshall Flume located in a concrete lined culvert section subsurface in between the eastbound and westbound lanes of I-70 at the Eisenhower Tunnel East Portal facilities. No provisions for telemetry are available. A staff gage located on the left wing wall at the flume's Ha location is the primary reference. The SDR unit was installed on August 1, 2007 to better monitor flow conditions in the tunnel. Prior to August 1, 2007 weekly observations by Coors staff were used to estimate the record. Coors installed a float actuated datalogger in the 2010 Water Year. In the 2013 Water Year, Coors installed non-contact radar level sensor with a digital read-out display in the Eisenhower Tunnel East Portal facilities office.

Hydrologic Conditions.-- This is considered to be a transmountain diversion from the Colorado River Basin. The flow is seepage and drainage from cleaning operations inside the Eisenhower Tunnel combined with the effluent from the CDOT sewage treatment facility. There is also some degree of runoff from a small drainage immediate to the West Portal which is the source of the water supply for tunnel operations. Spikes in flow originate from the tunnel cleaning operations and water treatment effluent discharges. The gage shows snow runoff characteristics in summer months.

Gage-Height Record.-- The primary record is 15-minute logged data from the SDR unit. There are no provisions for a backup record. The record is complete and reliable except for November 21, 2012 through April 30, 2013 when the instrument's tape was dislodged from the SDR's pulley, positioned externally from the protective NEMA enclosure. The tape was corrected during a visit to the gage on April 30, 2013. Data recorded after this date was consistent with a typical hydrograph for this site.

Due to noted inconsistencies of gage-height values obtained from Coors instruments this year, Coors data was only used for estimation during the period the SDR's tape was dislodged. Otherwise, Coors data was not used for backup or comparative purposes.

Datum Corrections.-- Levels were last run May 6, 2009 using the flume's crest as base. The staff gage was found to be within allowable tolerances.

Rating.-- The control is a steel 1-ft. Parshall flume; a standard 1-ft. Parshall flume rating (STD01FTPF) was continued in use for all of Water Year 2013. Three discharge Measurements (Nos. 19-21) were made this year, ranging in discharge from 0.13 to 0.60 cfs; covering the range in stage experienced this year well except for the higher daily flows of June 4 through July 18, 2013. The peak discharge of 1.52 cfs occurred at 1915 on June 14, 2013 at a gage-height of 0.60 ft. with a stage distributed shift of -0.06 ft. exceeding this year's high measurement (No. 21) by 0.92 cfs and 0.28 ft. of stage respectively.

Discharge.-- Stage dependent shifting was used for all periods of good record. Shifting is suspected to be caused by friction losses in the approach section as well as across the flume; principally caused by buildup of materials (mostly gravel) upstream of the flume and corrosion of the flume itself. Variable shift table STCTUNCOSVT12-1, developed in the 2012 water year, was continued in use this year up to November 21, 2012. Variable shift table STCTUNCOVST13-A, defined by 7 measurements (Nos. 16-22) made in the 2012, 2013 and 2014 water years, was applied from April 30 through September 30, 2013. Open water measurements made this year showed raw shifts stable at -0.02 ft. All were given full weight.

Special Computations.-- Discharges from November 21, 2012 through April 30, 2013, when the instruments tape was dislodged from the pulley, were estimated from CDOT's daily observations of the Coors instrument. This period is estimated and poor due to noted accuracy issues with Coors instrumentation.

Remarks.-- The record is fair except for November 21, 2012 through April 30, 2013 which is estimated and poor.

The accuracy of all measurements made this year can only be considered fair, since the depths involved were at or below the stated lower limit for a Pygmy meter. This record is requested by DWR Division 5 and the Upper Colorado River Commission to complete their accounting of transmountain diversions. Station maintained by Tony Arnett. Record developed by Tony Arnett and R. Stroud.

Recommendations.-- Visits should be made to the gage on a bimonthly basis. Discharge measurements should be continued throughout the full range, especially during peak runoff. Confined space procedures as per CDOT are required for tunnel entry at all times. Tunnel entry coordination with CDOT is required. Attempts to coordinate entry when Coors staff is present should be strived for. Well operation as well as free and clear instrument movement needs to be verified on every visit. Time corrections on the SDR should be performed before download of logs. Levels should be run in the 2014 Water Year. Visit Log sheet should be kept inside the NEMA enclosure and kept up to date.

STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

STRAIGHT CR. TUNNEL AT EAST PORTAL OF EISENHOWER

RATING TABLE-- STD01FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

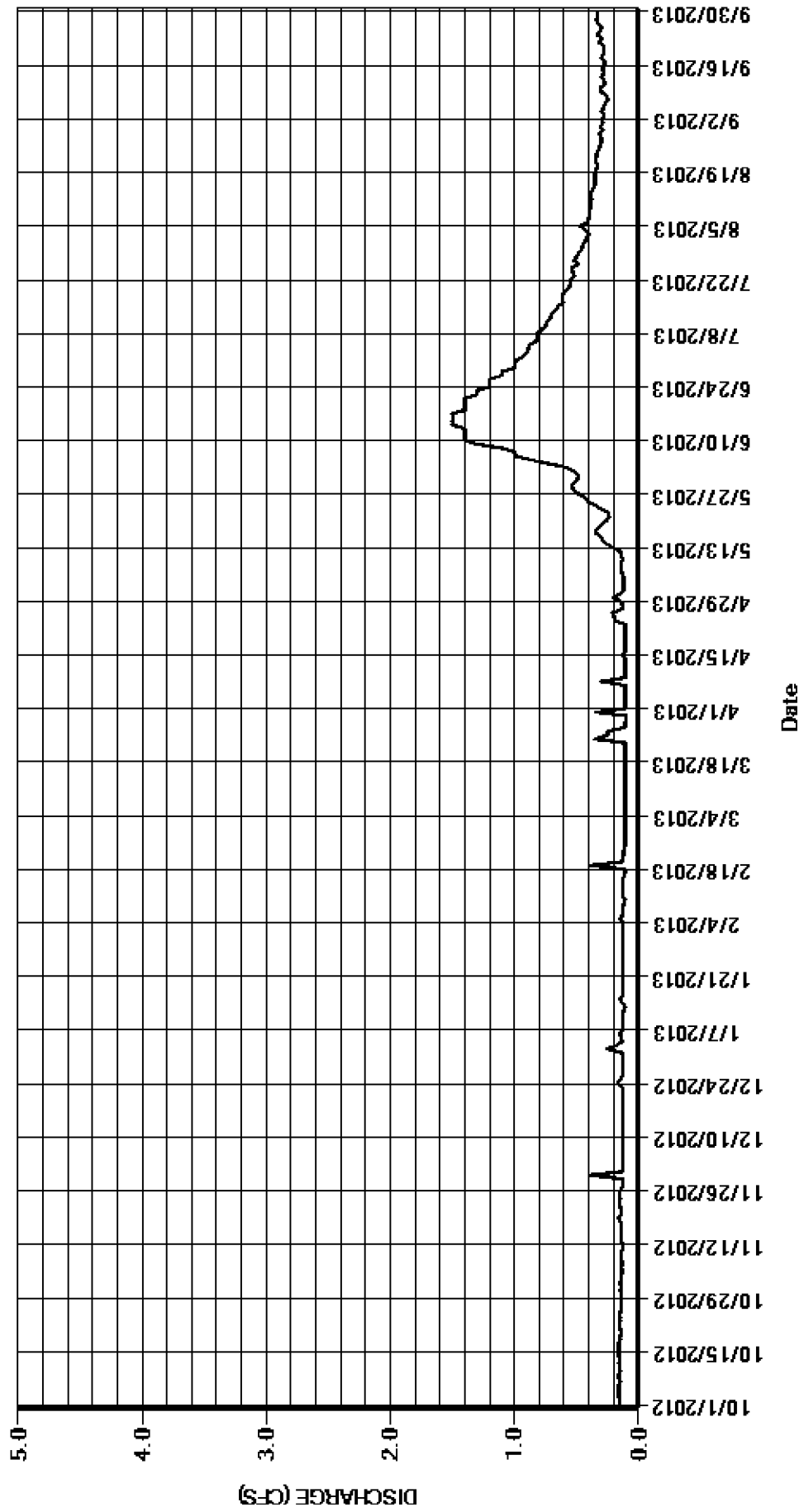
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.16	0.14	e0.13	e0.13	e0.13	e0.11	e0.11	0.14	0.49	0.98	0.43	0.29
2	0.15	0.15	e0.13	e0.25	e0.13	e0.11	e0.11	0.12	0.52	0.93	0.42	0.29
3	0.16	0.14	e0.13	e0.18	e0.13	e0.11	e0.11	0.12	0.60	0.90	0.40	0.28
4	0.16	0.14	e0.13	e0.13	e0.13	e0.11	e0.11	0.12	0.74	0.89	0.43	0.30
5	0.16	0.13	e0.13	e0.14	e0.15	e0.11	e0.11	0.12	0.88	0.88	0.47	0.28
6	0.16	0.14	e0.13	e0.15	e0.13	e0.11	e0.11	0.13	0.99	0.82	0.41	0.27
7	0.15	0.13	e0.13	e0.13	e0.13	e0.11	e0.11	0.14	1.0	0.82	0.40	0.25
8	0.16	0.14	e0.13	e0.13	e0.13	e0.11	e0.30	0.14	1.1	0.82	0.40	0.26
9	0.16	0.14	e0.13	e0.13	e0.12	e0.11	e0.11	0.14	1.3	0.78	0.40	0.30
10	0.15	0.14	e0.13	e0.13	e0.11	e0.11	e0.11	0.13	1.4	0.75	0.39	0.31
11	0.15	0.13	e0.13	e0.13	e0.13	e0.11	e0.11	0.14	1.4	0.74	0.38	0.27
12	0.16	0.13	e0.13	e0.12	e0.13	e0.11	e0.11	0.15	1.4	0.71	0.38	0.28
13	0.15	0.14	e0.13	e0.11	e0.13	e0.11	e0.11	0.21	1.4	0.70	0.39	0.30
14	0.16	0.14	e0.13	e0.13	e0.13	e0.11	e0.11	0.26	1.5	0.67	0.38	0.28
15	0.16	0.14	e0.13	e0.15	e0.13	e0.11	e0.13	0.29	1.5	0.65	0.36	0.29
16	0.16	0.14	e0.13	e0.13	e0.12	e0.11	e0.11	0.31	1.5	0.61	0.35	0.28
17	0.16	0.14	e0.13	e0.13	e0.11	e0.11	e0.11	0.35	1.5	0.61	0.35	0.27
18	0.15	0.15	e0.13	e0.13	e0.11	e0.11	e0.11	0.33	1.4	0.61	0.35	0.30
19	0.15	0.16	e0.13	e0.13	e0.38	e0.11	e0.11	0.30	1.4	0.60	0.35	0.28
20	0.14	0.14	e0.13	e0.13	e0.13	e0.11	e0.11	0.26	1.4	0.56	0.34	0.28
21	0.15	e0.14	e0.13	e0.13	e0.13	e0.11	e0.11	0.24	1.4	0.55	0.33	0.28
22	0.15	e0.15	e0.13	e0.13	e0.12	e0.11	e0.11	0.24	1.3	0.55	0.35	0.32
23	0.15	e0.15	e0.13	e0.13	e0.12	e0.11	e0.11	0.30	1.3	0.52	0.34	0.30
24	0.15	e0.15	e0.17	e0.13	e0.11	e0.35	e0.19	0.35	1.2	0.53	0.34	0.33
25	0.15	e0.15	e0.15	e0.13	e0.11	e0.25	e0.20	0.41	1.2	0.54	0.32	0.31
26	0.14	e0.15	e0.13	e0.13	e0.11	e0.25	e0.21	0.43	1.2	0.49	0.31	0.30
27	0.14	e0.13	e0.13	e0.13	e0.11	e0.11	e0.13	0.48	1.1	0.52	0.30	0.33
28	0.14	e0.13	e0.13	e0.13	e0.11	e0.11	e0.13	0.52	1.1	0.50	0.30	0.34
29	0.14	e0.13	e0.13	e0.13	---	e0.10	e0.15	0.54	1.0	0.48	0.32	0.33
30	0.14	e0.38	e0.13	e0.13	---	e0.10	e0.20	0.52	1.0	0.46	0.29	0.33
31	0.15	---	e0.13	e0.13	---	e0.35	---	0.49	---	0.45	0.31	---
TOTAL	4.71	4.46	4.09	4.22	3.71	4.15	3.95	8.42	35.22	20.62	11.29	8.83
MEAN	0.15	0.15	0.13	0.14	0.13	0.13	0.13	0.27	1.17	0.67	0.36	0.29
AC-FT	9.3	8.8	8.1	8.4	7.4	8.2	7.8	17	70	41	22	18
MAX	0.16	0.38	0.17	0.25	0.38	0.35	0.30	0.54	1.5	0.98	0.47	0.34
MIN	0.14	0.13	0.13	0.11	0.11	0.10	0.11	0.12	0.49	0.45	0.29	0.25

CAL YR	2012	TOTAL	85.67	MEAN	0.23	MAX	0.76	MIN	0.10	AC-FT	170
WTR YR	2013	TOTAL	113.67	MEAN	0.31	MAX	1.5	MIN	0.10	AC-FT	225

MAX DISCH: 1.52 CFS AT 19:15 ON JUN 14, 2013 GH 0.60 FT SHIFT -0.06 FT  
MAX GH: 0.60 FT AT 19:15 ON JUN 14, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

STRAIGHT CR. TUNNEL AT EAST PORTAL OF EISENHOWER  
WY2013 HYDROGRAPH





PLATTE RIVER BASIN

AUGUST P. GUMBLICK TUNNEL aka JONES PASS TUNNEL RELEASE TO CLEAR CREEK

Water Year 2013

Location.-- Lat. N.39°46'13", Long. 105°51'7" (NAD83); Gage is on the left side of a 10 ft. Parshall flume two miles east of Jones Pass in the Henderson Mine complex, 9 miles west of Empire, CO.

Drainage Area and Period of Record.-- Diversion is from tributaries of the Williams Fork River in the Colorado River Basin between the headgate on the right bank of Bobtail Creek in Sec. 28, T.3S, R.76 W., and the headgate on the left bank of McQueary Creek in Sec. 16 to the West Fork of Clear Creek in Sec. 24 in the South Platte River Basin. Since July, 1959, Gumlick water has been diverted into the Vasquez Tunnel to Vasquez Creek in Sec. 1, T. 3S. R. 76W., in the Frazier River and Colorado River Basins. ; Records are maintained by both the Water Administration group and the Hydrographic and Satellite Monitoring Branch of the Colorado Division of Water Resources. Sporadic daily release values are available under identifier 0704650 from July 14, 1993 to present. Daily discharge values are available under identifier GUMCLRCO from October 1, 2005 to present.

Equipment.-- Sutron SDR-0001-1 and a Steven's F-type graphic water stage recorder in a concrete shelter and stilling well at a 10-ft. Parshall flume. An adjustable reference point and metal drop tape serve as the primary reference with two supplemental staff gages, one located on the right wing wall at the flume's Ha location and the other in the stilling well. The stilling well is connected to the flume with a single 2 inch inlet. Facilities are owned, operated and maintained by Denver Water, gage operated by the Colorado Division of Water Resources (CDWR).

Hydrologic Conditions.-- Transmountain diversion diverting water from tributaries of the Williams Fork River in the Colorado River Basin between the head gate on the right bank of Bobtail Creek in Sec. 28, T. 3S, R. 76W., and the head gate on the left bank of McQueary Creek in Sec. 16, to the West Fork of Clear Creek in Sec. 24 in the South Platte River Basin. Since July, 1959, Gumlick water has been redirected through Vasquez Tunnel to Vasquez Creek in Sec. 1, T. 3S. , R. 76W, in the Frazier River and Colorado River Basins. Delivery through the 10 ft. Parshall into Clear Creek since the completion of Vasquez Tunnel in 1958 was rare prior to 2009. Currently, Denver has contracted with Golden to supply a small amount of water each year to Guanella Reservoir, delivered in one run.

Gage-Height Record.-- No water was diverted into the Clear Creek basin from the Gumlick Tunnel this water year. Instrument calibration as well as observations of no flow were verified by 6 visits to the gage by CDWR staff this year.

Datum Corrections.-- Levels were last run on July 29, 2009 using the average flume crest as base. The staff gage in the flume was found to be 0.07 ft. high with respect to the average flume crest and the staff gage in the stilling well was found to be 0.02 ft. low. The RP is presumed to have been established on this date. No corrections were made to either of the staff gages at the time of running levels. Datum of gage is at 10,312.5 ft. (Denver Water).

Rating.-- The control is a 10-ft. Parshall Flume. A standard 10-ft. Parshall Flume rating, STD10FTPF, is used when water is diverted

Discharge.-- No water was diverted this water year.

Special Computations.-- Residual gage-heights recorded by the SDR do not represent active diversions to Clear Creek and are therefore considered zero. Six observations of zero flow were made this year.

Remarks.-- Station maintained by Tony Arnett and record developed by Division One Hydrographic staff.

Recommendations.-- Flume and gate conditions during releases should be photographed and documented, and both staff and stilling well readings should be taken. If the Tunnel is running water to the Moffat system, a copy of the chart from the downstream flume should be obtained for comparison. In 2010, Denver did NOT notify the hydrographic staff of the release, and neither did the commissioner. In 2011, Denver notified DWR of a release the same day the release began. Golden should also be asked to independently provide notification of a release. It is imperative that hydrographers measure and document these releases. Observations and measurements during different gate scenarios are needed to establish the most reliable measurement conditions. Requests of cooperation from Denver Water will be needed to accomplish observations of these scenarios.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

AUGUST P. GUMBLICK TUNNEL aka JONES PASS TUNNEL RELEASE TO CLEAR CREEK

RATING TABLE-- STD10FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

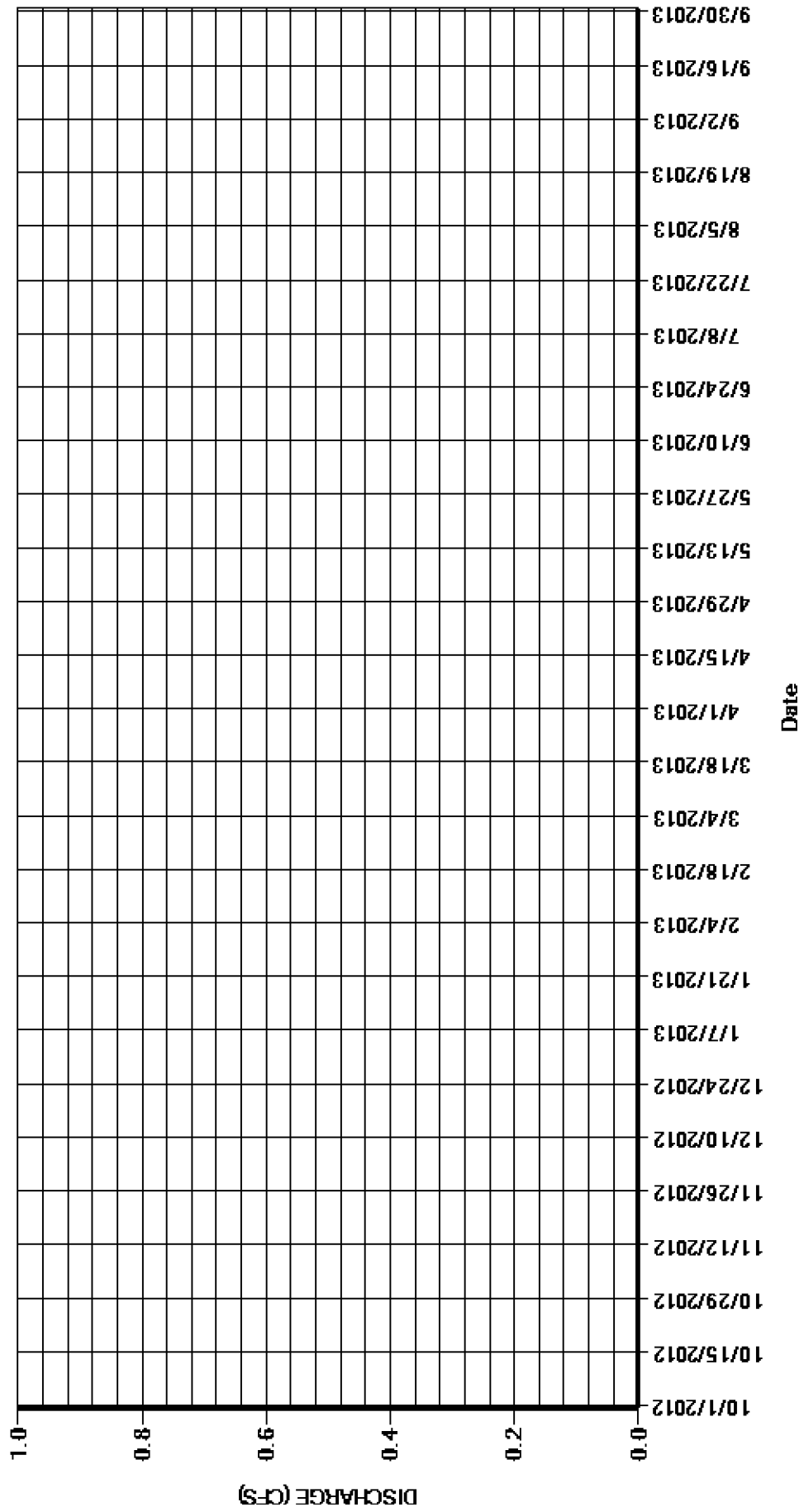
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AC-FT	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CAL YR	2012	TOTAL	108.00	MEAN	0.30	MAX	8.2	MIN	0.00	AC-FT	214
WTR YR	2013	TOTAL	0.00	MEAN	0.000	MAX	0.00	MIN	0.00	AC-FT	0

MAX DISCH: (NO WATER RUN THIS YEAR)  
 MAX GH: 0.00 FT (NO WATER RUN THIS YEAR)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**AUGUST P. GUMBLICK TUNNEL AKA JONES PASS TUNNEL RELEASE TO CLEAR CREEK  
WY2013 HYDROGRAPH**



BLUE RIVER BASIN  
09047300 VIDLER TUNNEL NEAR ARGENTINE PASS  
Water Year 2013

Location.-- Lat. N.39° 37' 22.36", Long. W105° 47' 29.61" (Spotted from Google Earth (NAD83)). Gage is located in a tunnel at the upstream end of Vidler tunnel near Argentine pass above the Keystone Ski Area in Summit County, CO.

Drainage Area and Period of Record.-- Transmountain diversion diverting water from collection points around Horseshoe Basin, tributary of the Snake River in the Colorado River Basin, to Leavenworth creek, tributary to Clear Creek in the South Platte River Basin. ; Daily values are available from DWR from 1971 to present.

Equipment.-- Digital incremental Sutron SDR-0001-1 shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) transmitting hourly. Shaft encoder is located on the right side of a 3-ft. Parshall Flume approximately 320 ft. down-tunnel from where the DCP is located near the tunnel's west portal entrance. A staff gage on the left wing wall at the flume's Ha location is the primary reference. The City of Golden maintains a secondary SDR-0001-1 at this site. Log files can be made available upon request. The City of Golden owns, operates and maintains all facilities.

Hydrologic Conditions.-- Vidler Tunnel, is a transmountain diversion. The collection system is located in Horseshoe Basin, near the base of Argentine Pass. The tunnel is approximately 1.5 miles long and passes across the Continental Divide. Water is diverted into the tunnel by a 3 ft. diameter CMP which empties into an open rock tunnel about 40 ft. above the flume. Low snow pack conditions throughout the basin limited the amount of water taken through the tunnel this year. Water was run from May 28 through June 27, 2013.

Gage-Height Record.-- The primary record is 15-minute telemetered satellite data with 15-minute logged DWR and Golden SDR data as backup. The CDWR's SDR Unit was activated on June 4, 2013 for this water year. The 15-minute gage height data from the actual turn-on point on May 28, 2013 was downloaded from Golden's SDR unit. The record is complete and reliable for the period of diversion.

Datum Corrections.-- Instrument calibration was maintained by 8 visits to the gage this year. Three instrument corrections of +0.01, +0.03 and +0.01 ft. were made. The corrections were applied to the record as defined by corrections made to the instrument. Two 15 -minute values were corrected on June 11, 2013 caused by Hydrographers visit.

Datum Corrections.-- Levels were last run on June 23, 2000. The staff gage was found to be correctly set with respect to the crest of the flume. Flume dimensions were found to be within close agreement of design parameters, although the floor at the crest does have some slope up towards the crest in the converging section. There is nearly one foot of getaway within 8 ft downstream of the exit of the flume.

Rating.-- The control is a 3 ft. steel Parshall flume positioned in a bare rock tunnel originally constructed for mining. A standard 3 ft Parshall Flume rating, STD03FTPF, was continued this year. Two discharge measurements (Nos. 49-50) were made ranging in discharge from 4.87 to 9.61 cfs. The peak flow of 13.7 cfs occurred at 1730 on June 11, 2013 at a gage-height of 1.12 ft. using a shift of -0.03 ft. exceeding Measurement No. 50 made June 20, 2013 by 0.22 ft. of stage and 3.69 cfs respectively.

Discharge.-- A notched index board is installed on the flume to insure current meter measurement sections are consistent. The measurement section width is 4.5 ft.

Discharge.-- A variable shift curve (VIDTUNCOVSC13-A) was used for the entirety of Water Year 2013. This variable shift curve uses measurements 30, 46-50. Negative shifts are most likely caused by the floor of the flume sloping upward towards the crest in the converging section of the flume. Discharge measurements made this year showed raw shifts of -0.05 and -0.03 ft. Measurement number 49 was adjusted +3.40% to better fit curve distributions.

Special Computations.-- Ice was reported to be as far back into the tunnel as the flume, and also reported to have gone through the flume. This report, in addition to the hydrographic evidence lead to the estimation of the first three days of diversion to be less than the calculated values.

Remarks.-- Zero flow is determined operationally. Residual gage-heights of up to 0.15 ft. were recorded this year with an accompanying observation of no flow.

Remarks.-- The record is good. Station operated and maintained by Tony Arnett. Record developed by Tony Arnett.

Recommendations.-- Continued care should be taken in recording measurement staff readings and calibration information. The reading of Golden's logger should also be recorded on visit logs and measurement field notes. Levels should be run as time allows.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09047300 VIDLER TUNNEL NEAR ARGENTINE PASS

RATING TABLE-- STD03FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

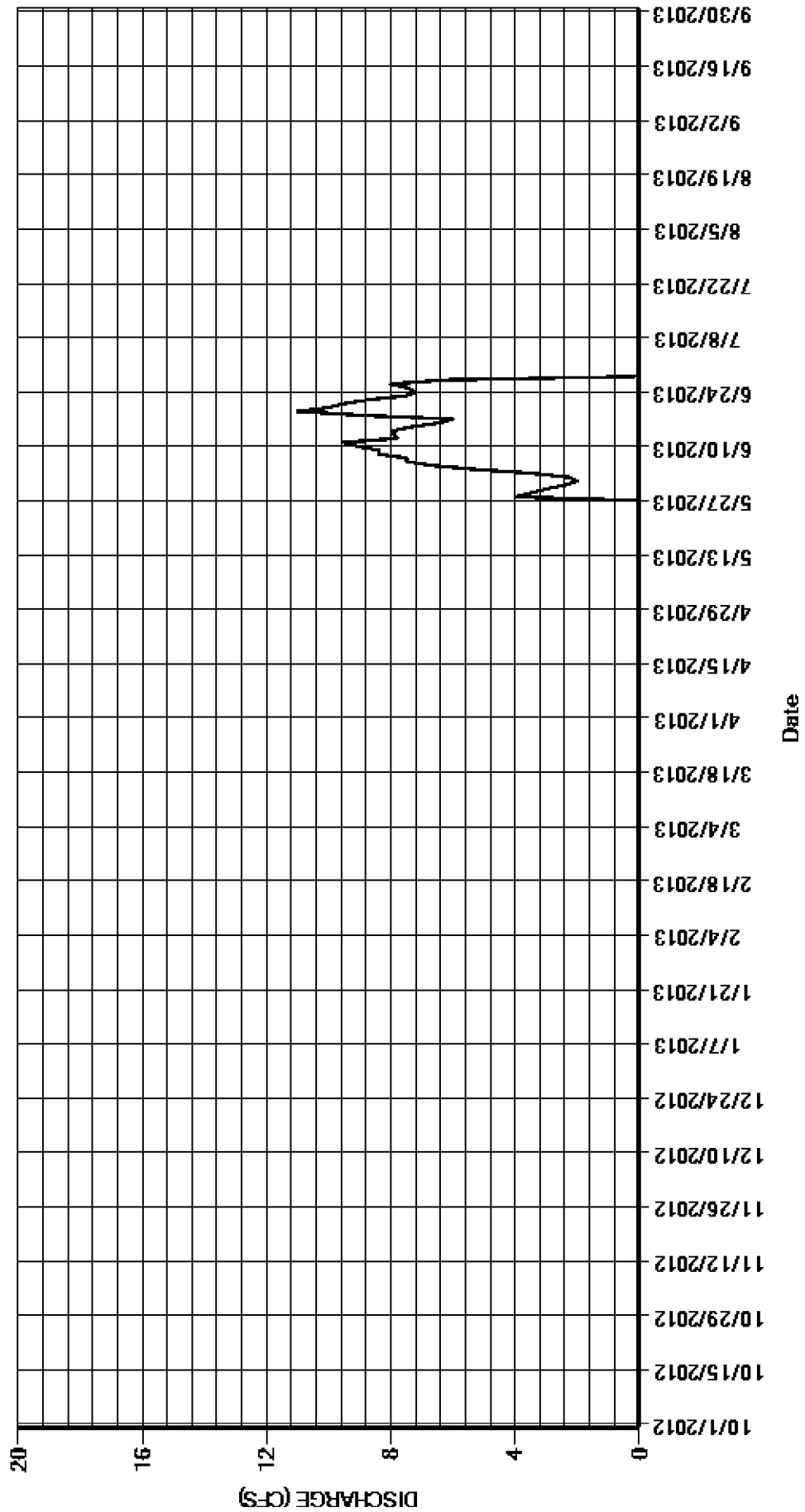
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.3	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.5	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.3	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.7	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.5	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.5	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.4	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.4	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.1	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.5	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.8	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.9	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.9	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.3	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.4	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.0	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.9	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.5	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.7	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.5	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.2	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.5	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.0	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.3	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e4.0	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	e3.5	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	e3.0	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	2.4	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.90	198.10	0.00	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.42	6.60	0.000	0.000	0.000
AC-FT	0	0	0	0	0	0	0	26	393	0	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.0	11	0.00	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CAL YR	2012	TOTAL	222.33	MEAN	0.61	MAX	6.0	MIN	0.00	AC-FT	441
WTR YR	2013	TOTAL	211.00	MEAN	0.58	MAX	11	MIN	0.00	AC-FT	419

MAX DISCH: 13.7 CFS AT 17:30 ON JUN 11, 2013 GH 1.12 FT SHIFT -0.03 FT  
 MAX GH: 1.12 FT AT 17:30 ON JUN 11, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09047300 VIDLER TUNNEL NEAR ARGENTINE PASS  
 WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
09021500 BERTHOUD PASS DITCH AT BERTHOUD PASS  
Water Year 2013

Location.-- Lat. 39° 47' 56.58", Long. 105° 46' 36.37" (NAD83). Gage is located on the left side of a 2.5 ft. by 9 ft. cutthroat flume near the summit of Berthoud Pass.

Drainage Area and Period of Record.-- Transmountain diversion diverting water from tributaries of the Fraser River into Hoop Creek in the Clear Creek Basin. ; Daily values are available from the DWR from June 18, 1931 to present.

Equipment.-- Digital Incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) transmitting hourly in a 42-inch corrugated metal pipe shelter and well next to a 2.5-ft. by 9-ft. cutthroat flume. The stilling well has been divided to accommodate a Ha and Hb well. The primary reference is a metal drop tape and an adjustable reference point (RP). A supplemental Ha staff gage is located on the right wing wall in the converging section of the flume. An RP is present for the Hb well but its elevation has not been verified by levels. The gage is owned and operated by the city of Northglenn.

Hydrologic Conditions.-- The ditch drainage is nearly all above tree line and is adjacent to the Berthoud Pass ski area. The ditch runs parallel to US Highway 40 for part of its length and acts to divert snowmelt away from the uphill side of the road. Construction was done at the gage in October and November 2007 to cover the ditch. Prior to construction, snow-plows and traffic would drop debris into the ditch. The incoming ditch itself was replaced with a 36 inch CMP conduit and the flume was covered with sheets of metal. An extra foot of concrete was also added to the walls of the flume, extending them from 3 ft. to 4 ft. in height. The exiting ditch was replaced with a 36 inch corrugated plastic pipe conduit with extensive dirt work done in the gage's vicinity. On September 18, 2009 the flume's inlet was observed to be at a gage-height of 0.13 ft whereas the flume's point of zero flow (PZF) was observed to occur at a staff reading of 0.04 ft. Residual stilling well readings of 0.13 feet and below are assumed to be zero flow.

Gage-Height Record.-- The record is 15-minute telemetered encoder data with 15-minute logged DCP values as backup. The record is complete and reliable for the period of operation. Gage operates seasonally; this year the DCP was activated by DWR staff on June 6, 2013, approximately two hours before the flume became operational. Water was turned into the ditch at 09:45 on June 6, 2013 and run through 08:45 on September 20, 2013.

The flume become operational when an upstream diversion turn-out gate is closed. The gate was only partially closed on June 7, 2013 as noted by visit log. City of Northglenn staff apparently closed the turn-out gate about 10:00 a.m. on June 14, 2013 resulting in a spike in the gage-height record at that time.

Datum Corrections.-- The RP and tape were first established with respect to the throat of the flume on June 20, 1989. Levels run on October 9, 2008 found the gage to be reading 0.04 ft low. The RP was adjusted back to the previously established elevation 6.630 ft. Movement was possibly caused by construction activities in October and November 2007. Levels were again run on July 14, 2009; November 10, 2009 and August 10, 2010. The RP elevation was found to be within allowable tolerance in all instances.

Rating.-- Prior to 2008, the control was a 2.50-foot by 9-foot cutthroat flume, which used a standard cutthroat flume rating (BERDITCO01). Pipe-lining the ditch negated the control of the flume. The control is now the downstream corrugated plastic pipe below the flume. The departing pipe has an invert that is 0.04 feet higher than the average elevation of the flume throat, resulting in submergence of the flume throughout the entire range of flow. Rating BERDITCO02, developed in water year 2008, was initially defined by seven measurements (Nos. 112-118), ranging in discharge from 0.82 to 7 cubic feet per second (cfs) and has subsequently been confirmed by measurements from 0.27 to 15.0 cfs. Six measurements (Nos. 142-147) were made this year ranging in discharge from 0.48 cfs to 6.24 cfs covering the range in stage experienced except the higher daily flows occurring between June 14- 23, 2013. The peak discharge of 15.2 cfs occurred at 1500 on June 14, 2013 at a gage-height of 1.63 ft. using a shift of 0.06 ft. exceeding Measurement No. 143, made June 24, 2013, by 0.56 ft. of stage and 8.96 cfs.

Discharge.-- Shifts are caused by changing downstream conditions, vegetative growth upstream of and in the flume as well as changes in submergence of the flume not addressed by the BERDITCO02 rating. Shifting control method was used all year. Shifts were applied by time as defined by measurements with consideration given to flume cleaning corrections. All measurements were given full weight except for measurement No. 144 which was discounted 2.9% to smooth shift distributions. Open water measurements made this year showed unadjusted shifts varying from 0.04 to 0.07 ft.

Special Computations.-- Zero flow is determined operationally. Residual gage-heights of 0.13 ft and below are considered zero. Unit stage values of 0.13 ft. and below occurring on June 6 and September 20 through 24, 2013 have been adjusted to zero.

Remarks.-- The record is good. Station maintained and record developed by Tony Arnett.

Recommendations.-- Strive to achieve better coordination and documentation of Northglenn's operations. Requesting Northglenn's staff to log their visits to the gage would also be highly valuable. Visits should continue to be made every two weeks throughout the water year to ensure the flume is clear and to ensure instrument calibration. Higher flow measurements should be sought to extend the BERDITCO02 or subsequent ratings. Evaluation for a new rating should be made in the 2014 water year.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09021500 BERTHOUD PASS DITCH AT BERTHOUD PASS

RATING TABLE-- BERDITCO02 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.2	1.4	0.58
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.8	1.3	0.55
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.6	1.3	0.49
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.5	1.2	0.47
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.3	1.2	0.46
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.5	4.2	1.2	0.47
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	4.0	1.1	0.45
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	4.0	1.2	0.54
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.3	3.7	1.2	0.62
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.4	3.6	1.0	0.74
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.4	3.3	0.94	0.67
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	3.3	0.88	0.76
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	3.1	1.0	1.0
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.7	3.2	0.90	0.84
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	2.8	0.76	0.95
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.1	2.9	0.70	0.92
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.4	3.1	0.68	0.92
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.5	3.3	0.66	0.98
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.2	3.0	0.62	0.98
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.0	2.8	0.59	0.42
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.6	2.5	0.57	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.8	2.3	0.59	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.7	2.1	0.68	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.2	2.1	0.63	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.6	2.2	0.66	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.5	1.9	0.59	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.5	1.8	0.55	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.6	1.9	0.53	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	5.6	1.7	0.57	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	5.5	1.7	0.54	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	1.5	0.57	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	142.70	95.4	26.31	13.81
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.76	3.08	0.85	0.46
AC-FT	0	0	0	0	0	0	0	0	283	189	52	27
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	5.2	1.4	1.0
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.5	0.53	0.00

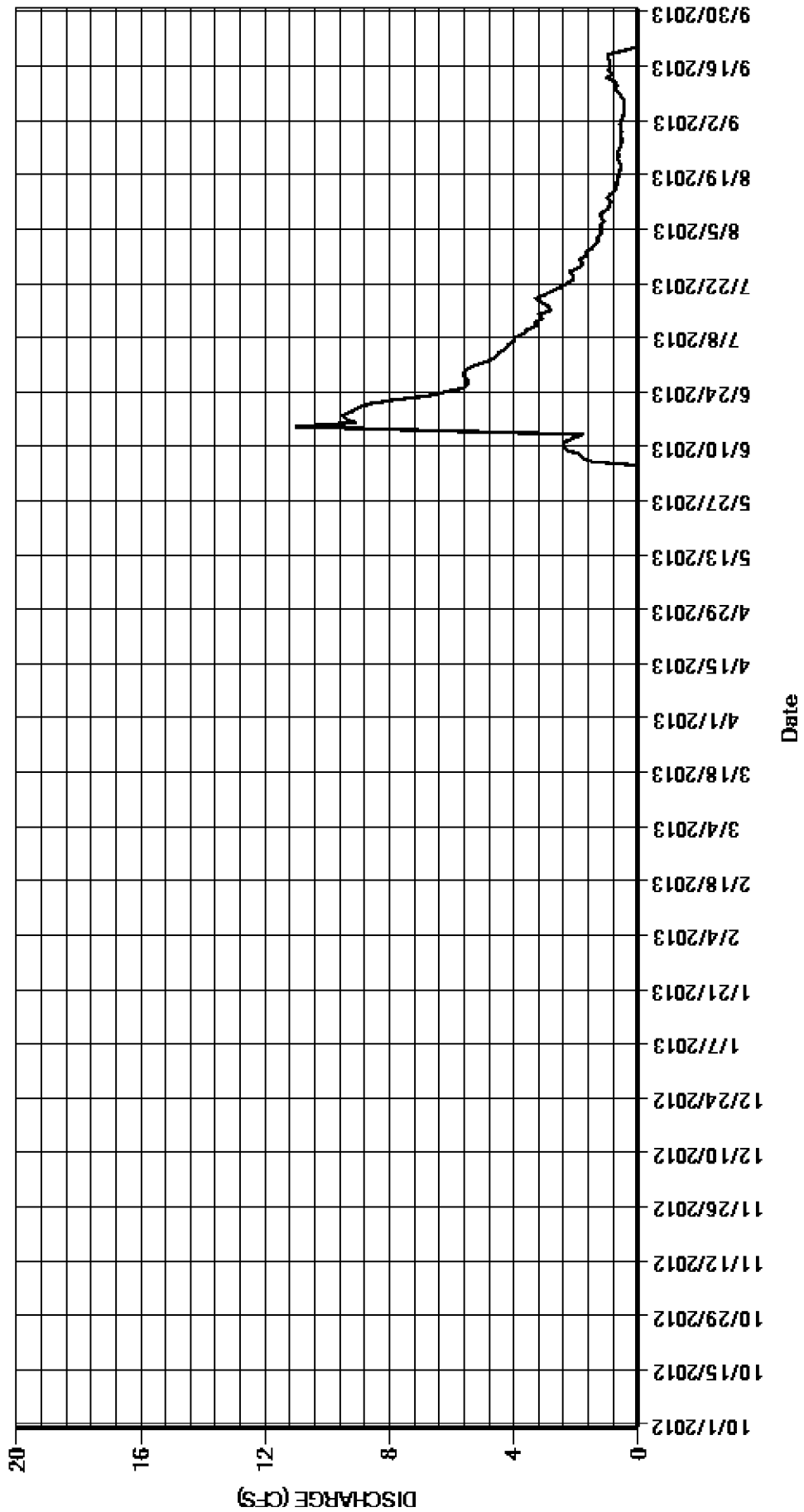
CAL YR	2012	TOTAL	203.09	MEAN	0.55	MAX	5.8	MIN	0.00	AC-FT	403
WTR YR	2013	TOTAL	278.22	MEAN	0.76	MAX	11	MIN	0.00	AC-FT	552

MAX DISCH: 15.2 CFS AT 15:00 ON JUN 14, 2013 GH 1.63 FT SHIFT 0.06 FT  
 MAX GH: 1.63 FT AT 15:00 ON JUN 14, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



09021500 BERTHOUD PASS DITCH AT BERTHOUD PASS  
 WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
09022500 MOFFAT WATER TUNNEL AT EAST PORTAL  
Water Year 2013

Location.-- Lat. N39° 54' 6.57", Long. 105° 38' 43.77" (NAD83). Gage is located on the right side of a 15-ft. Parshall Flume downstream from Moffat Tunnel's East Portal and 7.6 mi. west of the town of Rollinsville in Gilpin County, CO.

Drainage Area and Period of Record.-- Transmountain diversion delivering waters diverted off the Fraser River and its tributaries and the Williams Fork in the Colorado River Basin to South Boulder Creek in the South Platte River Basin. Daily values are available from the DWR from June 1, 1936 to present. ; (USGS): October 1955 to September 1960. Published in annual water-supply papers as a supplementary record with Fraser River near West Portal for water year 1936, and with Fraser River at Granby for water years 1938-1950.; For water year 1937, diversion to the tunnel is the sum of diversions published with the records for Fraser River near West Portal and for Vasquez Creek near West Portal. (COLORADO DWR): 1950 to present.

Equipment.-- F-type graphic water-stage recorder, a digital incremental Sutron SDR-0001-1 shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) transmitting hourly in a wooden shelter overtop a concrete stilling well at a 15 ft. concrete Parshall Flume. An Electric Tape Gage (ETG) placed on the instrument shelf is the primary reference with a supplementary staff gage on left wing wall of the flume at the Ha location. The gage is operated in cooperation with Denver Water.

Hydrologic Conditions.-- The flow is collected from transmountain diversions on Vasquez, Frazier-Jim, and Ranch Creeks in the Winter Park area, as well as some water imported from other drainages. Water is collected year-round and will show diurnal variations.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged DCP data and 5-minute logged SDR data as backup. The stage-discharge relationship is generally not affected by icing conditions as water is still warm from the tunnel. However, the well will freeze in extreme temperatures if heat lamps and space heaters are not turned on or adjusted correctly. Algal growth in the approach channel and flume can affect the flume's performance. Rapid algal growth generally occurs in the fall, winter and spring months. Seventeen visits by DWR staff were made this year ensuring instrument calibration. The record is complete and reliable. The flume was cleaned on October 22, February 15, March 1, April 11, May 3, and August 6. These cleanings did not return any gage height corrections. Chart record is obtained from Denver Water Department and was not available at the time for record development and therefore was not used.

Datum Corrections.-- Levels were last run on November 10, 2011. The elevation of the primary reference was found to be within allowable tolerances. No corrections were made. Reference Marks No. 2 and 3 were established on this date.

Rating.-- The control is a 15 ft. Parshall Flume. A standard 15 ft. Parshall Flume rating, STD15FTPF, was continued for all of WY2013. Seventeen measurements (Nos. 667-683) were made during the year, ranging in discharge from 4.16 to 746 cfs. Measurements made cover the range in stage experienced this year well. The peak flow of 803 cfs occurred at 20:30 on June 13, 2013 at a gage-height of 5.08 ft. with a shift of 0.10 ft.

Discharge.-- Shifting control method was used all year. The flume is in good condition but shifts can be caused by rock and gravel deposition as well as algal growth in the approach canal, flume, and flume departure. Positive shifts can be caused by heavy buildup of algal growth on the gage side of the flume, which diverts flows to the far side of the flume. Higher flows come into the flume with substantial approach velocity, and with faster velocities and deeper depths on the far side (outside staff side) of the flume. This leads to positive shifts at higher stages. Special shift distributions are used when flume cleaning changes the shift and staff readings in the flume before and after cleanings. Measurements for this water year show unadjusted shifts varying from -0.05 to + 0.11 ft. Shifts were distributed by time from the beginning of the water year through April 11, 2013 and July 15, 2013 through the end of the water year. Shifts were distributed by stage, using variable stage shift table MOFTUNCOVST13-A from April 11, 2013 through June 13, 2013, and MOFTUNCOVST13-B from June 13, 2013 through July 15, 2013. All measurements were given full weight, except for measurements 668, 670, 671, 673, and 679, which were adjusted up to 5.6% to better fit the distributions.

Special Computations.-- N/A

Remarks.-- The record is good. Station maintained by DWR staff and record developed by Matt Rusch.

Recommendations.-- The bottom of flume should be cleaned on a regular basis. Steps should be installed into the side of the canal above the flume. A non-standard rating may be developed if enough clean flume condition measurements can be made. Notations of algal growth should be included on all measurements.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09022500 MOFFAT WATER TUNNEL AT EAST PORTAL

RATING TABLE-- STD15FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

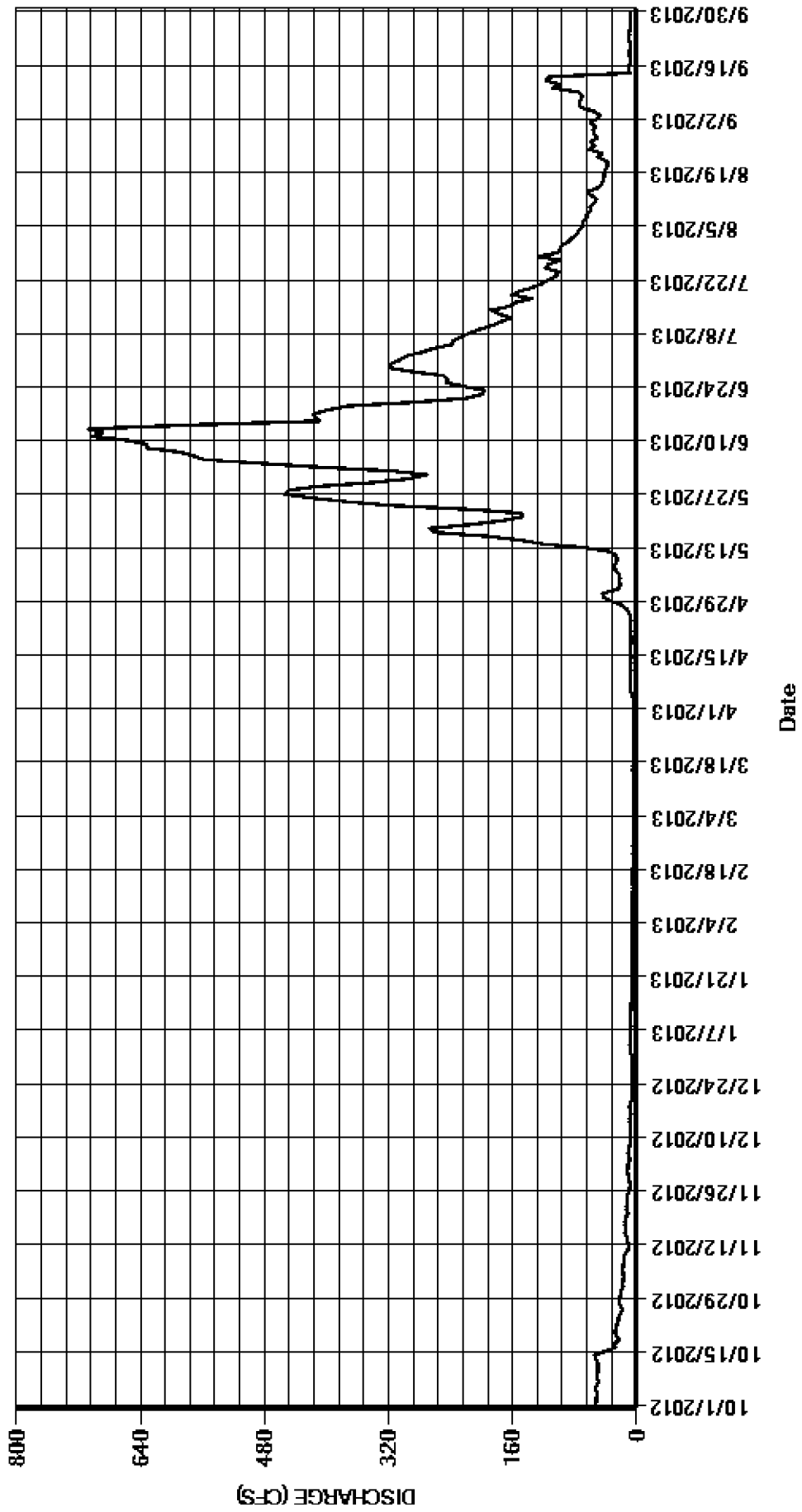
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	53	18	12	7.9	5.6	4.0	4.7	44	271	306	88	60
2	52	18	11	8.6	5.7	4.1	4.1	25	316	298	83	52
3	52	17	11	8.8	5.5	4.2	4.0	21	413	278	77	48
4	51	17	8.9	8.6	5.3	4.3	4.7	22	487	262	74	55
5	53	18	10	8.0	5.6	4.1	6.6	22	558	238	69	72
6	52	18	11	8.0	5.6	4.3	8.7	23	571	238	70	74
7	49	17	9.8	7.8	5.4	4.2	8.3	27	590	225	65	72
8	51	16	9.1	7.5	5.3	4.2	8.2	30	631	217	64	70
9	51	16	7.8	7.9	5.7	4.2	7.9	27	632	204	59	76
10	50	14	8.3	8.1	5.5	4.0	7.7	25	656	188	60	108
11	50	10	8.2	8.0	5.4	4.0	7.6	27	702	175	55	98
12	50	10	8.5	7.6	5.1	4.1	7.7	36	689	162	52	117
13	53	12	8.6	7.4	4.8	4.0	7.5	71	707	178	58	113
14	54	13	9.0	7.0	5.1	4.1	7.5	123	574	188	64	9.2
15	42	15	8.9	6.6	5.1	4.5	7.4	150	409	164	50	10
16	28	14	7.3	6.5	5.3	5.0	8.0	193	414	156	45	9.2
17	29	15	8.6	6.4	5.1	4.7	8.0	260	417	136	43	8.3
18	22	15	9.2	6.3	5.0	4.6	7.3	267	398	161	42	8.8
19	26	14	8.1	6.2	4.7	3.9	7.2	216	373	151	42	9.5
20	28	11	4.7	5.9	4.6	4.2	7.5	174	286	134	39	8.7
21	27	13	6.4	5.9	4.6	4.2	7.5	148	220	122	38	8.2
22	26	13	5.3	5.9	4.7	4.3	7.8	149	200	113	38	8.7
23	24	12	6.0	6.0	4.5	4.3	7.8	222	197	104	50	10
24	23	12	5.7	5.9	4.8	4.3	7.7	321	221	101	45	9.6
25	21	12	5.3	6.2	4.5	4.4	8.3	375	245	118	61	9.4
26	18	10	5.0	6.1	4.4	4.2	10	419	244	114	54	8.6
27	21	8.7	5.7	6.2	4.4	4.3	13	454	251	99	59	8.4
28	23	8.9	5.0	6.1	4.3	4.2	20	449	290	126	51	8.5
29	22	10	6.1	6.1	---	4.3	33	412	319	102	55	8.6
30	21	11	6.1	5.8	---	4.2	43	339	317	99	56	8.5
31	20	---	6.2	6.0	---	4.3	---	293	---	97	53	---
TOTAL	1142	408.6	242.8	215.3	141.6	131.7	298.7	5364	12598	5254	1759	1167.2
MEAN	36.8	13.6	7.83	6.95	5.06	4.25	9.96	173	420	169	56.7	38.9
AC-FT	2270	810	482	427	281	261	592	10640	24990	10420	3490	2320
MAX	54	18	12	8.8	5.7	5.0	43	454	707	306	88	117
MIN	18	8.7	4.7	5.8	4.3	3.9	4.0	21	197	97	38	8.2

CAL YR	2012	TOTAL	20991.4	MEAN	57.4	MAX	275	MIN	4.7	AC-FT	41640
WTR YR	2013	TOTAL	28722.9	MEAN	78.7	MAX	707	MIN	3.9	AC-FT	56970

MAX DISCH: 803 CFS AT 20:30 ON JUN 13, 2013 GH 5.08 FT SHIFT 0.1 FT  
 MAX GH: 5.08 FT AT 20:30 ON JUN 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09022500 MOFFAT WATER TUNNEL AT EAST PORTAL  
WY2013 HYDROGRAPH



## PLATTE RIVER BASIN

### 09013000 ALVA B. ADAMS TUNNEL AT EAST PORTAL NEAR ESTES PARK

Water Year 2013

Location.--	Lat. N40° 19' 40", Long. W105° 34' 42" (NAD83). Gage is located on the right side of a 15-foot Parshall flume located at the upstream end of Aspen Creek Siphon, 600 ft. downstream from the Alva B. Adams Tunnel East Portal afterbay and 4.9 mi. SW of the Town of Estes Park Visitors Center.
Drainage Area and Period of Record.--	Alva B. Adam's tunnel, the transmountain diversion component of the Colorado-Big Thompson (C-BT) system, diverts water from Grand Lake, Shadow Mountain Reservoir and Windy Gap Reservoir in the Colorado River Basin 13.35 miles west of the east portal gage to the South Platte River Basin west of Estes Park, CO. ; Daily values are available from August 11, 1947 to present.
Equipment.--	Digital incremental Sutron SDR-0001-4 shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly in a rectangular concrete shelter and concrete Ha / Hb well at a 15-foot Parshall flume. Gage is equipped with electric tape gages on both Ha and Hb wells. Submergence is not an issue. A supplementary staff gage is located on the left wing wall of the flume at the Ha location. The gage is operated cooperatively between the United States Bureau of Reclamation (USBR) and the Colorado Division of Water Resources (CDWR).
Hydrologic Conditions.--	Alva B. Adam's tunnel, the transmountain diversion component of the Colorado-Big Thompson (C-BT) system, empties into a stilling reservoir before entering the measurement flume. The stilling reservoir intercepts native (east slope) water from Wind River. Wind River water can be diverted under the stilling pond, or it can be taken into the pond and run through the C-BT system for power generation purposes, a process called "skimming". Wind River water is skimmed into the C-BT system during peak runoff periods of the summer when Wind River is in excess of 2 cubic feet per second (cfs). Skimmed water is determined from the difference of Wind River Above Adam's Tunnel (WINDESCO) and Wind River Below Adam's Tunnel (WINBYPCO). Intentional skimming of Wind River waters occurred from May 13 through July 8 and unintentional skimming occurred between September 12 through 30, 2013 of this year diverting 1410 acre feet(AF) of east slope water into the C-BT system.
Gage-Height Record.--	<p>The primary record is 15-minute satellite data with 15-minute logged DCP data and 5-minute logged SDR data as backup. The record is complete and reliable except for: January 14 and 15, 2013 when the stilling well froze due to a failed stilling well heat lamp. Missing or erroneous incremental data values were either taken from backup record or interpolated from adjacent good record without loss of accuracy on: October 3, 2012, May 14 and June 10, 2013.</p> <p>Frequent visits by USBR and CDWR staff showed good agreement between the sensor and base gage. Five instrument corrections of ±0.01 ft. were made in the field were applied to the record as defined by field observations and operations.</p> <p>Heat lamps and an electric radiant heater are used to keep the well open in winter months. Accuracy is not affected and ice accumulation is generally not an issue. Algal growth in the flume can affect the flume's performance. The flume was cleared of algal growth four times on November 6, 2012, March 15, June 10 and August 23, 2013. Because the flume is generally cleaned during periods of no flow the November 6, 2012 and March 15 cleaning corrections could not be determined by stage change but measurements made after the cleanings indicated a change in condition. The June 10 and August 23, 2013 cleanings returned cleaning corrections of -0.05 and -0.01 ft. respectively and were applied to the record as shift corrections.</p> <p>Note.: Flume entry for cleaning or any other purpose is strictly prohibited without prior authorization and lock-out tag-out procedures as per USBR Hazardous Energy Control Program (HECP) policy (document on file). All flume entries were carefully coordinated with USBR staff.</p>
Datum Corrections.--	Levels were last run on December 14, 2011. No correction was indicated nor made to the base or supplemental reference. Reference mark Nos. 2 and 3 were established on this date using bench mark 0 as base.
Rating.--	The control is a 15-foot Parshall flume. Rating ADATUNCO06, in use since October 1, 1971 was continued in use for all of WY2013. The rating is standard for a 15-foot Parshall flume at and above 0.60 ft. of stage and custom below 0.60 ft. of stage. The lower portion of the rating is defined by measurements to 6.40 cfs. Eleven discharge measurements (Nos. 399-409) were made this year, ranging in discharge from 24.9 to 558 cfs. Measurements made this year and five observations of no flow cover the range in stage experienced this year well except for higher daily flows occurring on December 28, 2012, January 1-7 and September 8, 2013. The peak flow of 578 cfs occurred at 11:15 on September 9, 2013 at a gage-height of 4.22 ft. with a shift of 0.00 ft. exceeding this year's high flow measurement (No. 399) made October 3, 2012 by 20 cfs.
Discharge.--	

Shifts were mainly distributed by time as defined by measurements with consideration given to operational events. Stage dependant shift due to heavy algal growth conditions using variable shift curves ADATUNCOVSC13-A and ADATUNCOVSC13-B were applied from March 22 and June 10 and July 29 and August 23, 2013 respectively. Open water measurements showed unadjusted shifts varying between -0.09 and 0.05 ft. All measurements were given full weight except for Nos. 399, 403-405 and 409 which were discounted up to 3.3% to smooth shift distributions.

Special Computations.-- Discharges for January 14 and 15, 2013, when the stilling well froze, were estimated from USBR water orders, known transit times and adjacent good record following removal of the ice.

Following the 2013 flood event, west slope deliveries to the east slope were discontinued. Flows from September 12, 2013 through the end of the 2013 water year were delivered to the ADATUNCO forebay from Wind River. Site observations showed that Wind River flows were outside the confines of the WINDESCO channel and streamgage from some point on September 12 through September 30, 2013. All flows were returned to the WINDESCO channel and gage on September 30, 2013. Because the WINDESCO gage, a 4 ft. Parshall flume, has better resolution at lower flow rates than the ADATUNCO flume, discharge on September 30, 2013 was partly taken from flows recorded at the WINDESCO site.

Zero flow is determined operationally. Small residuals draining through the flume after the tunnel is turned off are considered to be zero. Zero flow was determined to occur on part of the day or the whole day on the following days: November 6 through December 3, 2012; March 15, 16 and August 22, 23, 2013.

The Alva B. Adam's Tunnel Net (West Slope) delivery (ADANETCO) record is determined by calculating the amount of "skimmed" Wind River water moved through the ADATUNCO structure and subtracting that amount from the ADATUNCO record on days when skimming occurred. Thus,  $ADANETCO = ADATUNCO - (WINDESCO - WINBYPCO)$ . Wind River skimming operations intentionally occurred between May 13 and July 8, 2013 and unintentionally from September 12 through September 30, 2013 of this year.

Remarks.-- The record is good except for January 14 and 15, 2013 when the stilling well was frozen; record is fair. Zero flow is determined operationally and was determined to occur on part of the day of the entire day on the following days: November 6 through December 3, 2012; March 15, 16 and August 22, 23, 2013.

The 2013 flood event caused Wind River flows to inadvertently be diverted into the C-BT system from September 12 through 30, 2013 due to overtopping of the Wind River channel bank and a partial to complete plugging of the headgate and / or conduit conveying Wind River flows through the ADATUNCO pool.

The ADATUNCO record is gross water through the structure including native east slope water skimmed into Alva B. Adam's Tunnel from Wind River for power generation and appropriation purposes. For transmountain (west slope only) deliveries to the South Platte Basin see the ADANETCO record.

In previous years shifts of  $\pm 5\%$  have historically been zeroed per request of the USBR and agreement of the Water Commissioner. This historic paradigm was discarded in WY2011. Since then shifts have been applied to the record.

Station maintained by USBR and CDWR staff. Record developed by Russell V. Stroud.

Recommendations.-- Efforts to measure this structure regularly with increased frequency as algal growth is identified should be continued. Levels need to be run again in the 2015 water year.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09013000 ALVA B. ADAMS TUNNEL AT EAST PORTAL NEAR ESTES PARK

RATING TABLE-- ADATUNCO06 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

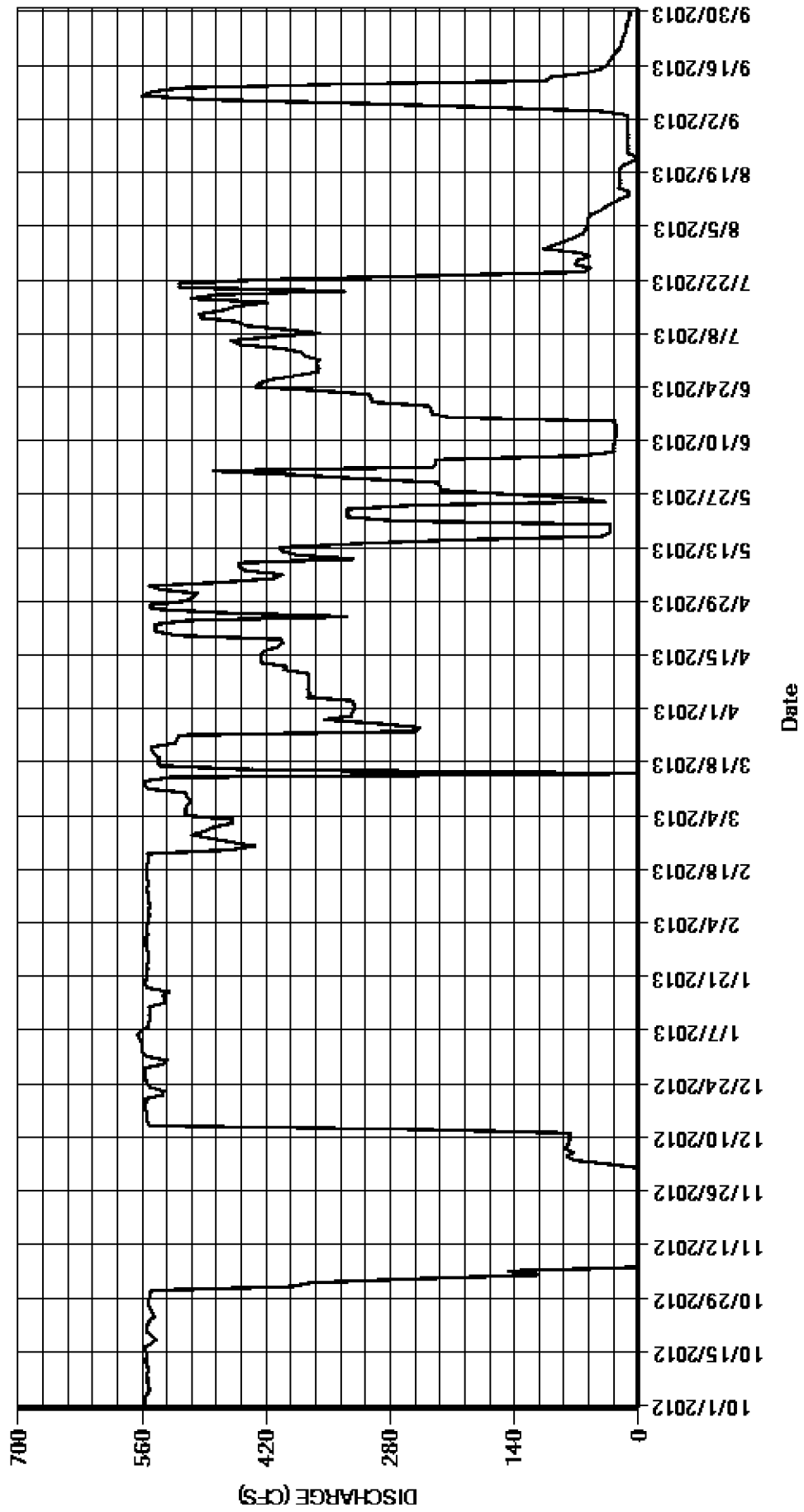
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	558	392	0.00	560	554	480	321	498	390	360	84	13
2	557	369	0.00	560	555	458	321	540	479	376	72	13
3	557	251	33	560	555	458	323	552	232	381	63	13
4	554	115	73	561	554	511	373	469	229	403	60	42
5	552	147	81	564	553	511	371	411	229	450	58	169
6	553	1.1	74	565	552	511	373	402	67	460	57	313
7	554	0.00	82	561	553	508	372	444	28	414	57	490
8	554	0.00	80	553	552	506	372	451	28	360	54	560
9	555	0.00	78	553	552	510	373	450	28	399	43	550
10	553	0.00	78	551	553	511	373	322	27	443	38	517
11	554	0.00	78	552	553	553	400	385	26	452	29	348
12	556	0.00	247	551	554	558	398	402	26	493	22	105
13	556	0.00	552	552	555	557	426	405	26	496	11	98
14	555	0.00	554	e535	553	529	426	322	26	469	12	59
15	556	0.00	555	e535	554	4.1	426	214	27	454	22	43
16	557	0.00	555	537	555	436	423	42	213	419	21	36
17	550	0.00	556	530	555	541	407	32	233	505	21	33
18	545	0.00	557	554	555	542	402	32	234	476	21	30
19	549	0.00	556	557	555	541	404	32	237	332	21	27
20	554	0.00	556	556	553	546	520	277	300	518	21	23
21	555	0.00	537	555	553	549	545	329	302	518	17	20
22	554	0.00	536	555	554	549	545	328	304	425	7.0	19
23	552	0.00	551	554	461	523	546	329	363	239	0.99	18
24	547	0.00	555	555	433	521	509	253	432	62	12	16
25	548	0.00	556	553	459	518	329	38	427	55	12	14
26	551	0.00	558	553	484	252	471	68	411	72	12	14
27	553	0.00	557	553	504	247	550	149	384	69	12	13
28	553	0.00	559	555	489	294	551	224	362	55	12	11
29	552	0.00	537	556	---	354	511	224	361	68	12	10
30	551	0.00	532	556	---	324	504	227	364	107	13	9.6
31	550	---	554	556	---	323	---	315	---	96	13	---
TOTAL	17145	1275.10	11377.00	17148	15012	14225.1	12865	9166	6795	10426	909.99	3626.6
MEAN	553	42.5	367	553	536	459	429	296	226	336	29.4	121
AC-FT	34010	2530	22570	34010	29780	28220	25520	18180	13480	20680	1800	7190
MAX	558	392	559	565	555	558	551	552	479	518	84	560
MIN	545	0.00	0.00	530	433	4.1	321	32	26	55	0.99	9.6

CAL YR	2012	TOTAL	153930.10	MEAN	421	MAX	589	MIN	0.00	AC-FT	305300
WTR YR	2013	TOTAL	119970.79	MEAN	329	MAX	565	MIN	0.00	AC-FT	238000

MAX DISCH: 578 CFS AT 11:15 ON SEP 09, 2013 GH 4.22 FT SHIFT 0 FT  
 MAX GH: 4.22 FT AT 11:15 ON SEP 09, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09013000 ALVA B. ADAMS TUNNEL AT EAST PORTAL NEAR ESTES PARK  
 WY2013 HYDROGRAPH





PLATTE RIVER BASIN  
ADAMS TUNNEL AT EAST PORTAL-COMPUTED FLOW  
Water Year 2013

Location.--	Lat. N40° 19' 40", Long. W105° 34' 42" (NAD83). Gage is located on the right side of a 15-foot Parshall flume located at the upstream end of Aspen Creek Siphon, 600 ft. downstream from the Alva B. Adams Tunnel East Portal afterbay and 4.9 mi. SW of the Town of Estes Park Visitors Center.
Drainage Area and Period of Record.--	Alva B. Adam's Tunnel, the transmountain diversion component of the Colorado-Big Thompson (C-BT) system diverts water from Grand Lake, Shadow Mountain Reservoir and Windy Gap Reservoir in the Colorado River Basin 13.35 miles west of the east portal gages to the South Platte River Basin.  Daily ADANETCO (West Slope Water only) values are available from October 1, 1996 to present. Daily ADATUNCO (gross water through Structure) values are available from August 11, 1947 to present.; October 1, 1996 to present
Equipment.--	Alva B. Adam's Tunnel (Net) (ADANETCO) is a computed record. This record is comprised of data obtained from the Alva B. Adam's Tunnel Near Estes Park, CO (ADATUNCO), Wind River Near Estes Park, CO (WINDESCO) and Wind River Bypass Below Adam's Tunnel Near Estes Park, CO (WINBYPCO). See individual records for WINDESCO and WINBYPCO station equipment. ADATUNCO equipment includes a Sutron SDR-0001-4 shaft encoder and a satellite monitored Sutron SatLink2 data collection platform in a rectangular concrete shelter and concrete Ha / Hb well at a 15-foot Parshall flume. Gage is equipped with electric tape gages on both Ha and Hb wells. A supplementary staff gage is located on the left wing wall of the flume at the Ha location. The well is connected to the stream by two 1.5- inch intakes. Intakes are flushed by a pressure device and have street keys and gate valves. 110 volt power is available to shelter for winter heating. The gage is operated cooperatively between the United States Bureau of Reclamation (USBR) and the Colorado Division of Water Resources (DWR) as part of the Colorado-Big Thompson (C-BT) project.
Hydrologic Conditions.--	Alva B. Adam's Tunnel, the transmountain diversion component of the Colorado-Big Thompson (C-BT) system empties into a stilling reservoir before entering the measurement flume. The stilling reservoir intercepts native (east slope) water from Wind River. Wind River water can be diverted under the stilling pond, or it can be taken into the pond and run through the C-BT system for power generation purposes (a process called "skimming"). Wind River water is skimmed into the C-BT system during peak runoff periods of the summer when Wind River is in excess of 2 cubic feet per second (cfs). Skimmed water is determined from the difference of Wind River Above Adam's Tunnel (WINDESCO) and Wind River Below Adam's Tunnel (WINBYPCO). Intentional skimming of Wind River waters occurred from May 13 through July 8 and unintentional skimming, due to flood conditions, occurred between September 12 through 30, 2013 of this year.
Gage-Height Record.--	Computed record. See gage-height record comments for individual gages.
Datum Corrections.--	Computed record. See individual gage station analyses.
Rating.--	Computed record. See individual gage station analyses.
Discharge.--	Computed record. See special computations section for discharge computations.
Special Computations.--	Discharge for the ADANETCO gage is determined by calculating the amount of skimmed Wind River water moved through the ADATUNCO structure, then subtracting that amount from the ADATUNCO record on days when skimming occurred. Thus,  ADANETCO = ADATUNCO - (WINDESCO - WINBYPCO).
Remarks.--	Intentional skimming of Wind River occurred from May 13 through July 8 and unintentional skimming of Wind River, due to uncontrolled flood waters entering the ADATUNCO stilling basin as well as subsequent plugging of the Wind River diversion gate, occurred from September 12 through 30, 2013, diverting 1410 AF of water into the C-BT system.  The majority of flow in this computed record is through the ADATUNCO structure. The ADANETCO record is rated as per ADATUNCO: "The record is good except for January 14 and 15, 2013 when the stilling well was frozen; record is fair".  Computed zero flow is determined operationally and was determined to occur on part of the day or the entire day on the following days: November 6 through December 3, 2012; March 15 and 16, August 22 and 23 and September 12 through 30, 2013.  Computed record developed by Russell V. Stroud. Individual stations maintained by and records developed by Russell V. Stroud.
Recommendations.--	



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

ADAMS TUNNEL AT EAST PORTAL-COMPUTED FLOW

RATING TABLE.--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

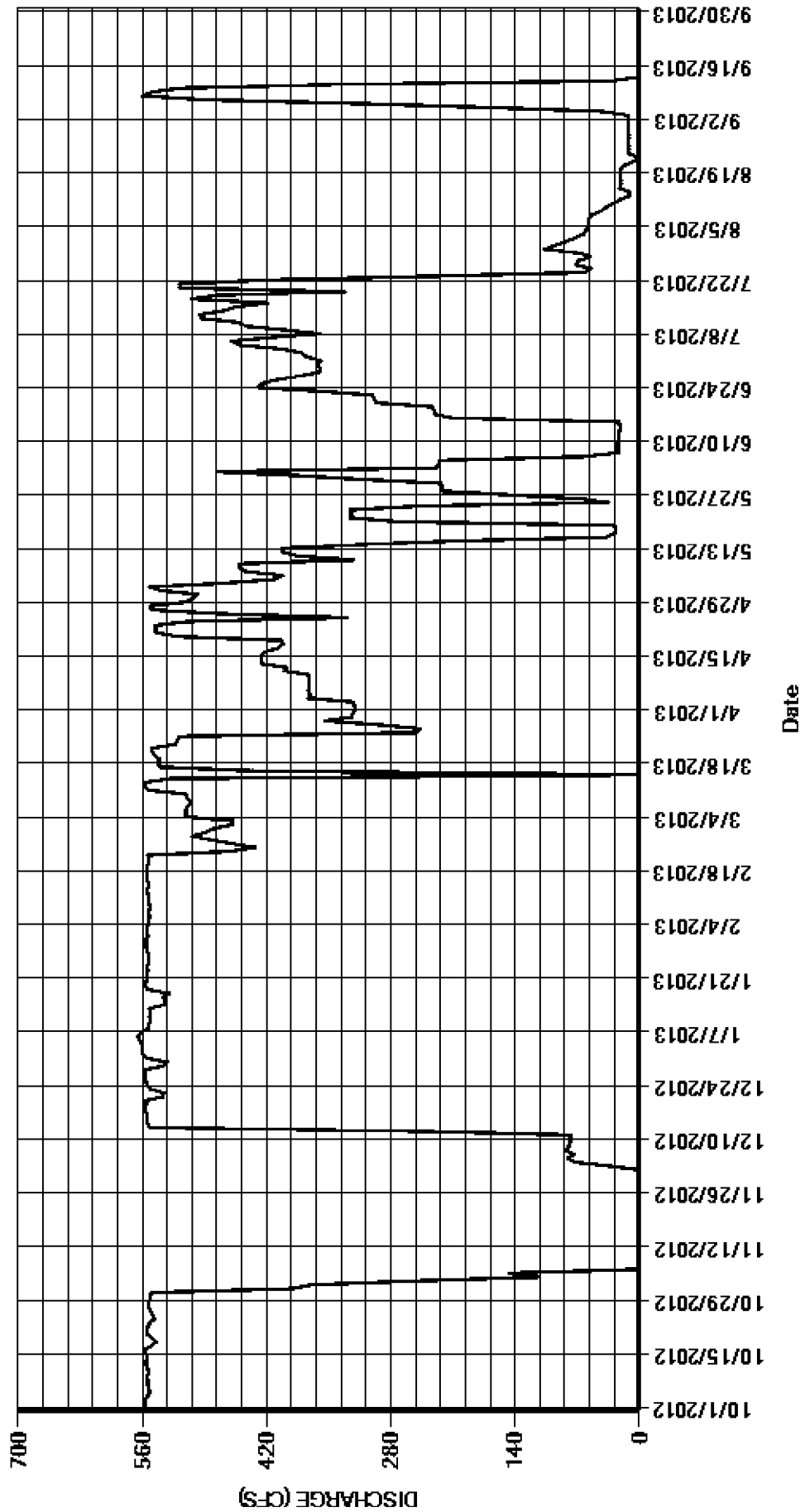
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	558	392	0.00	560	554	480	321	498	387	359	84	13
2	557	369	0.00	560	555	458	321	540	476	375	72	13
3	557	251	33	560	555	458	323	552	229	381	63	13
4	554	115	73	561	554	511	373	469	226	403	60	42
5	552	147	81	564	553	511	371	411	226	450	58	169
6	553	1.1	74	565	552	511	373	402	64	460	57	313
7	554	0.00	82	561	553	508	372	444	24	414	57	490
8	554	0.00	80	553	552	506	372	451	24	360	54	560
9	555	0.00	78	553	552	510	373	450	24	399	43	550
10	553	0.00	78	551	553	511	373	322	24	443	38	517
11	554	0.00	78	552	553	553	400	385	23	452	29	348
12	556	0.00	247	551	554	558	398	402	23	493	22	32
13	556	0.00	552	552	555	557	426	403	22	496	11	0.00
14	555	0.00	554	e535	553	529	426	317	22	469	12	0.00
15	556	0.00	555	e535	554	4.1	426	209	23	454	22	0.00
16	557	0.00	555	537	555	436	423	37	210	419	21	0.00
17	550	0.00	556	530	555	541	407	28	230	505	21	0.00
18	545	0.00	557	554	555	542	402	27	231	476	21	0.00
19	549	0.00	556	557	555	541	404	28	234	332	21	0.00
20	554	0.00	556	556	553	546	520	273	297	518	21	0.00
21	555	0.00	537	555	553	549	545	326	299	518	17	0.00
22	554	0.00	536	555	554	549	545	325	301	425	7.0	0.00
23	552	0.00	551	554	461	523	546	326	361	239	0.99	0.00
24	547	0.00	555	555	433	521	509	250	430	62	12	0.00
25	548	0.00	556	553	459	518	329	35	425	55	12	0.00
26	551	0.00	558	553	484	252	471	65	409	72	12	0.00
27	553	0.00	557	553	504	247	550	146	382	69	12	0.00
28	553	0.00	559	555	489	294	551	222	361	55	12	0.00
29	552	0.00	537	556	---	354	511	222	360	68	12	0.00
30	551	0.00	532	556	---	324	504	224	363	107	13	0.00
31	550	---	554	556	---	323	---	312	---	96	13	---
TOTAL	17145	1275.10	11377.00	17148	15012	14225.1	12865	9101	6710	10424	909.99	3060.00
MEAN	553	42.5	367	553	536	459	429	294	224	336	29.4	102
AC-FT	34010	2530	22570	34010	29780	28220	25520	18050	13310	20680	1800	6070
MAX	558	392	559	565	555	558	551	552	476	518	84	560
MIN	545	0.00	0.00	530	433	4.1	321	27	22	55	0.99	0.00

CAL YR	2012	TOTAL	153930.10	MEAN	421	MAX	589	MIN	0.00	AC-FT	305300
WTR YR	2013	TOTAL	119252.19	MEAN	327	MAX	565	MIN	0.00	AC-FT	236500

MAX DISCH:  
 MAX GH:

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ADAMS TUNNEL AT EAST PORTAL - COMPUTED FLOW  
 WY2013 HYDROGRAPH



True GRAND RIVER DITCH AT LA POUVRE PASS @ 10 FT PARSHALL FLUME

Water Year 2013

Location.-- Lat. N40° 28' 39", Long. W105° 49' 19"(NAD83) in the Cache La Poudre River Basin. Altitude of gage is 10,190 ft. Gage is on boundary of Rocky Mountain Park.

Drainage Area and Period of Record.-- Transmountain diversion. Converging near La Poudre Pass are two collection ditches. The north collection ditch is 15 -miles long, winding around the east slope of the Never Summer Mountain Range, and the south collection ditch is 2-miles long and diverts water from Specimen Creek. Water is diverted into La Poudre Creek and stored in Long Draw Reservoir. ; Daily values are available from May 16, 1928 to present.

Equipment.-- F-Type graphic water-stage recorder and a Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink2 satellite monitored data collection platform (DCP) in a 6-foot by 6-foot timber shelter ovetop a 3-foot by 3.5-foot concrete stilling well at a 10-foot Parshall flume. A metal drop tape and reference point serve as the primary reference. A supplemental staff gage is placed in the stilling well but it is not accurate.

Hydrologic Conditions.-- Regulated diversion. This was an average year for snow-pack. The ditch was turned on May 15, 2013 and it ran until October 7, 2013 when it was shut down for winter.

Gage-Height Record.-- The primary record is 15-minute satellite data with 15 minute logged DCP data and chart record as backup. The record is complete and reliable except for: May 15-19, when snow and ice were in the flume and August 21, 2013 when both the shaft encoder and the record's floats came dislodged from the instrument. Gage-height data for the affected period (August 21, 2013) was interpolated from adjacent record. Missing gage-heights values on May 23 were interpolated from adjacent record and observed readings (Msmr. No. 71) without loss of accuracy.

Datum Corrections.-- Levels were last run to the inside gage on September 10, 2012 using the average flume crest (RM1) as base. The gage was found to read 0.021 ft. low. No correction was made on September 10, 2012. Corrections were applied to both the gage-height record and the gage-heights of measurements made at the gage for all periods of active diversion this year.

Rating.-- The control is a 10-foot concrete Parshall flume. A standard 10-foot Parshall flume rating (STD10FTPF) was continued in use again this year. Six discharge measurements (Nos. 70 - 75) were made during the year ranging in discharge from 1.47 to 220 cubic feet per second (cfs). The peak discharge of 291 cfs occurred at 19:15 on June 11, 2013 at a datum corrected gage-height of 3.62 ft. using a stage distributed shift of -0.13 ft. exceeding this year's high measurement (No.73) by 0.56 feet of stage and 71 cfs.

Discharge.-- Shifting control method was used for all periods of active diversion. Shifts were distributed by stage using variable shift table GRNDRDCOVST13-1, defined by measurement Nos. 66-75 made in the 2012 and 2013 water years. All measurements were given full weight except for Nos. 68 and 69, both made in the 2012 water year, which were discounted -3% and 1% respectively to better fit the stage-shift distribution.

Special Computations.-- Zero flow is determined operationally. Residual gage-height values of 0.05 ft. have been observed with accompanying observations of no flow. Zero flow was determined to occur on part of the day or the entire day on the following days: October 1, 2012 through May 15, 2013. Discharge for May 15 – 19, 2013 when the flume was full of snow and ice, were estimated on a basis of observations made to the gage on May 15 and 21, 2013 as well as Msmr. Nos. 70 and 71.

Remarks.-- The record is good except for May 15-19, 2013, when the stage-discharge relation was affected by ice, and August 21, 2013, when a large portion of the day's gage-height record was interpolated from adjacent record. The ice affected period is estimated and poor and the interpolated period is rated as fair.

This is a seasonal diversion that does not operate in the winter. Ancillary flows occurring in the ditch prior to starting the chart recorder and DCP are not credited. Station maintained by Jean Lever and Lee Cunning. Record developed by Lee Cunning.

Recommendations.-- Levels should be run in the 2014 water year to confirm the indicated 0.021 ft. correction to the reference point elevation (RP). If again indicated, the correction should be made.

In previous years the chart recorder's float has been found to hang up above gage-heights of 1.93 ft. and above. If still present, the obstruction should be removed or the recorder should be repositioned.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

True GRAND RIVER DITCH AT LA POUVRE PASS @ 10 FT PARSHALL FLUME

RATING TABLE-- STD10FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

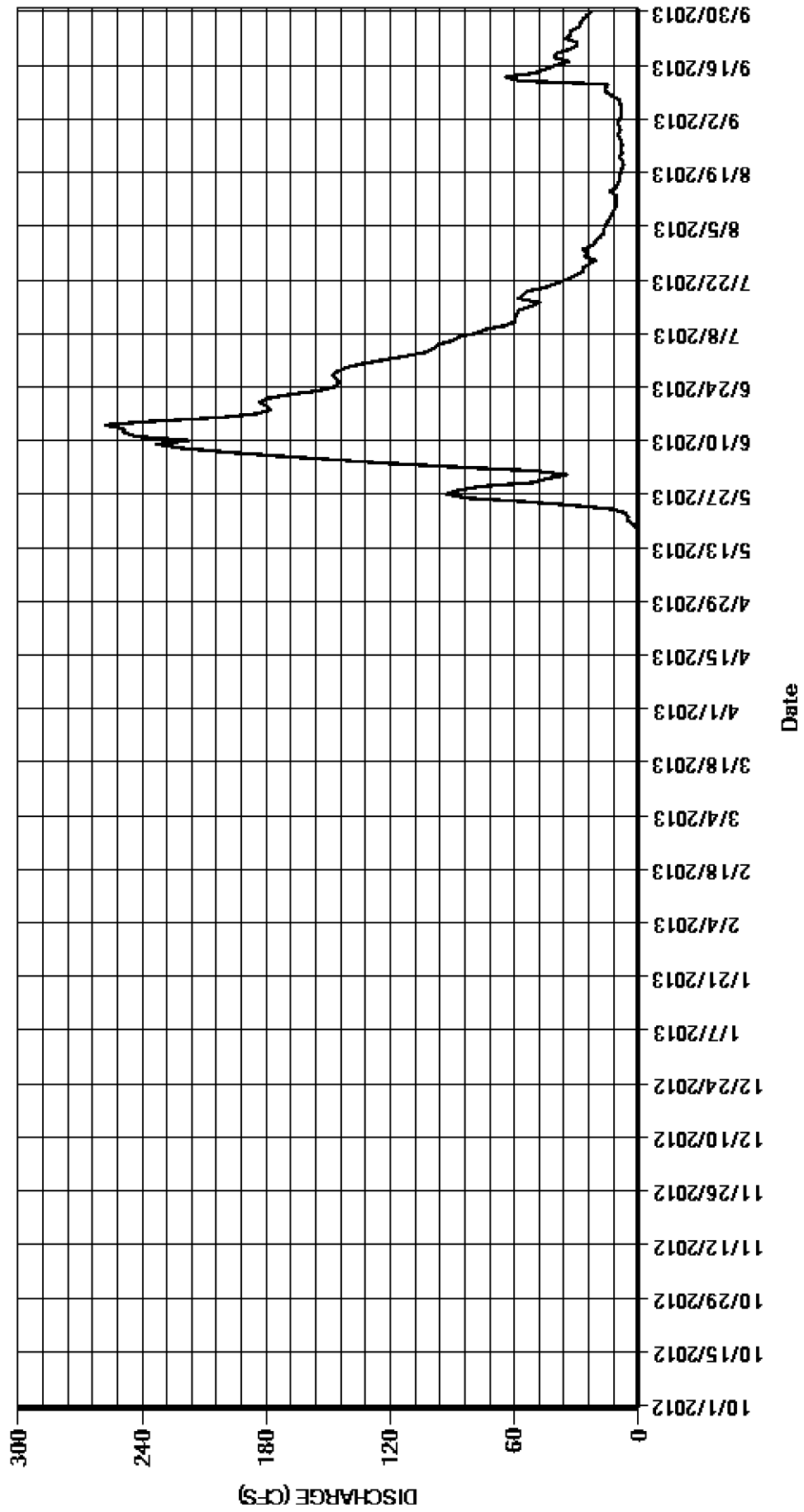
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35	124	21	10
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50	113	19	9.1
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	88	103	17	8.5
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	122	99	17	8.4
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	148	97	16	8.6
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	175	90	15	8.9
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	200	87	14	9.3
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	221	79	13	13
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	233	74	12	16
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	218	65	11	16
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	243	60	11	15
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	249	60	11	58
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	249	59	11	64
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	258	58	14	50
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.50	234	52	11	45
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.60	202	48	9.9	40
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.80	185	58	9.2	34
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e1.0	178	56	9.1	41
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e2.5	180	54	8.8	40
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.3	183	45	8.1	34
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.2	179	40	e7.5	30
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.3	169	35	7.7	30
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	154	31	9.4	35
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32	147	27	8.0	33
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	55	145	27	8.7	33
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	83	146	24	8.0	29
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	93	148	21	8.3	28
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	87	146	26	9.4	27
29	0.00	0.00	0.00	0.00	---	0.00	0.00	76	142	25	9.9	25
30	0.00	0.00	0.00	0.00	---	0.00	0.00	51	134	27	9.0	23
31	0.00	---	0.00	0.00	---	0.00	---	44	---	22	9.3	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	556.20	5161	1786	353.3	821.8
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	17.9	172	57.6	11.4	27.4
AC-FT	0	0	0	0	0	0	0	1100	10240	3540	701	1630
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	93	258	124	21	64
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35	21	7.5	8.4

CAL YR	2012	TOTAL	4957.10	MEAN	13.5	MAX	128	MIN	0.00	AC-FT	9830
WTR YR	2013	TOTAL	8678.30	MEAN	23.8	MAX	258	MIN	0.00	AC-FT	17210

MAX DISCH: 291 CFS AT 19:15 ON JUN 11, 2013 GH 3.62 FT SHIFT -0.13 FT  
 MAX GH: 3.62 FT AT 19:15 ON JUN 11, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

TRUE GRAND RIVER DITCH AT LA POUVRE PASS @ 10 FT PARSHALL FLUME  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
CAMERON PASS DITCH NEAR CAMERON PASS  
Water Year 2013

Location.-- Latitude 40° 31' 14", Longitude 105° 53' 33", in section 2, T. 6N, R 76 W., On US Highway 14 at Cameron Pass. Elevation of gage is 10,276 ft., from the Highway sign.

Drainage Area and Period of Record.-- Transmountain diversion, diverting water from Michigan River and other tributaries in the North Platte River Basin to Joe Wright Creek in the South Platte Basin. This is a controlled diversion.; Daily values available from May 25, 1930 to present.

Equipment.-- Sutron Stage Discharge Recorder (SDR-0001-1) shaft encoder in a timber shelter overtop a concrete stilling well at a 2-foot concrete Parshall flume. The primary reference is a staff gage located in the stilling well.

Hydrologic Conditions.-- Controlled diversion. Ditch is straight immediately above and below the flume. Average snowpack this year allowed for a typical start of diversion this water year. This year, the ditch was started on June 6, 2013 and shut down on July 24, 2013.

Gage-Height Record.-- The diversion was not active from October 1, 2012 through June 5, 2013 and from July 25 through the September 30, 2013. The primary record for the operational period, June 6 through July 24, 2013, is 15-minute logged SDR data. The record is complete and reliable. Instrument calibration was supported by eleven visits to the gage by CDWR staff. Four instrument corrections of ±0.02 ft. were made. Calibration corrections were applied to the record as defined field observations and corrections made to the instrument.

Datum Corrections.-- Levels were last run on October 9, 2012 using RM2 as base. The staff gage was found be 0.018 feet low with respect to the flume crest confirming the July 15, 2009 level run. The staff gage is anchored to the stilling well disallowing correction of the staff plate. A datum correction of +0.02 ft. was applied to the gage-heights of measurements made this year as well as the gage-height record.

Rating.-- The control is a degraded 2 ft. Parshall flume. A standard 2 ft. Parshall flume rating, STD02FTPF, was used for the entire period of record. The flume has been verified by measurements to 5.76 cfs.

Discharge.-- Three discharge measurements (Nos. 17 - 19) were made this year, ranging in discharge from 1.57 to 5.43 cubic feet per second (cfs) covering the range in stage experienced this year well. The peak discharge of 7.88 cfs occurred at 14:30 on June 14, 2013 at a gage-height of 1.05 ft. with a shift of -0.06 ft.

Special Computations.-- Shifting control method was used for all periods of active diversion. Shifts were applied to the record as defined by measurements with some consideration given to operation of the diversion. Open water measurements showed shifts varying between 0.01 and -0.08 ft. All measurements were given full weight.

Special Computations.-- None.

Remarks.-- According to the USBR Water Measurement Manual Table A8-12 flows below 0.20 ft. of stage are outside the reliable definition range of a Parshall flume of this size. As such, the record is good except July 1 - 16, 2013 when it is fair due to lack of definition of rating. Station maintained by Jean Lever and Lee Cunning. Record developed by Lee Cunning.

Recommendations.-- It should be noted that the flume width at the Ha location is 3.10 ft. at the bottom and 3.20 ft. at the top of the flume. The flume walls are beginning to collapse. Replacement of the flume is highly suggested. Reinstallation of the staff gage inside of the stilling well for more accurate readings should be considered. Additional measurements throughout the range in stage to verify the rating and evaluate the flume's performance should be watched for. A stage-shift relation may be present and should be watched for in subsequent records.



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

CAMERON PASS DITCH NEAR CAMERON PASS

RATING TABLE-- STD02FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

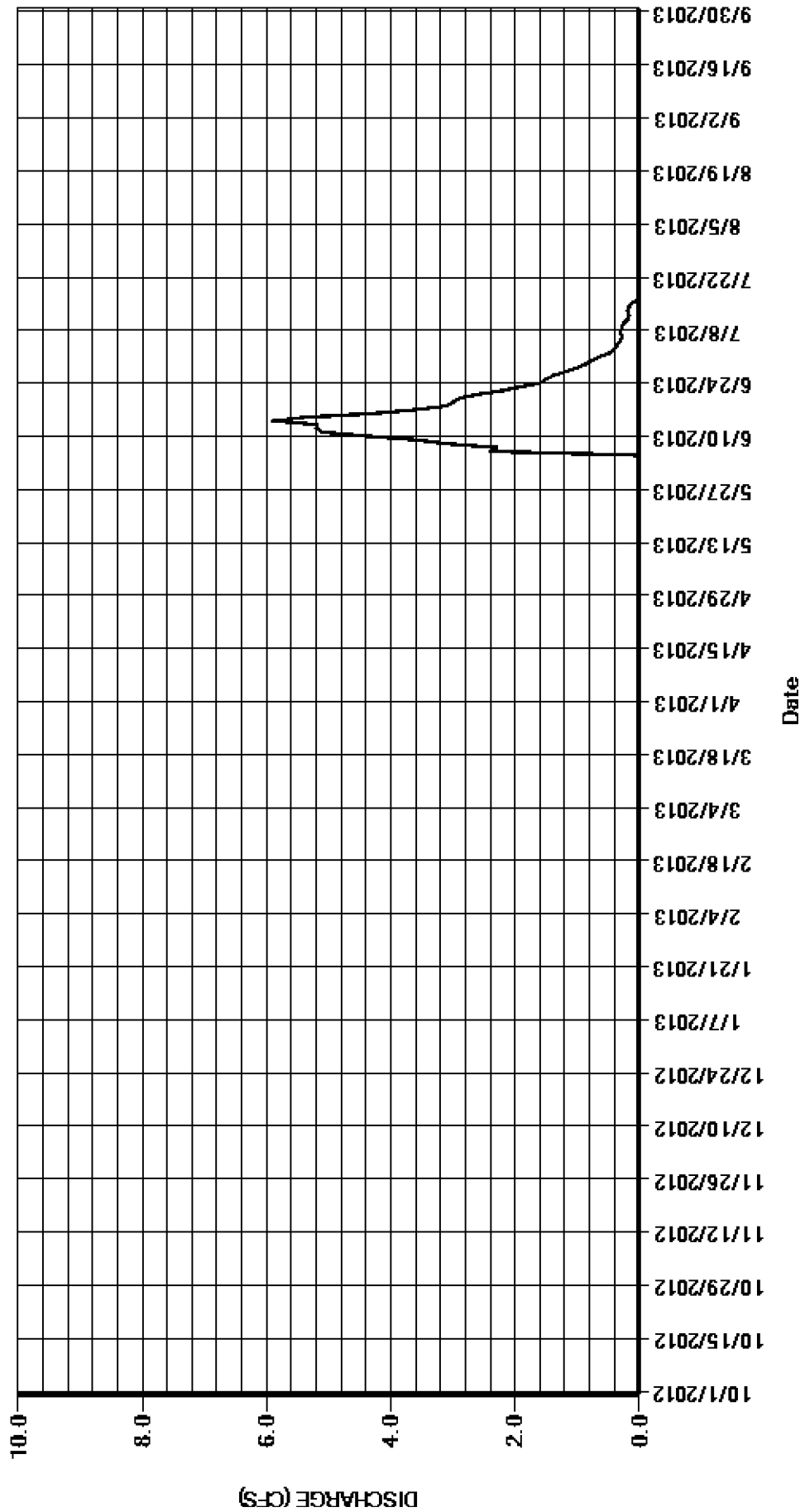
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e2.4	0.28	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.3	0.30	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	0.30	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	0.28	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.4	0.24	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.1	0.18	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.2	0.17	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.2	0.19	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.9	0.17	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.4	0.12	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.3	0.03	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.2	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.6	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.5	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.87	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.76	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	74.53	4.44	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.48	0.14	0.000	0.000
AC-FT	0	0	0	0	0	0	0	0	148	8.8	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.9	0.63	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CAL YR	2012	TOTAL	37.85	MEAN	0.10	MAX	2.2	MIN	0.00	AC-FT	75
WTR YR	2013	TOTAL	78.97	MEAN	0.22	MAX	5.9	MIN	0.00	AC-FT	157

MAX DISCH: 7.88 CFS AT 14:30 ON JUN 14, 2013 GH 1.05 FT SHIFT -0.06 FT  
 MAX GH: 1.05 FT AT 14:30 ON JUN 14, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CAMERON PASS DITCH NEAR CAMERON PASS  
 WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
06746000 MICHIGAN DITCH AT CAMERON PASS

Water Year 2013

Location.-- Lat. 40°31'20", Long. 105°53'30"; Diverts water from Michigan River and tributaries, to Joe Wright Creek (tributary to Cache la Poudre River) in sec. 2, T.6 N., R. 76 W., at Cameron Pass and Colorado Highway 14. Altitude of gage is 10,300 ft. (from topographic map).

Drainage Area and Period of Record.-- Diversion is from Michigan River and tributaries in Sec. 12, T 6N, R. 76W. in North Platte River basin (WD 47, Division 6) to Joe Wright Creek in Sec 2, T. 6N, R. 76W in the Cache La Poudre Basin. Flow can be stored in Joe Wright Reservoir and Chambers Lake. Ditch is 5.2 miles in length.; 1904 to present.

Equipment.-- Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 data collection platform (DCP) with temperature and precipitation sensors and a weekly Steven's Type F graphic water-stage recorder in a log shelter with a PVC well at 9-inch and 8-foot Parshall flumes flanking the stilling well. Only one flume is used at a time. The smaller 9-inch flume is used in winter months or other times when flows are low (below about 4.5 cfs) and the larger flume is used during periods of higher flow. Both flumes are monitored by a single stilling well equipped with an electric tape index and a single stage recorder. Facilities are owned and operated by the City of Fort Collins, gage operated by the Colorado Division of Water Resources (CDWR). City of Fort Collins personnel have placed sections of halved 2 foot culverts in the ditch below the flume in an attempt to stop backwater conditions experienced in the past.

Hydrologic Conditions.-- Controlled diversion. Average snow pack levels this year allowed 4980 acre feet (AF) of water to be diverted from the Michigan Creek water shed to the South Platte basin.

Gage-Height Record.-- The primary record is 15-minute telemetered data with logged DCP data and chart record as backup. The record is complete and reliable except for: November 10-13, 2012, when the stilling well and intakes frozen, and May 10-13, 2013 when the stage-discharge relation was affected by backwater. Four or less unit values were interpolated from adjacent record as well as observations made to the gage on the following days with no loss of accuracy: March 13, April 27 and May 16, 2013. Encoder calibration was maintained by fifteen visits made to the gage by CDWR personal this year. No instrument corrections were noted nor applied to the record.

Datum Corrections.-- Levels were run August 24, 2010 using the average crest elevation of the 8-foot Parshall flume as base. The two flume crests were found to be 0.03 ft. different in elevation from one another. The common electric tape index (ETI) was set to an elevation between the two crests. Reference Mark (RM) No. 3 was also established on this date. Per the water year 2010 levels and setting of the ETI to a point between the two flume crest elevations; a datum correction application method was developed as follows: when operating on the 8-foot Parshall flume a -0.02 ft. correction is applied to the gage-height record and the gage-heights of all measurements; when operating on the 9-inch Parshall flume a +0.01 ft. correction applied to the gage-height record and the gage-heights of all measurements. Levels were again run on September 11, 2012 but were found to be incomplete. RM 3 was used as base but neither RM 1 nor RM 2 were shot to confirm establishment of RM3. Levels indicated potential movement in the ETI elevation. A complete confirming levels run, using RM 1 as base is needed in the 2014 water year. The datum correction application paradigm developed following the August 24, 2010 levels run was continued this year.

Rating.-- The control is either an 8-foot Parshall flume using a standard 8-foot Parshall flume rating (STD08FTPF) or a 9-inch Parshall flume using a standard 9-inch Parshall flume rating (STD09INPF). These rating were used for all periods of open water. Ten discharge measurements were made this year (Nos. 44 - 48 on the 9-inch flume and Nos. 49 - 53 on the 8-foot flume) ranging in discharge from 0.35 to 73.5 cfs. Measurements made this year cover the full range in stage experienced well. This year's peak discharge of 82.3 cfs occurred while operating on the 8-foot Parshall flume on June 11, 2013 (16:30) at a datum corrected gage-height of 1.80 ft. using a zero shift; exceeding this year's high flow measurement (No. 52) by 0.12 ft. of stage and 8.8 cfs respectively.

Discharge.-- Shifting control method was used for all periods of open water. Shifts were distributed by time as defined by measurements with consideration given to operational conditions (control changes). Open water measurements showed shifts varying between 0.00 and -0.01 ft. Measurements Nos. 47, 49, 51 and 53 were discounted up to 6.1% to smooth shift distributions.

Special Computations.-- Discharge for the period when the stilling well and intakes were frozen was estimated from adjacent record with consideration given to temperature trends. Discharge for the backwatered period was estimated from adjacent record, measurement No. 48 made during the backwatered period and temperature trends logged at the gage site.

Zero flow is determined operationally. Residual flows flowing through the flume after notations of the ditch being turned off are negligible and considered to be zero. Zero flow was determined to occur part of the day or the entire day on the following days: September 23 - 30, 2013.

Remarks.-- Discharges on control transition days are carefully examined for continuity.

The record is good except for November 10-13, 2012 and May 10-13, 2013 which are estimated and poor. Station maintained by Lee Cunning. Record developed by Lee Cunning and Russell V. Stroud.

Recommendations.-- Levels should be run in WY2014 using RM1 as base to confirm establishment of RM3. When this is done, two separate tape indexes should be established and used independently depending on the control in operation. Because of the crest elevation issue well depths should never be used for discharge measurement depths. Transition from the 8-foot to the 9-inch flume should be observed and a pygmy meter measurement should be made at the time of the switch. The elevation of the boards placed in front of the 8 ft. flume should be documented.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06746000 MICHIGAN DITCH AT CAMERON PASS

RATING TABLE-- STD09INPF USED FROM 01-OCT-2012 TO 16-MAY-2013  
 STD08FTPFEXP USED FROM 16-MAY-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.0	1.6	0.73	0.55	0.39	0.42	0.41	0.46	15	26	7.1	4.5
2	1.9	1.5	0.65	0.54	0.39	0.43	0.40	0.44	19	23	6.9	4.3
3	1.9	1.5	0.62	0.53	0.39	0.44	0.40	0.40	25	23	6.8	4.1
4	1.8	1.6	0.56	0.52	0.39	0.39	0.44	0.38	31	22	7.3	4.1
5	1.9	1.5	0.65	0.51	0.39	0.40	0.45	0.37	35	21	7.1	4.2
6	1.9	1.4	0.64	0.50	0.38	0.40	0.44	0.38	40	20	6.8	4.6
7	1.8	1.4	0.57	0.49	0.39	0.42	0.42	0.46	44	19	6.5	5.0
8	1.8	1.3	0.56	0.49	0.38	0.44	0.41	0.42	51	17	6.6	5.7
9	1.8	1.3	0.53	0.49	0.39	0.42	0.41	0.40	57	16	6.4	6.3
10	1.7	e1.2	0.54	0.49	0.38	0.40	0.39	e0.40	63	15	6.1	6.5
11	1.6	e1.0	0.54	0.48	0.40	0.40	0.38	e0.60	66	14	6.0	6.6
12	1.7	e1.0	0.54	0.49	0.41	0.39	0.39	e1.4	73	14	5.8	16
13	1.6	e1.0	0.54	0.49	0.41	0.41	0.41	e1.1	73	15	5.9	17
14	2.0	1.1	0.54	0.48	0.41	0.41	0.38	2.8	71	15	5.5	15
15	2.0	1.1	0.54	0.45	0.41	0.43	0.39	4.0	64	15	5.2	16
16	1.9	1.0	0.54	0.46	0.41	0.43	0.39	7.5	56	14	5.0	15
17	1.8	1.1	0.56	0.45	0.41	0.38	0.37	13	50	14	4.8	14
18	1.8	1.1	0.56	0.44	0.42	0.37	0.34	13	46	14	4.8	16
19	1.8	1.1	0.55	0.44	0.41	0.38	0.30	9.9	44	13	4.6	11
20	1.8	0.97	0.56	0.44	0.41	0.38	0.31	8.0	43	12	4.5	2.0
21	1.8	0.94	0.56	0.43	0.42	0.38	0.30	6.8	42	11	4.3	1.8
22	1.8	0.88	0.56	0.43	0.41	0.38	0.32	6.7	39	10	4.9	1.9
23	1.7	0.85	0.56	0.42	0.41	0.38	0.32	11	36	9.5	4.7	0.74
24	1.3	0.88	0.56	0.42	0.41	0.39	0.32	16	34	9.0	4.5	0.00
25	1.3	0.83	0.56	0.41	0.42	0.39	0.33	20	33	9.2	4.5	0.00
26	1.4	0.74	0.56	0.41	0.43	0.39	0.36	23	32	8.7	4.3	0.00
27	1.6	0.67	0.56	0.41	0.43	0.39	0.38	25	32	8.1	4.7	0.00
28	1.6	0.71	0.56	0.40	0.42	0.40	0.38	27	31	8.8	4.8	0.00
29	1.6	0.72	0.56	0.40	---	0.41	0.41	25	31	8.5	4.5	0.00
30	1.7	0.71	0.56	0.39	---	0.41	0.46	18	30	8.2	4.4	0.00
31	1.7	---	0.56	0.39	---	0.41	---	15	---	7.5	4.5	---
TOTAL	54.0	32.70	17.68	14.24	11.32	12.47	11.41	258.91	1306	440.5	169.8	182.34
MEAN	1.74	1.09	0.57	0.46	0.40	0.40	0.38	8.35	43.5	14.2	5.48	6.08
AC-FT	107	65	35	28	22	25	23	514	2590	874	337	362
MAX	2.0	1.6	0.73	0.55	0.43	0.44	0.46	27	73	26	7.3	17
MIN	1.3	0.67	0.53	0.39	0.38	0.37	0.30	0.37	15	7.5	4.3	0.00

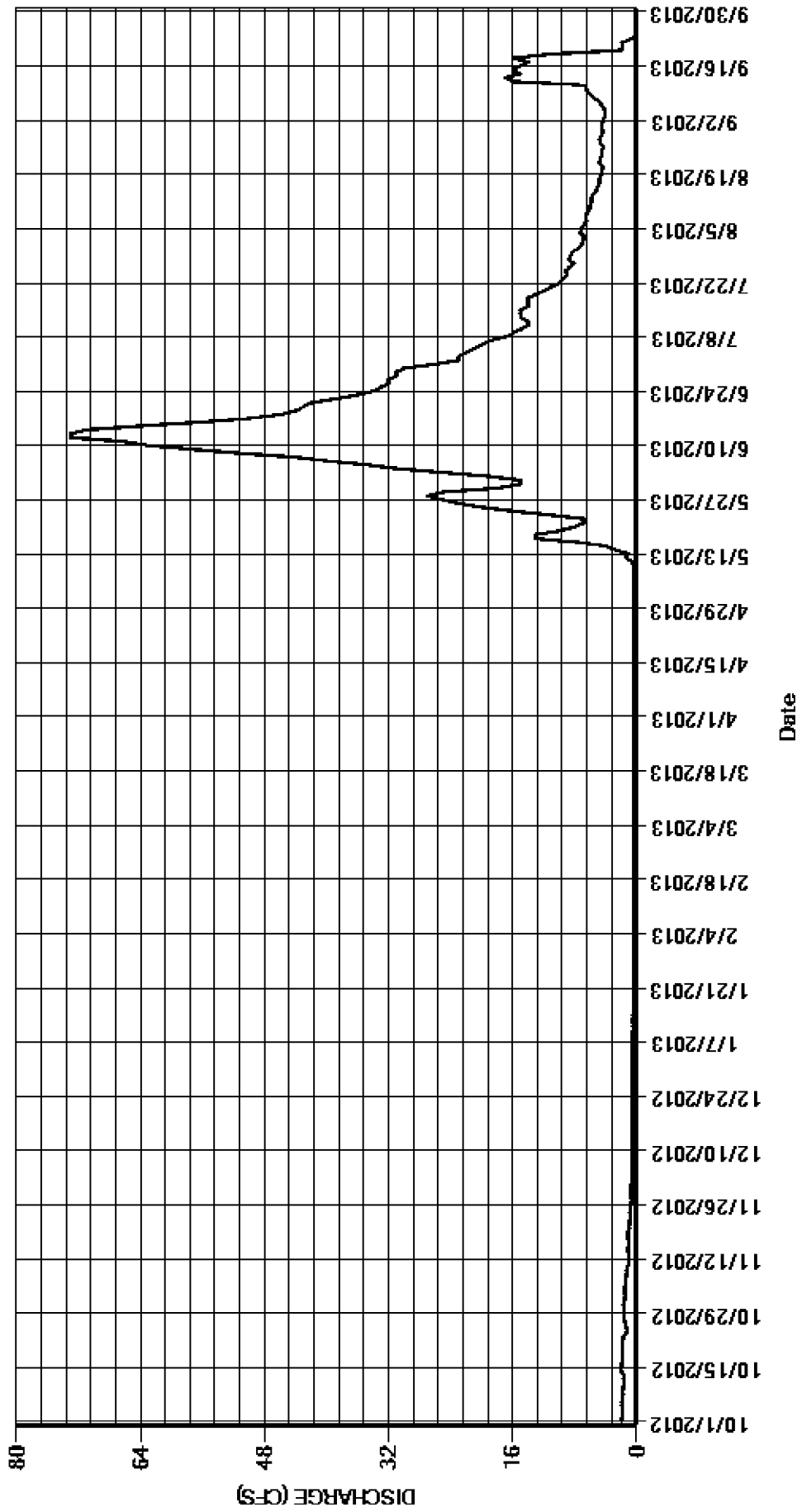
CAL YR	2012	TOTAL	844.64	MEAN	2.31	MAX	18	MIN	0.00	AC-FT	1680
WTR YR	2013	TOTAL	2511.37	MEAN	6.88	MAX	73	MIN	0.00	AC-FT	4980

MAX DISCH: 82.3 CFS AT 16:30 ON JUN 11, 2013 GH 1.80 FT SHIFT 0 FT

MAX GH: 1.80 FT AT 16:30 ON JUN 11, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06746000 MICHIGAN DITCH AT CAMERON PASS  
 WY2013 HYDROGRAPH



True SKYLINE DITCH AT CHAMBERS LAKE

Water Year 2013

Location.-- Lat. N.40°39'50", Long. W.105°53'10" (NAD27). Diverts water from the west branch of the Laramie River to Chambers Lake (tributary to Cache la Poudre River).

Drainage Area and Period of Record.-- Controlled diversion. This ditch runs in a southerly direction and diverts water from the west branch of the Laramie River and flows to a point (Lat. N.40°39'50", Long.W.105°53'10") where it is measured through the Parshall flume before reaching Chambers Lake. Near the top of the ditch, water can be diverted at various locations and transported down Rawah Creek for transfer through the Laramie-Poudre Tunnel. The ditch is approximately 5 miles long.; 1894 to present.

Equipment.-- Sutron Stage Discharge Recorder (SDR-0001-1) in a 6-foot by 6-foot timber shelter overtop a 3-foot by 3.5-foot concrete stilling well at a 10-foot Parshall flume. A drop tape and reference point serve as the primary reference and there are staff gages present in the flume and stilling well as supplemental references.

Hydrologic Conditions.-- Controlled diversion. The Skyline Ditch collapsed approximately 1.0 miles upstream from Chambers Lake in the fall of 2011. There is the ability to run a small amount of water through the collapsed portion into Chambers Lake. No water was diverted through the Skyline Ditch this water year.

Gage-Height Record.-- No water was diverted this water year. The flume's intakes sit approximately 0.15 to 0.20 ft. above the flume floor. Stages below this threshold are suspect as the stilling well may become isolated from the flume.

Datum Corrections.-- Levels were last run on October 9, 2012 using the average flume crest as base. The staff gage was within allowable tolerances and the reference point was found to be 0.02 ft. low. The reference point was not adjusted at the time of levels in lieu of confirming levels. Reference Mark 2 was also established on this date.

Rating.-- A standard 10 ft. Parshall flume rating (STD10FTPFXP) is used when water is diverted.

Discharge.-- No water diverted this water year.

Special Computations.-- None.

Remarks.-- Record developed by Lee Cunning.

Recommendations.-- Levels should be run again to track stability of the newly established reference mark in relation to the flume crest as well as to correct the RP. The intake invert elevation should also be determined and documented at that time. If water is run in next year, measurements should be made through the full range diverted.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

True SKYLINE DITCH AT CHAMBERS LAKE

RATING TABLE-- STD10FTPFXP USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

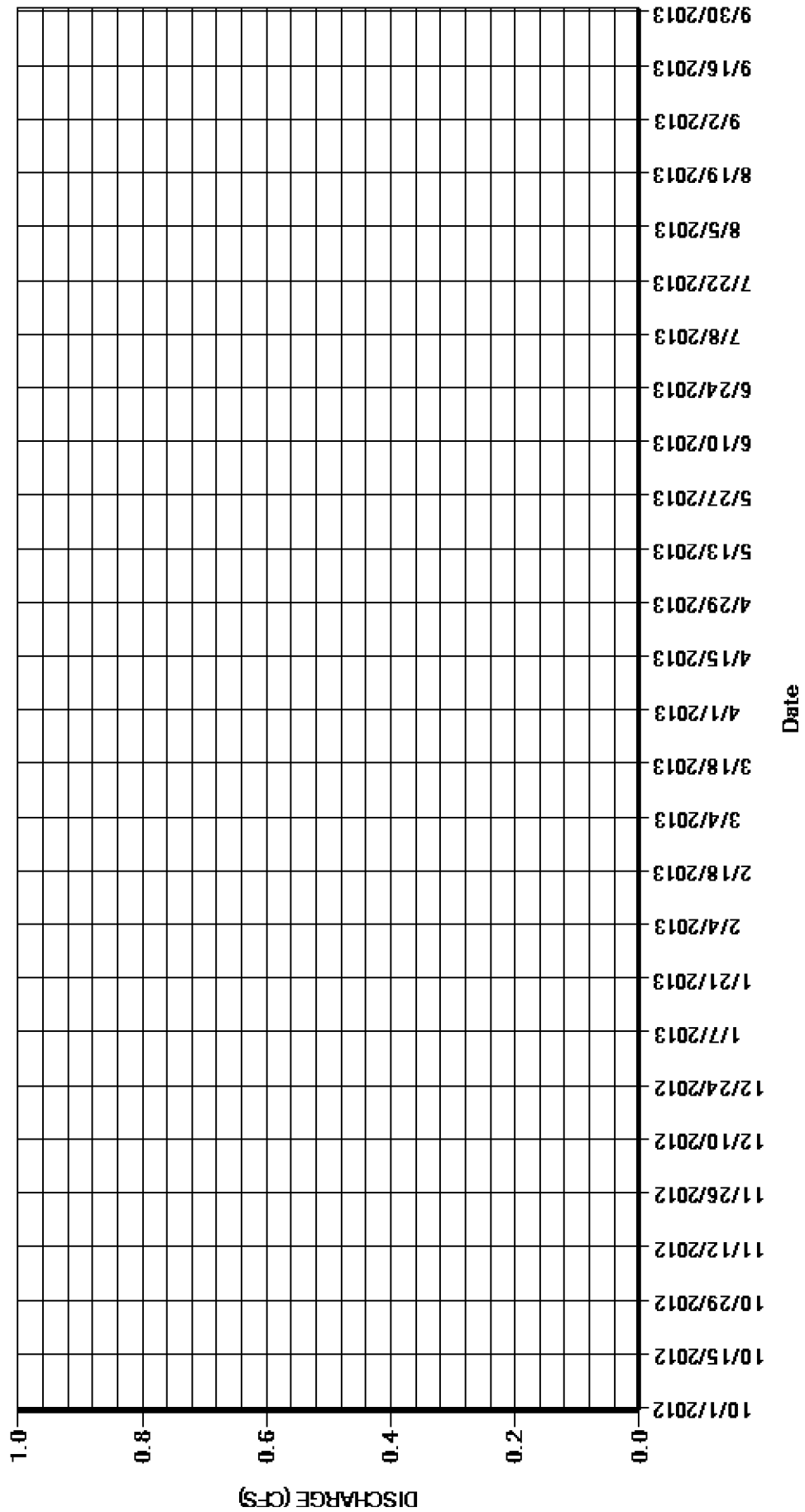
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AC-FT	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CAL YR	2012	TOTAL	158.45	MEAN	0.43	MAX	5.9	MIN	0.00	AC-FT	314
WTR YR	2013	TOTAL	0.00	MEAN	0.000	MAX	0.00	MIN	0.00	AC-FT	0

MAX DISCH: (no water diverted in WY2013)  
 MAX GH: 0.00 FT (no water diverted in WY2013)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

TRUE SKYLINE DITCH AT CHAMBERS LAKE  
WY2013 HYDROGRAPH





PLATTE RIVER BASIN  
06747000 LARAMIE POUDDRE TUNNEL @ 10 FT PARSHALL FLUME  
Water Year 2013

Location.-- Lat. 40°40'34.94", Long. 105°51'10.04"; in NE¼ SW¼ sec. 7, T.8 N., R.75 W., Sixth Principal Meridian, Larimer County, CO. Laramie-Poudre tunnel diverts water from Laramie River and tributaries to Cache la Poudre River.

Drainage Area and Period of Record.-- Transmountain diversion diverting water from Rawah Creek, a tributary of the Laramie River, to the Cache La Poudre River. ; Daily data is available from May 1, 1931 to present.

Equipment.-- Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 data collection platform (DCP) and a F-type graphic water stage recorder in a timber shelter at a 10 foot Parshall flume. The primary reference is an adjustable reference point and metal drop with a supplemental outside staff gage located within the flume.

Hydrologic Conditions.-- Controlled diversion. The ditch is straight above and below the flume; however, approach conditions do not allow sufficient stilling of waters entering the flume. The tunnel was started on May 9, 2013 and water was diverted until August 7, 2013 diverting 18,790 acre-feet of the 19,875 acre-foot "quota".

Gage-Height Record.-- The primary record is 15-minute satellite data with 15-minute logged DCP data and chart record as backup. The record is complete and reliable. Instrument calibration was ensured by 20 documented and undocumented visits to the site. No corrections were necessary this year.

Datum Corrections.-- Levels were last run on August 28, 2012 using RM2 (established July 15, 2009) as base. The gage was found to be reading accurately.

Rating.-- The control is a degraded 10-ft. Parshall flume. The floor of the flume experienced accelerated erosion this year. A standard 10-ft. Parshall flume rating, STD10FTPFEXP, was continued in use this year. Five discharge measurements (Nos. 58 - 62) were made this year ranging in discharge from 31.4 to 200 cfs. Unadjusted shifts ranged from 0.12 to -0.33 ft. The peak discharge of 241 cfs occurred at 17:30 on June 9, 2013 at a gage-height of 3.65 ft. using a stage distributed shift of -0.55 ft. The flume was observed to be running submerged at a lower gage-height (3.10 ft.) during measurement No. 60.

Discharge.-- Positive shifting is principally caused by insufficient stilling of waters approaching the flume while negative shifting occurs at higher discharge rates and is caused by submergence of the flume caused the tunnel opening downstream of the flume. Measurements made in previous years have shown positive shifting.

Special Computations.-- Stage dependent shifting using variable shift curve LAPTUNCOVST13-4 was applied for all periods of active diversion. The shift curve is defined by 5 measurements (Nos. 58-62) made this year. All measurements were given full weight. Zero flow is determined operationally. Residual positive stage values recorded after the diversion is turned off are adjusted to compute a zero discharge. Zero flow was determined to occur on part of the day or the entire day on the following days: October 1, 2012 through May 9, 2013 and August 7 through September 30, 2013.

Remarks.-- The flume was scheduled for a complete removal and replacement this past fall, but due to the flooding of September 2013 it has been postponed. On June 10, 2013 the flume was observed to be operating in a submerged condition. Further inspection of the hydrograph and the stage-shift relation indicated that the flume was operating submerged from May 25-29 and June 3-24, 2013. The record for these periods is rated as fair. The peak being greater than this year's high flow measurement (No. 60) is also regarded as fair due to unknown performance of the flume in the submerged condition. The record is otherwise good. Gage operated and maintained by Jean Lever and Lee Cuning, record developed by Lee Cuning.

Recommendations.-- Replacement of the flume is highly suggested. Until replacement, increased measurement frequency is required to track the flume's performance. Increased observations to determine the point and degree of submergence are required. A customized rating may need to be developed and applied if the structure is not replaced in the near future.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06747000 LARAMIE POUDDRE TUNNEL @ 10 FT PARSHALL FLUME

RATING TABLE-- STD10FTPFXP USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

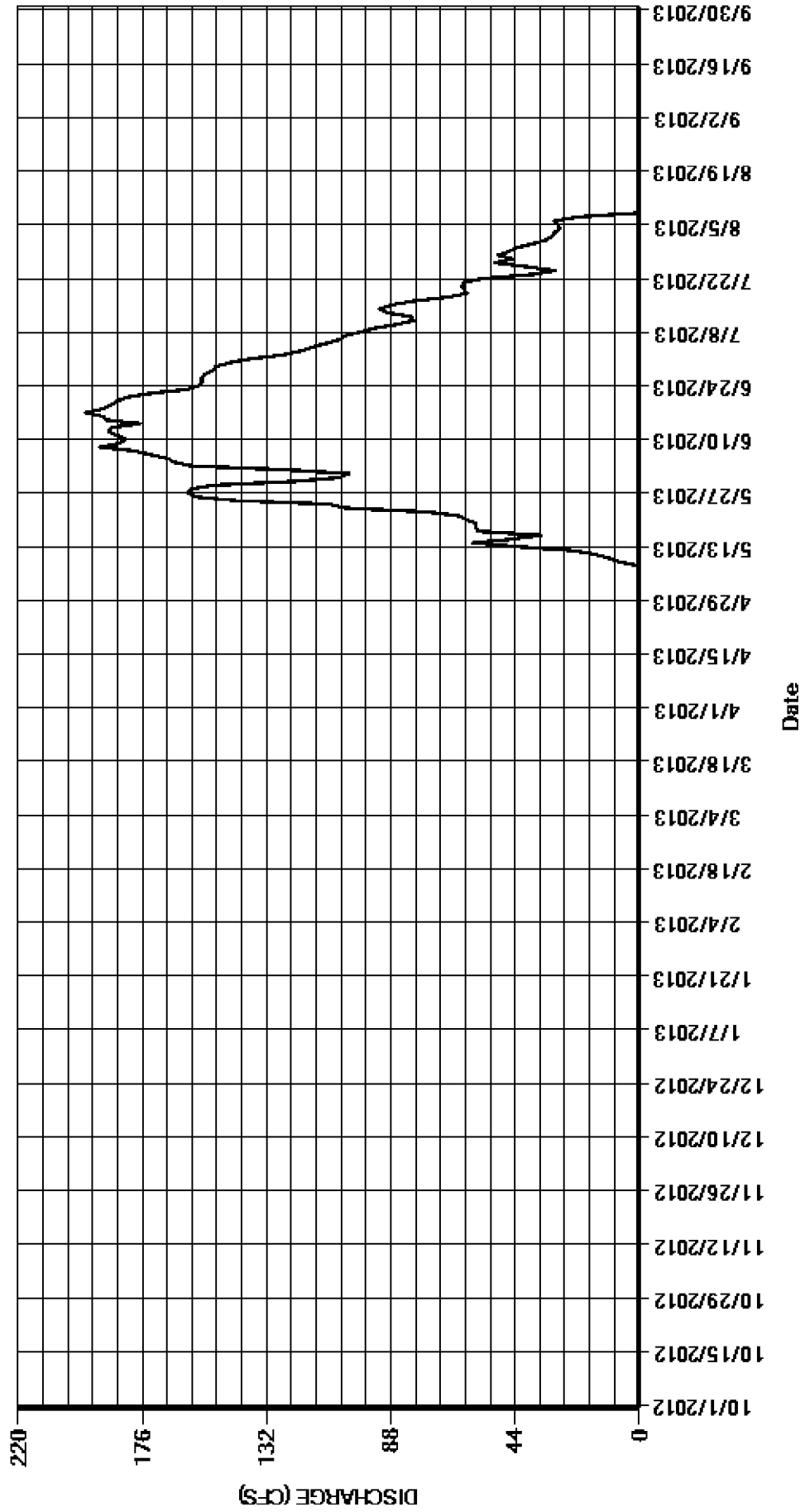
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	103	138	33	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	125	126	31	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e159	120	30	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e165	116	28	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e167	111	29	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e173	106	30	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e179	104	21	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e191	99	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.3	e184	94	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	e182	86	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16	e185	80	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25	e188	81	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	45	e187	89	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	59	e177	92	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	45	e189	88	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35	e190	80	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57	e196	68	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	58	e190	61	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	58	e187	62	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	61	e185	63	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64	e181	62	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	75	e173	55	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	104	e160	38	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	110	e156	30	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e143	155	40	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e157	155	51	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e160	154	45	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e159	151	50	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	e151	150	46	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	122	145	44	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	106	---	38	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1828.30	5082	2363	202.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	59.0	169	76.2	6.52	0.000
AC-FT	0	0	0	0	0	0	0	3630	10080	4690	401	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	160	196	138	33	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	103	30	0.00	0.00

CAL YR	2012	TOTAL	9264.30	MEAN	25.3	MAX	159	MIN	0.00	AC-FT	18380
WTR YR	2013	TOTAL	9475.30	MEAN	26.0	MAX	196	MIN	0.00	AC-FT	18790

MAX DISCH: 241 CFS AT 17:30 ON JUN 09, 2013 GH 3.65 FT SHIFT -0.55 FT (FLUME SUBMERGED)  
 MAX GH: 3.65 FT AT 17:30 ON JUN 09, 2013 (SUBMERGED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06747000 LARAMIE POWDRE TUNNEL @ 10 FT PARSHALL FLUME  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN  
BOBCREEK DITCH NEAR DEADMAN MTN., NEAR GLENDEVEY  
Water Year 2013

Location.-- Lat. 40° 45' 50", Long. 105° 45' 40" (Spotted from topographic map, NAD27). Gage is located on the left side of a 3 ft. Parshall flume 3 miles south of Deadman Hill and 3 miles SE of Glendevey, CO.

Drainage Area and Period of Record.-- Transmountain diversion diverting water from Nunn Creek in the Laramie River Basin to Roaring Creek in the Cache la Poudre River Basin. Daily values are available from the DWR from May 1, 1940 to present. ; Published (USGS) records are available from 1919. Daily DWR records are available from May 1, 1940 to present.

Equipment.-- F-type graphic water-stage recorder and Sutron SDR-0001-1 shaft encoder in a metal shelter with stilling well at a 3-foot Parshall flume. A metal drop tape and reference point serve as the primary reference. A supplemental staff gage is present. Gage is owned, operated and maintained by the City of Greeley. Elevation of gage is 9,890 ft. (from topographic map).

Hydrologic Conditions.-- Transmountain diversion. Water availability and diversion duration is driven by snow pack conditions. This year the snow pack in this area was about normal.

Gage-Height Record.-- The diversion operates seasonally and access to the gage is very difficult. The gage was dug out and the recorder was installed on May 21, 2013. Water was actively diverted from 13:00 on May 23, 2013 until 16:15 on June 23, 2013 and the recorder was removed at 10:00 on June 27, 2013. The primary record for the operational period is 15-minute logged SDR data with chart record as backup. The chart record was not made available this year. No instrument corrections were made per the SDR event log. No visit log was maintained this year. The record is complete and reliable.

Datum Corrections.-- The crest of the flume is nearly level (only about 0.01 ft change across the crest); however, there is a slight 'tilt' from the staff to the inlets of about 0.15 ft. The floor of the flume at the staff is about 0.04 feet higher causing the outside staff to read about 0.04 feet less water than the drop tape.

Rating.-- Levels were last ran on September 25, 2012 to the inside reference point using the average crest elevation as base. The gage was found to be reading 0.017 ft. high. No corrections were made in lieu of confirming levels. Reference Mark No. 2 was also established on this date at an elevation of 3.739 ft.

Rating.-- The control is a 3 ft. Parshall flume. A standard 3-foot Parshall flume rating table was continued in use this year. No discharge measurements were made this year because of difficulties associated with driving to or near the gage. The peak flow of 12.8 cfs occurred at 17:45 on May 24, 2013 at a gage height of 1.02 ft. with a shift of 0.02 ft.

Discharge.-- Shifting control method was used for all periods of active diversion. Measurement No. 8, made in water year 2012, returned a computed shift of 0.02 ft. confirming expected results from levels run on September 25, 2012. The shift was applied for the entire operational period.

Special Computations.-- None.

Remarks.-- The record is good. Station operated and maintained by City of Greeley staff, record developed by Lee Cunning.

Recommendations.-- Levels should be run at the end of Water Year 2014 to verify RM2 and to adjust the RP\_TL if again indicated. An ATV would greatly help getting into and out of this area during the time water is running.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

BOBCREEK DITCH NEAR DEADMAN MTN., NEAR GLENDEVEY

RATING TABLE-- STD03FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

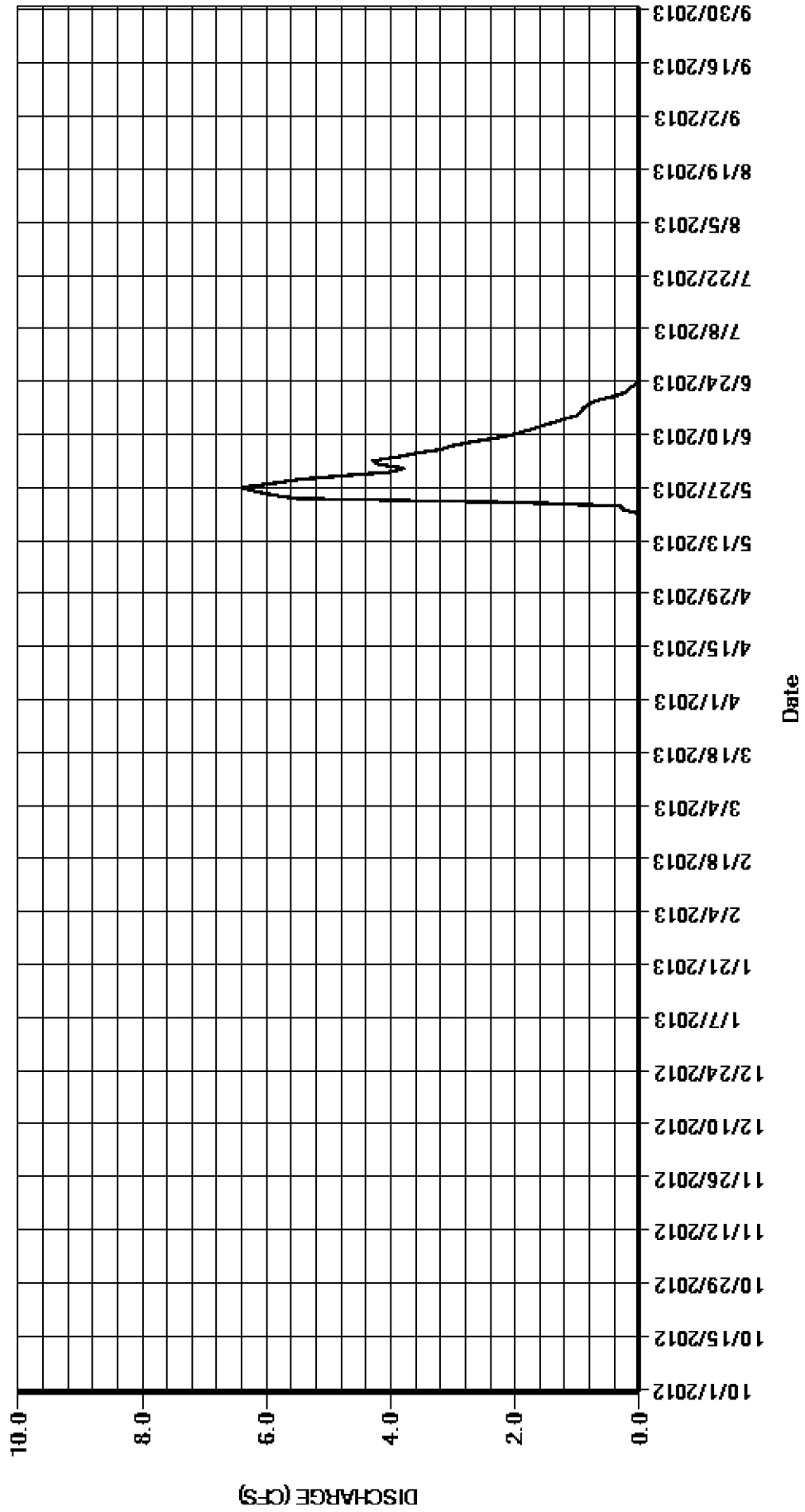
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.2	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.3	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.9	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.2	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.7	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.3	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.6	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.95	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.90	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.82	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.25	0.23	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.17	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.07	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.5	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.9	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.2	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.4	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.9	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	5.5	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	4.8	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	4.0	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46.87	44.21	0.00	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.51	1.47	0.000	0.000	0.000
AC-FT	0	0	0	0	0	0	0	93	88	0	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.4	4.3	0.00	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CAL YR	2012	TOTAL	94.41	MEAN	0.26	MAX	3.7	MIN	0.00	AC-FT	187
WTR YR	2013	TOTAL	91.08	MEAN	0.25	MAX	6.4	MIN	0.00	AC-FT	181

MAX DISCH: 12.8 CFS AT 17:45 ON MAY 24, 2013 GH 1.02 FT SHIFT 0.02 FT  
 MAX GH: 1.02 FT AT 17:45 ON MAY 24, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**BOBCREEK DITCH NEAR DEADMAN MTN., NEAR GLENDEVEY  
WY2013 HYDROGRAPH**



PLATTE RIVER BASIN  
DEADMAN DITCH NEAR DEADMAN PARK  
Water Year 2013

Location.-- Lat 40° 50' 06.03"; long 105° 48' 08.32"; sec. 15, T. 10 N., R. 75 W., Diverts water from tributaries of the Laramie River, to Sheep Creek (tributary to Cache La Poudre River) via Sand Creek.

Drainage Area and Period of Record.-- The ditch is 4.5 miles long. There are turnouts that allow collected water to be returned to the Laramie River drainage, making this a controlled diversion. The water is diverted to the headwaters of Sand Creek. About 5 miles downstream it is diverted by Wilson Supply ditch into Sheep Creek in the Cache La Poudre Basin.; Daily values are available from October 1902 to present.

Equipment.-- Stevens type F chart recorder and a digital incremental Sutron SDR-0001-1 shaft encoder in a steel shelter at a 6-foot Parshall flume. The flume is referenced by a staff gage at the Ha location in the flume.

Hydrologic Conditions.-- Controlled diversion. Lower than average snow pack levels this year allowed an early turn-on date but flows for the year were lower than average. 794 acre feet (AF) of water was diverted this year.

Gage-Height Record.-- The primary record is 15-minute logged SDR data with chart record from May 15 to 21, 2013 as backup. The period of active diversion for the 2013 Water Year was May 15 through July 22, 2013. Chart record was used without loss of accuracy from May 15 to 21, 2013 and logged SDR data was used from May 22, when the SDR unit was installed, through July 29, 2013. The record is complete and reliable.

Datum Corrections.-- Levels were last run on September 9, 2013 using RM2 as base. Levels run this year showed results consistent to levels run in previous years indicating that the staff is 0.012 ft. high with respect to the flume's crest. No corrections were made this year.

Rating.-- The control is a 6-foot Parshall flume. It is well defined by current and historic discharge measurements from 1.40 to 17.0 cfs. A standard 6-foot Parshall flume rating (STD06FTPF) was continued in use this year. Two discharge measurements (Nos. 24 and 25) were made at discharge rates of 12.3 and 1.04 cfs respectively. The peak discharge of 24.8 cfs occurred at 19:30 on June 3, 2013 at a gage-height of 1.05 ft. using a shift of -0.03 ft. exceeding this year's high measurement by 12.5 cfs and 0.36 ft. of stage respectively.

Discharge.-- Shifting control method was used for all periods of active diversion. Shifts were applied by time as defined by measurements. Open water measurements showed shifts steady at -0.03 ft. All were given full weight.

Special Computations.-- Zero flow is determined operationally. Zero flow was determined to occur on part of the day or the entire day on the following days: October 1, 2012 to May 14, 2013 and July 22 through September 30, 2013.

Remarks.-- Record is good except for the period when the flows were below 2.63 cfs. Flows below 2.63 cfs should be considered fair. The peak instantaneous flow should be considered good. No credit was given to residual or leak flows recorded prior to or after the stated period of record. Gage maintained and record developed by Lee Cuning.

Recommendations.-- An additional reference mark, independent of the flume structure, should be established and an RP and metal drop tape should be placed and used as the base reference. Levels should be run for several subsequent years to confirm flume stability. Multiple discharge measurements through the full range of stage should be made annually.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

DEADMAN DITCH NEAR DEADMAN PARK

RATING TABLE-- STD06FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.3	1.8	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	1.6	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16	1.4	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15	1.4	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	2.0	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	2.2	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	1.4	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	1.1	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	0.97	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	0.94	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10	0.87	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.7	0.83	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.0	1.2	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.1	0.94	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	6.4	0.97	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.9	5.9	0.75	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	5.8	0.61	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.6	5.4	0.62	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.9	4.8	0.82	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0	4.2	0.70	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	3.9	0.55	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.2	3.7	0.40	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	3.6	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	3.3	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	3.0	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	2.5	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	1.9	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	1.7	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	12	1.7	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	9.7	1.8	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	8.4	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	153.70	222.7	24.07	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.96	7.42	0.78	0.000	0.000
AC-FT	0	0	0	0	0	0	0	305	442	48	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	16	2.2	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.7	0.00	0.00	0.00

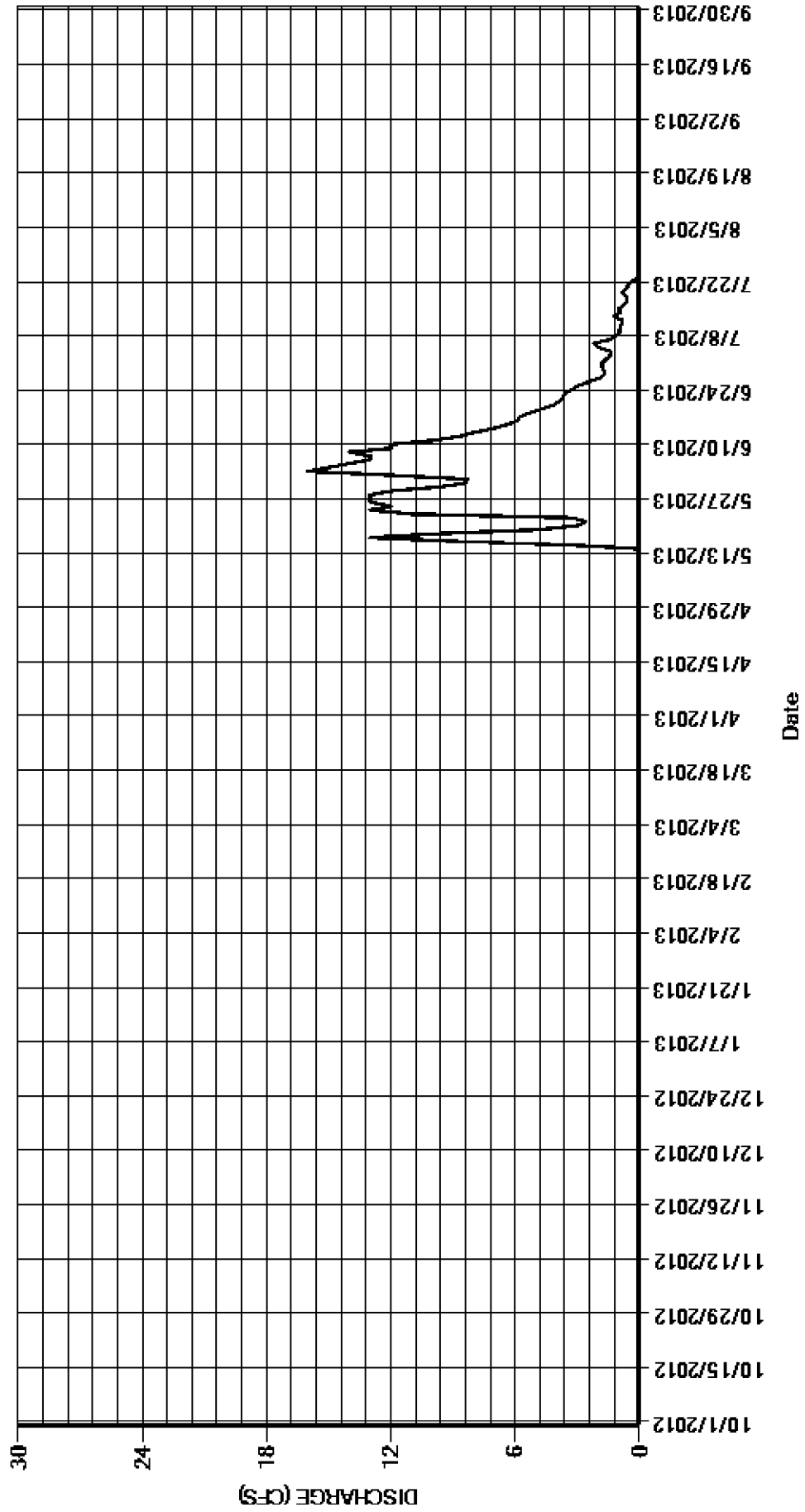
CAL YR	2012	TOTAL	283.72	MEAN	0.78	MAX	10	MIN	0.00	AC-FT	563
WTR YR	2013	TOTAL	400.47	MEAN	1.10	MAX	16	MIN	0.00	AC-FT	794

MAX DISCH: 24.8 CFS AT 19:30 ON JUN 03, 2013 GH 1.05 FT SHIFT -0.03 FT  
 MAX GH: 1.05 FT AT 19:30 ON JUN 03, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



DEADMAN DITCH NEAR DEADMAN PARK  
WY2013 HYDROGRAPH



PLATTE RIVER BASIN

06750500 WILSON SUPPLY DITCH NEAR EATON RESERVOIR @ 10 FT PARSHALL FLUME

Water Year 2013

Location.-- Lat. N 40° 54' 27.73" Long. W 105° 46' 47.75" (NAD 83), in section 23, T. 11 N., R. 75 W., 3 miles southwest of Eaton Reservoir and 11 miles northeast of Glendevey.

Drainage Area and Period of Record.-- Transmountain diversion. Diversion is from Sand Creek in sec. 22, T.11 N., R. 75 W. At times includes water diverted from tributaries of Deadman Creek (tributary to Nunn Creek ) in sec. 9, T. 10 N., R. 75 W. via the Deadman Ditch (measured at the "Deadman Ditch at Deadman Park" gage). The Deadman Creek water is diverted into the headwaters of Sand Creek, making it available to the Wilson Supply Diversion from Sand Creek, about 5 miles downstream. Sand Creek diversions can be arrived at by subtracting the Deadman Ditch gage from the Wilson Supply gage.

Diversion is to Sheep Creek (tributary to North Fork Cache la Poudre River) in sec. 13 T. 11 N., R. 75 W., in Cache la Poudre River basin. Water is stored in Eaton (aka "Worster" reservoir, owned by the City of Greeley.; Data is available from the USGS (WSP 1310) from October 1912 to September 1947. Daily values are available from the DWR from May 1, 1933 to present.

Equipment.-- F-Type graphic water-stage recorder and a Sutron 56-0540-400-DTR shaft encoder connected to a satellite monitored data collection platform in a 42-inch corrugated metal pipe shelter overtop a 2.50-foot square concrete stilling well at a 10-foot Parshall flume. A metal drop tape and an adjustable reference point are the primary reference. A supplemental staff gage is present but it is set too deep in the flume's converging section and should not be used.

Hydrologic Conditions.-- Regulated diversion. This was a normal or average year for snow-pack. The ditch started May 14, 2013 and turned off July 20, 2013. Only one small rain event was captured on July 20, 2013.

Gage-Height Record.-- The primary record is 15-minute satellite data logged DCP data and chart record as backup. This year, chart record was made available from May 14 through June 19, 2013. Chart values were used without loss of accuracy from 1700 on May 14 to 1045 on May 15, 2013 when the shaft encoder was set and from 0600 - 0945 and 1100 - 1145 on May 20, 2013 when the battery voltage was insufficient to power the station's instrumentation. Instrument calibration was maintained by four visits made this season by DWR hydrographers. The instrument was found to be reading accurately on all visits.

Datum Corrections.-- Levels were last run on August 28, 2012 using RM. 2 as base. No correction was necessary.

Rating.-- The control is a 10-ft. Parshall flume, a standard 10-ft. Parshall flume rating was continued again this year. Two discharge measurements (Nos. 26 and 27) were made during the year at 19.4 and 0.77 cubic feet per second (cfs), respectively. The peak discharge of 107 cfs occurred at 1815 on May 17, 2013 at a gage height of 1.87 ft. with a stage distributed shift of 0.00 ft. exceeding this year's high flow measurement by 87.6 cfs and 1.22 ft. of stage respectively.

Discharge.-- Stage dependant shifting was for all periods of active diversion using variable shift table WSDEARCOVSC13-1. The variable shift table is defined by three measurements (Nos. 25-27) made in the 2012 and 2013 water years. Measurement Nos. 25 and 26 were adjusted to the rating requiring adjustments of -3.28% and -2.02% respectively.

Special Computations.-- None.

Remarks.-- The record is good. The diversion operates seasonally. Water was run from May 14, 2013 until July 20, 2013. The gage was shut down for the season on July 29, 2013. Gage maintained and record developed by Lee Cunning.

Recommendations.-- Multiple measurements per year should be endeavored, specifically watching for measurement opportunities at low, mid and higher flow rates with an emphasis on higher flow rates. A SDR-0001-1 unit should be installed at the gage to better track interactions with the instrumentation by ditch company personnel.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06750500 WILSON SUPPLY DITCH NEAR EATON RESERVOIR @ 10 FT PARSHALL FLUME

RATING TABLE-- STD10FTPFXP USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

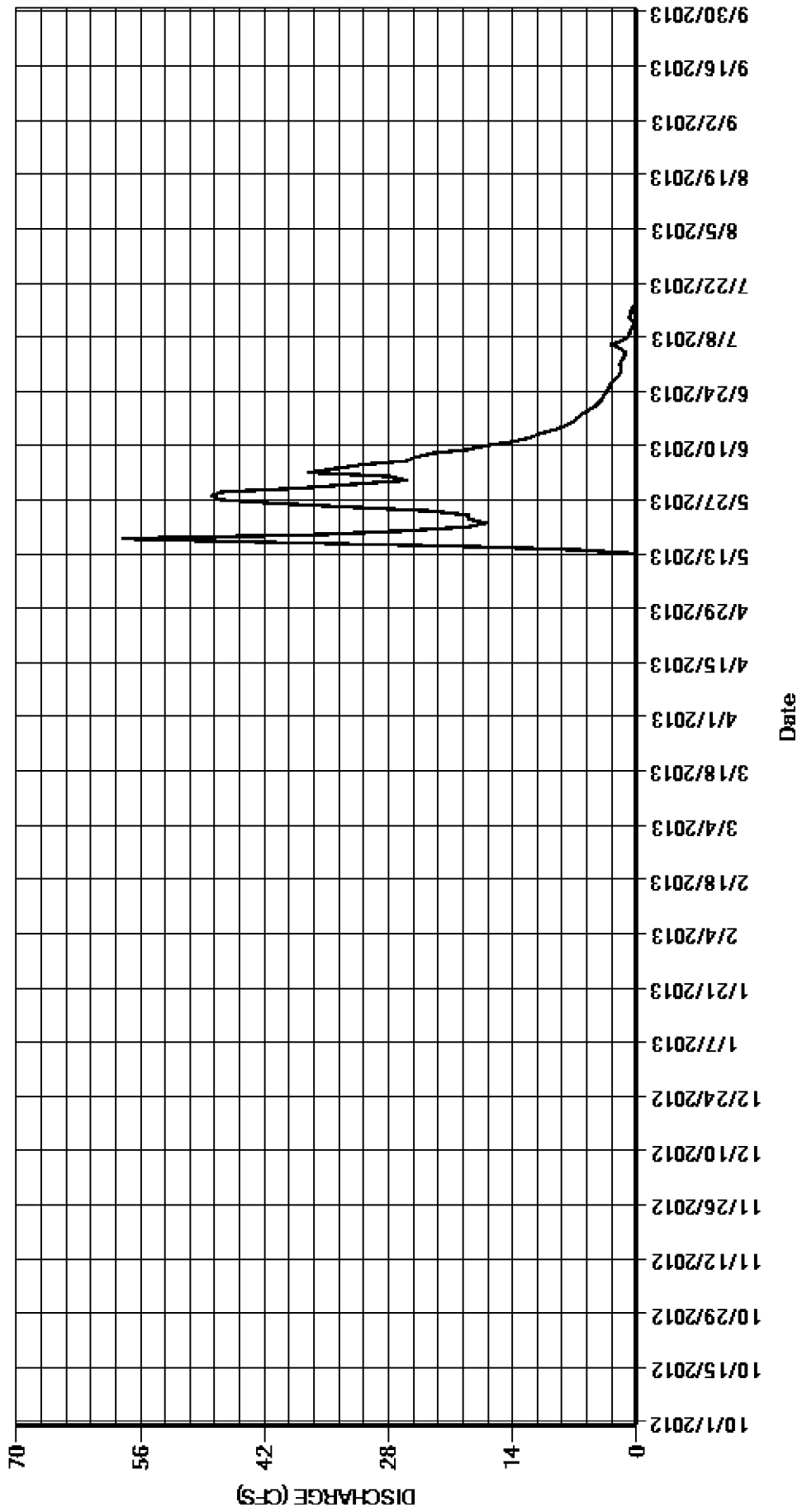
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26	1.9	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28	1.7	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37	1.4	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34	1.3	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31	1.9	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26	2.9	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25	1.6	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23	1.0	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	0.78	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17	0.69	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	0.33	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	0.32	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	0.91	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.6	9.3	0.65	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21	8.1	0.64	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41	7.2	0.34	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	58	6.8	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36	6.3	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26	5.5	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	4.8	0.23	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17	4.3	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	3.9	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	3.7	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23	3.4	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32	3.1	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41	2.9	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	47	2.5	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48	2.0	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	47	1.8	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	38	1.8	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	32	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	570.60	380.4	18.59	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	18.4	12.7	0.60	0.000	0.000
AC-FT	0	0	0	0	0	0	0	1130	755	37	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	58	37	2.9	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.00	0.00	0.00

CAL YR	2012	TOTAL	437.89	MEAN	1.20	MAX	18	MIN	0.00	AC-FT	869
WTR YR	2013	TOTAL	969.59	MEAN	2.66	MAX	58	MIN	0.00	AC-FT	1920

MAX DISCH: 107 CFS AT 18:15 ON MAY 17, 2013 GH 1.87 FT SHIFT 0 FT  
 MAX GH: 1.87 FT AT 18:15 ON MAY 17, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06750500 WILSON SUPPLY DITCH NEAR EATON RESERVOIR @ 10 FT PARSHALL FLUME  
 WY2013 HYDROGRAPH



# REPUBLICAN RIVER BASIN

## PIONEER DITCH

Water Year 2013

Location.--	Lat. N.40°04'54.0"; Long. W. 102°7'23.24" (WGS84). Gage is on the right side of a 5 ft. Parshall flume along the Pioneer Ditch 4 mi east of Wray, CO, and 1000 ft. south of U.S. Highway 34. in Yuma County, CO.
Drainage Area and Period of Record.--	Controlled diversion from the North Fork of the Republican River. Since the ditch is senior to any downstream users, it will frequently dry the river at its headgate, which is about 5 miles from the Stateline. Rush Creek comes into the river between the Pioneer headgate and the USGS gage on the Stateline.;
Equipment.--	Digital incremental Sutron 8500 shaft encoder connected to a SatLink 1 Data Collection Platform (DCP) and a weekly Stevens Type F chart recorder at a 5 ft. Parshall flume in a concrete lined canal section. A staff gage at the flume's left Ha location serves as the primary and only reference. The canal has a timber suspended upstream of the gage to slow approach velocities of waters entering the flume.
Hydrologic Conditions.--	The Pioneer Ditch is a controlled diversion from North Fork of the Republican River, which is derived from underground sources and sand hill plains storm runoff. Diversion is regulated by obligations to the states of Kansas and Nebraska under the Republican River Compact.
Gage-Height Record.--	The primary record is telemetered 15-minute data with logged DCP data and chart record as backup. The record is complete and reliable. Diversions from the river ended on November 2, 2012 for the winter and resumed on June 28, 2013. Instrument calibration was supported by 51 visits made to the gage. Instrument calibration corrections were applied to the record as defined by observations made at the gage. Residual, non-zero gage-heights are typically seen after the water is turned off. This year gage-heights below about 0.12 ft were considered zero flow.
Datum Corrections.--	Levels were last run on May 9, 2011 using the average flume crest elevation of 0.000 ft. as base. The staff was found to be 0.027 ft. high but was not corrected. These findings account for a large portion of the negative shifts typically found at this gage.
Rating.--	The control is a 5 ft. Parshall flume set in a trapezoidal concrete canal section with a concave transition section to the flume. The canal is straight above and below the flume and submergence is generally not a problem. A timber is suspended in the canal upstream of the Parshall flume to slow waters entering the flume. Accumulation of debris on the timber can cause unpredictable velocity variations in the flume. A standard 5 ft. Parshall flume rating, STD05FTPF, was continued this year. Twelve discharge measurements (Nos. 742-753) were made this year by Colorado Division of Water Resources and Nebraska Natural Resources staff ranging in discharge from 9.78 to 25.1 cfs. The peak discharge of 27.8 cfs occurred at 03:45 on July 30, 2013 at a gage-height of 1.26 ft. with a shift of -0.03 ft. exceeding this year's high measurement (No. 748), made July 31, 2013 by 0.08 ft. of stage. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/-5%) discharge measurement for a 5 ft Parshall Flume is 1.56 to 85.6 cfs. Anything above or below this range is outside the +/-5% accuracy range, unless defined by measurements.
Discharge.--	Shifts are primary caused by the changes in approach velocities or the accumulation of vegetal growth in the flume itself. Given the variability of approach conditions, time shifting is generally used. Shifting control method was used all year and shifts were distributed by time as defined by measurements. Measurements made this year showed shifts varying between -0.01 and -0.13 ft. Measurement Nos. 742, 744, 747, 750, 752 and 754, made by State of Nebraska staff, were not used for the following reasons: inconsistency in depths, angle coefficients, and velocities. All remaining measurements were given full weight except for Nos. 749 which was discounted 0.85% to smooth shift distributions. By agreement with the State of Nebraska, all discharge measurements are made at an angle iron brace 6.0 ft. in width at the staff cross section. Measured depths are usually quite close to the staff GH, which gives a reasonable check on depths. Velocities are compared with Colorado measurements that are close in time and at similar GH.
Special Computations.--	Zero flow is determined operationally. Sustained stages at or below 0.12 ft. in depth are assumed to be zero flow and were adjusted as such. State of Colorado personnel measured with a custom rated Mag-Head Pygmy meter, taking 21 depths and velocities across the flume at 0.30 ft. intervals. Nebraska Natural Resources personnel used a standard rating AA meter, taking 13 sections at 0.5 ft intervals.
Remarks.--	The ditch started later than normal due to compact issues between the State of Nebraska and the Pioneer Ditch (Nebraska's portion of the ditch). The record is good. Station maintained and record developed by Devin Ridnour.
Recommendations.--	Do not make encoder or pen corrections when the ditch is off and the floats are bottomed out. Make sure the encoder and pen floats are clear of each other and the well cylinder. Cooperation between the Colorado Hydrographer/Water Commissioner and Nebraska personnel has been helpful in arriving at consistent measurement techniques at this flume. Nebraska's spin times could be documented better. At the start of next season we should meet with Nebraska and ask them to write on our visit sheets and compare notes on technique. The pygmy meter should always be used at this flume, but if one State uses it and the other does not, then there may be problems with shifts.

STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

PIONEER DITCH

RATING TABLE-- STD05FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

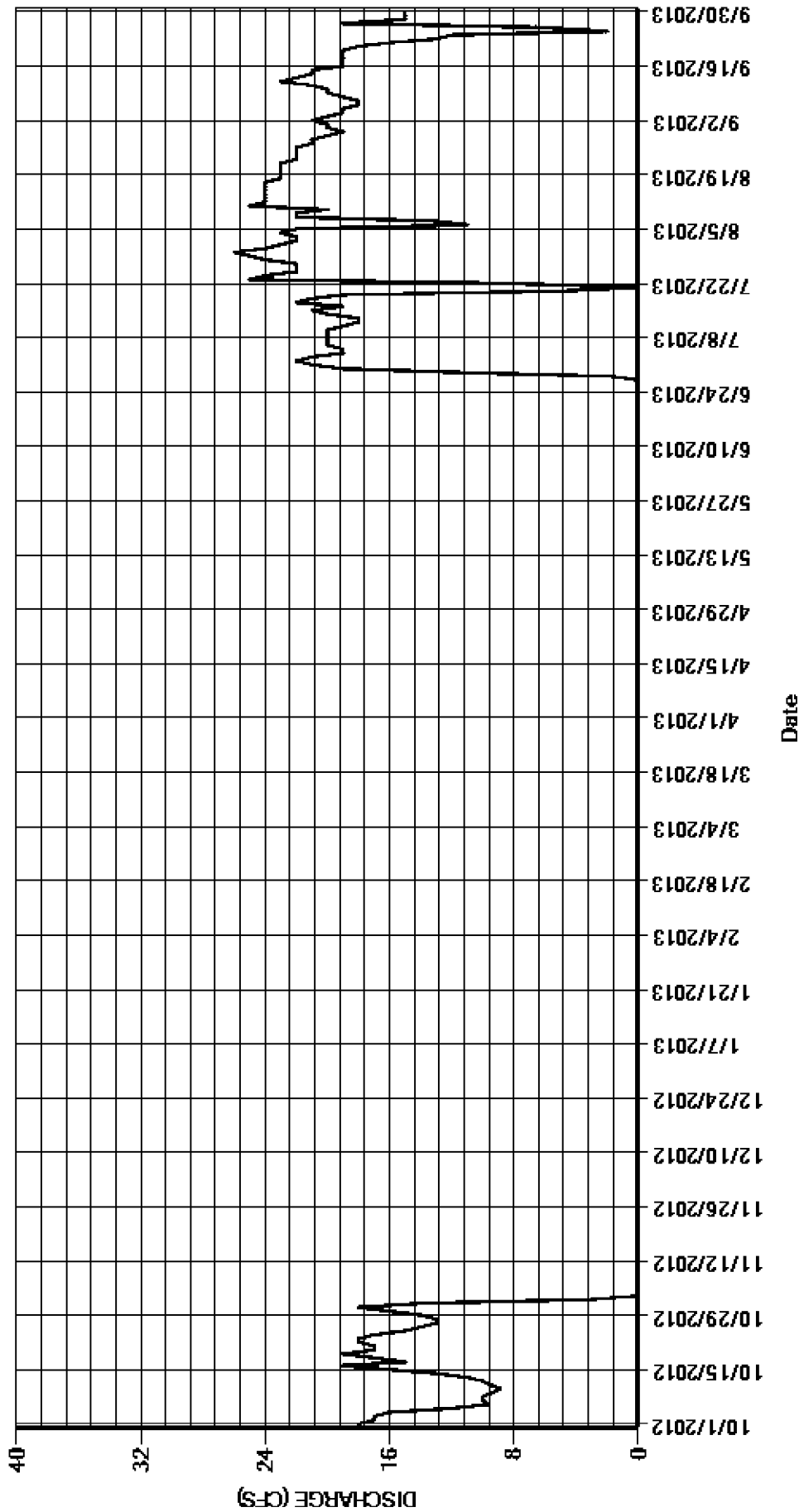
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21	23	20
2	17	3.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22	22	21
3	17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21	22	20
4	16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	23	19
5	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	22	19
6	9.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20	11	18
7	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20	13	18
8	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20	22	19
9	9.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20	22	20
10	8.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20	20	20
11	9.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	25	21
12	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18	24	23
13	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18	24	22
14	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20	24	21
15	16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21	24	21
16	19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	24	19
17	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22	24	19
18	17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21	23	19
19	19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	23	19
20	17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.0	23	19
21	17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23	18
22	18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.6	23	16
23	18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25	22	13
24	17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24	22	12
25	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22	22	2.0
26	14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22	22	6.6
27	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22	21	19
28	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.7	24	21	15
29	14	0.00	0.00	0.00	---	0.00	0.00	0.00	11	25	20	15
30	16	0.00	0.00	0.00	---	0.00	0.00	0.00	19	26	19	15
31	18	---	0.00	0.00	---	0.00	---	0.00	---	24	20	---
TOTAL	447.5	17.20	0.00	0.00	0.00	0.00	0.00	0.00	31.70	606.60	673	528.6
MEAN	14.4	0.57	0.000	0.000	0.000	0.000	0.000	0.000	1.06	19.6	21.7	17.6
AC-FT	888	34	0	0	0	0	0	0	63	1200	1330	1050
MAX	19	14	0.00	0.00	0.00	0.00	0.00	0.00	19	26	25	23
MIN	8.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	2.0

CAL YR	2012	TOTAL	3607.79	MEAN	9.86	MAX	27	MIN	0.00	AC-FT	7160
WTR YR	2013	TOTAL	2304.60	MEAN	6.31	MAX	26	MIN	0.00	AC-FT	4570

MAX DISCH: 27.8 CFS AT 03:45 ON JUL 30, 2013 GH 1.26 FT SHIFT -0.03 FT  
MAX GH: 1.26 FT AT 03:45 ON JUL 30, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PIONEER DITCH  
WY2013 HYDROGRAPH



REPUBLICAN RIVER BASIN  
PIONEER DITCH AT THE COLORADO-NEBRASKA STATELINE  
Water Year 2013

Location.-- Lat. N. 40°03'39"; Long. W. 102°03'4.70" (WGS84) on the right bank of the Pioneer Ditch at a 4 ft. Parshall flume 6.77 miles northwest of Haigler, NE, 1200 ft. south of US 34 near the Colorado-Nebraska Stateline.

Drainage Area and Period of Record.-- Controlled diversion from the North Fork of the Republican River. Since the ditch is senior to any downstream users, it will frequently dry the river at its headgate, which is about 5 miles from the Stateline. Rush Creek comes into the river between the Pioneer headgate and the USGS gage on the Stateline.

Nebraska also maintains a gage at the end of the ditch where wastewater tails back into the Arikaree River (aka "Middle Fork of the Republican River"). This is at a point just above where the Arikaree confluences with the North Fork of the Republican River.;

Equipment.-- Digital incremental Sutron 8500 shaft encoder connected to a SatLink 1 Data Collection Platform (DCP) and a weekly Steven's Type F chart recorder at a 4 ft. Parshall flume. The site has two outside vertical enameled steel staffs (Ha-Hb, with the Hb staff set with 4.0 ft = 0.0). The Ha staff is the primary and only reference gage.

Hydrologic Conditions.-- The Pioneer Ditch is a controlled diversion from North Fork of the Republican River, which is derived from underground sources and sand hill plains storm runoff. This gage measures water delivered to Nebraska under the Republican River Compact. Heavy rains and some natural springs will cause flows to show up at the flume when the headgate is off. During the winter months an earth dam is in place to let the natural springs flow to the North Fork Republican River.

Gage-Height Record.-- The primary record is telemetered 15-minute data with logged DCP data and chart record as backup. The record is complete and reliable. Recorded gage-heights less than 0.05 feet were considered zero flow due to the float being beached on the mud in the stilling well. If it is noted the ditch was off on visit logs and some residual GH's were between 0.00 and 0.05, then flow was considered zero. Instrument calibration was maintained by over 48 visits to the gage. Instrument calibration corrections were applied to the record as defined by visits made to the gage.

Datum Corrections.-- Levels were last run on May 9, 2011 using the average flume crest elevation of 0.000 ft as base. The flume was found to be out of level laterally, with the right side (stilling well intake side) found to be about 0.07 ft lower than the left (staff gage side). This accounts for a part of the positive shifts being measured. No correction was made to the staff.

Rating.-- The control is a 4 ft. Parshall flume with concrete wing walls in an earthen canal section. The canal is mostly straight above and below the flume. Submergence can be caused by vegetal growth downstream of the flume. A standard 4 ft. Parshall flume rating, STD04FTPF, was continued this year. Twelve discharge measurements (Nos. 743-754) were made this year by Colorado Division of Water Resources and Nebraska Natural Resources staff ranging in discharge from 7.99 to 21.6 cfs. The peak discharge of 33.9 cfs occurred at 17:15 on July 19, 2013 at a gage-height of 1.52 ft using a shift of +0.09 ft. exceeding this year's high measurement (No. 750) made August 15, 2013 by 0.40 ft. in stage.

Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/-5%) discharge measurement for a 4 ft Parshall Flume is 1.26 to 67.9 cfs. Anything above or below this range is outside the +/-5% accuracy range, unless defined by measurements.

Discharge.-- Shifts are primarily caused by changes in approach and departure conditions. Positive shifts can arise from the tilt and the slightly warped geometry of the flume. Encroachment of the flume wing walls into the flume entrance section and the resulting turbulence wake also is contributing to the positive shift and may also cause variability in staff gage readings and/or the need for gage height corrections to the shaft encoder. Shifting control method was used all year. Shifts were distributed by time as defined by measurements. Measurements made this year showed unadjusted shifts varying between 0.04 to +0.11 ft. All remaining measurements were given full weight except for Nos. 743, 745, 748, 752 and 753 which were discounted up to 6.4% to smooth shift distributions.

Special Computations.-- Zero flow is determined operationally. Sustained stages at or below 0.05 ft. are assumed to be zero flow and were adjusted as such. State of Colorado personnel measure using a custom rated Mag-Heady Pygmy meter at 0.30 ft. intervals where as State of Nebraska staff generally use a standard AA meter using 0.50 ft. intervals. The record is compared with Pioneer Ditch at the Headgate figures to make sure Stateline flows are consistent with the amounts diverted above. Daily flows greater at Stateline only occurred as a result of time delays when flow was dropping at the headgate or due to rain events causing runoff into the ditch between the two gages.

Remarks.-- The ditch started later than normal due to compact issues between the State of Nebraska and the Pioneer Ditch (Nebraska's portion of the ditch). The record is good, except for June 29, July 22 and September 26 which are downgraded to fair due to the accuracy of the Parshall Flume. Station maintained and record developed by Devin Ridnour.

Recommendations.-- Do not make encoder or pen corrections when the ditch is off and the floats are bottomed out. Make sure the encoder and pen floats are clear of each other and the well cylinder.



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

PIONEER DITCH AT THE COLORADO-NEBRASKA STATELINE

RATING TABLE-- STD04FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

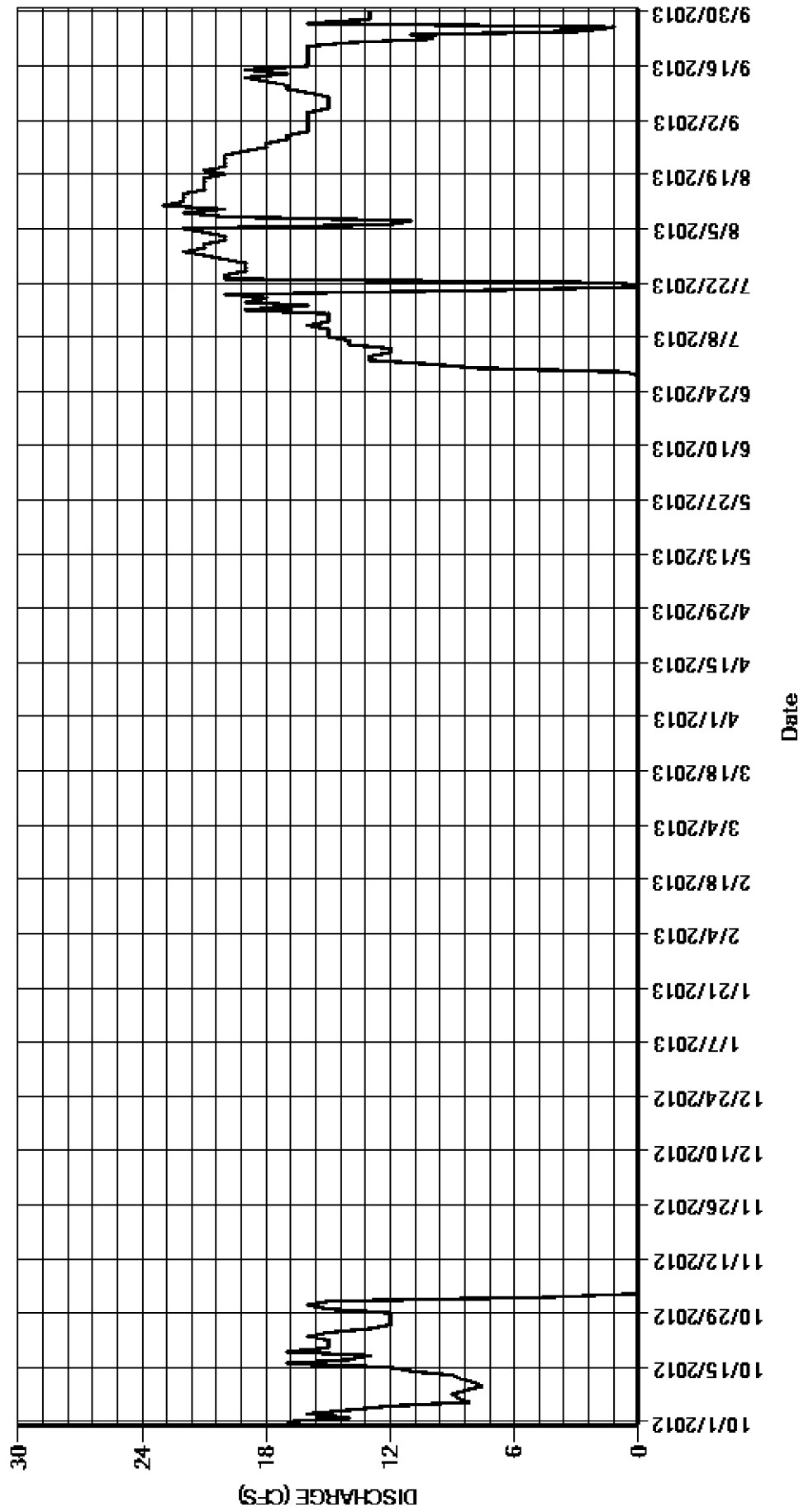
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10	21	16
2	14	4.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	20	16
3	16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	20	16
4	14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	21	16
5	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	22	15
6	8.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	12	15
7	8.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	11	15
8	9.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15	20	15
9	8.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15	22	16
10	7.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15	20	17
11	7.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16	23	17
12	8.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15	22	18
13	9.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15	22	19
14	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15	22	17
15	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	21	19
16	17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16	21	16
17	14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	21	16
18	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18	21	16
19	17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20	20	16
20	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.2	21	16
21	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20	16
22	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.83	20	14
23	16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20	20	10
24	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20	20	11
25	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	19	2.7
26	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	18	1.2
27	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	18	16
28	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20	17	13
29	12	0.00	0.00	0.00	---	0.00	0.00	0.00	0.56	21	17	13
30	15	0.00	0.00	0.00	---	0.00	0.00	0.00	7.8	22	16	13
31	16	---	0.00	0.00	---	0.00	---	0.00	---	21	16	---
TOTAL	392.4	19.80	0.00	0.00	0.00	0.00	0.00	0.00	8.36	476.03	604	436.9
MEAN	12.7	0.66	0.000	0.000	0.000	0.000	0.000	0.000	0.28	15.4	19.5	14.6
AC-FT	778	39	0	0	0	0	0	0	17	944	1200	867
MAX	17	15	0.00	0.00	0.00	0.00	0.00	0.00	7.8	22	23	19
MIN	7.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	1.2

CAL YR	2012	TOTAL	3086.26	MEAN	8.43	MAX	22	MIN	0.00	AC-FT	6120
WTR YR	2013	TOTAL	1937.49	MEAN	5.31	MAX	23	MIN	0.00	AC-FT	3840

MAX DISCH: 33.9 CFS AT 17:15 ON JUL 19, 2013 GH 1.52 FT SHIFT 0.09 FT  
 MAX GH: 1.52 FT AT 17:15 ON JUL 19, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PIONEER DITCH AT THE COLORADO-NEBRASKA STATELINE  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
07082500 LAKE FORK CREEK BELOW SUGAR LOAF DAM NEAR LEADVILLE  
Water Year 2013

Location.-- Lat. 39°15'4.2", Long. 106°22'28.5", UTM Zone 13 381694 E and 4345815 N, in SE¼NW¼NW¼ sec. 19, T.9 S., R.80 W., Lake County, on right bank 4.2 miles upstream from junction of Lake Fork Creek and Arkansas River, approximately 500 ft below outlet of Sugarloaf Dam, approximately 4 miles west of Leadville CO..

Drainage Area and Period of Record.-- 27.55 sq. mi.;

Equipment.-- Satellite-monitored data collection platform including a shaft encoder and a Stage Discharge Recorder for backup purposes. The gage is constructed from a 42-inch diameter corrugated metal pipe and concrete well. Shaft encoder and SDR are set to inside electric tape gage mounted on instrument shelf. An outside staff gage is also used for reference purposes. Shelter is equipped with AC power for the well heater. Control is a concrete weir/apron tapered lower from left to right bank, located at gage. The ET broke on Sept 28, 2011 and has not been repaired or replaced. The OG is being used as the primary reference gage.

Hydrologic Conditions.-- This gage is located approximately 500 ft from the discharge gates of Sugar Loaf Dam on Turquoise Reservoir. During winter months the flow comes from the gates of the dam and runs through and below the very large boulders in the stream bed and surfaces just before the gage. The water released is warm enough the control does not experience ice affected days. The well is also kept thawed with small tank heater during the winter months.

Gage-Height Record.-- The primary record is 15-minute satellite data. SDR record is used for back-up purposes. Record is complete and reliable. Missing data for one 15-minute value on October 3, 2012 and eight 15-minute value on May 23, 2013 was completed using data stored in the the DCP.

Datum Corrections.-- Levels were last run on May 31, 2007, from BM#3 to the RP. No corrections were needed.

Rating.-- The control is a 38-ft. wide, concrete weir/apron with ogee lip. Rating No. LFCBSLCO04A, dated Oct. 1, 1975, was used all water year. It is well defined to about 350 cfs. Two discharge measurements (Nos. 577-578) with a discharge of 14.8 cfs were made this water year. Measurement No. 577 not used in record development due to ADCP accuracy issues. The peak flow of 18.0 cfs occurred at 1445 on May 31, 2013 at a GH of 0.52 ft, with a shift of 0.04 ft. The gage height for the peak exceeded the stage of maximum discharge Measurement No. 578 made August 7, 2013 by 0.04 ft.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and distributed by stage and time. Variable stage-shift relationship LFCBSLCOVS13 was used the whole water year. This variable shift curve is developed based on current water year measurements and historical measurement (#571) at the top end. Discharge measured (#577) on April 30, 2013 was not used for record development due to ADCP accuracy issues.

Special Computations.--

Remarks.-- Record is complete and is considered good. The peak discharge and gage height are rated good based on a related measurement and site visit. Station maintained by Cheston Hart and record developed by Ashenafi Hydebo.

Recommendations.-- Levels need to be run in WY2014 to verify the PZF and previous levels, as level history indicates a correction to the ET index elevation may be warranted. High water measurements cannot be made at this gage at this time. A bank operated cable way installation should be further investigated. The electric tape gage should be repaired or replaced.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

07082500 LAKE FORK CREEK BELOW SUGAR LOAF DAM NEAR LEADVILLE

RATING TABLE-- LFCBSLCO04A USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

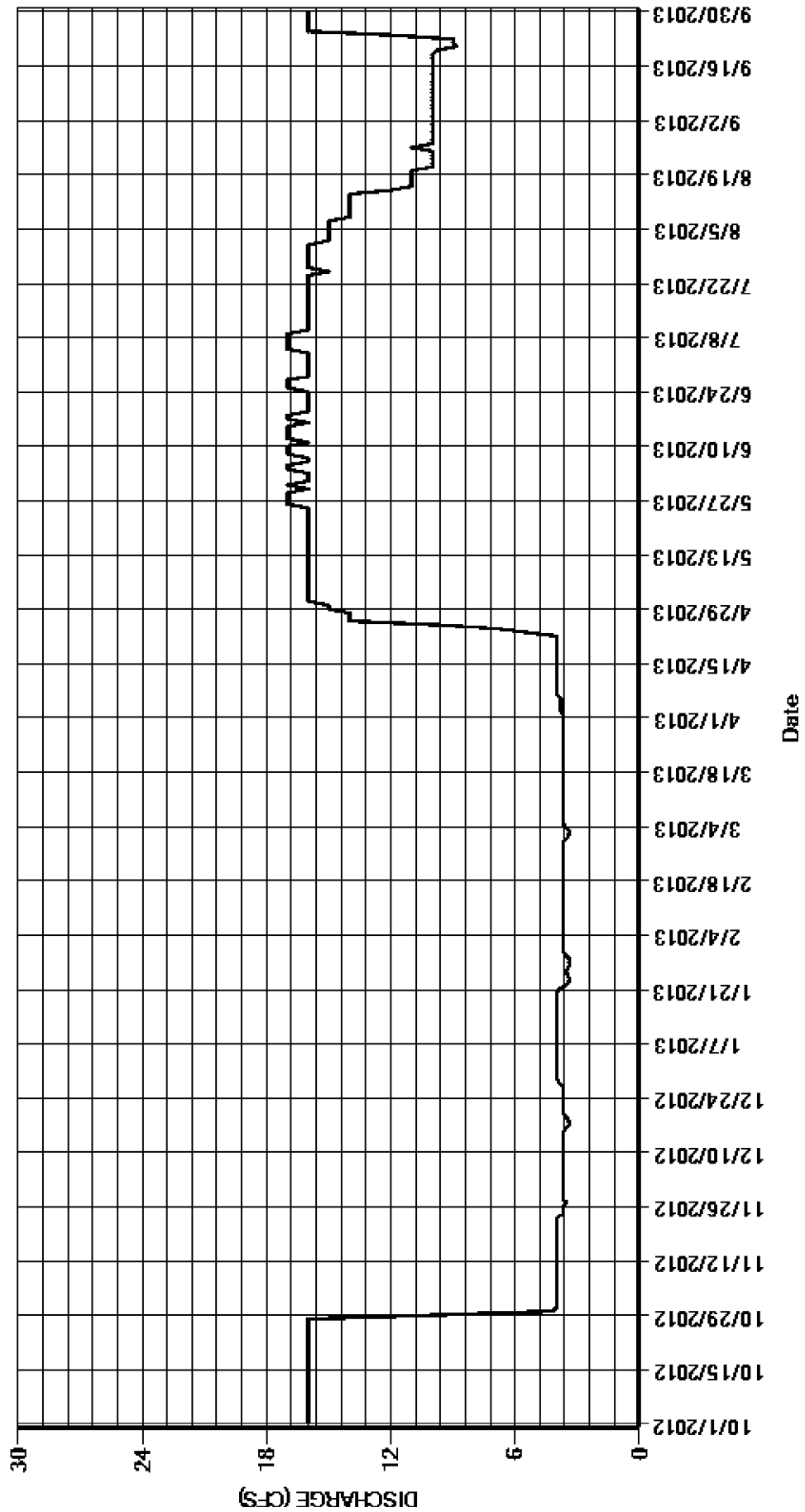
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16	4.0	3.7	4.0	3.7	3.5	3.7	16	16	16	16	10
2	16	4.0	3.7	4.0	3.7	3.4	3.7	16	16	16	15	10
3	16	4.0	3.7	4.0	3.7	3.4	3.8	16	16	16	15	10
4	16	4.0	3.7	4.0	3.7	3.6	3.8	16	17	16	15	10
5	16	4.0	3.7	4.0	3.7	3.7	3.8	16	17	17	15	10
6	16	4.0	3.7	4.0	3.7	3.7	3.8	16	16	17	15	10
7	16	4.0	3.7	4.0	3.7	3.7	4.0	16	16	17	15	10
8	16	4.0	3.7	4.0	3.7	3.7	4.0	16	17	17	14	10
9	16	4.0	3.7	4.0	3.7	3.7	4.0	16	17	17	14	10
10	16	4.0	3.7	4.0	3.7	3.7	4.0	16	17	16	14	10
11	16	4.0	3.7	4.0	3.7	3.7	4.0	16	16	16	14	10
12	16	4.0	3.7	4.0	3.7	3.7	4.0	16	17	16	14	10
13	16	4.0	3.7	4.0	3.7	3.7	4.0	16	17	16	14	10
14	16	4.0	3.7	4.0	3.7	3.7	4.0	16	17	16	14	10
15	16	4.0	3.7	4.0	3.7	3.7	4.0	16	17	16	12	10
16	16	4.0	3.6	4.0	3.7	3.7	4.0	16	16	16	11	10
17	16	4.0	3.4	4.0	3.7	3.7	4.0	16	17	16	11	10
18	16	4.0	3.4	4.0	3.7	3.7	4.0	16	17	16	11	10
19	16	4.0	3.5	4.0	3.7	3.7	4.0	16	16	16	11	10
20	16	4.0	3.7	4.0	3.7	3.7	4.0	16	16	16	11	9.8
21	16	4.0	3.7	3.9	3.7	3.7	4.0	16	16	16	10	8.8
22	16	4.0	3.7	3.6	3.7	3.7	4.0	16	16	16	10	9.0
23	16	4.0	3.7	3.4	3.7	3.7	5.5	16	16	16	10	9.0
24	16	3.7	3.7	3.4	3.7	3.7	7.0	16	16	16	10	12
25	16	3.7	3.7	3.5	3.7	3.7	9.9	16	17	15	10	16
26	16	3.7	3.7	3.5	3.7	3.7	14	17	17	16	11	16
27	16	3.5	3.7	3.4	3.7	3.7	14	17	17	16	10	16
28	16	3.7	3.9	3.4	3.7	3.7	14	17	16	16	10	16
29	10	3.7	4.0	3.4	---	3.7	15	17	16	16	10	16
30	4.2	3.7	4.0	3.6	---	3.7	15	16	16	16	10	16
31	4.0	---	4.0	3.7	---	3.7	---	17	---	16	10	---
TOTAL	466.2	117.7	114.9	118.8	103.6	113.8	181.0	501	494	500	382	334.6
MEAN	15.0	3.92	3.71	3.83	3.70	3.67	6.03	16.2	16.5	16.1	12.3	11.2
AC-FT	925	233	228	236	205	226	359	994	980	992	758	664
MAX	16	4.0	4.0	4.0	3.7	3.7	15	17	17	17	16	16
MIN	4.0	3.5	3.4	3.4	3.7	3.4	3.7	16	16	15	10	8.8

CAL YR	2012	TOTAL	2873.8	MEAN	7.85	MAX	16	MIN	3.2	AC-FT	5700
WTR YR	2013	TOTAL	3427.6	MEAN	9.39	MAX	17	MIN	3.4	AC-FT	6800

MAX DISCH: 18.0 CFS AT 14:45 ON MAY 31, 2013 GH 0.52 FT SHIFT 0.04 FT  
 MAX GH: 0.52 FT AT 14:45 ON MAY 31, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07082500 LAKE FORK CREEK BELOW SUGAR LOAF DAM NEAR LEADVILLE  
 WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
07084500 LAKE CREEK ABOVE TWIN LAKES RESERVOIR  
Water Year 2013

Location.-- Lat 39°03'47", Long 106°24'28" (Mt. Elbert, Colorado quadrangle, 1:24000 scale), in NE1/4 SE1/4 Sec. 26, T11S, R81W, Lake County, Hydrologic Unit 11020001, on left bank at refurbished concrete section and bridge over Lake Creek originally established by US Forest Service, 1.35 mile upstream from high water line of Twin Lakes Reservoir, 0.65 miles upstream from Willis Creek tributary, and 2.1 miles southwest of village of Twin Lakes CO.

Drainage Area and Period of Record.-- 75 mi<sup>2</sup>;

Equipment.-- A Constant Flow Bubbler (CFB) stage sensor and satellite-monitored data collection platform in a 4 ft x 4 ft metal shelter. Primary reference gage is a drop wire weight mounted on the pedestrian bridge over the control. A temperature sensor is operated at the site. No changes this water year.

Hydrologic Conditions.-- Lake Creek fills Twin Lakes Reservoir and is tributary to the main stem of the Arkansas River. Flows at the gage are heavily affected by transmountain diversions from the Roaring Fork Basin in Division 5 through Twin Lakes Tunnel and into Lake Creek several miles above the gage. Diversions occur year round. Lake Creek Basin is approximately 73.1 sq miles with a mean elevation of 11,900 ft. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except many low volume trail roads and Highway 82 that travels over Independence Pass. No hydrologic condition changes were apparent this water year.

Gage-Height Record.-- The primary record is fifteen minute satellite transmitted data and DCP log with the CFB log used as backup. Record is complete and reliable, except for the following periods: Oct 26-29; Nov 8-12 2012; April 10, 18, 19, 2013, when ice affected the stage discharge relationship; and Nov 13, 2012 – April 3, 2013 when the station was closed for the winter. Turbulence at the gage, caused by the high flow velocities and large boulders, makes reading the wire weight gage for the site very difficult -- with accuracy of only ±0.10 ft during high water. This water year the wire weight gage was read to note the large discrepancies in gage height, but corrections to the CFB were not applied during times of high water. The CFB is calibrated before high water commences and is checked again once high water subsides and is re-calibrated as needed.

Datum Corrections.-- Levels were last run May 9, 2006.

Rating.-- The control at low flow (±50 cfs) is the 25-ft. long by 41.8 ft. wide concrete apron edged with angle iron on the upstream and downstream sides. At higher flows the channel immediately above the concrete section along with the vertical walls of the concrete section form the control. The concrete section also serves as a measuring base for high flow measurements made from a bridge directly over the control. Wading measurements are made on the same concrete apron during winter as this section stays more open than surrounding sections, although considerable ice breaking and removal is required. Outside of winter, wading measurements are made either at the current section or downstream at the old gage location as flow is more laminar and steady there. Whether wading or cabling, velocities are in the extreme range and this station is difficult to measure. This is especially true for cable measurements. For any flows above 500 cfs, a 100 lb. weight is required, and the depths are so shallow that placing the meter in the correct velocity profile is problematic. Rating No. 23, dated Nov 20, 2007, was used this year. Fifteen discharge measurements (Nos. 1042-1056) were made during the water year, ranging in discharge from 11.7 to 1320 cfs. Seven of these measurements were during the winter period and have no gage heights or shift but are used for winter estimation. Measurements covered the range in stage experienced, except higher daily flows of June 6-12, 2013. The peak discharge of 1920 cfs occurred at 2115 hours on June 10, 2013 at a gage height of 6.09 ft. with a shift of -.09 ft. It exceeded maximum flow Measurement No. 1053, made June 11, 2013, by 0.73 ft. in stage.

Discharge.-- Shifting control method was used for all periods of good record. Shifts were applied as defined by measurements and were distributed by stage and by time from Oct 1 - Nov 8 2012. Variable stage shift relationship LAKATLCOVSC13D was developed and applied from Nov 8, 2012 - June 11, 2013. Variable stage shift relationship LAKATLCOVSC13C was developed and applied from June 11 - Sept 30 2013. Open water measurements for this water year indicated shifts varying from -0.09 to 0.26 ft. Measurement Nos. 1042, 1052, 1054, and 1055 were discounted from 1.10% to 9.08%, respectively, for smoothing purposes. Shifts trended toward more negative during and after runoff due to fill above the concrete structure.

Special Computations.-- Discharge for periods of no gage-height or ice affected record were estimated based on record from the upstream station of Twin Lakes Tunnel added to an estimated base flow and adjusted daily from weather records. Estimated base flow is derived from seven measurements (Nos. 1043-1049). A hydrograph was used comparing estimated and computed flows with the upstream gage Twin Lakes Tunnel. Temperature data from this site was used in the estimating winter flows. A spreadsheet was created to help determine estimate days.

Remarks.-- Record is good, except during periods of ice affect, and times of no record, which are estimated and poor. Peak discharge is rated fair due to inability to accurately read the primary outside gage during the event. Station maintained and record developed by Cheston Hart.

Recommendations.-- Bank stabilization needs to be attempted for both sections upstream and downstream of control.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

07084500 LAKE CREEK ABOVE TWIN LAKES RESERVOIR

RATING TABLE-- LAKATLCO23 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

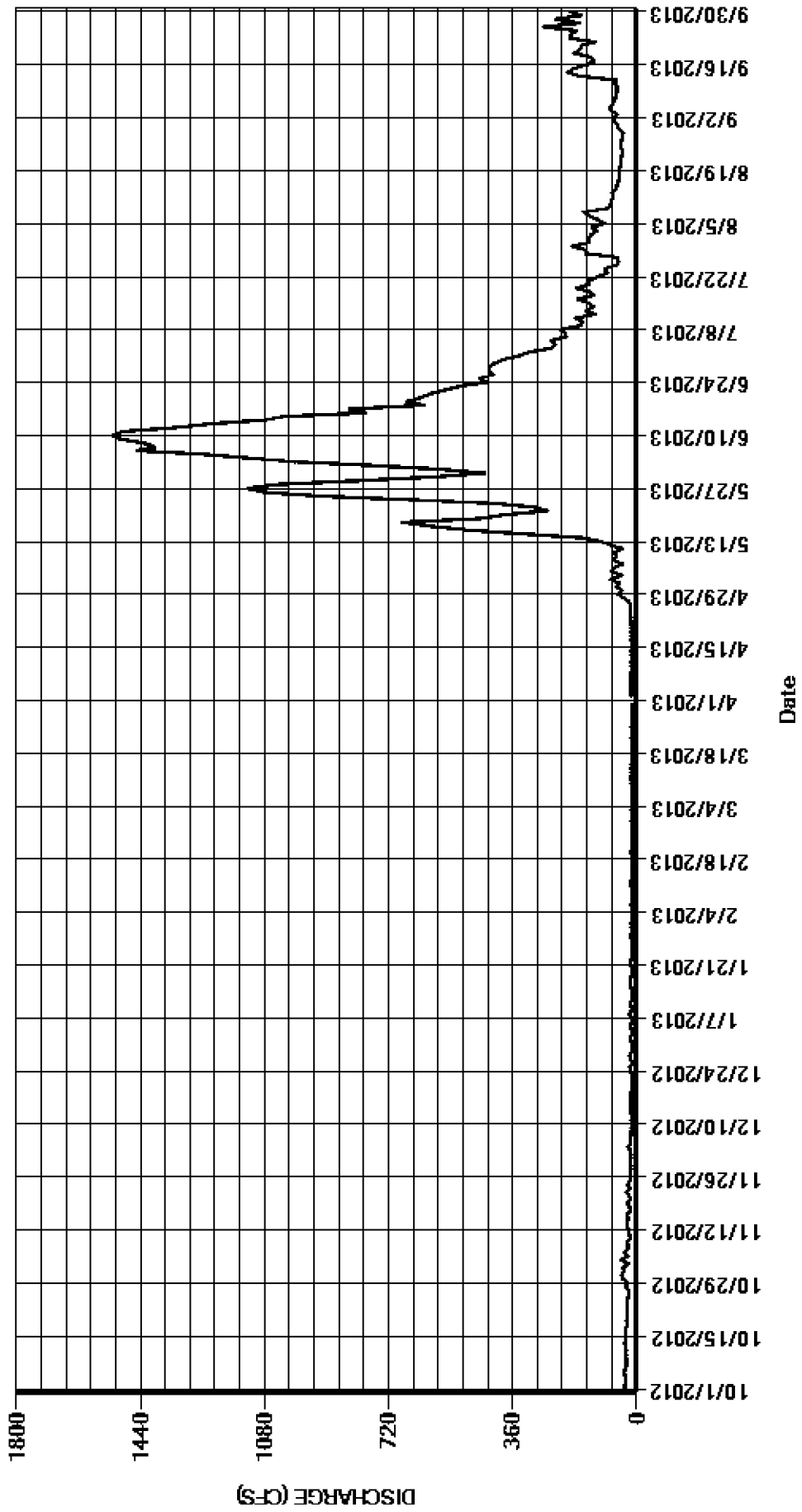
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	38	e17	e17	e16	e15	---	59	572	341	139	66
2	34	39	e17	e18	e14	e15	e16	50	770	314	133	66
3	33	25	e19	e14	e14	e15	e16	76	993	249	116	58
4	32	44	e25	e16	e14	e15	16	44	1120	238	130	76
5	36	25	e17	e18	e15	e15	17	73	1250	247	94	76
6	34	38	e18	e14	e17	e15	16	66	1450	206	114	67
7	31	25	e17	e15	e14	e15	16	42	1400	208	137	63
8	30	e25	e16	e21	e14	e15	16	69	1430	221	154	60
9	31	e27	e15	e15	e14	e15	15	60	1500	165	84	57
10	31	e18	e15	e16	e14	e15	e15	64	1520	157	78	57
11	31	e23	e15	e18	e17	e16	16	43	1490	178	73	63
12	33	e24	e15	e14	e16	e16	15	76	1340	121	68	61
13	34	e27	e16	e13	e14	e15	15	103	1240	147	71	166
14	33	e28	e16	e13	e14	e16	16	162	1080	125	62	200
15	33	e24	e16	e16	e14	e15	15	333	1030	142	58	181
16	33	e29	e16	e19	e14	e15	15	491	786	171	53	145
17	32	e19	e16	e18	e14	e15	16	598	834	123	51	123
18	28	e21	e16	e15	e14	e15	e15	679	619	136	51	137
19	29	e27	e15	e15	e15	e15	e16	454	667	174	50	181
20	29	e19	e14	e15	e17	e15	15	381	625	139	48	165
21	28	e22	e14	e17	e14	e15	16	261	600	137	46	160
22	28	e29	e13	e18	e14	e15	17	300	555	111	47	118
23	27	e21	e14	e14	e14	e15	17	419	511	86	44	193
24	28	e26	e18	e14	e14	e14	18	659	436	93	42	191
25	25	e19	e20	e14	e15	e15	18	921	457	58	45	175
26	e23	e18	e14	e14	e15	e15	19	1080	417	54	47	270
27	e24	e18	e18	e14	e15	e15	22	1130	428	54	44	168
28	e31	e17	e21	e16	e15	e15	37	1050	429	148	41	234
29	28	e17	e13	e17	---	e15	55	810	414	147	40	161
30	39	e17	e14	e15	---	e15	44	588	390	186	53	193
31	44	---	e14	e15	---	e15	---	442	---	139	56	---
TOTAL	967	749	504	488	411	467	560	11583	26353	5015	2269	3931
MEAN	31.2	25.0	16.3	15.7	14.7	15.1	19.3	374	878	162	73.2	131
AC-FT	1920	1490	1000	968	815	926	1110	22970	52270	9950	4500	7800
MAX	44	44	25	21	17	16	55	1130	1520	341	154	270
MIN	23	17	13	13	14	14	15	42	390	54	40	57

CAL YR	2012	TOTAL	32226	MEAN	88.0	MAX	622	MIN	13	AC-FT	63920
WTR YR	2013	TOTAL	53297	MEAN	146	MAX	1520	MIN	13	AC-FT	105700

MAX DISCH: 1920 CFS AT 21:15 ON JUN 10, 2013 GH 6.09 FT SHIFT -0.09 FT  
 MAX GH: 6.09 FT AT 21:15 ON JUN 10, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07084500 LAKE CREEK ABOVE TWIN LAKES RESERVOIR  
 WY2013 HYDROGRAPH





ARKANSAS RIVER BASIN  
LAKE CREEK BELOW TWIN LAKES RESERVOIR

Water Year 2013

Location.-- Lat. 39°04'36", Long. 106°18'04" NAD83, in NE¼SE¼, sec. 22, T.11 S., R. 80 W., Lake County, on right bank 1.2 miles upstream from confluence of Lake Creek and Arkansas River and 1500 ft downstream of Twin Lakes Dam.

Drainage Area and Period of Record.-- N/A.; 1961-present

Equipment.-- Satellite-monitored high data collection platform, shaft encoder, stage-discharge recorder (SDR) in a concrete shelter and well. Shaft encoder and SDR are set to an inside electric tape-down mounted on instrument shelf. Outside staff gage installed in flume but generally used as backup to primary reference tape-down gage. Control is a 30-foot concrete Parshall flume.

Hydrologic Conditions.-- The gage is located approximately 400 ft downstream of the outlet of Twin Lakes Reservoir. The water released is warm enough so the control does not experience ice affected days. No hydrologic condition changes were apparent this year.

Gage-Height Record.-- Primary record is 15-minute satellite data with the SDR data log used for backup purposes. Record is complete and reliable for the entire year.

Datum Corrections.-- Levels were last run on Sept. 6, 2007. Results were well within allowable limits; no corrections were needed/ taken.

Rating.-- Control at all stages is a 30-ft. concrete Parshall flume. A standard 30 ft. Parshall flume table was used all year. It is well defined at all stages. Three discharge measurements (Nos. 139-141) were made this year ranging from 14.4 cfs to 1280 cfs. Measurements cover the range in stage experienced except for the lower mean daily flows on October 20-22, 28-30; November 5, 16-18, 27-28, 2012; January 17-23, March 18-19, 2013 and higher mean daily flows of June 12, 2013. The peak discharge of 1400 cfs occurred at 1645 on June 11, 2013 at a gage height of 4.42 ft, with a shift of 0.39 ft. The maximum gage height exceeded maximum measurement (No. 140) by 0.23 ft. in stage.

Discharge.-- Shifting control method was used for the entire water year. Shifts were distributed using variable stage shift relationship, LAKBTLCOVSC13A, which is based on historical low flow measurements and high flow measurements made at the gage in WY10, WY11 and WY12 using an ADCP.

Special Computations.-- None.

Remarks.-- The record is good. Peak gage height and discharge are rated good. Station maintained by Cheston Hart and record developed by Ashenafi Hydebo.

Recommendations.-- Installation of a bank operated cable system below the control will allow safe and timely measurements at all stages for this site. Level results indicated the gage is very stable. Recommended to run level in WY14, as it is over 5 years since last survey.

STATE OF COLORADO  
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LAKE CREEK BELOW TWIN LAKES RESERVOIR

RATING TABLE-- STD30FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

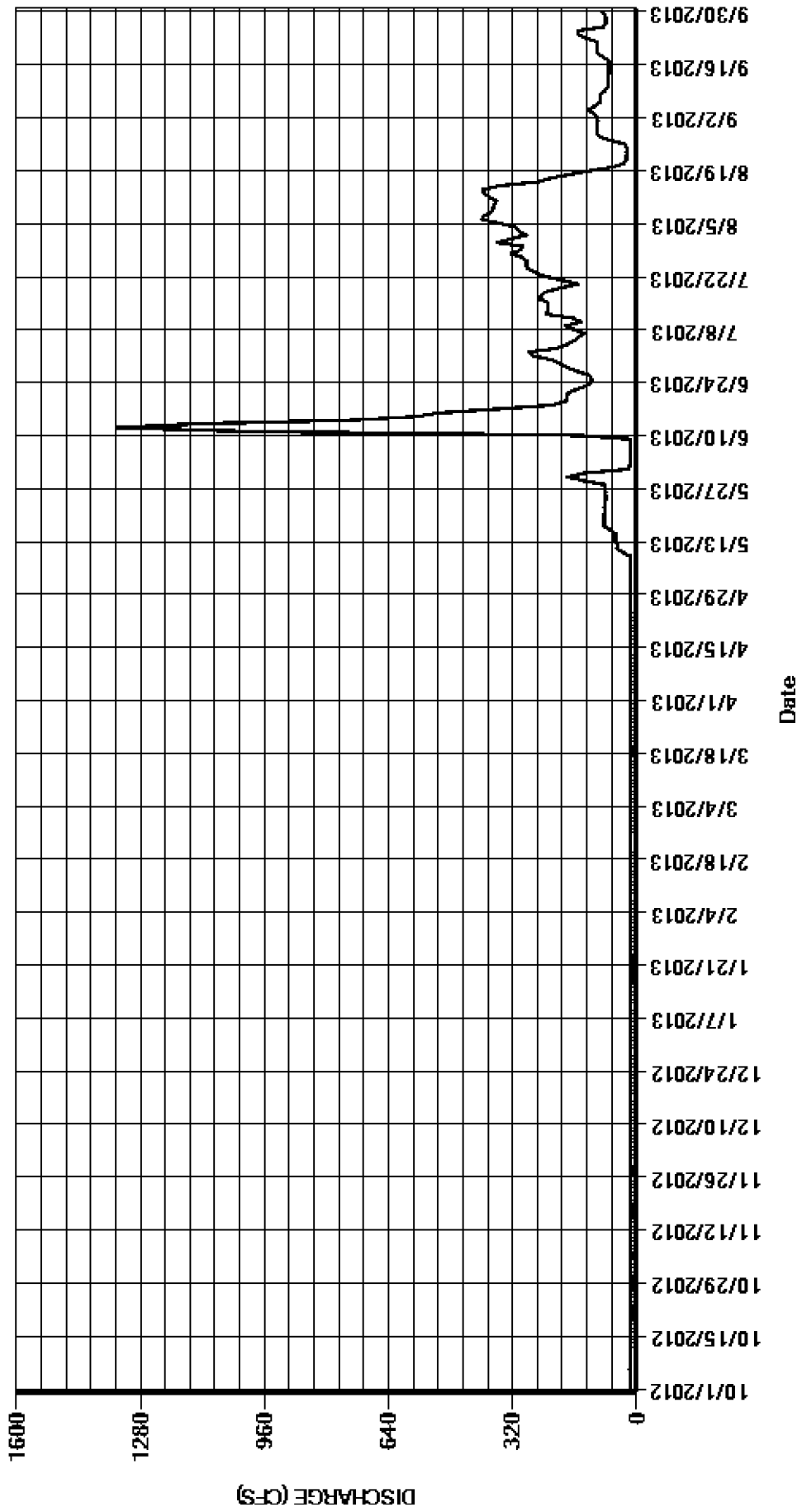
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	15	15	15	15	15	15	17	23	268	322	101
2	17	15	15	15	15	15	15	16	17	279	284	101
3	17	15	15	15	15	15	15	16	17	206	304	111
4	17	15	15	15	15	15	15	16	17	178	312	126
5	17	14	15	15	15	15	15	16	16	162	352	109
6	18	15	15	15	15	15	15	16	16	149	399	95
7	17	15	15	15	15	15	15	16	16	136	394	95
8	17	15	15	15	15	15	15	16	16	162	375	94
9	17	15	15	15	15	15	15	16	16	184	371	83
10	17	15	15	15	15	15	15	35	153	143	367	74
11	17	15	15	15	15	15	15	51	999	165	363	73
12	15	15	15	15	15	15	15	49	1340	232	380	73
13	15	15	15	15	15	15	15	56	1140	230	394	73
14	15	15	15	15	15	15	15	55	737	229	397	72
15	15	15	15	15	15	15	15	55	569	228	353	72
16	15	14	15	15	15	15	15	69	509	250	252	72
17	15	14	15	14	15	15	15	84	357	246	220	72
18	15	14	15	14	15	14	15	84	219	233	167	87
19	15	15	15	14	15	14	15	84	183	197	117	102
20	14	15	15	14	15	15	15	84	180	151	59	103
21	14	15	15	14	16	15	15	83	179	191	32	103
22	14	15	15	14	16	15	15	83	159	235	27	103
23	15	15	15	14	16	15	15	82	132	261	26	128
24	15	15	15	15	16	15	15	80	117	280	26	152
25	15	15	15	15	15	15	16	80	117	286	26	151
26	15	15	15	15	15	15	16	81	124	284	31	86
27	15	14	15	15	15	15	16	82	154	294	69	80
28	14	14	15	15	15	15	16	84	180	324	97	80
29	14	15	15	15	---	15	16	136	199	301	103	81
30	14	15	15	15	---	15	16	178	221	294	102	90
31	15	---	15	15	---	15	---	134	---	360	102	---
TOTAL	482	444	465	458	424	463	456	1954	8122	7138	6823	2842
MEAN	15.5	14.8	15.0	14.8	15.1	14.9	15.2	63.0	271	230	220	94.7
AC-FT	956	881	922	908	841	918	904	3880	16110	14160	13530	5640
MAX	18	15	15	15	16	15	16	178	1340	360	399	152
MIN	14	14	15	14	15	14	15	16	16	136	26	72

CAL YR	2012	TOTAL	35126	MEAN	96.0	MAX	303	MIN	14	AC-FT	69670
WTR YR	2013	TOTAL	30071	MEAN	82.4	MAX	1340	MIN	14	AC-FT	59650

MAX DISCH: 1400 CFS AT 16:45 ON JUN 11, 2013 GH 4.42 FT SHIFT 0.39 FT  
 MAX GH: 4.42 FT AT 16:45 ON JUN 11, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LAKE CREEK BELOW TWIN LAKES RESERVOIR  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
07086000 ARKANSAS RIVER AT GRANITE  
Water Year 2013

Location.-- Lat. 39°02'34", Long. 106°15'55", in SE¼SW¼ sec. 31, T.11 S., R.79 W., Chaffee County, Hydrologic Unit 11020001, on right bank at Granite, 100 ft east of U.S. Highway 24, 100 ft downstream from county bridge, and 200 ft upstream from Cache Creek at Granite, Colorado.

Drainage Area and Period of Record.-- 427 mi<sup>2</sup>. ; Gage established April 1895. Sporadic data from April 1895 to May 1901. Complete data from April 1910 to current year. Monthly data for some periods only.

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform and shaft encoder in 42-inch diameter corrugated metal pipe (CMP) shelter and well. Shaft encoder and chart set to inside electric tape gage. Gage shelter is supplied with AC power. A stock tank heater is used inside the well during periods of freezing weather to keep well open. A cableway for high flow measurements is located approximately 100 feet downstream from gage.

Hydrologic Conditions.-- The Arkansas River at Granite is located below both Twin Lakes and Turquoise Lake. The flow conditions are subject to releases from these lakes as well as native flows. Natural drainage area is approximately 427 sq miles. The basin consists of high mountain terrain some of which is above tree line with very little development.

Gage-Height Record.-- Primary record is 15-minute satellite data with DCP log and chart record used for back-up purposes. The record is complete and reliable, except for the following periods: Nov 11 thru Dec 31, 2012; Jan 1 thru Mar 11, 2013 when the stage discharge relationship was affected by ice. The shelter and well are situated on the right bank in calm water subject to significant shore ice, including complete channel and control freeze-over during periods of extreme cold weather.

Datum Corrections.-- Levels were last run Nov. 28, 2012, with no corrections needed.

Rating.-- Control is a boulder riffle 150 ft downstream. At high water stages channel and banks are the control. Rating No. 11A, implemented in Dec 2002, was used for the water year. Twelve discharge measurements (Nos. 417-428) were made during the water year ranging in discharge from 55.2 to 1680 cfs. They cover the range in flows experienced except for the lower daily flow of Dec 21, 22, 2012 and higher flows of June 11-13, 2013. The peak flow of 2100 cfs occurred at 0615 on June 12, 2013 at a of gage height of 5.12 ft with a shift of 0.19. ft. It exceeded mean stage of Measurement No. 424, made June 12, 2013 by 0.36 ft. in stage.

Discharge.-- Shifting control method was used during all periods of ice-free record. Shifts were distributed by time and event the entire year. Measurements show shifts varying from -0.03 ft. to +0.19 ft. All were given full weight and applied directly except Meas. #417 which was discounted by 4.73%.

Special Computations.-- Discharge for periods of no or suspect gage-height record and ice-affected record were estimated on the basis of related measurements, surrounding good record, weather records, site visits and by using the final record from Lake Creek below Twin Lakes. A hydrograph was used comparing flows with up and downstream gages.

Remarks.-- Record good, except during periods of no or suspect gage height record and ice affect, which are poor. Peak is rated good. Station maintained and record developed by Cheston Hart.

Recommendations.-- Continued use of the ADCP from the cableway should help confirm its effectiveness during the high water periods.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

07086000 ARKANSAS RIVER AT GRANITE

RATING TABLE-- ARKGRNCO11A USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

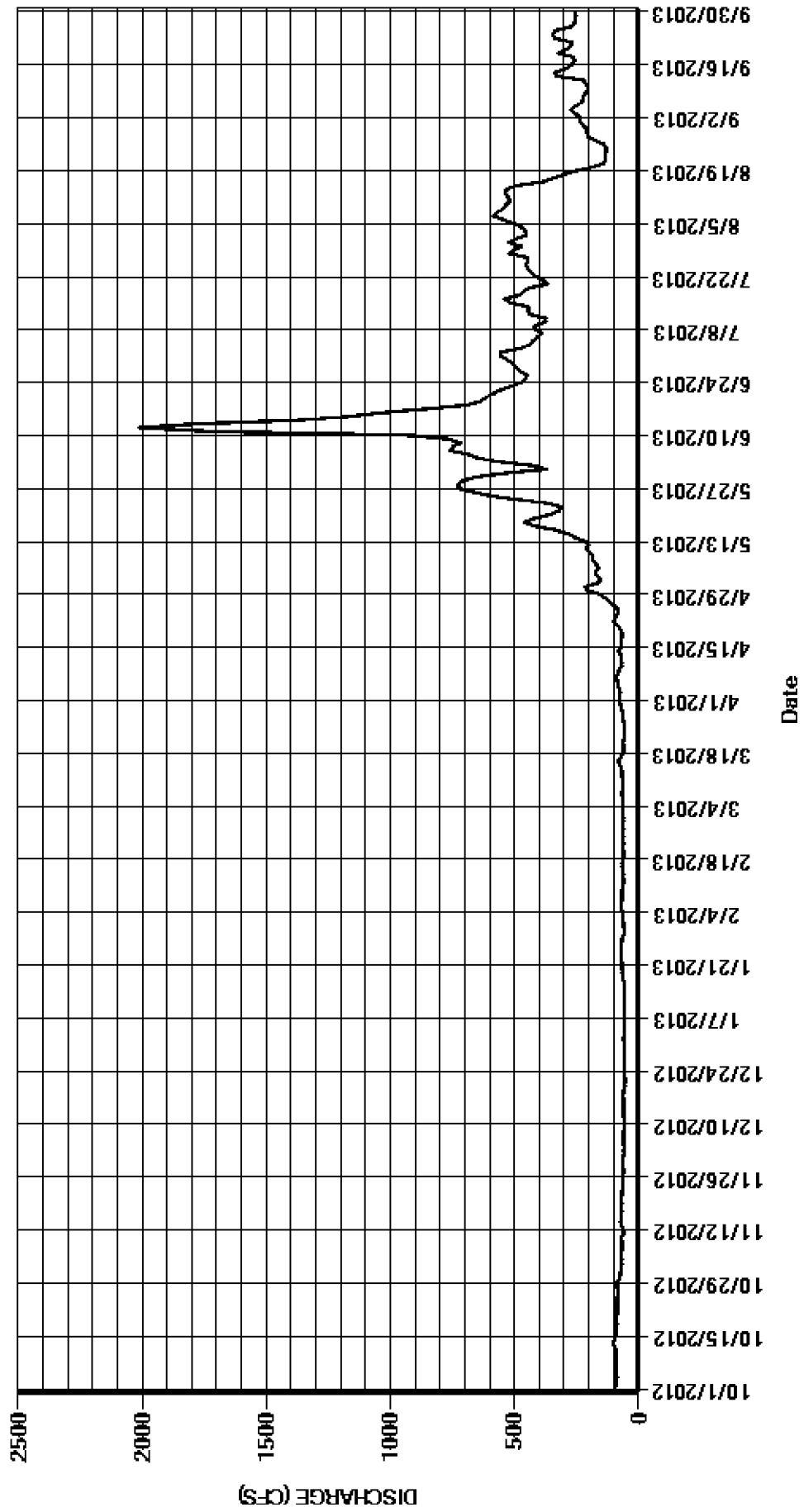
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	95	72	e65	e60	e61	e62	79	219	374	556	494	238
2	91	71	e59	e60	e63	e65	77	164	429	556	453	236
3	90	69	e61	e57	e65	e65	74	152	558	473	456	253
4	88	68	e59	e58	e66	e66	78	170	648	438	472	271
5	91	70	e62	e59	e70	e63	84	174	683	424	501	257
6	91	70	e61	e59	e69	e65	86	161	761	409	549	229
7	90	67	e60	e59	e69	e68	91	172	749	388	585	224
8	89	67	e60	e59	e67	e66	83	185	719	416	569	220
9	89	68	e58	e59	e68	e64	78	184	768	420	546	205
10	90	70	e58	e58	e66	e63	69	197	918	375	533	204
11	90	e60	e59	e57	e64	e65	68	212	1720	375	520	213
12	95	e62	e60	e57	e60	67	71	202	2010	441	526	223
13	105	e70	e60	e56	e62	66	73	215	1780	445	538	332
14	96	e72	e60	e57	e62	70	80	257	1370	445	534	337
15	94	e70	e61	e57	e63	78	73	283	1170	519	493	288
16	91	e69	e60	e58	e66	82	69	336	1040	540	386	270
17	93	e69	e62	e62	e66	71	70	414	861	481	343	257
18	88	e69	e62	e64	e63	62	66	461	695	465	296	265
19	89	e68	e60	e66	e61	61	68	421	638	444	248	322
20	89	e69	e56	e67	e61	60	76	358	616	368	181	290
21	86	e68	e55	e67	e63	63	91	319	586	385	141	272
22	86	e67	e55	e68	e61	58	100	310	555	415	134	271
23	86	e65	e58	e70	e63	57	94	364	510	430	134	339
24	86	e65	e59	e69	e62	57	84	479	471	447	131	345
25	86	e64	e59	e69	e63	59	85	594	453	454	132	338
26	84	e64	e58	e69	e62	59	99	663	450	447	142	275
27	84	e61	e58	e69	e62	63	116	725	477	450	180	258
28	86	e62	e58	e66	e62	63	135	726	494	522	204	257
29	88	e64	e57	e60	---	66	159	710	508	504	207	254
30	77	e64	e58	e58	---	70	208	656	530	472	210	254
31	74	---	e59	e61	---	75	---	536	---	522	225	---
TOTAL	2757	2014	1837	1915	1790	2019	2684	11019	23541	14026	11063	7997
MEAN	88.9	67.1	59.3	61.8	63.9	65.1	89.5	355	785	452	357	267
AC-FT	5470	3990	3640	3800	3550	4000	5320	21860	46690	27820	21940	15860
MAX	105	72	65	70	70	82	208	726	2010	556	585	345
MIN	74	60	55	56	60	57	66	152	374	368	131	204

CAL YR	2012	TOTAL	66744	MEAN	182	MAX	421	MIN	55	AC-FT	132400
WTR YR	2013	TOTAL	82662	MEAN	226	MAX	2010	MIN	55	AC-FT	164000

MAX DISCH: 2100 CFS AT 06:15 ON JUN 12, 2013 GH 5.12 FT SHIFT 0.19 FT  
 MAX GH: 5.12 FT AT 06:15 ON JUN 12, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07086000 ARKANSAS RIVER AT GRANITE  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
07086500 CLEAR CREEK ABOVE CLEAR CREEK RESERVOIR  
Water Year 2013

Location.-- Lat. 39°01'05", Long. 106°16'38", in SE¼ sec. 12, T,12 S., R.80 W., Chaffee County, Hydrologic Unit 11020001, on left bank 0.5 mi upstream from water line of Clear Creek Reservoir at elevation 8,875 ft, 1.5 mi downstream from unnamed tributary, and 1.9 mi southwest of Granite.

Drainage Area and Period of Record.-- 67.1 mi<sup>2</sup>.; May 1946 to present.

Equipment.-- Satellite-monitored data collection platform and shaft encoder in a 42-inch diameter corrugated metal pipe (CMP) shelter and well. Shaft encoder set to inside drop tape gage with adjustable RP on instrument shelf. Control is a concrete dam tapered lower towards the center, located approximately 10 feet downstream. An outside staff gage is used as a supplemental reference gage. However, since its installation, it does not agree with the inside tape, most likely due to draw-down. No changes this water year.

Hydrologic Conditions.-- Clear Creek fills Clear Creek Reservoir and is tributary to the main stem of the Arkansas River. Clear Creek basin is approximately 42,880 acres with a mean elevation of 11,700 ft. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except a low volume trail road. No hydrologic condition changes were apparent this water year.

Gage-Height Record.-- Primary record is 15-minute satellite and DCP data. The record is complete and reliable, except for the following periods: Oct 26, 2012; and April 16, 18, 19, 24, 2013; when the stage-discharge relationship was affected by ice; Nov. 12, 2012 through April 11, 2013 when the station was closed for the winter.

Datum Corrections.-- Levels were last run on Aug 19, 2009. No corrections were needed or taken.

Rating.-- The control is a concrete dam tapered lower towards the center and located 10 ft below the gage. Control at high stages includes brush and boulders lining the edges of the channel. Rating No. 14, dated 20 Feb 1996, was used for the entire water year. Eight discharge measurements (Nos. 138-145) were made during the water year, ranging in discharge from 10.2 to 209 cfs. They cover the range in stage experienced, except for the higher daily flows of May 25-28; June 3-15, 2013 and lower daily flows of Jan 12-14, 29, 30; Feb 10-28; Mar 5, 6, 18-27; April 2-21, 24-26, 2013. The peak flow of 485 cfs occurred at 2330 on June 5, 2013 at a gage height of 4.41 ft with a shift of +0.11 ft. It exceeded Measurement No. 142, made May 28, 2013, by 0.51 ft. in stage.

Discharge.-- Shifting control method was used for all periods of good, ice-free record. Shifts were applied as defined by measurements and were distributed by time. The condition of this weir and the approach channel are assumed to be the cause of the more positive shifts. Open water measurements indicated shifts varying from +0.11 to +0.15 ft. All open water measurements were given full weight and applied directly.

Special Computations.-- Discharge for periods of no gage-height record and ice-affected record were estimated on the basis of four measurements (Nos. 138-141), temperature records from Clear Creek Reservoir and comparable good data. Use of the ADCP Section by Section software was successful this year from the upstream bridge.

Remarks.-- Record good, except during periods of no gage height record and ice effect, which are estimated and poor. The peak gage height and peak discharge are rated good considering related measurements and site visits. Station maintained and record developed by Cheston Hart.

Recommendations.-- More documentation of the weir condition is needed to track damage and wear that the weir is exhibiting. Levels should be run in WY2014 to document the weir condition and to investigate differences between the outside staff gage and inside drop tape.

STATE OF COLORADO  
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07086500 CLEAR CREEK ABOVE CLEAR CREEK RESERVOIR

RATING TABLE-- CCACCRCO14 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	28	18	e15	e13	e11	e11	e11	26	119	93	57	35
2	28	18	e15	e13	e11	e11	e10	24	190	85	58	38
3	27	17	e15	e12	e11	e11	e10	23	246	80	52	34
4	26	17	e15	e13	e12	e11	e10	24	269	74	49	36
5	31	17	e15	e13	e12	e10	e10	24	315	73	47	42
6	29	17	e15	e13	e12	e10	e10	24	336	71	48	38
7	28	16	e14	e13	e12	e11	e10	26	315	67	53	36
8	26	16	e13	e13	e12	e11	e10	28	301	72	57	35
9	26	16	e13	e13	e11	e11	e8.0	29	317	65	54	36
10	25	17	e13	e12	e10	e11	e8.0	27	303	59	51	36
11	25	15	e13	e11	e9.0	e12	e8.0	27	301	57	48	37
12	27	e15	e14	e10	e8.0	e13	8.4	29	294	56	46	40
13	29	e15	e14	e10	e9.0	e13	8.5	34	270	55	46	58
14	26	e15	e14	e10	e9.0	e14	9.8	44	258	56	44	61
15	25	e15	e14	e11	e9.0	e14	9.0	74	235	71	41	55
16	24	e15	e14	e12	e10	e13	e8.5	109	202	59	39	55
17	24	e16	e14	e12	e10	e11	8.9	145	190	53	38	55
18	23	e16	e14	e12	e9.0	e10	e8.5	168	181	52	37	53
19	23	e15	e13	e12	e9.0	e9.0	e9.0	121	172	57	36	60
20	22	e15	e13	e12	e9.0	e9.0	7.9	92	165	54	35	54
21	22	e15	e14	e13	e10	e9.0	8.5	85	155	48	35	51
22	21	e15	e14	e13	e9.0	e9.0	11	101	148	45	36	52
23	21	e15	e14	e13	e10	e9.0	11	150	136	43	35	67
24	20	e15	e14	e12	e10	e8.0	e10	193	120	41	34	61
25	20	e15	e14	e12	e9.0	e8.0	10	238	111	41	34	61
26	e17	e15	e14	e11	e10	e9.0	10	267	114	39	36	57
27	17	e15	e14	e11	e10	e10	12	284	115	40	34	59
28	17	e15	e14	e11	e10	e11	15	245	111	97	33	60
29	18	e15	e13	e10	---	e11	18	199	105	93	32	60
30	18	e15	e13	e10	---	e11	24	144	102	74	32	58
31	18	---	e14	e11	---	e12	---	122	---	62	32	---
TOTAL	731	471	432	367	283.0	333.0	313.0	3126	6196	1932	1309	1480
MEAN	23.6	15.7	13.9	11.8	10.1	10.7	10.4	101	207	62.3	42.2	49.3
AC-FT	1450	934	857	728	561	661	621	6200	12290	3830	2600	2940
MAX	31	18	15	13	12	14	24	284	336	97	58	67
MIN	17	15	13	10	8.0	8.0	7.9	23	102	39	32	34

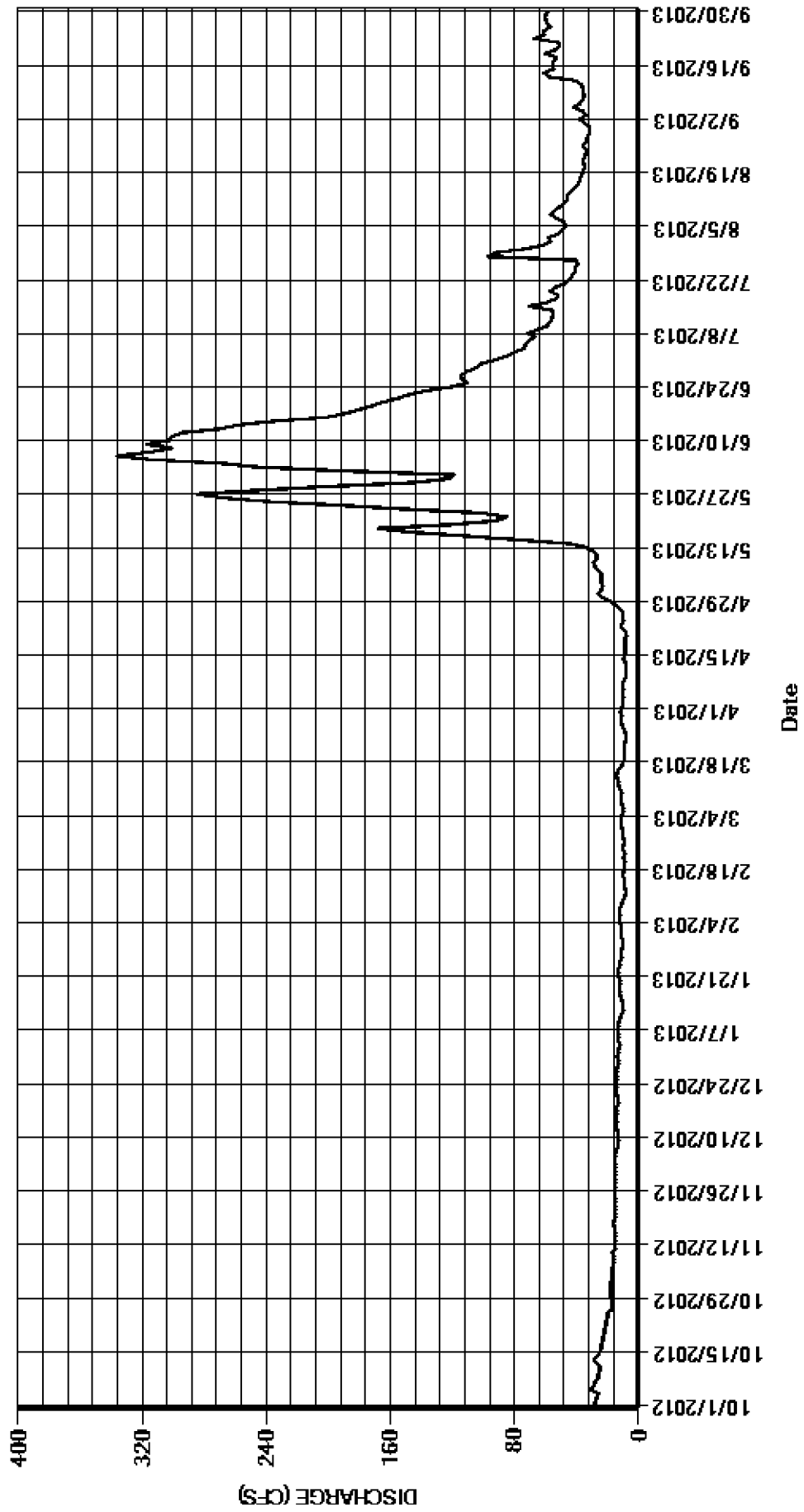
CAL YR	2012	TOTAL	13765.0	MEAN	37.6	MAX	168	MIN	10	AC-FT	27300
WTR YR	2013	TOTAL	16973.0	MEAN	46.5	MAX	336	MIN	7.9	AC-FT	33670

MAX DISCH: 485 CFS AT 23:30 ON JUN 05, 2013 GH 4.41 FT SHIFT 0.11 FT  
 MAX GH: 4.41 FT AT 23:30 ON JUN 05, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



07086500 CLEAR CREEK ABOVE CLEAR CREEK RESERVOIR  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
CLEAR CREEK BELOW CLEAR CREEK RESERVOIR  
Water Year 2013

Location.-- Lat 39°01'19.71", long 106°14'33.38" NAD83, Lake County, on left bank 200 ft. upstream from junction of Clear Creek and Arkansas River, and approximately 1500 ft downstream of Clear Creek Dam.

Drainage Area and Period of Record.-- 68.98 sq. mi. ;

Equipment.-- High-Data-Rate data collection platform and shaft encoder in a wood frame shelter and concrete stilling well. A Stage Discharge Recorder (SDR) is used for backup purposes. The shaft encoder and SDR are set to the inside drop tape gage with adjustable RP on instrument shelf. Outside gage is used as supplemental reference. A bridge is located across the concrete section at the entrance to the converging section of the flume and used for making high water measurements. The compound weir was repaired March 2, 2011.

Hydrologic Conditions.-- The gage is located approximately 1500 ft downstream of the outlet of Clear Creek Reservoir. The stream flows under the highway approximately 200 ft above the gage through three separate 6 ft diameter culverts. During the winter the water flows solely in the south culvert where shallow water can be measured. The water released is warm enough the control does not experience ice affected days. No hydrologic condition changes were apparent this year.

Gage-Height Record.-- Primary record is fifteen-minute satellite data with the DCP and SDR logs used for backup purposes. Record is complete and reliable. The following dates were missing from one to five data points: May 4, 8, 9, 15, 21, June 19, July 7, 12, 18, August 8, 24, September 18, these were filled in from the SDR log.

Datum Corrections.-- Levels were run November 28, 2012, no corrections were needed. Previous levels were run on July 14, 2006. No corrections were required and level results in previous years have shown this gage to be stable.

Rating.-- The control is a 20-ft wide, compound, broad crested weir constructed in 1993 and repaired February 28 through March 2, 2011. Rating No. 4 was used all year. It is well defined to about 400 cfs. Seven discharge measurements (Nos. 257-263) were made during the year. Measurements range in discharge from 5.07 to 342 cfs. They cover the range in stage except lower daily flows of Nov 15 - Dec 31, 2012; Jan 1 - Mar 14, 25 - Apr 4, 18, 19, 2013; and higher daily flows of Jun 6, 7, 9 - 12, 2013. The peak flow of 388 cfs occurred at 0330 June 6, 2013 at a gage height of 3.11 ft with a shift of 0.10 ft. This exceeded the stage of Measurement No. 262 made June 11, 2013, by 0.19 ft.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by variable stage-shift relationship, CCBCRCOVSC13B, the entire year. The shift curve used the last measurement of water year 2012 along with the measurement made in 2013. All measurements were made in open water and given full weight with the exception of Nos. 259 and 261, which were discounted by 1.87% and 2.43% respectively to smooth the shift distribution and No. 257 which was not used due to a gate change made at the reservoir during the measurement.

Special Computations.-- No special computations were used this year.

Remarks.-- Record is good, except for the winter low flow period: Nov 15, 2012 to Mar 14, 2013, which is poor due to difficulty measuring the low flows and defining shifts. The peak GH and discharge are rated good based on site visits and measurement near the peak. Due to the depths at the measurement section the ADCP has become the primary measurement device. The station is maintained by Cheston Hart. The record was developed by Cheston Hart and Anthony D Gutierrez.

Recommendations.-- Continue measurements to confirm shifts at upper and lower ranges of the rating. Increase measurements made at the beginning of the water year.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

CLEAR CREEK BELOW CLEAR CREEK RESERVOIR

RATING TABLE-- CCBCRCO04 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

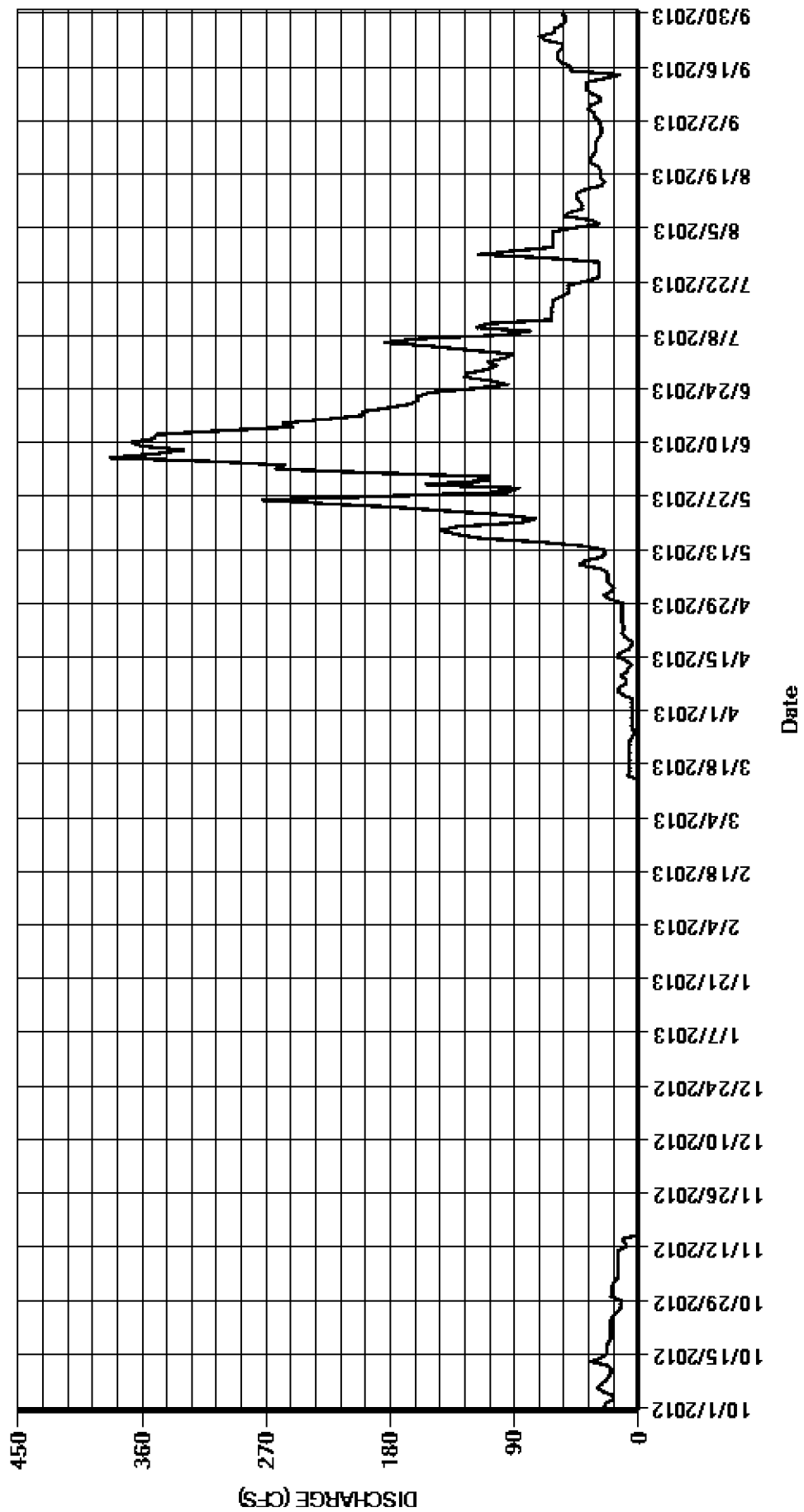
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	19	0.78	0.78	0.66	0.72	5.0	25	109	109	62	28
2	24	19	0.78	0.78	0.66	0.78	5.0	20	193	97	62	29
3	19	17	0.78	0.78	0.66	0.78	5.0	18	263	91	62	32
4	18	15	0.78	0.78	0.66	0.78	5.0	21	257	121	62	32
5	25	15	0.78	0.78	0.70	0.78	11	23	307	149	46	37
6	30	15	0.78	0.78	0.68	0.78	15	22	383	184	29	35
7	27	15	0.78	0.78	0.70	0.78	14	23	351	159	35	28
8	24	15	0.78	0.78	0.70	0.78	9.2	28	330	100	54	28
9	22	15	0.78	0.78	0.74	0.78	9.4	43	360	79	50	34
10	20	15	0.78	0.78	0.66	0.76	13	39	368	117	41	38
11	20	15	0.78	0.78	0.74	0.78	8.8	27	351	111	41	38
12	23	8.9	0.78	0.78	0.74	0.78	7.6	24	350	63	43	38
13	34	9.9	0.78	0.78	0.68	0.78	5.4	26	302	63	45	25
14	27	12	0.78	0.78	0.74	0.76	9.1	42	251	63	45	14
15	23	0.94	0.78	0.78	0.69	7.8	15	71	258	63	39	49
16	23	0.85	0.78	0.78	0.75	6.6	14	115	228	62	27	49
17	23	0.84	0.78	0.78	0.78	6.6	7.1	132	201	62	25	55
18	22	0.84	0.78	0.78	0.78	6.6	5.0	144	200	56	28	59
19	20	0.85	0.78	0.79	0.78	6.6	5.0	132	182	51	28	59
20	20	0.85	0.78	0.85	0.78	6.6	9.6	86	166	51	28	58
21	20	0.85	0.78	0.85	0.78	6.6	12	75	160	51	29	55
22	20	0.84	0.78	0.84	0.78	6.6	11	97	160	39	35	55
23	20	0.85	0.78	0.81	0.78	6.6	11	138	151	29	35	67
24	20	0.85	0.78	0.73	0.78	6.6	12	177	120	29	33	72
25	18	0.85	0.78	0.68	0.78	4.7	12	229	95	29	31	61
26	15	0.85	0.78	0.71	0.77	2.8	12	273	107	29	31	61
27	13	0.85	0.78	0.77	0.77	4.1	12	181	126	29	31	56
28	13	0.85	0.78	0.78	0.76	5.0	12	95	125	63	30	53
29	13	0.85	0.78	0.74	---	5.0	12	87	111	116	28	53
30	20	0.79	0.78	0.68	---	5.0	21	154	103	91	27	56
31	19	---	0.78	0.66	---	5.0	---	109	---	62	27	---
TOTAL	660	219.40	24.18	23.93	20.48	109.62	305.2	2676	6668	2418	1189	1354
MEAN	21.3	7.31	0.78	0.77	0.73	3.54	10.2	86.3	222	78.0	38.4	45.1
AC-FT	1310	435	48	47	41	217	605	5310	13230	4800	2360	2690
MAX	34	19	0.78	0.85	0.78	7.8	21	273	383	184	62	72
MIN	13	0.79	0.78	0.66	0.66	0.72	5.0	18	95	29	25	14

CAL YR	2012	TOTAL	13047.85	MEAN	35.6	MAX	218	MIN	0.66	AC-FT	25880
WTR YR	2013	TOTAL	15667.81	MEAN	42.9	MAX	383	MIN	0.66	AC-FT	31080

MAX DISCH: 388 CFS AT 03:30 ON JUN 06, 2013 GH 3.11 FT SHIFT 0.1 FT  
 MAX GH: 3.11 FT AT 03:30 ON JUN 06, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CLEAR CREEK BELOW CLEAR CREEK RESERVOIR  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
07089250 COTTONWOOD CREEK NEAR BUENA VISTA  
Water Year 2013

Location.-- Lat 38°50'07.88", Long 106°07'17.01" , NAD83, (Buena Vista East, Colorado quadrangle, 1:24000 scale), in NW1/4, NW1/4, NW1/4 Sec 16, T14S, R78W, Chaffee County, Hydrologic Unit 11020001, on left bank about 1500 ft upstream from confluence of Cottonwood Creek and Arkansas River, and about 1200 ft upstream from bridge near Buena Vista High School.

Drainage Area and Period of Record.-- 109.24 sq.mi.; 1975-present

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform and constant flow bubbler (CFB) in a 42-inch corrugated metal pipe shelter. Primary reference gage is outside staff. Inside well can be used for supplemental reference but no data is collected from stilling well elevation. No changes this water year.

Hydrologic Conditions.-- Cottonwood Creek is tributary to the main stem of the Arkansas River. The Cottonwood Creek basin is approximately 108 sq miles with a mean elevation of 10,900 ft. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except many low volume trail roads. The creek does flow through the town of Buena Vista and a small pond that is about one surface acre in size. In the fall this pond is drained and large amounts silt and sand are released to the creek filling most of the channel including the control. No hydrologic condition changes were apparent this water year.

Gage-Height Record.-- Primary record is fifteen minute CFB data downloaded from satellite telemetry with DCP log as backup. The station was visited on 14 occasions this water year to verify the sensor remained calibrated to the reference. The record is complete and reliable, except for the following periods: Nov 12-14; Dec 9-31, 2012; Jan 11-28, Feb 12-28, 2013; when ice affected the stage-discharge relationship and Jan 1-3, 2013, when trash/other obstructions affected the stage-discharge relationship.

Datum Corrections.-- Levels were last run on Sep. 19, 2011. Results were well within acceptable limits, so no corrections were made at that time.

Rating.-- The control is a concrete compound broad-crested weir with a center V- notch for low flows and a rectangular shape for higher flows. Rating No. 4, dated Mar. 25, 1996, was used the entire water year, and is well defined to about 676 cfs. Nine discharge measurements (Nos. 773-781) were made this water year. Discharge measurements ranged from 0.93 to 75.7 cfs. They cover the range in stage experienced except for the lower daily flows of Oct 19-20, 28, 2012, May 2-5, 21, 2013; and the higher daily flows of May 26-28, June 3-15, 2013. The peak discharge of 252 cfs occurred at 0130 on June 6, 2013 at a gage height of 3.63 ft with a shift of 0.04 ft. The peak gage height exceeded the mean stage of Measurement No. 778, made on June 3, 2013, by 0.93 feet.

Discharge.-- Shifting control method was used for periods of good, ice-free record. Shifts were applied as defined by measurements and distributed by time for the entire water year. Many fill and scour events are assumed to cause varied shifts especially in the spring and fall when the city lake fills and releases. The control does appear to change slightly during these times of fill and scour therefore making it inadequate for a variable shift curve. Shifts ranged from -0.05 to +0.06 feet. All shifts were applied directly and given full weight.

Special Computations.-- Estimation of discharge for periods of ice effect, trash or other obstruction, and no gage height were made using adjacent good record, partial day records, weather records and discharge measurements. A hydrograph was developed and used.

Remarks.-- Record is good, except during periods of ice effect which are estimated and considered poor. Peak GH and discharge are rated good. Station maintained by Cheston Hart and record developed by Ashenafi Hydebo

Recommendations.-- Continued use of the ADCP at high flows to better define upper end of rating. Additional research to understand inflows and outflows of this stream through town of Buena Vista would be beneficial. Continue to monitor Rating No. 4 for validity, especially at gage heights greater than 2.0 feet.

STATE OF COLORADO  
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07089250 COTTONWOOD CREEK NEAR BUENA VISTA

RATING TABLE-- COCRBVCO04 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

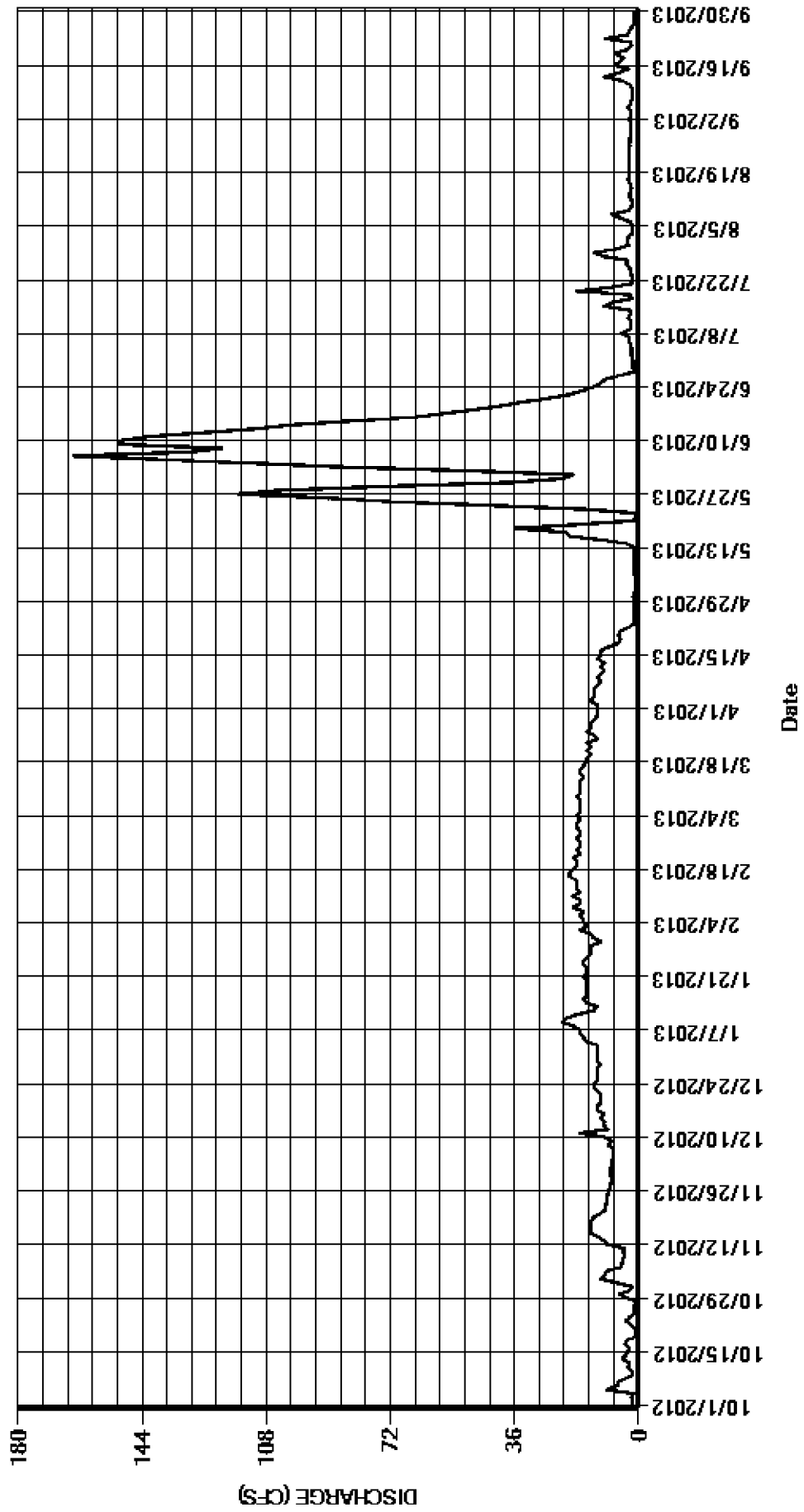
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.8	1.9	8.1	e12	14	18	12	1.3	19	1.7	3.3	2.4
2	1.9	6.7	8.0	e12	17	18	12	0.89	48	2.0	3.0	2.6
3	2.0	11	7.8	e12	15	17	14	0.79	86	2.1	2.0	2.3
4	1.6	9.7	7.6	15	16	18	13	0.82	112	2.0	1.8	2.3
5	9.1	9.3	7.4	16	16	17	13	0.84	138	2.4	1.8	3.0
6	6.3	5.2	7.4	17	17	17	13	1.2	164	2.9	2.3	2.3
7	5.9	4.8	7.3	17	16	17	12	1.2	130	2.8	5.3	2.0
8	3.7	4.6	8.9	19	19	17	11	1.3	121	5.1	7.8	1.9
9	1.7	4.1	e8.0	22	17	18	12	1.3	151	2.5	3.0	1.9
10	2.1	4.5	e10	21	17	17	11	1.2	150	2.3	2.1	1.9
11	3.0	4.2	e17	e18	19	17	10	1.1	142	2.3	1.8	2.6
12	2.8	e9.0	e9.0	e13	e17	17	11	1.2	126	3.0	2.2	4.7
13	4.8	e10	e10	e12	e18	17	10	1.2	111	2.4	2.7	10
14	3.8	e12	e10	e15	e18	16	12	3.3	101	2.6	2.4	5.9
15	3.0	14	e11	e16	e18	17	11	10	84	9.9	2.2	3.1
16	2.9	14	e10	e15	e20	17	11	20	66	7.5	2.4	7.0
17	3.9	14	e12	e15	e20	16	8.9	21	57	2.0	3.0	5.4
18	3.2	14	e12	e15	e19	15	5.9	36	48	2.4	2.8	4.4
19	0.69	13	e11	e15	e18	15	5.4	18	40	18	2.8	6.9
20	0.85	11	e11	e15	e18	14	5.8	1.5	34	8.3	2.7	3.4
21	1.0	9.8	e11	e16	e19	15	5.5	0.36	26	1.9	2.7	2.1
22	2.3	9.6	e12	e15	e17	14	3.2	1.3	20	1.7	2.7	2.3
23	3.7	9.3	e13	e15	e18	15	1.5	16	16	2.1	2.7	9.5
24	2.6	9.2	e13	e16	e17	12	1.4	44	13	2.2	2.7	3.2
25	1.3	9.0	e12	e16	e17	13	1.4	72	11	2.6	2.7	2.8
26	1.1	8.6	e12	e15	e18	15	1.3	90	9.5	3.5	2.6	2.0
27	1.2	8.2	e12	e14	e17	14	1.3	116	5.3	3.2	2.6	1.3
28	0.73	8.0	e12	e14	e17	14	1.1	104	1.2	10	2.5	1.4
29	3.6	7.9	e11	14	---	13	1.2	73	1.6	13	2.3	1.1
30	5.5	8.1	e12	11	---	12	1.6	37	1.6	6.8	2.2	1.2
31	2.7	---	e12	13	---	12	---	22	---	3.0	2.2	---
TOTAL	90.77	264.7	325.5	471	489	484	233.5	699.80	2033.2	134.2	85.3	102.9
MEAN	2.93	8.82	10.5	15.2	17.5	15.6	7.78	22.6	67.8	4.33	2.75	3.43
AC-FT	180	525	646	934	970	960	463	1390	4030	266	169	204
MAX	9.1	14	17	22	20	18	14	116	164	18	7.8	10
MIN	0.69	1.9	7.3	11	14	12	1.1	0.36	1.2	1.7	1.8	1.1

CAL YR	2012	TOTAL	3544.66	MEAN	9.68	MAX	28	MIN	0.69	AC-FT	7030
WTR YR	2013	TOTAL	5413.87	MEAN	14.8	MAX	164	MIN	0.36	AC-FT	10740

MAX DISCH: 252 CFS AT 01:30 ON JUN 06, 2013 GH 3.63 FT SHIFT 0.04 FT  
 MAX GH: 3.63 FT AT 01:30 ON JUN 06, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07089250 COTTONWOOD CREEK NEAR BUENA VISTA  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
07091015 CHALK CREEK AT NATHROP  
Water Year 2013

Location.-- Lat. 38°44'30", Long. 106°04'57", in NE¼SW¼ sec. 14, T.15 S., R.78 W., Chaffee County, on left bank, 640' north of the Junction of Co. Hwy. 162 and U.S. 285 on the frontage rd. parallel to U.S. 285, ¼ mi. south of Nathrop, Co., and 1 mi. west of the confluence of Chalk Creek and the Arkansas River.

Drainage Area and Period of Record.-- 88.74 sq. mi. ;

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform with shaft encoder in 32-inch diameter corrugated metal pipe (CMP) shelter and well with tipping bucket rain gage. Shaft encoder and SDR are set to the inside drop tape gage with adjustable RP on instrument shelf. Outside staff gage is also used for reference purposes. Control is a concrete dam, tapered lower towards the center, located approximately 5 feet downstream.

Hydrologic Conditions.-- Chalk Creek is tributary to the main stem of the Arkansas River. The Chalk Creek basin is approximately 88.74 sq miles with a mean elevation of 11,200 ft. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except many low volume trail roads. No hydrologic condition changes were apparent this water year.

Gage-Height Record.-- Primary record is 15-minute transmitted data with SDR log as backup. Missing data for July 18, 21-22, and Sep 18, 2013, were completed using backup SDR record data. Record is complete and reliable except for the following periods: Dec 19-31, 2012 and Jan 1-24, 2013 when ice formed in the well affecting float movement.

Datum Corrections.-- Levels were run on August 18, 2009. Results were well within acceptable limits, so no corrections were needed or taken.

Rating.-- The low concrete dam is the control at all stages, except at higher stages the webbed box culvert (~approx. 75 ft. downstream) under the highway will sometimes cause backwater and affect the rating. Rating No. 7 (dated Jan. 19, 2006) was used the entire water year. It is well defined to about 1000 cfs. Nine discharge measurements (Nos. 770-778) were made during the water year. Measurements ranged in discharge from 1.68 to 185 cfs. They cover the range in flows experienced, except for higher daily flows of May 26-29, June 3-13, 2013. The peak discharge of 345 cfs occurred at 0200 on June 6, 2013 at a gage height of 4.67 ft with a shift of 0.05 ft. The peak gage height exceeded the mean stage of Measurement No. 775, made on June 3, 2013 by 0.55 feet.

Discharge.-- Shifts were applied as defined by measurements and distributed by time for the entire water year. Measurements showed shifts ranged from 0.00 to +0.05 ft. All measurements were given full weight and shifts applied directly except measurement no. 772 in which there is no shift as a result of no effective gage height since the well frozen completely.

Special Computations.-- This site is fairly difficult to make a high water measurement at in a typical year due to high velocity for wading and shallow conditions for bridge measurements. ADCP measurements have been attempted during high water but unfortunately this river has high sediment load causing inconsistent reading from the Acoustic equipment. People have continued to stack rocks above and near the control. Also beavers built small dams above the gage causing irregular approach angles to control. Before each measurement an attempt was made to remove debris from beavers and rocks that caused a change in the stream. This gage stays open and is seldom ice effected given it is located approximately 5mi downstream of the Mt Princeton hot springs. Ice effected days are usually caused by ice within the well and are estimated using surrounding good days and weather data from the ARKWELCO gage. Missing data was filled using backup SDR record.

Remarks.-- Record is considered good, except during periods of ice affected gage height and frozen well which were estimated and should be considered poor. Peak discharge is rated fair based on lack of historical high water measurements. Station maintained by Cheston Hart and record developed by Ashenafi Hydebo.

Recommendations.-- Levels should be run in water year 2014. Inspection of control and documentation of wear should be completed.



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

07091015 CHALK CREEK AT NATHROP

RATING TABLE-- CHCRNACO07 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

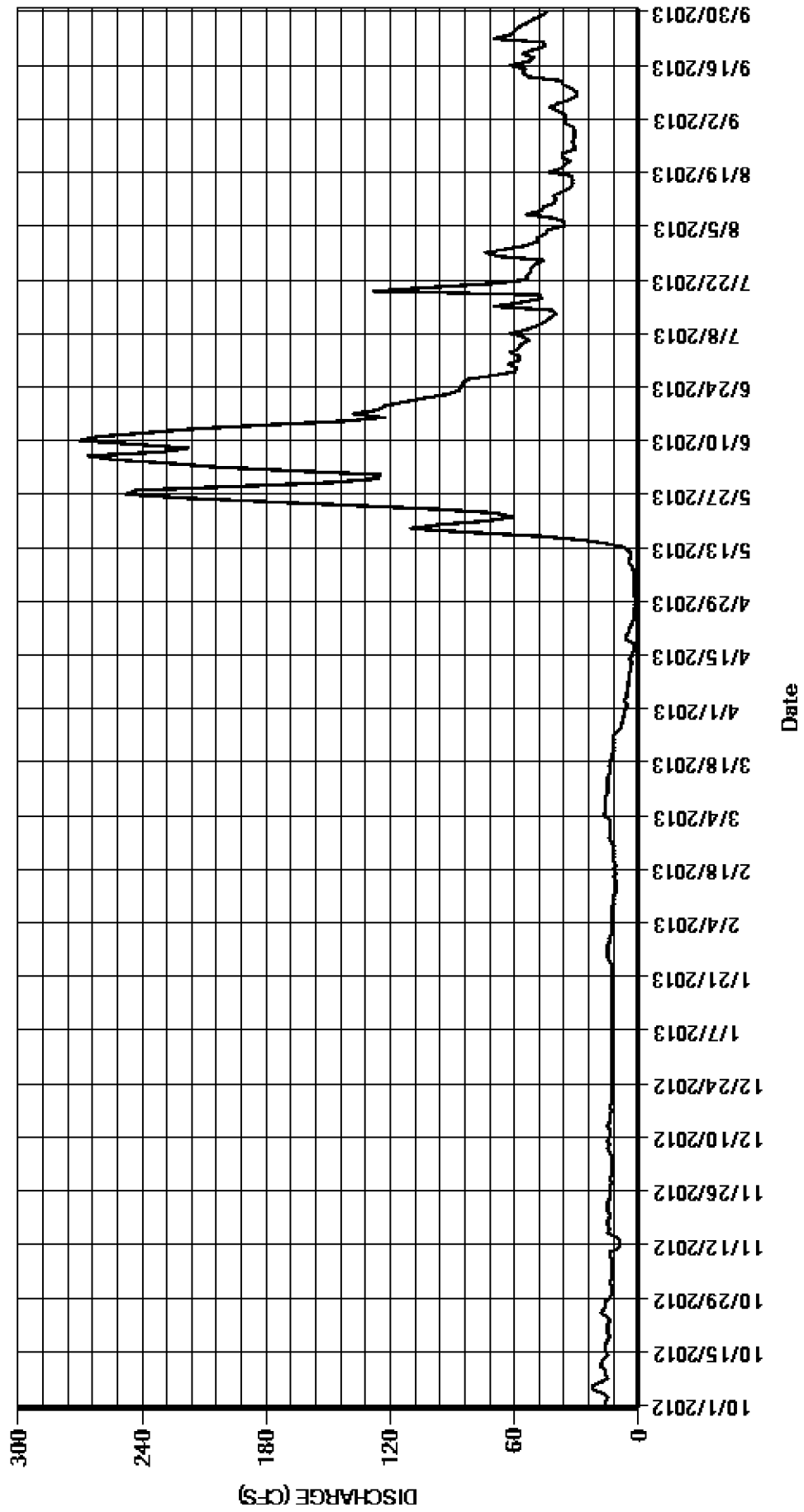
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16	13	13	e13	13	14	6.5	1.9	125	58	49	36
2	16	14	13	e13	13	14	5.3	2.1	165	58	49	35
3	15	13	13	e13	13	14	7.0	1.9	205	62	45	35
4	17	13	13	e13	13	17	5.9	1.9	227	58	44	39
5	22	13	13	e13	13	16	5.7	2.0	254	57	36	43
6	22	13	14	e13	13	16	5.3	2.1	266	53	36	39
7	18	13	15	e13	13	16	5.0	2.5	231	56	41	33
8	15	13	14	e13	13	16	4.9	3.2	218	62	54	30
9	16	14	15	e13	12	16	4.8	4.7	244	54	47	30
10	16	14	14	e13	12	15	4.8	4.3	270	49	46	33
11	18	10	14	e13	12	15	3.7	3.7	261	45	41	37
12	18	9.1	14	e13	11	15	3.8	4.4	237	43	40	37
13	17	9.2	15	e13	11	15	3.4	7.0	215	40	41	53
14	15	11	14	e13	11	15	4.2	15	180	42	37	56
15	16	15	14	e13	11	14	3.2	27	142	70	33	55
16	16	14	14	e13	12	14	2.4	47	123	57	32	62
17	16	15	13	e13	11	14	2.4	82	138	47	32	53
18	15	15	14	e13	12	14	2.3	110	126	48	32	51
19	14	14	e13	e13	11	13	6.0	96	123	128	43	56
20	15	14	e13	e13	12	13	5.9	72	114	101	38	51
21	15	15	e13	e13	12	12	4.7	61	104	71	36	45
22	15	15	e13	e13	12	12	4.4	69	93	54	33	46
23	14	15	e13	e13	12	12	3.5	98	87	54	37	70
24	15	14	e13	e13	12	12	2.7	140	86	52	37	62
25	18	14	e13	14	13	12	2.0	181	85	52	31	60
26	17	14	e13	15	14	10	1.9	220	82	50	31	58
27	16	14	e13	15	14	8.5	1.9	248	70	46	32	54
28	16	13	e13	15	14	8.2	1.8	243	60	67	31	51
29	14	14	e13	15	---	7.7	1.8	194	59	74	31	47
30	13	13	e13	14	---	7.3	1.8	148	63	64	31	44
31	13	---	e13	14	---	6.8	---	126	---	54	32	---
TOTAL	499	400.3	418	414	345	404.5	119.0	2218.7	4653	1826	1178	1401
MEAN	16.1	13.3	13.5	13.4	12.3	13.0	3.97	71.6	155	58.9	38.0	46.7
AC-FT	990	794	829	821	684	802	236	4400	9230	3620	2340	2780
MAX	22	15	15	15	14	17	7.0	248	270	128	54	70
MIN	13	9.1	13	13	11	6.8	1.8	1.9	59	40	31	30

CAL YR	2012	TOTAL	8157.3	MEAN	22.3	MAX	84	MIN	5.1	AC-FT	16180
WTR YR	2013	TOTAL	13876.5	MEAN	38.0	MAX	270	MIN	1.8	AC-FT	27520

MAX DISCH: 345 CFS AT 02:00 ON JUN 06, 2013 GH 4.67 FT SHIFT 0.05 FT  
 MAX GH: 4.67 FT AT 02:00 ON JUN 06, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07091015 CHALK CREEK AT NATHROP  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
07091500 ARKANSAS RIVER AT SALIDA  
Water Year 2013

Location.-- Lat. 38°32'45", Long. 106°00'36", in NE¼ sec. 31, T.50 N., R.9 E., Chaffee County on right bank at Salida, 450 ft. upstream from bridge on State Highway 291, and 2.7 mi. upstream from South Arkansas River.

Drainage Area and Period of Record.-- 1,218 mi<sup>2</sup>;

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform (High data rate DCP transmitter) and shaft encoder in a 4 ft x 4 ft steel shelter placed over a CMP stilling well. Shaft encoder set to inside drop tape from an adjustable RP on instrument shelf. A Constant Flow Bubbler is installed for use when well is frozen. A cableway is approximately 35 feet downstream from gage. No other changes this water year.

Hydrologic Conditions.-- The Arkansas River at Salida is located below Twin Lakes, Turquoise Lake and Clear Creek Reservoirs. The flow conditions are subject to releases from these lakes as well as native flows of tributary creeks. Natural drainage area is approximately 1200 sq miles with a mean elevation of 10300 ft. The basin consists of high mountain terrain some of which is above tree line.

Gage-Height Record.-- The primary record is fifteen minute DCP log data with SDR and CFB log used for back-up. Record is complete and reliable, except for the following periods: Dec 23-31, 2012; Jan 1 - Mar 16 2013 when both the well and CFB were frozen providing no effective GH, and Aug 21 2013 when there was transmission issues. Faulty GH data were replaced using DCP, SDR data and straight line method for days of Apr 14, 27, and 29 2013 without loss of accuracy. The well and SE data was used as primary from Oct 1, 2012 thru Feb 20, 2013 and May 2 thru Sept 30 2013. The CFB data was used as primary from Feb 20, thru May 2, 2013. OG was used solely for CFB reference and the well and drop tape is used for referencing the SE.

Datum Corrections.-- No levels were run this year. Levels were last run on Jan 26, 2012. The drop tape was adjusted due to the RP being moved when the shelf was replaced.

Rating.-- The control consists of placed boulders 80 ft downstream of gage which affect flow at all ranges of stage. Heavy brush on both banks also affects flows at high stages. Rating No. 30, dated August 26, 2009 was used for entire water year. It is well defined to about 3500 cfs. Fifteen discharge measurements (Nos. 470 to 484), ranging in discharge from 153 to 2560 cfs, were made during the water year. They cover the range in stage experienced, except higher flow day of June 12, 2013. The peak discharge of 2860 cfs occurred at 0730 on June 12, 2013 at a gage height 5.37 ft with a shift of 0.11 ft. It exceeded maximum flow Measurement No. 480, made June 13, 2013 by 0.25 ft. in stage.

Discharge.-- Shifting control method was used for the entire water year record. Shifts were distributed by time for the entire water year. Site visit and measurements show the placed rock riffle appears to be unstable and moving causing control changes throughout the year. Significant scour and fill events were observed throughout the runoff period causing shift changes during this period. Measurements show shifts varying from +0.05 to +0.19 ft. All shifts were given full weight and applied directly.

Special Computations.-- Estimates of flow during ice affected periods were made based on good record prior to, during, and after such periods, measurements 471-475, and a hydrographic comparison to upstream and downstream gages: Arkansas River at Granite and Arkansas River near Wellsville, respectively. Measurement 472 and 473 were either ice effected or had no effective GH.

Remarks.-- Record good, except for those periods of ice affected record and missing data, which are estimated and poor. Peak gage height and discharge are rated good based on site visits and related measurements. Station maintained and record developed by Cheston Hart.

Recommendations.-- Continued use of the ADCP and SxS software will prove its reliability at this site, multiple ADCP measurements were made water year with positive results.

STATE OF COLORADO  
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 OFFICE OF STATE ENGINEER

07091500 ARKANSAS RIVER AT SALIDA

RATING TABLE-- ARKSALCO30 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

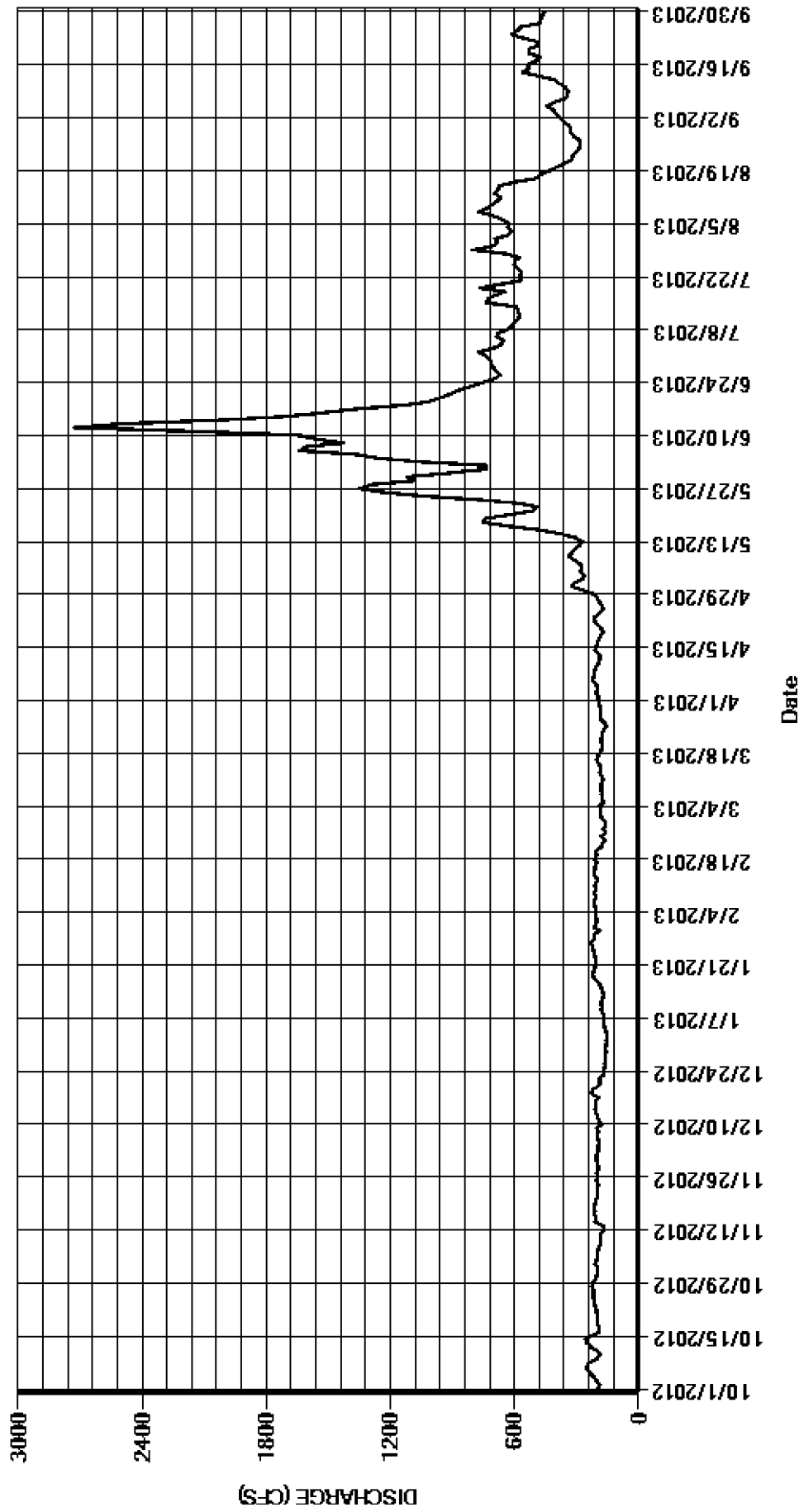
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	196	198	205	e156	e205	181	195	324	740	737	694	361
2	188	198	203	e155	e203	183	195	314	739	772	630	382
3	204	210	196	e155	e206	183	206	271	1060	703	618	400
4	214	202	196	e160	e206	188	199	262	1260	664	632	412
5	231	200	191	e168	e209	171	205	284	1360	652	628	444
6	248	198	197	e169	e214	176	221	276	1640	685	660	410
7	251	194	199	e170	e215	179	219	281	1610	682	706	356
8	238	186	195	e172	e207	179	215	309	1430	634	773	344
9	200	184	203	e180	e216	182	212	338	1560	610	736	342
10	188	184	176	e179	e205	180	205	321	1640	599	712	355
11	199	183	192	e182	e214	172	192	308	2130	579	682	385
12	231	168	200	e175	e201	180	188	283	2730	578	667	402
13	249	169	206	e170	e204	187	187	270	2500	584	699	482
14	257	209	210	e175	e215	185	210	308	2030	592	681	561
15	230	207	209	e180	e213	190	205	376	1710	734	674	532
16	192	214	207	e190	e210	203	200	479	1530	730	589	535
17	191	212	195	e210	e203	199	193	628	1370	691	487	495
18	199	215	228	e220	e213	185	185	753	1130	645	473	478
19	198	210	223	e220	e202	179	168	743	1010	769	427	530
20	198	206	196	e213	e210	178	183	625	957	665	397	531
21	202	198	185	e208	182	180	199	512	906	568	e354	490
22	204	200	192	e209	175	180	212	491	866	574	323	485
23	211	198	e170	e209	162	178	212	576	805	568	317	556
24	215	196	e168	e214	183	171	190	773	749	582	298	612
25	220	203	e163	e219	159	157	172	1040	694	601	286	588
26	219	201	e164	e224	172	165	176	1240	668	599	285	567
27	218	203	e162	e232	160	185	190	1350	687	577	285	474
28	226	195	e160	e215	164	184	201	1290	703	649	314	474
29	222	196	e157	e215	---	184	219	1090	714	805	329	465
30	207	202	e160	e189	---	184	268	1120	719	710	328	456
31	202	---	e157	e216	---	192	---	918	---	681	339	---
TOTAL	6648	5939	5865	5949	5528	5620	6022	18153	37647	20219	16023	13904
MEAN	214	198	189	192	197	181	201	586	1255	652	517	463
AC-FT	13190	11780	11630	11800	10960	11150	11940	36010	74670	40100	31780	27580
MAX	257	215	228	232	216	203	268	1350	2730	805	773	612
MIN	188	168	157	155	159	157	168	262	668	568	285	342

CAL YR	2012	TOTAL	114094	MEAN	312	MAX	610	MIN	157	AC-FT	226300
WTR YR	2013	TOTAL	147517	MEAN	404	MAX	2730	MIN	155	AC-FT	292600

MAX DISCH: 2860 CFS AT 07:30 ON JUN 12, 2013 GH 5.37 FT SHIFT 0.11 FT  
 MAX GH: 5.37 FT AT 07:30 ON JUN 12, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07091500 ARKANSAS RIVER AT SALIDA  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
07093700 ARKANSAS RIVER NEAR WELLSVILLE

Water Year 2013

Location.-- Lat. 38°30'10", Long. 105°56'21", in SW¼NE¼ sec. 14, T.49 N., R.9 E., Chaffee County, Hydrologic Unit 11020001, on right bank 50 ft upstream from Chaffee-Fremont County line, 2.0 mi northwest of Wellsville, 2.8 mi downstream from South Arkansas River, and 3.5 mi southeast of Salida.

Drainage Area and Period of Record.-- 1,485 mi<sup>2</sup>. ; April 1961 to current year.

Equipment.-- Station is equipped with a high data rate satellite-monitored data collection platform with a Constant Flow Bubbler (CFB). The CFB is referenced using an outside horizontal chain weight gage. Cableway located 400 feet downstream from gage.

Hydrologic Conditions.-- The Arkansas River near Wellsville is located below Twin Lakes, Turquoise Lake and Clear Creek Reservoirs. The flow conditions are subject to releases from these lakes as well as native flows of tributary creeks. Natural drainage area is approximately 1485 sq miles with a mean elevation of 10,200 feet. The basin consists of high mountain terrain some of which is above tree line.

Gage-Height Record.-- The primary record is 15-minute satellite-monitored and DCP data with CFB logs used as back-up. Record is complete and reliable, except for the following periods: Dec 21-31 2012; Jan 1-19 2013, when gage height was affected by ice.

Datum Corrections.-- Levels were last run Sept 12, 2007. No adjustments were needed or taken.

Rating.-- Control is a rock riffle about 90 ft downstream. High water control is channel and rock banks. Rating No. 6A, dated Dec. 20, 1993 (extended lower on Dec. 30, 2002), was used this water year. It is well defined from about 170 to 5500 cfs. Sixteen discharge measurements (Nos. 968-983) were made during the water year ranging in discharge from 178 cfs to 1670 cfs. They cover the range in flows experienced except for the higher daily flows of Jun 10-15 2013. The peak flow of 2960 cfs occurred at 0930 June 12, 2013 at a gage height of 6.41 ft with a shift of +0.16 ft. It exceeded mean gage height of Measurement No. 978, made June 7, 2013 by 1.17 ft. in stage.

Discharge.-- Shifting control method used the entire year. All shifts were distributed and applied by time. Measurements show shifts varying from 0.00 to +0.18 ft. All were given full weight and applied directly except #972 which was discounted by 8% for smoothing purposes. Changing stream conditions throughout the year light moss and channel scour/fill. Measurement #971, was made during periods of ice effect with no effective GH and only used for estimate purposes.

Special Computations.-- For comparison, the station Arkansas River at Salida, located 2.5 miles upstream, was plotted on the same hydrograph. Initially, the record for Arkansas River at Salida (ARKSALCO) is worked, determining flows for ice-affected days there. Then, flows for missing/ice affected/suspect days at Arkansas River near Wellsville can be estimated from the ARKSALCO data, as there is a reasonable correlation that exists between the two stations. There are no known withdrawals from the river between these two stations; only inflows, especially from the South Arkansas River.

Remarks.-- Record good, except for periods of ice affected record, which are estimated and poor. Peak gage height and discharge are rated good based on related measurements and site visits during this time. Station maintained and record developed by Cheston Hart.

Recommendations.-- Preventative maintenance on outside horizontal chain gage should be performed. Installation of a radar reference gage is planned in the coming water year.

STATE OF COLORADO  
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07093700 ARKANSAS RIVER NEAR WELLSVILLE

RATING TABLE-- ARKWELCO06A USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

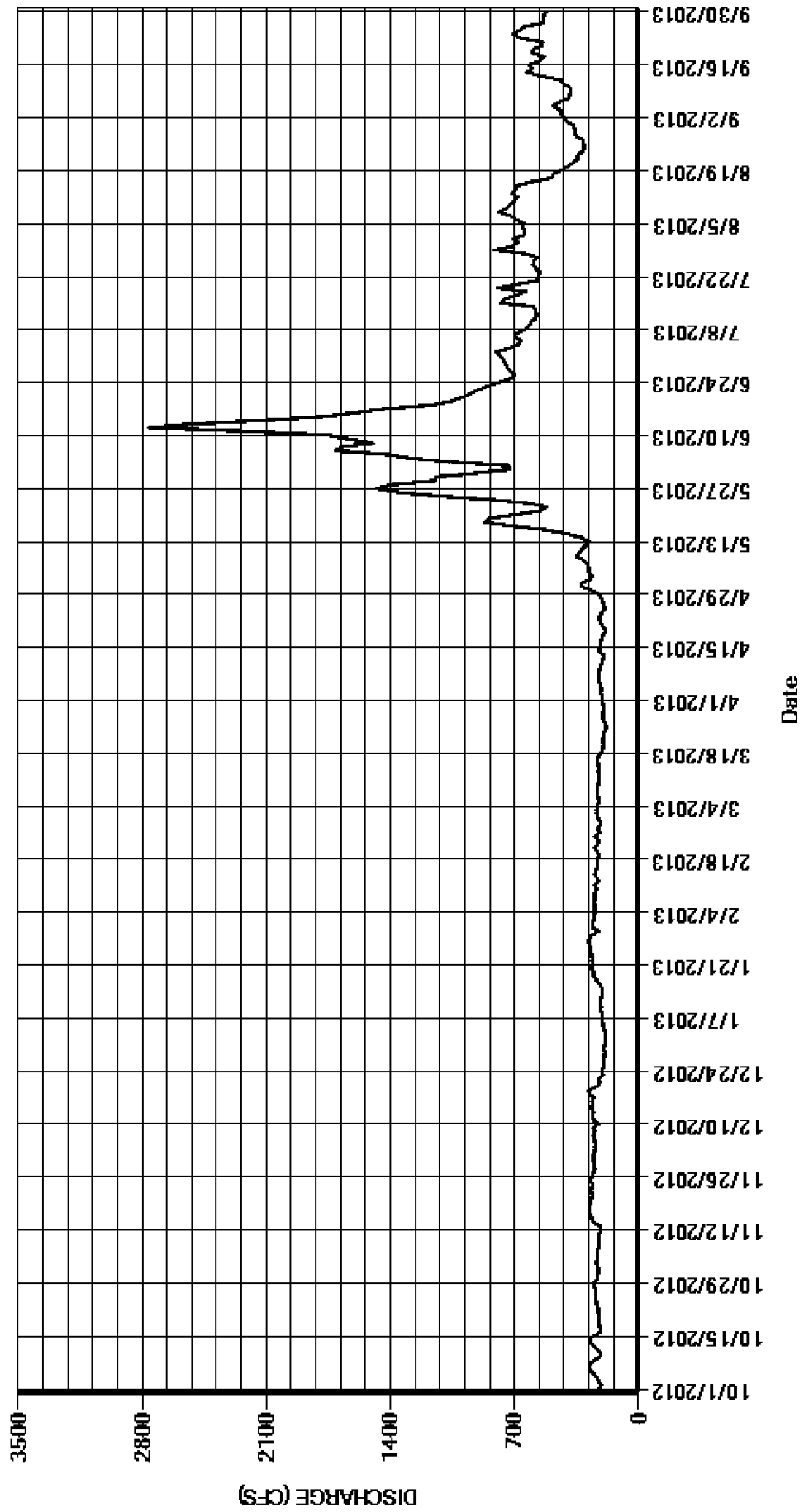
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	221	227	256	e189	261	233	206	323	724	780	704	404
2	212	229	253	e188	253	236	206	320	732	807	647	419
3	226	241	246	e188	252	236	215	270	1070	727	642	434
4	237	234	244	e193	245	236	208	261	1290	677	655	444
5	254	233	243	e201	245	224	214	284	1420	661	647	485
6	274	232	250	e204	248	227	226	283	1710	700	689	452
7	278	229	253	e205	248	231	226	286	1680	692	725	397
8	266	223	247	e207	244	232	224	314	1500	644	791	388
9	229	224	256	e215	248	234	221	348	1640	619	748	384
10	213	225	226	e212	237	227	214	335	1740	606	727	392
11	222	222	251	e215	245	222	206	316	2180	580	699	423
12	250	210	260	e215	226	225	200	294	2760	576	683	440
13	268	218	257	e206	236	228	199	282	2520	582	713	548
14	275	256	265	e205	246	226	220	321	2100	592	692	632
15	250	262	262	e209	240	228	218	403	1770	776	687	597
16	215	273	262	e218	235	235	213	523	1600	756	600	616
17	217	278	254	e238	234	227	210	705	1440	691	491	556
18	222	276	280	e255	235	213	203	869	1170	636	483	533
19	224	273	282	e255	224	204	187	844	1060	794	437	597
20	224	268	229	266	235	200	195	696	998	680	409	594
21	227	261	e218	261	244	201	206	557	948	566	369	546
22	228	267	e225	263	233	201	219	521	907	566	345	543
23	235	264	e203	262	223	198	223	609	848	557	345	659
24	239	261	e208	265	245	190	210	824	783	578	318	707
25	244	268	e196	270	219	180	193	1130	720	595	307	676
26	243	264	e197	274	233	190	194	1360	696	591	310	647
27	240	255	e195	286	217	201	203	1480	722	574	314	536
28	251	248	e193	277	218	201	212	1390	743	650	348	539
29	247	250	e190	259	---	201	225	1150	751	810	361	534
30	234	253	e198	225	---	197	265	1140	761	714	361	519
31	231	---	e190	262	---	201	---	918	---	684	369	---
TOTAL	7396	7424	7289	7188	6669	6685	6361	19356	38983	20461	16616	15641
MEAN	239	247	235	232	238	216	212	624	1299	660	536	521
AC-FT	14670	14730	14460	14260	13230	13260	12620	38390	77320	40580	32960	31020
MAX	278	278	282	286	261	236	265	1480	2760	810	791	707
MIN	212	210	190	188	217	180	187	261	696	557	307	384

CAL YR	2012	TOTAL	126100	MEAN	345	MAX	668	MIN	190	AC-FT	250100
WTR YR	2013	TOTAL	160069	MEAN	439	MAX	2760	MIN	180	AC-FT	317500

MAX DISCH: 2960 CFS AT 09:30 ON JUN 12, 2013 GH 6.41 FT SHIFT 0.16 FT  
 MAX GH: 6.41 FT AT 09:30 ON JUN 12, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07093700 ARKANSAS RIVER NEAR WELLSVILLE  
WY2013 HYDROGRAPH





ARKANSAS RIVER BASIN  
07095000 GRAPE CREEK NEAR WESTCLIFFE  
Water Year 2013

Location.-- Lat. 38°11'10", Long. 105°29'02" (Westcliffe, Colorado quadrangle, 1:24000 scale) in NW¼, NW¼, Section 31, T21S, R72W, Custer County, Hydrologic Unit 11020001, on left bank 0.5 mi upstream from waterline of DeWeese Reservoir at elevation 7690 ft, 0.5 mile downstream from Swift Creek, and 3.6 mile NW of Westcliffe CO.

Drainage Area and Period of Record.-- 320 square miles (furnished by Corps of Engineers).; April 1, 1925-June 30, 1928; April 1, 1930-Sept 30, 1961; Oct 1, 1962 to present.

Equipment.-- A graphic water stage recorder (A-35), Sutron a SatLink II V2 DCP, and stage-discharge recorder (SDR) in a 48-inch diameter metal pipe (CMP) shelter and well. The A-35 was removed July 5, 2013. The primary reference gage is an electric drop tape inside the well. No outside gage. The control is a compound, broad-crested weir located 17 ft. downstream from the gage. An air temperature sensor, installed in radiation shield, and a tipping bucket rain gage are also installed at the gage and monitored by the DCP. The weight on the electric tape gage was replaced on June 6 2013. No other changes this year.

Hydrologic Conditions.-- The gage is located on Grape Creek approximately 3,000 ft upstream of the high water line of DeWeese Reservoir. Grape Creek is one of two major creeks draining the Wet Mountain Valley. The gage is located downstream of approximately 15,000 acres of grass hay and pasture fields in the south and central portions of the valley. The gage is at elevation 7690 ft MSL with a drainage area consisting of the high mountain valley and east slope of the Sangre de Cristo mountains which rise to elevations of 12,000 ft to over 14,000 ft. Snowpack and snowmelt runoff, and summer thunderstorms dictate the shape and volume of the annual streamflow hydrograph. Peak runoff often occurs in the spring (late March-late May) due to high elevation snowmelt or melt of very wet (and often deep) spring snows in the valley. As a result of irrigation diversions, streamflows at the gage can generally be low during late May to late August, but often flashy peaks during this period are experienced due to intense summer thunderstorms. WY2013 was dry with low snowpack and low runoff, however late summer thunder storms helped to "catch up" for the year.

Gage-Height Record.-- Primary record is 15-minute satellite data with the graphic chart record, DCP and SDR log data used for backup purposes. Record is complete and reliable, except for the following periods: November 10-16, 23-30, December 4, 5, 8, 9, 10-19, 2012, March 24-26, April 9-12, 17-19, 2013, when the stage-discharge relationship was affected by ice on the control; December 20 2012-March 14, 2013, when floats were frozen in ice in the well, the well was frozen, intakes were frozen, and the control/weir pool was frozen over. Four missing unit values on March 24 were filled in using surrounding flat gage height trend without loss of accuracy. Missing values for July 16 from 1030 to 1615, July 17 from 830 to 1315, July 28 from 0300 to 0715, September 2 from 0730 to September 3 at 0730, and September 3 from 1130 to 1315 were filled in with the DCP log.

Datum Corrections.-- Levels were run April 5, 2013 to the electric tape index using RM No. 1 as base. No corrections were necessary as the electric tape index elevation was found to be within allowable tolerances. Weir crest elevations across the refurbished weir were also taken at 2 foot intervals on this date. Low point on the weir (estimated PZF) was found to be an elevation of 0.301 ft.

Rating.-- The control is a compound, broad-crested weir located 17 feet downstream from the gage. The PZF on the weir is gage height of approximately 0.30 ft. Rating No. 9, in use since October 6, 2005, was continued in use for all of WY2013. It is well-defined to flows of about 525 cfs, 150% of the historical highest discharge measurement made in WY2007. Seventeen discharge measurements (Nos. 306-322) were made during the year, ranging in discharge from 5.61 to 33.6 cfs. They cover the range in stage experienced except the lower daily flows of October 1-4, 24, 2012; May 29-June 2, 14, 15, 22-29; July 10-13, 27 and August 18, 20-31, 2013 as well as the higher daily flows of May 10; September 3, 16, 23, 24, 2013. The peak flow of 181 cfs occurred at 0115 on September 3, 2013 at a gage height of 1.74 ft with a shift of -0.04 ft.. It exceeded the stage of high flow Measurement No. 322, made September 24, 2013 by 0.85 feet.

Discharge.-- Shifting section control method was used for all periods of good record as the range in stage experienced this year was confined to the weir section for all periods of good record. Shifts were applied as defined by measurements and were distributed by time, with consideration of stage change, for the periods 0000 Oct 1, 2012 to 0945 Mar 14, 2013. Shifts were distributed by stage using variable stage-shift relationship GRAWESCOVSHF13A for the period 1000 Mar 14 to 1330 April 5. For the period 1345 April 5 to 1515 May 14 shifts were applied by stage by transitioning from variable stage shift curve VSHF13A to variable stage shift curve GRAWESCOVSHF13B. VSHF13A and VSHF13B are based on Msmts 312-316 made during the period of application. The period from 0830 June 6 to 1645 June 19 shifts were prorated from Msmts 316B to 317 to transition to variable stage shift curve GRAWESCOVSC13C. VSC13C takes into account the algae/moss buildup on the weir crest and minor "cleansing/scouring" rainfall events as well as the high water during the period and the peak. It is based on Msmts 317-323, and the high water measurement made in 2007. Msmt 323 begins Water Year 2014. Open water measurements showed raw shifts varying between -0.07 ft and -0.01 ft. All open water measurements were given full weight and applied directly with the exception of Measurement No 319 which was not used because it was a training measurement.

Special Computations.-- Discharge for periods of ice-affected record was estimated on the basis of 4 measurements (Nos. 309-312), and air temperature data collected at the gage. A hydrograph and air temperature graph was used to determine estimated discharge trends.

Remarks.--

Record is good, except for periods of ice effect and no gage height record, which are estimated and poor. The peak gage height and discharge are considered good. Station maintained and record developed by Thomas W. Ley and Anthony D. Gutierrez

Recommendations.-- A new rating should be considered based on the PZF from the levels survey with the accumulation of more data points.

STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

07095000 GRAPE CREEK NEAR WESTCLIFFE

RATING TABLE-- GRAWESCO09 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

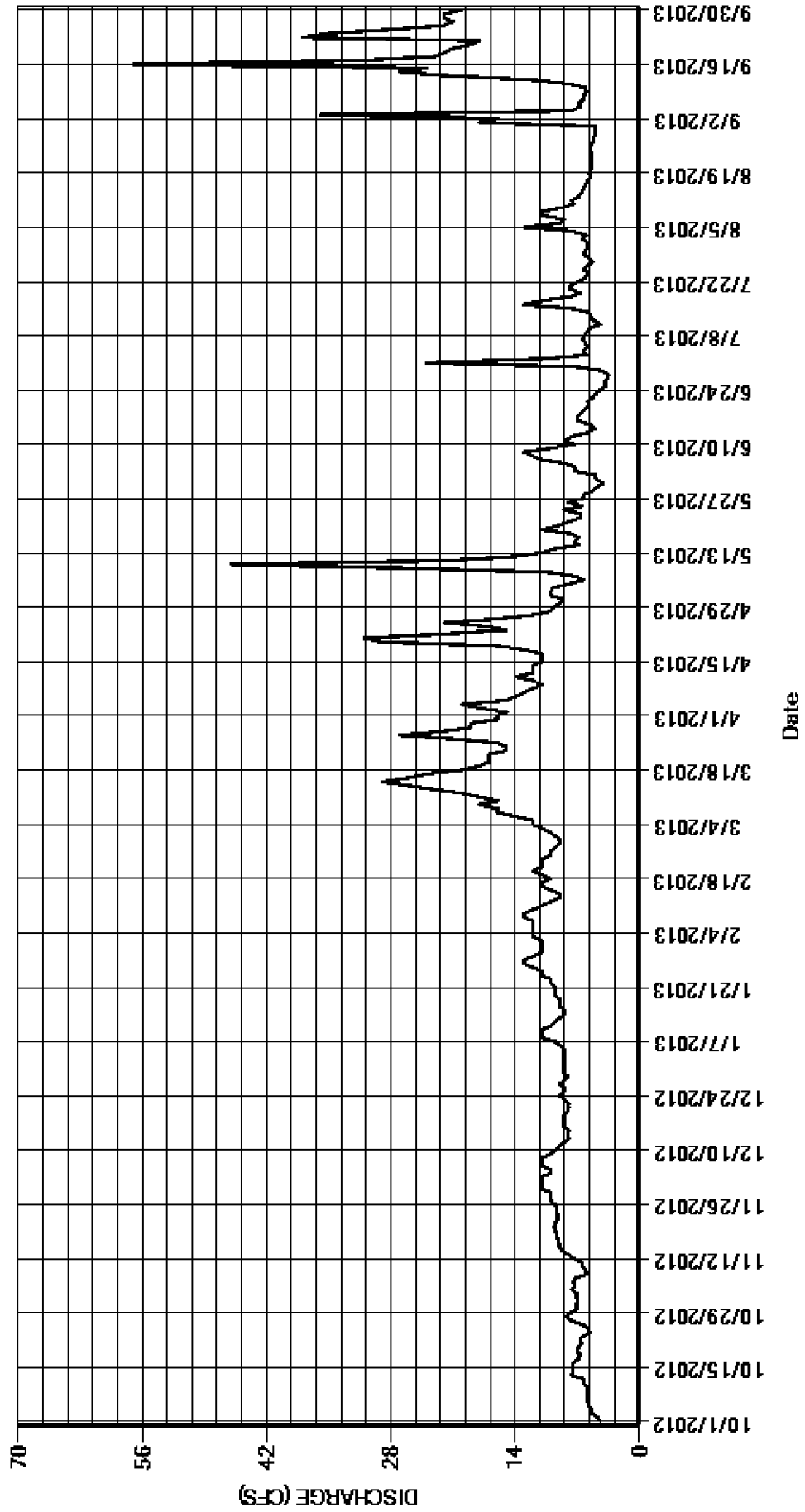
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.4	7.0	11	e8.5	e11	e9.5	16	8.6	4.9	24	5.9	18
2	4.7	7.1	11	e8.5	e11	e10	15	10	5.0	11	6.4	16
3	5.3	7.0	11	e8.5	e12	e11	18	10	7.3	6.0	6.0	36
4	5.4	7.6	e10	e8.5	e12	e12	20	9.7	7.2	6.3	7.7	7.8
5	5.7	7.3	e10	e8.5	e12	e12	15	7.8	8.2	5.9	13	6.6
6	5.8	7.5	11	e9.0	e12	e14	14	6.3	11	6.1	8.9	6.8
7	5.9	7.2	11	e9.5	e12	e16	13	7.2	12	6.4	8.5	6.3
8	5.8	5.9	e11	e11	e13	e16	12	10	13	6.2	11	6.2
9	5.8	6.1	e10	e11	e13	e18	e11	25	10	5.9	11	6.0
10	6.0	e6.5	e9.5	e11	e12	e16	e12	46	7.4	5.6	8.8	6.1
11	6.3	e6.5	e9.0	e10	e11	e18	e14	21	8.4	4.4	7.4	8.0
12	6.4	e7.5	e8.5	e9.5	e10	e20	e12	14	7.5	5.2	7.7	12
13	7.7	e8.0	e8.0	e9.0	e9.0	e23	12	11	5.9	5.5	6.8	21
14	7.5	e8.7	e8.0	e8.5	e9.0	e26	12	9.5	5.1	5.7	6.5	27
15	7.5	e9.0	e8.0	e8.5	e10	29	11	6.9	5.6	7.6	6.3	24
16	7.5	e9.1	e8.5	e9.0	e11	26	11	7.3	6.9	13	6.1	57
17	6.9	9.2	e8.5	e9.0	e11	24	e11	6.8	7.0	11	5.8	31
18	6.6	9.3	e8.5	e9.0	e10	20	e13	7.8	6.6	7.8	5.5	23
19	7.0	9.4	e8.5	e9.5	e11	18	e16	11	6.2	6.6	5.7	22
20	6.9	9.6	e8.0	e9.5	e12	17	29	9.2	5.7	7.8	5.4	21
21	6.5	9.5	e8.0	e9.5	e11	17	31	8.0	5.8	7.8	5.4	19
22	6.7	9.2	e8.0	e10	e11	17	22	6.7	5.3	6.9	5.4	18
23	6.3	e9.2	e8.5	e10	e11	15	15	6.6	4.9	6.1	5.4	38
24	5.6	e9.3	e9.0	e11	e10	e15	17	8.5	4.4	5.7	5.4	35
25	5.8	e9.3	e8.5	e11	e10	e16	22	6.5	3.8	6.3	5.6	28
26	6.4	e9.5	e8.5	e12	e9.5	e21	16	8.0	3.9	5.9	5.5	22
27	7.7	e10	e9.0	e13	e9.0	27	12	6.3	3.6	5.3	5.2	21
28	8.3	e10	e8.5	e13	e9.0	22	10	6.3	3.5	5.7	5.2	22
29	7.7	e10	e8.0	e12	---	19	9.6	5.3	4.2	6.3	5.0	22
30	7.0	e11	e8.5	e11	---	19	9.0	4.8	7.0	6.1	5.0	20
31	7.1	---	e8.5	e11	---	16	---	4.1	---	5.8	5.1	---
TOTAL	200.2	252.5	282.0	309.0	304.5	559.5	450.6	316.2	197.3	225.9	208.6	606.8
MEAN	6.46	8.42	9.10	9.97	10.9	18.0	15.0	10.2	6.58	7.29	6.73	20.2
AC-FT	397	501	559	613	604	1110	894	627	391	448	414	1200
MAX	8.3	11	11	13	13	29	31	46	13	24	13	57
MIN	4.4	5.9	8.0	8.5	9.0	9.5	9.0	4.1	3.5	4.4	5.0	6.0

CAL YR	2012	TOTAL	3493.0	MEAN	9.54	MAX	95	MIN	2.6	AC-FT	6930
WTR YR	2013	TOTAL	3913.1	MEAN	10.7	MAX	57	MIN	3.5	AC-FT	7760

MAX DISCH: 181 CFS AT 01:15 ON SEP 03, 2013 GH 1.74 FT SHIFT -0.04 FT  
MAX GH: 1.74 FT AT 01:15 ON SEP 03, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07095000 GRAPE CREEK NEAR WESTCLIFFE  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
07096000 ARKANSAS RIVER AT CANON CITY

Water Year 2013

Location.-- Lat. 38°26'02", Long. 105°15'24", in SE¼SE¼ sec. 31, T.18 S., R.70 W., Fremont County, Hydrologic Unit 11020002, on right bank 800 ft upstream from Sand Creek, 0.7 mi downstream from Grape Creek, and 0.7 mi upstream from First Street Bridge in Canon City.

Drainage Area and Period of Record.-- 3,060 square miles according to the USGS. ; January 1888 to current year. Monthly data only for some periods. Published as near Canyon 1900-1906.

Equipment.-- A float controlled Sutron shaft encoder logged and transmitted with a Satlink 2 data collection platform in a 4-ft x 4-ft steel outhouse-type shelter over a 42-inch stilling well. Backup data is logged by an independently float controlled Sutron SDR. Primary reference gage is electric drop tape in the stilling well. Water temperature and specific conductance is monitored by the USGS and logged and transmitted with the Satlink 2. No equipment modifications this water year. A manned cableway is positioned 25 feet downstream from gage. Control is a 2-stage diversion dam for the Canon City Water Works pump station (diversion structure #503) located approximately 250 ft downstream of the gage.

Hydrologic Conditions.-- The drainage basin above the gage includes elevation differences from Mt. Elbert at 14,433 ft to the gage at elevation 5,361 ft with vegetation ranging from alpine tundra to sparse pinon-juniper. Upstream from the gage, the Arkansas River is characterized by steep gradient, high velocity flows that are confined to a relatively narrow rock and cobble stream channel. The gage is located downstream of the Royal Gorge bridge 3.10± miles and is 0.7± miles downstream of Grape Creek inflows. Stream flow exhibits considerable seasonal variability with the majority of the total annual streamflow resulting from snowmelt runoff with high intensity – short duration summer thunderstorms contributing in the minor. Mean annual precipitation for the basin is 18.02± inches. Flow varies seasonally due mainly to snowmelt in the Sawatch Range. Snowmelt generally runs from May through July and peak flows typically occur during this period. Flows can also be affected by thunderstorm runoff and flash flooding on upstream tributaries during the summer months. Otherwise flows are affected by regulation of upstream reservoirs. Upstream diversions, Hydraulic and South Canon ditches, affect flows and often cause flows at the gage to be lower than those at the upstream Parkdale gage. No hydrologic conditions changes in the basin observed this water year.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted shaft encoder (SE) data with DCP log and SDR log as backup. Record is complete and reliable except for Jan 13-16, 2013 when floats were frozen; and from Apr 5-8 due to DCP and battery failures. Primary and backup stage sensor calibration to reference gage is supported by 20 visits made to the gage station this water year. There were 3 instrument calibration corrections ranging from -0.01 to 0.01 which were prorated back to the previous visit. There were 5 flush corrections ranging from 0.01 to 0.05 which were prorated by time back to the previous inflection points. The stage-discharge relationship was affected by ice Dec 9-Jan 12; Jan 17-Feb 23 and Feb 25-28.

Datum Corrections.-- Levels were run on Apr 25, 2012 using RM11 as base. The electric tape index was found to be reading within allowable tolerance and no corrections were made. A new brass cap reference mark, RM11A, was established on the top of concrete on the south side of right bank cableway frame adjacent to the southwest leg at elevation 13.674 feet.

Rating.-- The 1st stage of the control consists of a grouted riprap whitewater bypass chute, approximately 13 ft wide, with sloped sides, and a concrete sill with a point of zero flow at approximately 3.65 ft, gage datum, according to construction plans. Flow through the chute appears to go through critical depth at most stages but could be subject to submergence due to downstream obstructions. The whitewater bypass was cut into the original ogee weir around 1993. The 2nd stage control consists of an ogee weir, about 65 ft wide and with a crest elevation of about 4.90 ft, gage datum. Boulders were grouted to the downstream face of the weir during the 1993 work. The weir and whitewater bypass have vertical abutments up to a gage height around 12 feet above which the channel banks would become part of the control. At a gage height of approximately 14-ft, flows would spill into floodplain along the left bank. Rating No. 23, implemented on Nov 6, 2003, was used all water year. The rating is well-defined by historical measurements ranging from 132 cfs to 4320 cfs. Eighteen discharge measurements (Nos. 782-799) were made this water year ranging from 152 cfs (4.94 ft) to 2690 cfs (8.06 ft). WY2013 measurements covered the range in stage experienced except for intermittent lower daily flows Oct 3, 17; Nov 9, 12-13; and Apr 26-29. The peak instantaneous flow of 3030 cfs occurred at 19:45 on Aug 09, 2013 at a gage height of 8.36 ft with a shift of 0.2 ft. It exceeded high measurement no. 791, made Jun 13, 2013, by 0.30 ft in stage.

Discharge.-- Shifting control method was used to compute discharge for the entire water year. Shifts were applied as defined by measurements and distributed by time, event and stage. Shifts were distributed by time most of the water year except for periods of high flows. Two variable shift curves were developed and implemented during periods of high flows. Variable shift curve ARKCANCOVSC13A was utilized from 12:00 May 7, 2013 to 12:30 Jun 25, 2013. The variable shift curve is based on measurements 789-792. Variable shift curve ARKCANCOVSC13B was utilized from 12:45 Aug. 5, 2013 to 09:00 Aug. 21, 2013. The variable shift curve is based on measurements 791, 796 and 797. Open water measurements showed unadjusted shifts ranging from -0.11 to +0.20 ft. All measurements were given full weight and applied directly except for nos 794-800, which were adjusted as much as -4.34% to smooth the shift trend. Shifts for measurement nos. 784 and 785 were not used as the stage-discharge relationship was affected by ice on the control.

Special Computations.-- Hydrographic comparisons were made with upstream gage Arkansas River at Wellsville, downstream gage Arkansas River at Portland, and inflows to Pueblo Reservoir to check/validate average daily flows and produce estimates for periods of poor record.

Remarks.-- Record is good for the entire water year, except during times of ice effect and equipment failure, which is rated poor. The peak instantaneous flow is rated good. Station maintained the first part of the year by Charles DiDimenico and Anthony Gutierrez and the second half was maintained and the record developed by Joseph C. Talbott, Jr.

Recommendations.--

An outside reference gage is recommended to validate stilling well levels. All chiseled benchmarks should be replaced with either a brass cap or concrete pin for improved accuracy during levels. The whitewater bypass section of the control should be surveyed during any low flow events (less than 200 cfs) to confirm the point of zero flow. The measurements show a trend of positive shifts at gage heights near the break for the second stage (<4.90) indicating that the offset in the rating may be in error. It is advised to gather and analyze more data to determine if a revised rating at lower gage heights is in order.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

07096000 ARKANSAS RIVER AT CANON CITY

RATING TABLE-- ARKCANCO23 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

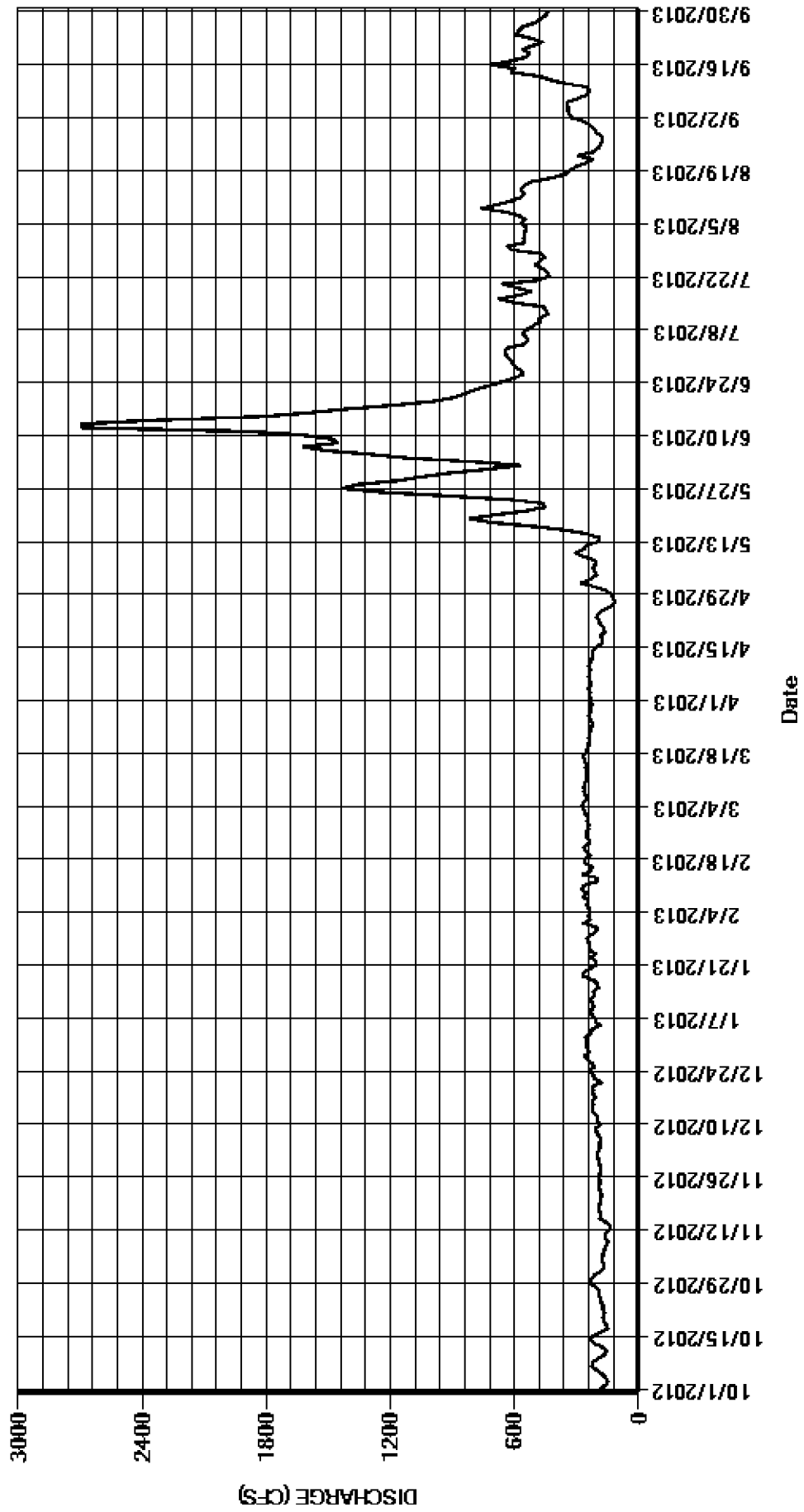
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	185	185	196	e250	e266	246	233	217	729	640	555	262
2	158	168	201	e258	e234	258	236	277	578	645	553	323
3	150	170	193	e230	e242	264	236	238	790	639	549	340
4	161	179	187	e225	e234	275	244	204	1110	557	545	341
5	177	174	187	e186	e242	267	e232	211	1290	535	568	343
6	203	171	185	e208	e249	251	e236	221	1510	545	549	346
7	225	163	196	e212	e245	259	e240	208	1620	563	577	295
8	223	155	205	e228	e266	263	e238	212	1460	541	643	249
9	198	150	e206	e229	e253	265	235	269	1480	509	759	241
10	166	162	e185	e218	e273	261	241	303	1610	480	687	245
11	153	162	e199	e225	e263	250	236	263	1890	479	615	352
12	178	141	e201	e230	e204	249	226	251	2690	439	568	424
13	217	138	e218	e215	e201	254	222	193	2690	447	555	482
14	231	159	e224	e218	e269	256	224	192	2330	461	570	614
15	223	187	e220	e196	e230	254	206	251	1820	599	552	600
16	185	184	e224	e199	e226	260	177	359	1600	675	519	710
17	151	190	e209	e218	e260	270	177	516	1410	579	422	612
18	157	191	e221	e269	e260	255	182	719	1180	522	354	542
19	170	188	e220	e264	e234	248	165	815	993	585	333	530
20	171	184	e222	e234	e255	243	168	690	895	656	306	563
21	167	179	e179	e207	e264	240	185	543	840	495	258	508
22	172	183	e216	e208	e242	240	192	455	792	434	224	465
23	173	192	e220	e230	e240	239	202	461	732	440	291	522
24	183	189	e236	e210	e253	230	192	618	666	462	218	593
25	186	187	e217	e239	e253	227	165	910	608	501	195	580
26	192	192	e225	e237	e244	223	131	1240	563	476	184	560
27	192	187	e249	e243	e242	235	115	1430	564	456	176	505
28	210	183	e260	e250	e249	241	123	1360	592	470	180	473
29	235	188	e240	e228	---	231	133	1170	611	615	206	451
30	228	193	e250	e203	---	229	158	1050	621	634	216	434
31	215	---	e253	e204	---	226	---	918	---	551	237	---
TOTAL	5835	5274	6644	6971	6893	7709	5950	16764	36264	16630	13164	13505
MEAN	188	176	214	225	246	249	198	541	1209	536	425	450
AC-FT	11570	10460	13180	13830	13670	15290	11800	33250	71930	32990	26110	26790
MAX	235	193	260	269	273	275	244	1430	2690	675	759	710
MIN	150	138	179	186	201	223	115	192	563	434	176	241

CAL YR	2012	TOTAL	109291	MEAN	299	MAX	553	MIN	138	AC-FT	216800
WTR YR	2013	TOTAL	141603	MEAN	388	MAX	2690	MIN	115	AC-FT	280900

MAX DISCH: 3030 CFS AT 19:45 ON AUG 09, 2013 GH 8.36 FT SHIFT 0.20 FT  
 MAX GH: 8.36 FT AT 19:45 ON AUG 09, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07096000 ARKANSAS RIVER AT CANON CITY  
WY2013 HYDROGRAPH





ARKANSAS RIVER BASIN  
07097000 ARKANSAS RIVER AT PORTLAND  
Water Year 2013

Location.-- Lat 38°23'18", Long 105°00'56" (Florence, Colorado quadrangle, 1:24000 scale) in NE¼, NE¼, Section 20, T19S, R68W, Fremont County, Hydrologic Unit 11020002, on right bank on upstream side of State Highway 120 bridge, 5.4 mi. west of the intersection of State Highway 120 and US Highway 50 on SH120, 1 mile downstream of Hardscrabble Creek, and across the road approximately 170 ft ENE of entrance to Holcim Cement Plant (previously known as Portland and Holnam) at Portland Colorado.

Drainage Area and Period of Record.-- 3,950 mi<sup>2</sup>.; October 1, 1939 to present.

Equipment.-- Primary sensor is a Sutron constant flow bubbler (CFB) inside a 4-ft x 4-ft steel shelter on the right bank upper terrace. The shelter also accommodates a tipping bucket rain gage. The primary reference gage is a staff gage mounted to a piece of steel channel placed in the river at the orifice line of the CFB. Due to construction at the Highway 120 Bridge, equipment modifications for this water year include: the USGS water temperature and specific conductance monitor has been temporarily discontinued, the shaft encoder and CMP well/shelter was removed from service October 2012, and the the cable car monorail attached to the bridge was removed from service June 2013.

Hydrologic Conditions.-- Flow varies seasonally due mainly to snowmelt. Snowmelt generally runs from May through July and peak flows typically occur during this period. Flows can also be affected by thunderstorm runoff and flash flooding on upstream tributaries during the summer months. Otherwise, flows are highly affected by regulation of upstream reservoirs. Upstream operations from the Minnequa Canal also affect flows at the gage. No hydrologic conditions changes in the basin observed this water year.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted data with DCP log and CFB as backup. Record is complete and reliable. Two 15-minute values were filled on Apr 1 from DCP backup without loss of accuracy. There was one instrument calibration correction of -0.19 ft that was prorated to the previous visit. No purgeline corrections were made during the year. The stage-discharge relation was affected by ice Dec 18-31; Jan 1-23, 28-29.

Datum Corrections.-- An abbreviated level survey was ran from RM 102 to the water surface at the CFB staff gage to recalibrate the staff gage and CFB on Sept 25, 2012.

Rating.-- The control during most flow conditions at present is the coffer dam immediately downstream of the OSG and CFB orifice line. The coffer dam constricts the channel approximately 50%. At high flows, the riverbank, railway abutments and the highway bridge are part of the control along with the coffer dam. Rating no. ARKPORCO 10 was used in use since Oct 31, 2007 was used until Oct 12, 2012. Rating no. ARPORCO10T was used from Oct 12, 2012 to the end of the water year. Rating no. ARKPORCO10 was well defined at all stages prior to the coffer dam being installed. Rating no. ARKPORCO10T is a temporary rating curve developed taking the coffer dam into consideration. More measurements and a stable OSG are needed to determine how well defined ARKPORCO10T is at various flows. Seventeen discharge measurements (nos. 1032-1048) were made this water year ranging in discharge from 109 cfs to 1670 cfs. The measurements cover the discharge range experienced except for the lower daily flows on Apr 28-30 and higher daily flows on Jun 7, 10-15; Sep 12. The peak flow of 7820 cfs occurred at 1015 on Sep 12 at a gage height of 9.46 ft with a shift of 0.45 ft. It exceeded high measurement no. 1041 made Jun 7 by 4.94 ft.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were distributed by time from Oct 1 until Apr 28. Variable shift curve ARKPORCOVSC13D began on Apr 29 and was used until Jul 8. Shifts were again distributed by time from Jul 9 until the end of the water year. Open-water measurements showed unadjusted shifts varying between -0.07 and +0.45 feet. Shifts were applied directly and given full weight. The shift for measurement no. 1039 was not used due to being too far outside of the range of shifts noted during the rest of the water year and was more than likely an artificial increase in gage height caused by construction in the channel.

Special Computations.-- The hydrograph and temperature gage for Arkansas River at Canon City (ARKCANCO) and inflows into Pueblo Reservoir (PUERESCO) were used to determine periods of ice-affected record. The record is also affected by Minnequa Canal sluicing operations which occur upstream of the gage approximately 8.75 miles and at irregular intervals throughout the water year. This operation causes the gage height to increase then decrease rapidly over a short period of time before returning to pre-operation levels and is essentially smoothed in the record by the computation of the daily average of unit data. A hydrograph was used to compare the mean daily flows with upstream gage Arkansas River at Canon City. Minnequa Canal diversions were also examined for sluicing operations. It was also determined through observation and analysis that the outside reference gage was affected by ice damage during the winter. The staff gage was not reset due to construction and operational transitions. All instrument corrections were considered as part of the stage-shift regime. Data indicates that the staff gage was relatively stable after the damage occurred, but a reliable levels survey was not performed during the water year.

Remarks.-- The record is considered poor for the entire year because of the lack of rating definition and validation, and the lack of reliable reference gage to ensure that each measurement made actually adds good definition and not artificial points. The peak instantaneous flow should be considered poor. Station maintained and record development started by Charles DiDomenico and Anthony Gutierrez and finished by Joseph Talbott.

Recommendations.--

The primary reference gage needs to be re-established. Upon completion of the bridge project, it is desired to install a radar level sensor and wire-weight gage on the downstream side of the bridge. It is also advisable to make more frequent visits to this gage during the construction period.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

07097000 ARKANSAS RIVER AT PORTLAND

RATING TABLE-- ARKPORCO10 USED FROM 01-OCT-2012 TO 12-OCT-2012  
 ARKPORCO10T USED FROM 12-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

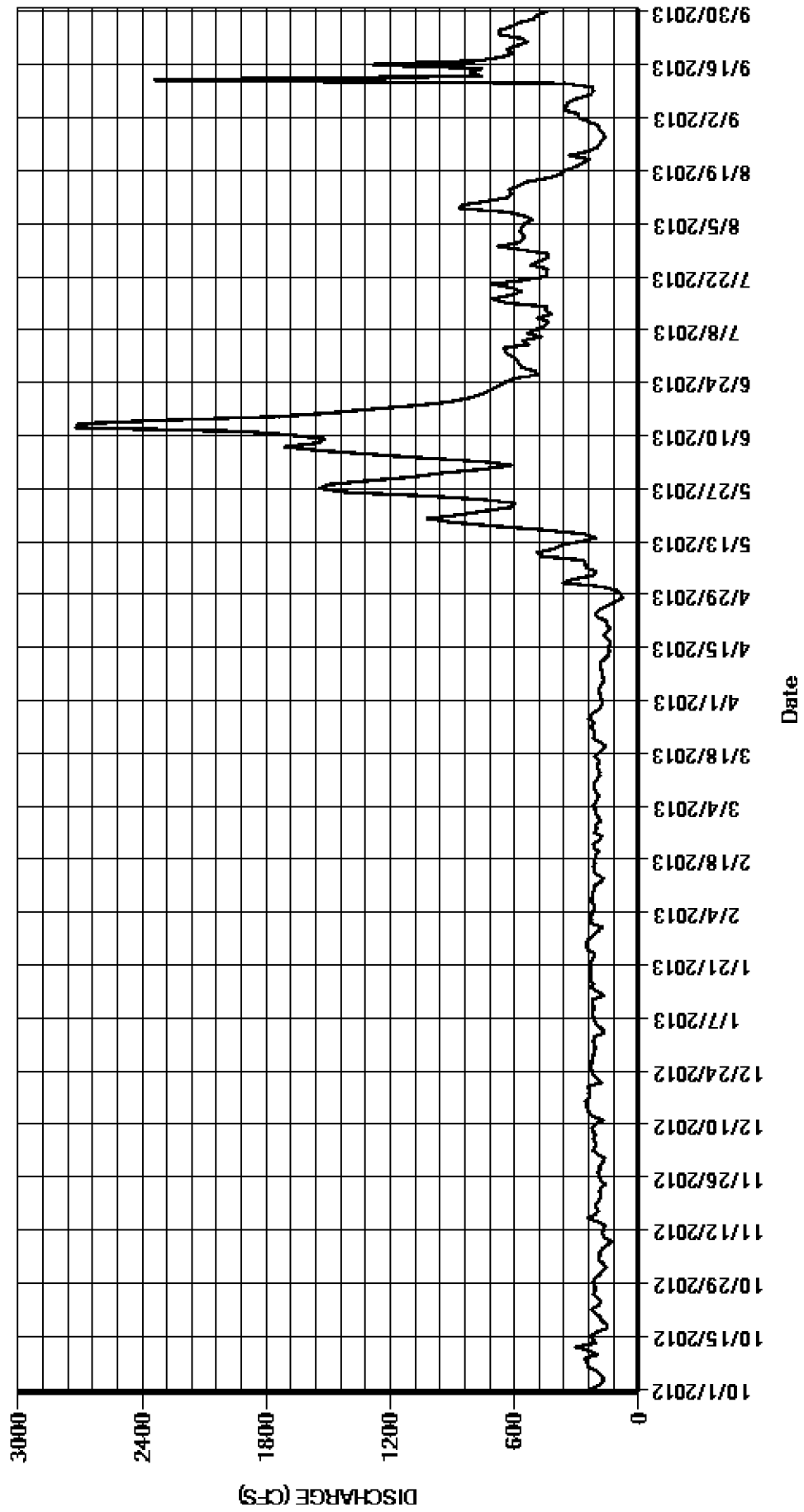
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	227	176	167	e220	231	195	180	178	756	616	557	242
2	189	157	197	e215	228	208	184	365	618	645	558	290
3	171	169	222	e172	229	210	189	319	742	651	572	291
4	173	194	210	e173	223	222	192	220	1030	533	566	361
5	188	190	209	e200	214	207	183	206	1280	560	551	351
6	214	188	217	e212	217	198	170	251	1540	471	514	341
7	247	176	211	e217	229	195	172	259	1710	538	556	299
8	250	151	219	e225	224	208	176	266	1550	493	636	231
9	261	133	227	e220	224	217	180	471	1520	455	866	220
10	201	166	206	e218	214	217	185	489	1670	435	849	224
11	237	175	172	e223	211	202	184	406	1900	489	722	356
12	303	172	222	e221	181	189	163	371	2720	421	630	2340
13	210	161	241	e168	171	189	147	277	2710	450	617	763
14	221	191	246	e198	206	198	140	209	2280	447	624	813
15	237	244	253	e230	215	198	146	268	1740	640	574	758
16	203	210	256	e221	217	191	138	462	1490	706	542	1280
17	153	195	239	e231	212	211	145	685	1280	620	435	777
18	155	209	e240	e235	213	194	169	901	1060	568	377	659
19	179	206	e240	e233	206	174	151	1020	899	607	358	605
20	186	190	e244	e230	194	161	138	863	811	710	304	640
21	212	183	e180	e235	216	190	156	738	751	564	273	585
22	226	188	e201	e230	218	219	155	615	717	450	240	535
23	195	183	e220	e219	189	214	200	597	681	444	332	570
24	184	162	e225	213	179	217	210	742	645	442	253	673
25	197	185	e230	244	211	231	186	1010	602	522	202	678
26	217	191	e228	255	203	213	151	1420	491	480	189	620
27	211	196	e225	252	209	241	112	1540	501	439	176	585
28	210	188	e220	e240	185	230	78	1500	564	443	163	510
29	219	189	e215	e215	---	210	84	1310	580	560	177	491
30	215	172	e210	195	---	186	109	1090	588	678	193	445
31	191	---	e215	176	---	177	---	954	---	579	198	---
TOTAL	6482	5490	6807	6736	5869	6312	4773	20002	35426	16656	13804	17533
MEAN	209	183	220	217	210	204	159	645	1181	537	445	584
AC-FT	12860	10890	13500	13360	11640	12520	9470	39670	70270	33040	27380	34780
MAX	303	244	256	255	231	241	210	1540	2720	710	866	2340
MIN	153	133	167	168	171	161	78	178	491	421	163	220

CAL YR	2012	TOTAL	110892	MEAN	303	MAX	609	MIN	131	AC-FT	220000
WTR YR	2013	TOTAL	145890	MEAN	400	MAX	2720	MIN	78	AC-FT	289400

MAX DISCH: 7820 CFS AT 10:15 ON SEP 12, 2013 GH 9.46 FT SHIFT 0.45 FT  
 MAX GH: 9.46 FT AT 10:15 ON SEP 12, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07097000 ARKANSAS RIVER AT PORTLAND  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
07099400 ARKANSAS RIVER ABOVE PUEBLO

Water Year 2013

Location.-- Lat. 38°16'18", Long. 104°43'03", in NE¼NE¼ sec. 36, T.20 S., R.66 W., Pueblo County, Hydrologic Unit 11020002, on left bank of Arkansas River, 100' downstream from NE corner of Arkansas River bridge, approx. 0.25 mi. downstream from Pueblo Dam, and 7 mi. West of Pueblo.

Drainage Area and Period of Record.-- 4,670 mi<sup>2</sup>. ; October 1965 to current year. Periodic water quality and sediment data available Oct. 1965 to current year.

Equipment.-- Satellite-monitored data collection platform (high data rate Sutron SatLink 2 DCP) with a Sutron Constant Flow Bubbler (CFB) and shaft encoder; and a Sutron Stage Discharge Recorder (SDR) in a 4 ft x 4 ft concrete block shelter over a CMP stilling well. The primary reference when the well has good contact to the river (gage heights greater than 1.80 ft) is an electric drop tape referenced to a fixed index mounted on the instrument shelf. A cableway located approximately 20 feet upstream from gage is used for high flow measurement. USGS Hydrolab measuring water temperature and specific conductance is co-located at the gage and monitored by the DCP. An outside staff gage was installed on June 13 2012; this was abandoned due to warping of the staff gage board and removed September 6, 2013. A cantilever wire weight gage and radar gage were installed September 9, 2013. The wire weight is the primary reference gage with the radar becoming the primary gage on October 1, 2013. No other equipment changes made this water year.

Hydrologic Conditions.-- The gage is located approximately a quarter mile downstream of the Pueblo Reservoir Dam at an elevation of 4740 ft above MSL. Streamflow is directly affected at all stages by regulation of the reservoir gates. The riverbed mainly consists of gravel and cobble to large rocks 24+ inches. The channel is subject to moss growth of various types, varying from light accumulations to very dense at any time during the year, with increased growth from October - April due to the cold and low flows. The moss growth contributes to negative shifts as it tends to back up and slow down the flow of the water. Discharge measurements in the range from 650 to 800 cfs are of poor quality as the gage height is too deep to wade and too shallow for a good cable measurement. Measurements of less than 650 cfs are made from 50 to 600 feet below the gage depending on the gage height, while measurements over the 650 cfs are made from the cableway. The bridge above the gage can be used for ADCP (Acoustic Doppler Current Profiler) measurements.

Gage-Height Record.-- Primary record is 15-minute satellite data. For the periods: October 1, 2012 to 1135 May 20, 2013 and from 0900 July 23 to 2345 September 30, 2013, when gage heights were less than 2.50 ft, the CFB was used for primary record. For the period:1145 May 2 to 1500 July 3, 2012 when gage heights were over 2.50 ft, the shaft encoder was used for primary record, with stage discharge recorder used for backup purposes. The CFB is not used during high water, due to a problem with it tracking accurately at high stages. The record is complete and reliable for entire water year. Missing data was filled in with DCP log. This gage is immediately below the Pueblo Reservoir and does not experience ice effects.

Datum Corrections.-- Levels were run twice this year; the first was on May 24 to the electric tape index using BM6. The tape was found to be 0.016 ft low, no correction made at this time. The second Levels run were done September 10 to set the Wire Weight and Radar gages using BM's 6, 8, and 11. The ETI was found to be 0.020ft low, correction not made at this time. Previous Levels were run April 25, the ETI was 0.065ft low, not corrected. A levels run was attempted on May 2, but was unsuccessful. Levels were also run on June 12, 2012 to establish the elevation of a new outside staff gage.

Rating.-- The control at low flow is a series of rock riffles and large rocks, forming jetties below the gage. The large rocks (36 inch plus) were placed in clusters, starting at 100 feet below the gage house at various points crossing the river, while the "riffles" which start 150 feet below the gage house consist of 24 to 36 inch rock placed in a series of jetties extending from the left bank angling upstream at lengths from 30% to 50% across the river. The control at medium and high flows is the riverbed (gravel to large cobble) along with the large rock placements and banks (grass and brush). Negative shifts continued to be measured at gage-heights less than 2.50 ft this water year due to moss growth in the channel. Various moss conditions were noted for the entire water year. Rating No.18, implemented on November 19, 2008, was used this entire water year and is well defined to 7370 cfs. Twenty-three discharge measurements (Nos. 1261 – 1283) were made this water year, ranging in discharge from 12.8 to 2700 cfs. They cover the range in stage experienced for the entire water year. The peak discharge of 3050 cfs occurred at 1145 September 14, 2013 at a gage height of 6.03 ft with a shift of 0.00 ft. This exceeded meas. No 1274 made June 14 by 0.29 feet

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and prorated by time and/or stage change events due to upstream reservoir gate changes. Shifts were prorated by time with consideration of stage change events due to gate changes from 0000 October 1, 2012 to 1045 April 11 and from 1330 July 9 1730 July 10. Three variable shift curves were developed and applied as determined by discharge measurements after reservoir releases. Variable shift curve ARKPUECOVSC13A (based on measurements No 1269 – 1276) was applied from 1100 April 11 to 1350 July 9. Variable shift curve ARKPUECOVSC13B (based on measurements No 1273, 1274, and 1277 – 1281) was applied from 1745 July 10 to 1045 September 9. Variable shift curve ARKPUECO13C (based on measurements No 1273, 1274, and 1281 – 1284) was applied from 1100 September 9 to 1430 October 9, 2013. Shifts varied from -0.16 to +0.03 ft, with all measurements being made in open channel conditions. All measurements were given full weight with the exception of No 1270, 1272, 1277A, 1277, 1282, and 1283, which were discounted from -5% to + 4% for smoothing purposes.

Special Computations.-- The downstream hydrograph at ARKMOFCO was compared to the final hydrograph for general validation of daily flows. On July 11, the stilling well was pumped out and flushed, with no change in gage-height. The shift on 7/9 starts at 1315(gh =2.79) 0.01 going to -0.14 at 1345 (gh = 2.56) with the measurement 1276 made at 1400. The next measurement 1277 made 7/11 at gh 2.96, shift = 0.00. GH change on 7/10 from 2.53 at 1715 to 2.97 at 1745, shift -0.14 to 0.00 due to gate changes made at Pueblo Reservoir. The period of the May 9 – 20 the CFB and SE were reading differently due to a problem with the intakes being plugged up after being isolated.

Remarks.--

The record is rated fair, due to the low flows with moss in the channel observed for most of the year. The peak gage-height and discharge are rated good due to the proximity of high water measurements to the peak. Station maintained and record developed by Anthony D. Gutierrez.

Recommendations.--

STATE OF COLORADO  
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07099400 ARKANSAS RIVER ABOVE PUEBLO

RATING TABLE-- ARKPUECO18 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

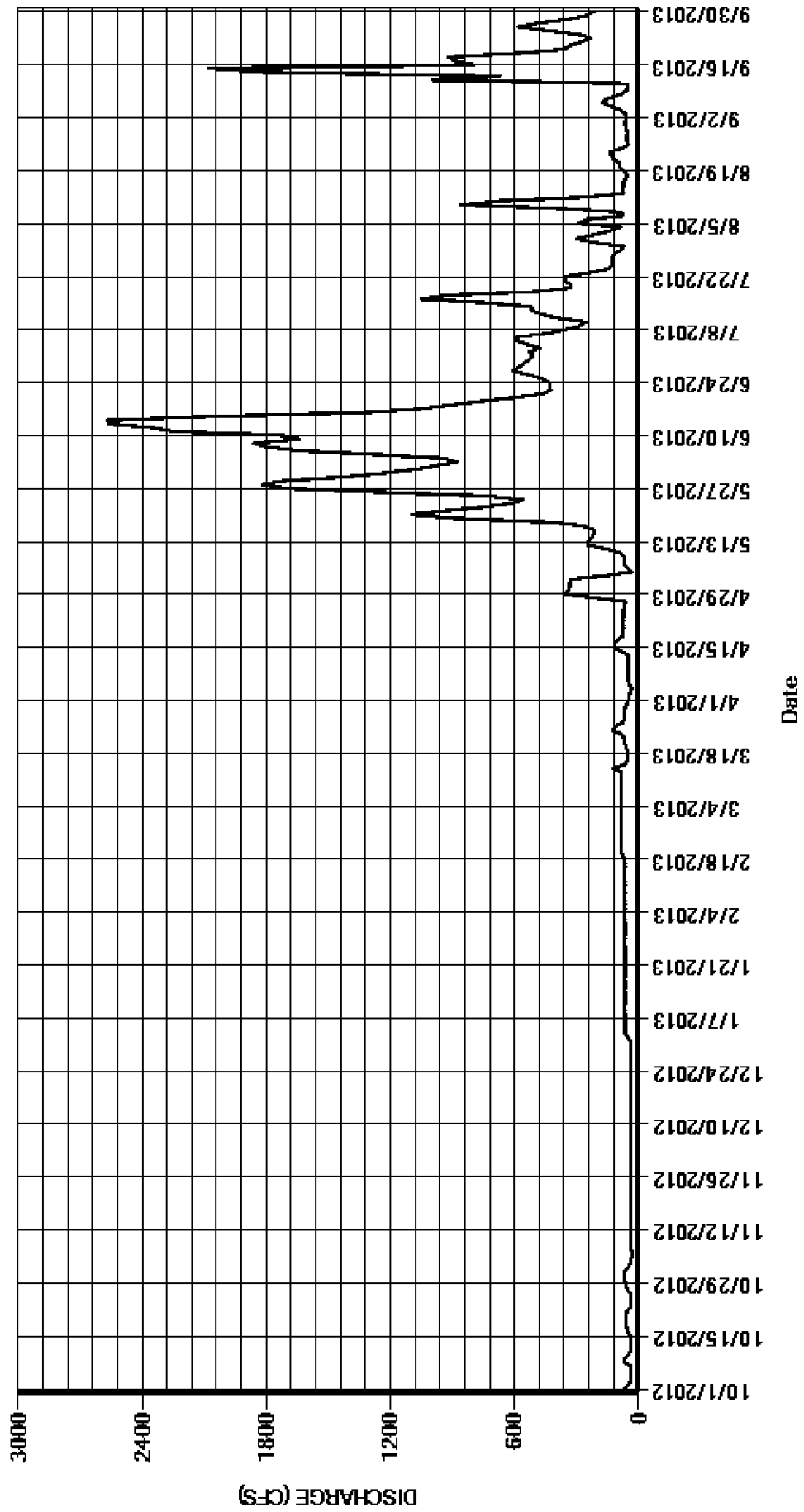
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	69	69	39	40	66	85	50	335	1080	515	299	65
2	50	52	39	54	67	85	45	332	968	528	218	63
3	38	41	38	66	67	84	41	332	874	479	145	64
4	38	41	38	66	67	84	34	153	946	538	87	86
5	38	30	38	66	67	84	43	34	1270	590	292	135
6	39	29	38	66	67	84	50	54	1650	588	251	174
7	38	39	38	66	67	84	50	69	1800	438	79	151
8	69	39	39	66	67	84	50	70	1860	353	82	90
9	68	39	39	67	67	85	51	70	1640	285	375	59
10	47	39	39	67	67	84	50	90	1720	255	856	54
11	40	39	39	66	67	84	50	166	2250	388	667	58
12	39	39	38	66	67	85	50	247	2350	468	258	999
13	39	39	39	66	67	85	50	247	2560	518	73	672
14	39	39	39	67	68	122	92	228	2570	519	76	1800
15	39	39	39	66	67	66	118	215	2080	726	73	2080
16	52	39	39	66	67	56	117	215	1350	1050	73	799
17	57	39	39	67	67	56	99	261	1060	924	61	888
18	62	39	39	66	68	56	77	410	914	495	54	921
19	62	39	40	66	78	56	75	882	764	332	75	576
20	61	39	39	66	84	62	74	1100	595	330	92	359
21	61	39	39	66	84	70	74	929	462	362	92	334
22	47	39	39	66	84	71	75	751	427	351	119	276
23	37	39	39	66	84	81	74	608	430	238	135	230
24	38	39	40	66	85	125	73	561	431	147	136	283
25	39	39	40	66	84	110	73	726	468	128	74	432
26	39	39	40	67	84	81	68	1240	530	128	50	580
27	52	39	40	67	84	69	63	1700	604	128	58	482
28	61	39	40	67	85	69	213	1820	578	113	58	336
29	66	39	40	66	---	69	357	1710	558	86	56	248
30	69	39	40	66	---	67	339	1420	529	72	60	217
31	69	---	40	66	---	56	---	1230	---	221	66	---
TOTAL	1562	1198	1212	2015	2043	2439	2675	18205	35318	12293	5090	13511
MEAN	50.4	39.9	39.1	65.0	73.0	78.7	89.2	587	1177	397	164	450
AC-FT	3100	2380	2400	4000	4050	4840	5310	36110	70050	24380	10100	26800
MAX	69	69	40	67	85	125	357	1820	2570	1050	856	2080
MIN	37	29	38	40	66	56	34	34	427	72	50	54

CAL YR	2012	TOTAL	56778	MEAN	155	MAX	750	MIN	29	AC-FT	112600
WTR YR	2013	TOTAL	97561	MEAN	267	MAX	2570	MIN	29	AC-FT	193500

MAX DISCH: 3050 CFS AT 11:45 ON SEP 14, 2013 GH 6.03 FT SHIFT 0.00 FT  
 MAX GH: 6.03 FT AT 11:45 ON SEP 14, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07099400 ARKANSAS RIVER ABOVE PUEBLO  
WY2013 HYDROGRAPH





ARKANSAS RIVER BASIN  
07111000 HUERFANO R AT MANZANARES XING, NR REDWING, CO  
Water Year 2013

Location.-- Latitude 37° 43' 41.3", Longitude 105° 21' 12" by NAD83 (Redwing, Colorado quadrangle, 1:24000 scale) in NW1/4, SE1/4, Sec. 5, T27S, R71W, Hydrologic Unit 1102006, Huerfano County, 500 ft downstream from Manzanares Crossing private bridge, 0.2 mi downstream from Manzanares Creek and 4.0 mi WSW of Redwing, Colorado

Drainage Area and Period of Record.-- 73 mi<sup>2</sup>.; 1923 to present.

Equipment.-- Sutron SatLink 2, High Data Rate (HDR) satellite-monitored data collection platform (DCP) with Sutron Stage-Discharge Recorder and graphic water-stage recorder, inside a 48-inch diameter corrugated metal pipe (CMP) shelter and stilling well. The A-35 graphic water stage recorder was removed April 3, 2013. The SDR/ graphic stage recorder are set to the inside electric tape gage. A tipping bucket rain gage and temperature sensor are also recorded and transmitted by the DCP. A Bank Operated Cableway (BOC) is installed 10 ft above the gage for high water measurements. No other changes were made this water year.

Hydrologic Conditions.-- The gage is set in a narrow reach of the Upper Huerfano Valley at an elevation of 8190 feet MSL. Above the gage is a combination of mountainous and high alpine terrain which are subject to flash flooding. There are tributaries to the river along with diversions above the gage. Below the gage are several agricultural diversions, which are in a wide valley that extends to the eastern prairie of Colorado.

Gage-Height Record.-- The primary gage height record is 15-minute satellite data, with the DCP log and A-35 chart record / SDR used for back-up purposes. The record is complete and reliable, except for the following periods: October 25 – 27, November 3, 10 – 30, December 1 –21, 2012, March 12 –31, April 1 – 4, 9 – 28, May 1 –4, when the stage-discharge relationship was affected by ice in the river and/or well or ice on the control; December 22 - 31, 2012, January 1 – March 11, 2013, when the well was frozen. Missing data on October 2, January 12, 14, 15 and July 30 were filled in with good DCP data. May 22 missing data during gage flush was filled in from before and after data without loss of accuracy.

Datum Corrections.-- No levels were run this water year. Levels were last run May 12, 2009.

Rating.-- A boulder/rock weir is the current control for stages up to about 3.60 ft (90 cfs). At higher stages, the banks (left side is a concrete wing wall and right side covered with grass) become part of the control. Rating No. 25 was used the entire water year; it was developed from cross sections made May 20, 2009 along with a measurement of 93.6 cfs at gage-height of 3.65 ft. It has been extended to a gage-height of 5.31 ft and discharge of 400 cfs, approximately four times the historic high measurement, but is not well-defined above about 150 cfs. Eighteen discharge measurements (Nos. 537 – 554) were made this water year, ranging in discharge from 6.30 to 52.1 cfs. They cover the range in stage experienced, except for the lower daily flows of November 7 - 30, December 8 – 31, 2012; January 1 - 31; February 1 - 3; March 19 – 21, 23, 26 –29; and the higher daily flows of September 14, 15, 2013. The peak discharge of 67.8 cfs occurred at 1900 August 22, 2013 at a gage height of 3.60 ft with a shift of -0.17 ft. It exceeded high Measurement No. 549 made July 15, 2013 by 0.14 feet in stage.

Discharge.-- Shifting control method was used the entire water year. Shifts were applied as defined by measurements and distributed by time or event from 0000 October 1, 2012 to 1200 May 22, 2013 and from 1215 Sept 30 to the end of the water year. One variable stage shift relationship was used during the water year: HURREDCOVSC13E (based on M545 – 554 made during the period of use) was used from 1215 May 22 to 1215 September 30, this covered the high water due to rain events after runoff. All measurements were made in open water and showed shifts ranging from -0.20 to +0.27 feet. All measurements were given full weight and shifts applied accordingly, except for Measurement Nos. 546, 548, 550, and 553, which were adjusted -5% and +5% for smoothing purposes. Rain events along with apparent filling in and washing out of fines material at the weir caused some of the shift changes. The shift change during the ice period may have been due to a change in the weir from the ice.

Special Computations.-- Discharges for periods of ice effect were estimated based on four discharge measurements (No. 540 - 543), temperature record, partial days of usable data and trends in flow. It should be noted that the measurements during the period of ice were all made in open water, with ice in the well either broken or cleared, or frozen.

Remarks.-- Record is considered good during periods of open water when the well was clear. Periods of ice effect which are estimated are considered poor. The peak gage-height and discharge is considered good. Station maintained and record developed by Anthony D. Gutierrez, PS/ET II.

Recommendations.-- Levels need been run at the gage which should include a cross section of the weir to help define the PZF. This should be used to evaluate a new rating for the gage.

STATE OF COLORADO  
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07111000 HUERFANO R AT MANZANARES XING, NR REDWING, CO

RATING TABLE-- HURREDCO25 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

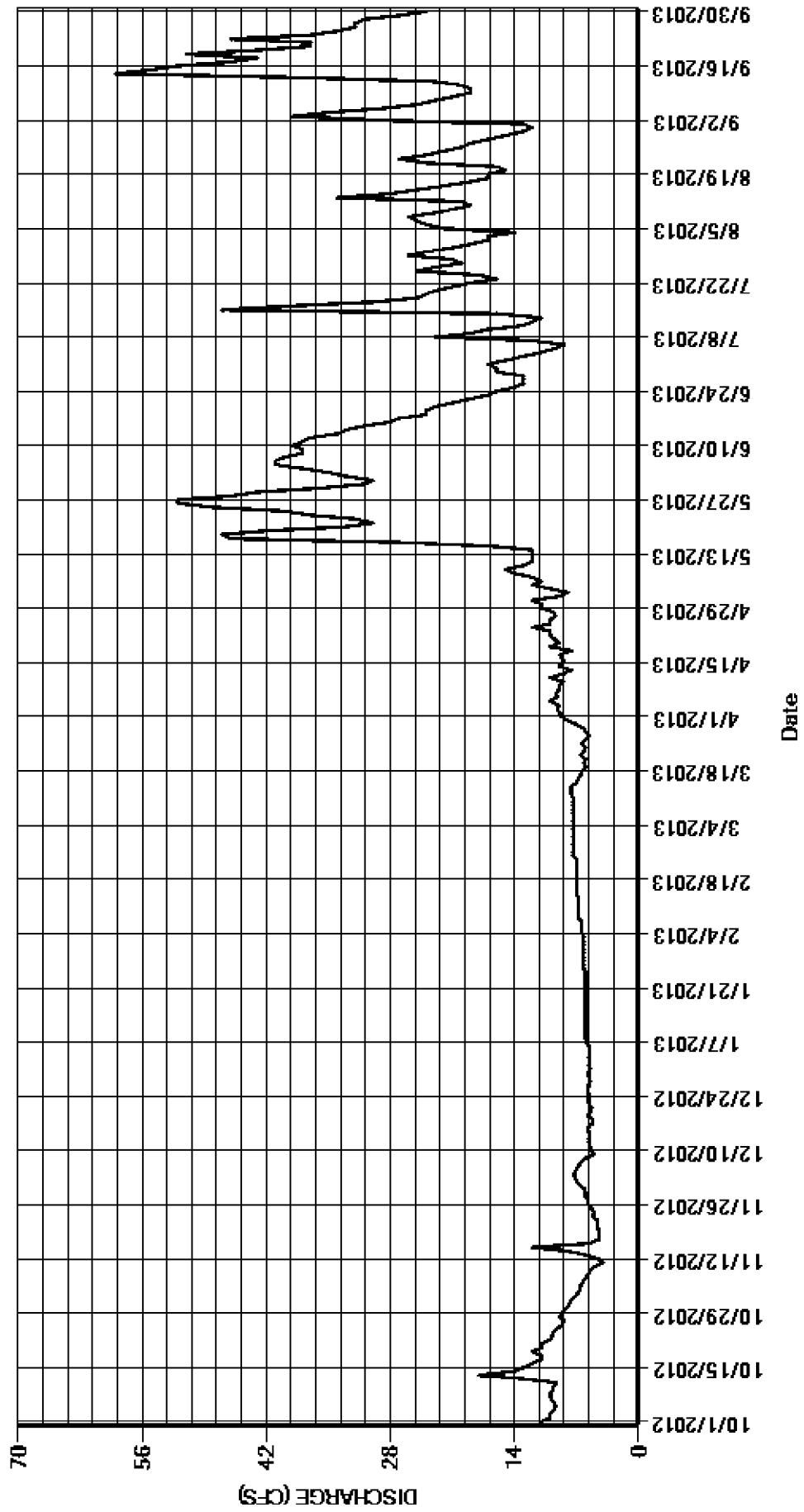
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	7.7	e6.6	e5.6	e6.2	e7.4	e8.8	e12	30	17	19	13
2	10	7.3	e7.0	e5.6	e6.2	e7.4	e8.9	e8.9	33	15	17	29
3	10	e6.9	e7.2	e5.6	e6.2	e7.4	e9.2	e8.0	35	13	17	39
4	9.6	6.6	e7.3	e5.6	e6.4	e7.4	e9.0	e10	38	11	14	35
5	9.4	6.6	e7.0	e5.6	e6.4	e7.4	10	12	41	9.5	22	29
6	9.6	6.3	e6.8	e5.6	e6.4	e7.4	9.2	11	41	8.4	24	25
7	9.9	6.0	e6.5	e5.9	e6.4	e7.4	9.3	12	40	12	25	23
8	10	5.7	e6.0	e6.0	e6.8	e7.4	9.0	14	38	23	26	21
9	9.7	5.5	e5.0	e6.0	e6.8	e7.4	e9.0	15	38	19	23	19
10	9.6	e5.0	e5.3	e6.0	e6.8	e7.4	e8.5	13	39	17	21	19
11	9.3	e4.0	e5.5	e6.0	e6.8	e7.4	e10	12	38	13	19	20
12	13	e4.6	e5.6	e6.0	e6.8	e7.6	e8.5	12	37	12	20	23
13	18	e6.0	e5.6	e6.0	e6.8	e7.6	e7.6	12	34	11	34	38
14	14	e8.0	e5.5	e6.0	e7.0	e7.6	e9.0	12	33	16	28	59
15	13	e12	e5.7	e6.0	e7.0	e7.0	e8.4	17	31	47	25	55
16	12	e5.6	e5.7	e6.0	e7.0	e6.8	e8.6	27	28	39	22	52
17	11	e4.5	e5.2	e6.0	e7.0	e6.5	e8.9	46	27	30	19	46
18	11	e4.5	e5.2	e6.0	e7.0	e6.4	e7.6	47	24	25	17	43
19	12	e4.5	e5.7	e6.0	e7.0	e6.0	e10	42	24	24	17	51
20	11	e4.6	e5.4	e6.0	e7.0	e6.2	e9.0	33	23	23	15	43
21	11	e4.7	e5.3	e6.0	e7.0	e6.0	e9.5	30	21	21	16	37
22	10	e4.7	e5.6	e6.0	e7.0	e6.5	e10	32	19	19	24	37
23	9.8	e5.2	e5.7	e6.0	e7.0	e6.2	e10	37	17	16	27	46
24	9.7	e5.0	e5.6	e6.0	e7.4	e6.0	e12	40	16	18	24	37
25	e9.2	e5.3	e5.7	e6.0	e7.4	e6.4	e10	48	14	25	22	34
26	e8.6	e5.7	e5.7	e6.2	e7.4	e6.0	e10	52	13	23	20	32
27	e8.4	e5.7	e5.6	e6.2	e7.4	e5.6	e9.4	52	13	20	19	32
28	8.9	e6.0	e5.5	e6.2	e7.4	e6.0	e9.6	46	13	21	17	31
29	8.7	e6.0	e5.6	e6.2	---	e6.2	11	43	16	26	15	27
30	8.3	e6.1	e5.7	e6.2	---	e7.1	11	36	16	24	13	24
31	7.9	---	e5.5	e6.2	---	e8.0	---	31	---	21	12	---
TOTAL	323.6	176.3	181.3	184.7	192.0	213.1	281.0	822.9	830	618.9	633	1019
MEAN	10.4	5.88	5.85	5.96	6.86	6.87	9.37	26.5	27.7	20.0	20.4	34.0
AC-FT	642	350	360	366	381	423	557	1630	1650	1230	1260	2020
MAX	18	12	7.3	6.2	7.4	8.0	12	52	41	47	34	59
MIN	7.9	4.0	5.0	5.6	6.2	5.6	7.6	8.0	13	8.4	12	13

CAL YR	2012	TOTAL	4865.3	MEAN	13.3	MAX	47	MIN	4.0	AC-FT	9650
WTR YR	2013	TOTAL	5475.8	MEAN	15.0	MAX	59	MIN	4.0	AC-FT	10860

MAX DISCH: 67.8 CFS AT 19:00 ON AUG 22, 2013 GH 3.60 FT SHIFT -0.17 FT  
 MAX GH: 3.60 FT AT 19:00 ON AUG 22, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07111000 HUERFANO R AT MANZANARES XING, NR REDWING, CO  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
07112500 HUERFANO RIVER AT BADITO  
Water Year 2013

Location.-- Lat. 37°43'40.1", Long. 105°00'49.5" (Farisita, Colorado quadrangle, 1:24000 scale) in the SE¼ NE¼ SE¼ Sec.5, T27S, R68W, Huerfano County on left bank, 30 feet downstream of the crossing of CR 616 bridge over the Huerfano River.

Drainage Area and Period of Record.-- 532 sq mi. ; 10/1/1993-summer of 1999, 5/4/2005-present

Equipment.-- Sutron Satlink-2 with high data rate (HDR) satellite-monitored data collection platform (DCP) attached to a Sutron Constant Flow Bubbler (CFB) in a 4 ft x 6 ft steel shelter. A Temperature sensor was installed April 24, 2013, which is monitored by the DCP. The primary gage is a concrete slope-gage immediately below the orifice. No other changes were made this water year.

Hydrologic Conditions.-- The gage is located at a site across the river from the old Badito jail and settlement approximately 13.1 miles west of Interstate 25 on SR 69 elevation 6450 MSL with a drainage area of 532 mi<sup>2</sup> as the river enters the Eastern Colorado prairie. There are several diversions above the gage, primarily for alfalfa irrigation. The river is subject to flash floods with numerous "feeder" streams contributing discharge above the gage.

Gage-Height Record.-- The primary record is 15-minute satellite-monitored continuous flow bubbler (CFB) data with DCP and CFB 5-minute logs data used for backup. The record is complete. The record shows extreme gage height variability caused by debris and silt moving on and off the bubbler orifice and control and therefore its reliability is of concern. The stage-discharge relationship was affected on the following dates by ice in the channel and/or ice on the control: October 8, 18, 19, 26 – 28; November 10 – 20, 23, 26 – 28; December 4, 8 – 31, 2012; January 1 – 24, 29 – 31; February 1 - 28; March 1 – 6, 11 – 13, 20 – 29; April 9 – 13, 17 – 24; and May 1 – 4, 2013. Large amounts of sediment continue to pass through the control and cover the muffler and plugging it up. The muffler was removed August 14; this has appeared to help reduce the "chatter" in the CFB. Twenty-seven different instrument calibration corrections ranging from -0.27 ft to +0.29 ft were applied to the record. The peak gage-height value was entered from visual observation on July 29 of a high watermark on the slope-gage along with the 5-minute data after the event that occurred on July 28.

Datum Corrections.-- No levels were run this water year. Levels were last run on September 3, 2008.

Rating.-- The primary control at all stages is the channel, along with thick bank vegetation on both banks downstream at higher stages. The bottom part of the concrete apron structure of the gage is buried by mud and debris; this has formed a riffle control at lower flows. The channel immediately below the gage narrows and has thick growth with overhang on either side. Extreme flows with gage height over 9 feet will go into open field on both sides of the river 300+ feet across. Rating 04, dated April 4, 2012, was used for the entire water year with. It is well defined to 100 cfs (measurement #187) with a limited number of higher flow measurements. Seventeen discharge measurements (Nos. 176 – 192) were made this water year ranging in discharge from 0.61 to 103 cfs. They cover the range in stage experienced except for the higher daily flow of July 15, 2013. The peak discharge of 818 cfs occurred at 1610 on July 28, 2013; at a gage height of 4.20 ft. with a shift of 0.02 feet (this is considered an estimated peak discharge). The peak gage-height and time were taken from the CFB five minute data. It exceeded the highest measured flow this water year (No. 187), made July 16, 2013 by 2.06 feet in stage.

Discharge.-- Shifting-control method was used for the entire water year. Shifts were applied as defined by measurements and distributed by time from 0000 October 1, 2012 to 1315 July 2, from 1415 July 29 to 1145 July 30 (transition from VSC13C to VSC13D), and from 1430 September 18 to end of the water year. Two variable shift curves were developed for use during the periods of high flow. Variable shift curve HUEBADCOVSC13C1 (based on measurements No 186 – 188) was used from 1330 July 2 to 1400 July 29 and HUEBADCOVSCD (based on measurements No 187 and 189 – 191) from 1200 July 30 to 1415 September 18. Discharge measurements showed shifts ranging from -0.03 to +0.10 ft, with all measurements being made in open channel. Shifts were prorated by time and/or event due to the extreme variability in shifts at similar unit values. All measurements were given full weight with the exception of measurements No 189 and 190 which were discounted which were discounted -9.65% and +2.20% respectively for smoothing.

Special Computations.-- Discharge during periods of ice-effect was estimated based on five measurements (No 178 – 182), temperature record from the HUEBADCO DCP temperature sensor and partial day data. Hydrographs from this gage and upstream gage HURREDCO were used as a general comparison to validate events. The high water during the July peak was due to rain below the HURREDCO gage.

Remarks.-- The overall record and the peak (including any flows where the gage height exceeded 2.5 feet) are considered poor due to the extreme gage height variability caused by debris, silt and large rocks moving on and off the bubbler orifice and control, ice effect, lack of any recent higher flow measurements to support the rating extension and lack of precision in the primary reference gage. The peak is also affected by overhanging trees and brush starting about 30 feet below the gage as well as a narrowing of the channel. The rocks moving across the control tend to stop just past the concrete, resulting in an unstable riffle which changes in height. Station maintained and record developed by Anthony D. Gutierrez .

Recommendations.-- Continue to make frequent measurements and gage visits to ensure debris is not caught on the bubbler orifice. Run levels, including channel cross sections, and perform a HEC-RAS modeling evaluation of the rating extension. Evaluate possible suitable alternative to the concrete slope gage used as a primary reference.

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07112500 HUERFANO RIVER AT BADITO

RATING TABLE-- HUEBADCO04B USED FROM 01-OCT-2012 TO 25-OCT-2012  
 HUEBADCO04 USED FROM 25-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.2	6.5	5.1	e5.0	e5.9	e2.1	1.4	e7.1	11	5.3	18	3.4
2	6.3	6.3	5.3	e5.2	e5.6	e1.4	0.72	e7.0	15	7.2	17	40
3	6.3	6.3	4.6	e5.3	e5.0	e0.99	0.79	e6.7	16	6.8	26	10
4	6.3	6.0	e4.0	e5.3	e4.0	e0.74	1.0	e6.6	22	6.4	17	9.0
5	6.8	4.9	4.3	e5.5	e3.6	e0.75	0.77	6.8	23	6.4	6.0	2.6
6	7.2	4.3	4.1	e5.5	e3.8	e0.64	0.84	7.6	21	3.9	12	7.3
7	7.2	4.1	4.2	e5.7	e3.7	0.58	1.1	8.5	19	3.4	70	14
8	e5.2	3.7	e4.2	e5.8	e4.0	0.59	1.3	9.5	14	6.3	43	8.5
9	4.5	3.8	e4.2	e5.1	e4.0	0.70	e1.5	11	11	7.8	30	4.5
10	4.1	e3.6	e4.5	e5.9	e4.4	e1.1	e2.4	12	12	9.2	16	9.7
11	4.3	e3.6	e4.5	e6.2	e4.5	e0.97	e2.1	10	13	7.1	19	6.9
12	4.9	e3.7	e4.7	e6.2	e4.4	e0.74	e2.4	8.8	14	6.3	1.8	16
13	6.0	e3.7	e4.8	e6.3	e3.5	e0.73	e2.3	7.6	15	6.1	1.1	4.2
14	6.0	e3.7	e4.7	e6.3	e4.3	0.64	2.4	8.0	18	22	1.1	38
15	4.5	e3.8	e4.6	e6.6	e4.5	0.66	2.4	8.8	15	122	3.5	24
16	4.7	e3.7	e4.8	e6.9	e3.8	0.63	2.8	11	17	23	10	29
17	5.3	e3.7	e4.8	e7.4	e2.3	0.65	e3.3	15	16	9.8	11	11
18	e4.7	e3.6	e4.4	e7.9	e2.2	0.61	e3.2	16	17	18	9.7	10
19	e5.2	e3.5	e4.5	e8.2	e3.0	0.58	e3.5	19	15	16	7.9	12
20	6.1	e3.5	e4.5	e8.5	e3.8	e0.70	e3.9	14	13	21	7.4	5.4
21	4.9	3.8	e4.6	e8.8	e2.9	e0.80	e4.2	14	13	32	7.8	4.6
22	4.9	3.6	e4.6	e9.0	e2.6	e0.85	e4.5	16	14	10	8.3	1.8
23	4.8	e3.7	e4.7	e9.2	e2.5	e0.90	e4.6	18	12	13	9.3	12
24	4.5	3.8	e4.8	e9.5	e2.0	e0.97	e5.3	17	13	11	8.4	12
25	4.5	4.1	e4.8	5.6	e2.2	e1.1	5.6	20	8.8	15	7.1	7.9
26	e5.2	e4.0	e4.8	5.2	e2.2	e1.2	7.4	24	7.6	19	3.0	14
27	e5.4	e4.1	e4.8	4.3	e2.2	e1.4	6.7	17	6.7	17	7.3	9.6
28	e5.7	e4.1	e4.6	3.5	e2.1	e1.5	7.2	16	5.7	51	6.0	19
29	6.3	4.3	e4.5	e5.4	---	e1.7	7.2	15	3.4	8.3	12	13
30	6.4	5.1	e4.8	e6.0	---	1.9	7.3	14	5.6	11	12	9.7
31	6.6	---	e4.7	e6.1	---	1.8	---	10	---	16	4.9	---
TOTAL	172.0	126.6	142.5	197.4	99.0	30.62	100.12	382.0	406.8	517.3	413.6	369.1
MEAN	5.55	4.22	4.60	6.37	3.54	0.99	3.34	12.3	13.6	16.7	13.3	12.3
AC-FT	341	251	283	392	196	61	199	758	807	1030	820	732
MAX	7.2	6.5	5.3	9.5	5.9	2.1	7.4	24	23	122	70	40
MIN	4.1	3.5	4.0	3.5	2.0	0.58	0.72	6.6	3.4	3.4	1.1	1.8

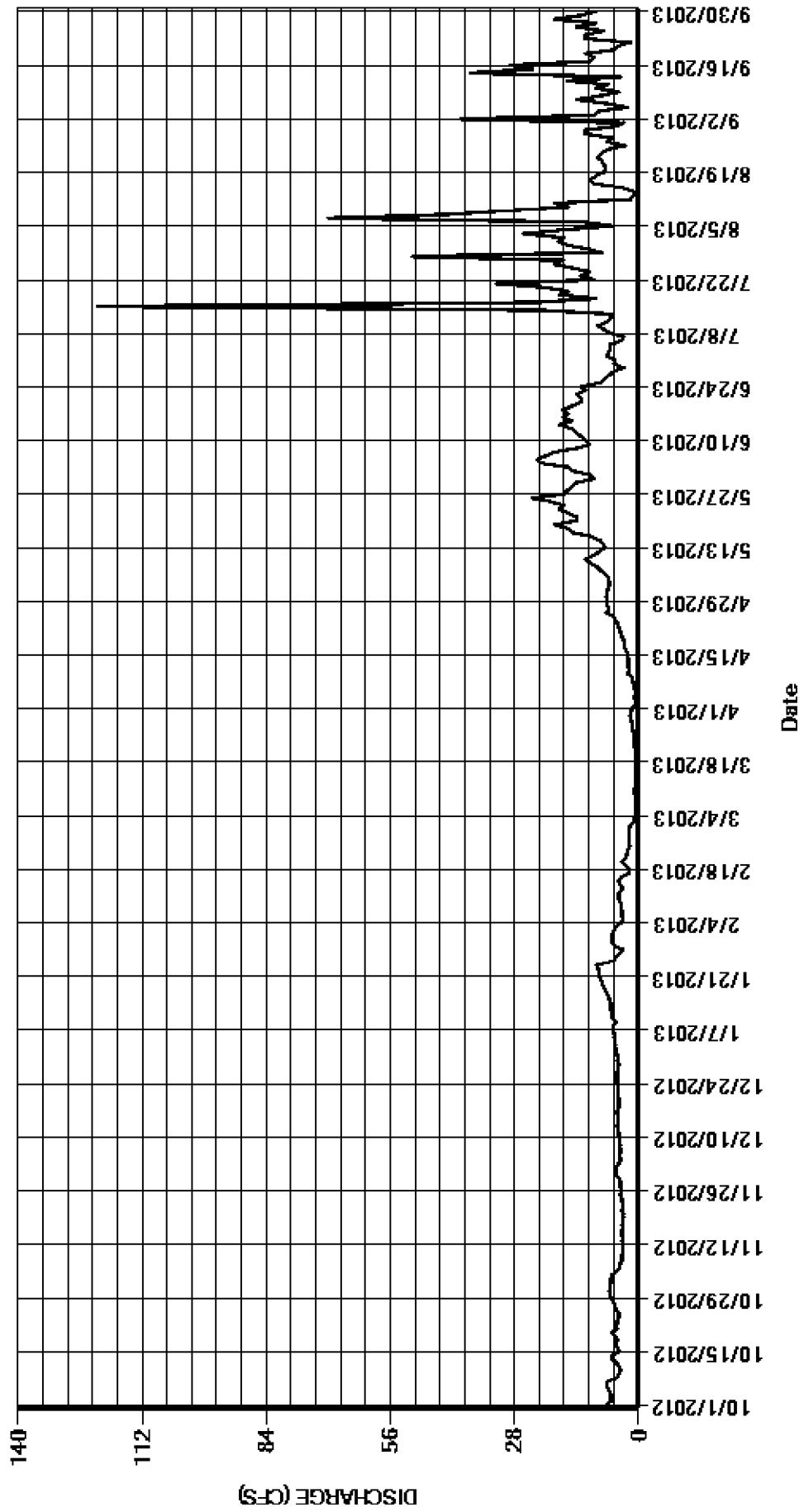
CAL YR	2012	TOTAL	2340.80	MEAN	6.40	MAX	42	MIN	1.0	AC-FT	4640
WTR YR	2013	TOTAL	2957.04	MEAN	8.10	MAX	122	MIN	0.58	AC-FT	5870

MAX DISCH: 818 CFS AT 16:15 ON JUL 28, 2013 GH 4.20 FT SHIFT 0.02 FT (Peak gage-height from CFB 5 min data)

MAX GH: 4.20 FT AT 16:15 ON JUL 28, 2013 (Peak gage-height from CFB 5 min data)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07112500 HUERFANO RIVER AT BADITO  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
07114000 CUCCHARAS RIVER AT BOYD RANCH NEAR LA VETA  
Water Year 2013

Location.-- Latitude 37° 25' 12", Longitude 105° 03' 08" (Cuchara, Colorado quadrangle, 1:24000 scale) in the SE¼ NE¼ SE¼ Sec.24, T30S, R69W, Huerfano County on left bank at Boyd Ranch, 29 feet downstream from private bridge, 6.5 miles southwest of La Veta CO on Highway 12.

Drainage Area and Period of Record.-- 56 mi<sup>2</sup>. ; 1979-1987, 1995-present.

Equipment.-- Sutron SatLink 2 satellite-monitored data collection platform (DCP) with a High Data Rate (HDR) radio transmitter, with shaft encoder and graphic water-stage recorder in a 4 ft x4 ft x 8 ft steel shelter over 48-inch corrugated pipe well. Shaft encoder and chart are set to the reference mark on the front of the equipment shelf using a drop-tape. A temperature sensor is also connected to the DCP. The A-35 graphic water-stage recorder was removed April 4, 2013. In addition, the shaft encoder was replaced with a Sutron stage-discharge recorder (SDR) on April 25, 2013 as the backup to the DCP data. There is no outside staff gage. There were no other changes this year.

Hydrologic Conditions.-- The gage is located in a gentle slope section of the Cucharas River Valley at an elevation of approximately 7,790 feet by topographic map. There are several diversions upstream of the gage for agriculture and the town of Cuchara. State Highway 12 is parallel to the right riverbank at an elevation of approximately 10 feet higher than pastureland adjacent to the left bank. Flooding would spill into the pasture on the left before flooding the highway. The gage is subject to freezing during the winter months.

Gage-Height Record.-- Primary record is 15-minute satellite data with DCP log and graphic chart record, currently the SDR used for back-up purposes. The record is complete and reliable, except for the following periods: October 25 – 28; November 10 – 16, 20, 23 – 28; December 2, 4, 8 – 24, 2012; March 10 - 24, April 4, 17 – 20, 23, 24; and May 1 – 4, 2013 when the stage-discharge relationship was affected by ice on the control or in the river or well. In addition, December 25 – 31, 2012; January 1 – 31; February 1 –28; March 1 – 9, 25 –31; and April 1 – 3 2013 when the well was frozen and the floats were trapped in the ice and the river was also ice covered, with ice on the control. Two flush corrections were made, one on June 3 of +0.12 ft and one on June 20 of +0.04 ft, which were applied to the record. The control continues to collect considerable amounts of silt in the weir pool, which help to "seal" the weir, as appeared to have happened on July 15, from a rain event. Negative shifts occur during the winter months with positive shifts beginning in April.

Datum Corrections.-- No levels were run this year. Levels were last run April 24, 2009.

Rating.-- The control is a rock weir constructed in April 2009. It is rated for flows up to 350 cfs by cross section. Flows higher than 350 cfs are controlled by the brush-lined bank on the right side and the left bank, which was constructed using 4 – 8 inch cobble with large rocks lining the bottom of the bank. Rating No. 15 dated June 1, 2009 was used the entire water year. Rating 15 was developed as a result of the weir construction. Shifts for Rating 15 continue plotting slightly to the left during the winter measurements and as the runoff occurred the shifts started plotting to the right. Thirteen discharge measurements (Nos. 585 - 597) were made and ranged in discharge from 5.07 cfs to 12.7 cfs. They cover the range in stage experienced, except for the lower daily flows of October 7 - 11; November 3 – 9, 11, 14, 20, 24; December 1 – 31, 2012; January 1 – 31 February 10 – 28; March 1 - 8; and the higher daily flows of May 15 –31; June 1 – 3, 5 – 11; July 15, 16, 19 – 22, 24 – 27; and September 16, 23, 2013. The peak discharge of 54.6 cfs occurred at 0200 on July 21, 2013 at a gage height of 2.30 ft with a shift of +0.08 ft. The peak exceeded measurement No 593 made July 17, 2013 by 0.71 ft.

Discharge.-- Shifting control method was used for all periods of good, ice-free record. Shifts were applied by time and stage proration through the year. Shifts were applied as defined by measurements and were distributed by time from 0000 October 1, 2012 to 1130 July 1, 2013 and from 1145 September 24 to the end of the water year. One variable curve was developed: CRBRLVCOVSC13A from 1145 July 1 to 1130 September 24 and used during the high water caused by rain events. The increased positive shifts starting in August to the beginning of September indicate weir leakage, this falls well to the right of rating 15 at the lower end. Measurements showed shifts varying from –0.04 to +0.11 ft. All open water measurements were given full weight, except Measurement Nos 592 and 594, which were adjusted -6.92% and -3.57% for smoothing purposes.

Special Computations.-- Discharges for periods of ice-affected record were estimated based on four measurements (Nos. 586 – 589), air temperature data collected at the gage, and the hydrograph. Short periods of missing data December 23, April 4, 8, 12, 23, and July 17 were filled in with the DCP log. The time from 1230 to 1445 on April 25 (changing from the SE to the SDR) was entered using surrounding data without loss of accuracy

Remarks.-- The record is good, except during periods when the well was frozen and of ice effect in the river and on the weir which are estimated and considered poor. The peak is considered good due to the measurement being made 4 days prior to the peak. This station maintained and record developed by Anthony D. Gutierrez PS/ET 2.

Recommendations.-- Levels need to be run with cross section of the weir for PZF, in water year 2014. Development of a new rating should be considered, as the weir appears to be stabilizing.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

07114000 CUCCHARAS RIVER AT BOYD RANCH NEAR LA VETA

RATING TABLE-- CRBRLVCO15 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.0	5.3	4.9	e4.7	e5.1	e5.0	e5.3	e8.0	15	11	8.4	7.3
2	5.6	5.1	e4.8	e4.7	e5.1	e5.0	e5.5	e7.8	15	10	8.2	8.0
3	5.5	5.0	4.8	e4.7	e5.1	e5.0	e5.5	e8.0	13	9.7	8.3	7.4
4	5.6	5.0	e4.9	e4.7	e5.1	e5.0	e5.7	e7.6	12	9.3	8.9	7.7
5	5.1	5.0	4.9	e4.7	e5.1	e5.0	e5.9	8.0	13	9.0	8.8	6.6
6	5.1	5.0	4.8	e4.7	e5.1	e5.0	e5.7	8.7	14	8.8	8.6	5.9
7	5.0	5.0	4.9	e4.7	e5.1	e5.0	e6.2	9.5	14	9.8	9.4	5.4
8	4.6	4.9	e4.4	e4.7	e5.1	e5.0	e6.4	9.4	14	11	12	5.1
9	4.5	5.0	e4.0	e4.8	e5.1	e5.3	e6.5	9.6	13	9.2	11	5.4
10	4.5	e5.5	e3.2	e4.8	e5.0	e5.3	e6.5	9.8	13	9.9	9.0	5.9
11	4.3	e5.0	e4.2	e4.8	e5.0	e5.3	e6.5	9.5	14	9.8	8.2	7.8
12	5.4	e5.2	e4.4	e4.8	e5.0	e5.3	7.2	9.5	13	9.0	11	7.9
13	7.6	e5.1	e4.5	e4.8	e5.0	e5.3	6.7	9.8	12	8.8	11	9.0
14	5.9	e5.0	e4.5	e4.8	e5.0	e5.3	6.9	11	14	9.6	9.0	8.1
15	5.5	e5.4	e4.4	e4.8	e5.0	e5.3	6.5	12	13	26	8.3	9.5
16	5.4	e5.6	e4.5	e4.8	e5.0	e5.3	6.9	14	13	15	8.1	14
17	5.1	5.7	e4.5	e4.8	e5.0	e5.3	e6.7	15	13	12	8.0	9.6
18	5.2	5.3	e4.6	e4.8	e5.0	e5.3	e5.9	16	11	9.4	7.9	8.6
19	5.2	5.2	e4.6	e4.8	e5.0	e5.4	e6.6	16	11	14	8.0	9.7
20	5.5	e5.0	e4.6	e4.8	e5.0	e5.4	e7.1	16	11	22	7.6	8.5
21	5.4	5.1	e4.5	e4.8	e5.0	e5.4	7.3	15	11	20	7.3	8.2
22	5.2	5.1	e4.5	e4.8	e5.0	e5.4	7.6	15	10	14	10	8.4
23	5.1	e5.2	e4.5	e4.8	e5.0	e5.4	e7.0	16	10	11	10	14
24	5.2	e5.0	e4.5	e4.8	e5.0	e5.4	e7.6	16	10	14	8.3	9.3
25	e5.1	e5.3	e4.6	e4.8	e5.0	e5.4	e7.6	17	9.5	15	8.2	8.2
26	e5.2	e5.3	e4.6	e4.8	e5.0	e5.4	8.1	17	9.8	13	8.2	7.5
27	e5.1	e5.5	e4.6	e4.8	e5.0	e5.4	7.4	17	9.5	13	7.9	7.9
28	e5.4	e5.7	e4.6	e4.8	e5.0	e5.4	7.9	16	10	12	7.8	8.5
29	5.6	5.8	e4.6	e4.8	---	e5.4	8.4	16	11	11	7.3	8.1
30	5.4	5.7	e4.6	e4.8	---	e5.4	8.7	16	11	9.6	6.8	7.6
31	5.3	---	e4.6	e4.8	---	e5.4	---	15	---	8.9	6.7	---
TOTAL	164.6	157.0	140.6	148.0	140.9	163.2	203.8	391.2	362.8	374.8	268.2	245.1
MEAN	5.31	5.23	4.54	4.77	5.03	5.26	6.79	12.6	12.1	12.1	8.65	8.17
AC-FT	326	311	279	294	279	324	404	776	720	743	532	486
MAX	7.6	5.8	4.9	4.8	5.1	5.4	8.7	17	15	26	12	14
MIN	4.3	4.9	3.2	4.7	5.0	5.0	5.3	7.6	9.5	8.8	6.7	5.1

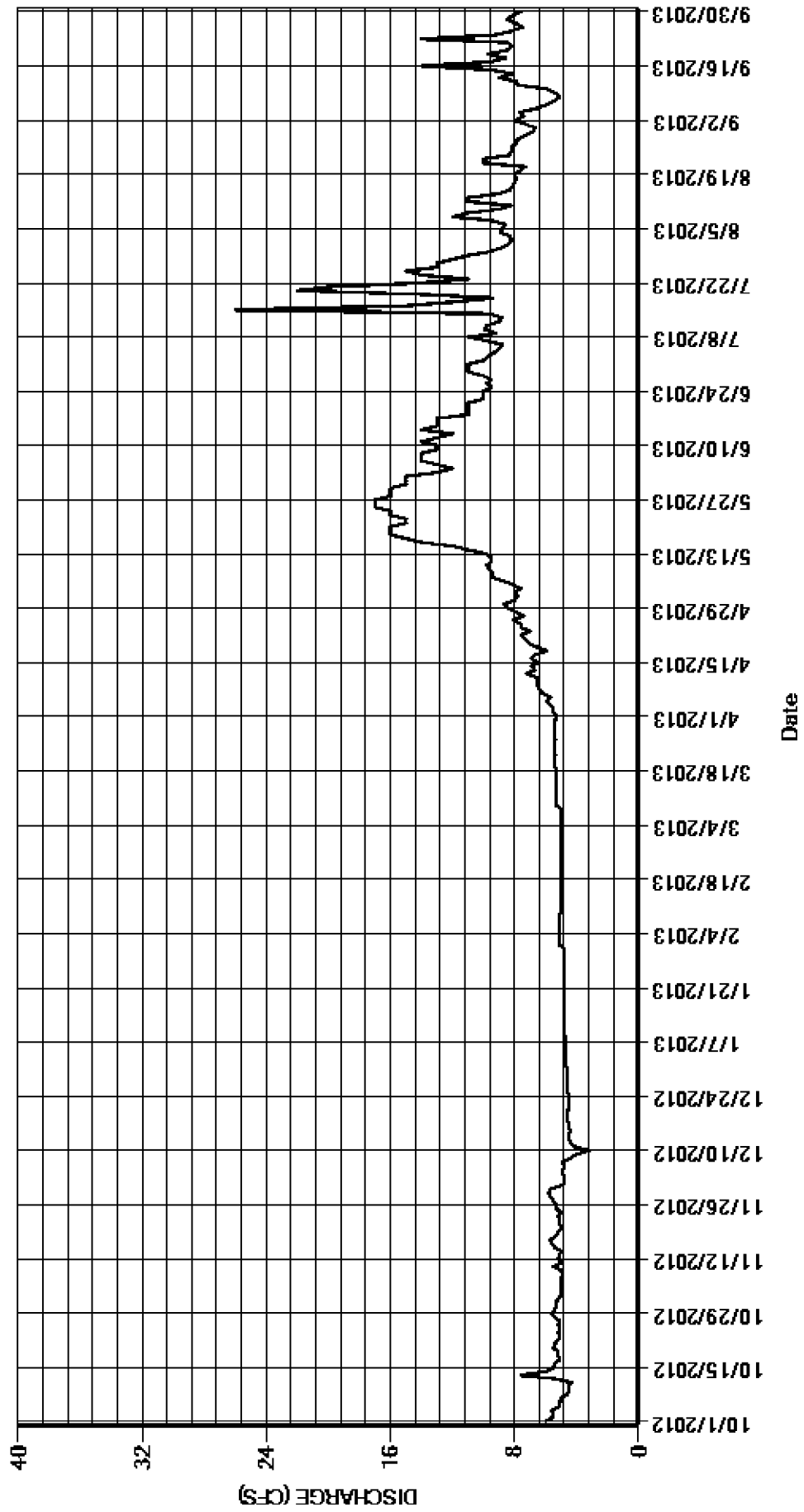
CAL YR	2012	TOTAL	6109.7	MEAN	16.7	MAX	76	MIN	3.2	AC-FT	12120
WTR YR	2013	TOTAL	2760.2	MEAN	7.56	MAX	26	MIN	3.2	AC-FT	5470

MAX DISCH: 54.6 CFS AT 02:00 ON JUL 21, 2013 GH 2.30 FT SHIFT 0.08 FT  
 MAX GH: 2.30 FT AT 02:00 ON JUL 21, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



07114000 CUCCHARAS RIVER AT BOYD RANCH NEAR LA VETA  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
CUCHARAS RIVER AT HARRISON BRIDGE NEAR LA VETA, CO  
Water Year 2013

Location.-- Latitude 37° 33' 02", Longitude 104° 56' 11" (Ritter Arroyo, Colorado quadrangle, 1:24000 scale) in the NE1/4 SW1/4 Sec.6, T29S, R67W, Huerfano County on the Harrison Bridge, 0.66 miles south on the Valley Road from Highway 160 and 9.93 miles west of Walsenburg, Colorado on Highway 160.

Drainage Area and Period of Record.-- 196.16 sq.mi.; October 2000-present

Equipment.-- A Sutron SatLink 2 satellite-monitored high data rate (HDR) data collection platform (DCP) and shaft encoder. The DCP is housed inside a 4 ft x 4 ft x 8 ft metal shelter at a higher elevation than the riverbank on the right side, while the shaft encoder is in a 20 in x 30 in metal "half" shelter atop an 18 inch diameter CMP stilling well attached to the downstream side of the center pier of Harrison Bridge. The shaft encoder is set using an electric tape inside of the well. A temperature sensor is attached to the antenna mast on the main shelter. No changes this water year.

Hydrologic Conditions.-- The gage sits in a wide valley of the Cucharas River approximately 4.5 miles NNE of the town of La Veta. There are several tributaries as well as the urban runoff from La Veta which contribute to the flows. There are several irrigation diversions and a pipe line for the city of Walsenburg municipal water as well as the LaVeta Municipal Pipe line. Due to the where the gage sits east of La Veta Pass it is subject to flash flooding from rain storms in the summer and blizzard conditions in the winter.

Gage-Height Record.-- The primary record is 15-minute satellite data with DCP log data used for back-up purposes. Record is complete and reliable except for the following periods: November 23 – 28; December 4, 8 – 30, 2012; January 6 - 10, 17 – 25, 28 – 31; February 1 – 25; March 4 – 6, 9 – 13, 18 – 20, 23 –28; April 9 – 11, 15 – 19, 23 – 25, 2013, when the stage-discharge relationship was affected due to ice in the river and or the well. The periods of December 31, 2012; January 1 – 5, 11 – 16, the well was frozen giving false discharge readings.

Datum Corrections.-- No levels were run this year. Levels were last run April 4, 2007 when the electric tape was set..

Rating.-- The control at low and medium flows up to 50 cfs is the gravel to large cobble bed of the river channel. At medium to high stages the riverbanks and brush lining the edges of the channel as well as the center bridge pier, become part of the control. High flows of up to approximately 2000 cfs should be contained by the bridge. Extreme high flows can go out of channel to the flood plain north of the bridge, which is at a slightly lower elevation, and extends for approximately 200 feet to the north. Rating No. 2, dated Oct 1, 2003, was used from October 1 to 1445 October 26, 2013. Rating No. 03 was used from 1500 on October 26, 2012 to the end of the Water Year. Rating No. 03 dated January 7, 2014 was developed from measurements as the result of large amounts of material that had "piled" at the gage, it ties into the upper end of Rating No 2 which is a theoretical rating extension based on channel survey work and is well-defined to about 500 cfs. Twelve discharge measurements (Nos. 163 to 174) were made during water year. Measured discharges ranged from 0.00 cfs to 7.84 cfs, with three observations of no flow. They cover the range in stage experienced, except for the higher daily flow of June 28; July 15 – 17, 19 – 22; August 9, 10, 13 - 15; and September 12 – 25, 2013. The peak discharge of 801 cfs occurred at 0030 on June 28, 2013, at gage height of 4.31 ft with a shift of 0.00 ft. The peak exceeded measurement No.174 made on September 26, 2013 by 2.44 feet in stage.

Discharge.-- Shifting control method was used for all periods of flow. Shifts were distributed by time with consideration given to stage and event from 0000 October 1, 2012 to 2245 June 27, 2013, from 1500 July 25 to 2330 August 4, and from 0330 September 4 (to the end of the water year) to 1245 October 10, 2013. Zero flow occurred from October 1 to November 14, 2012, from February 26 to March 1, from June 23 to 26, and from July 3 - 13, 2013. Two variable shift curves were developed and used CRHBLVCOVSC13C from 2300 June 27 to 1445 July 25 and CRHBLVCOVSC13D from 2345 August 4 to 1315 September 4, 2013 to cover periods of high water. The stage-shift relation covers all periods of flow. Open water measurements indicated shifts varying from -0.15 to +0.03 feet. All measurements were given full weight and applied directly.

Special Computations.-- Discharge for periods of ice-affected record was estimated utilizing one measurement (No 165), station temperature record, and partial days of usable record. The Cucharas River at Boyd Ranch hydrograph was used for comparison of high water events due to rain. The peak is considered poor due to the lack of measurements near the gage-height experienced. The gage-height increase on September 11 was the result of rain that started at the end of the measurement made on September 10, which washed out material below the gage. During the period from November 14, 2012 to February 25, 2013 started with a shift of +0.03 ( the last good measurement made July 19 2012) and ended with a shift of +0.02 (the next good measurement made April 14, 2013).

Remarks.-- Record is fair, except during periods of ice effect and no gage height, which are estimated and poor. The peak is rated poor, due to lack of measurement made at, or near this stage. Station maintained and record developed by Anthony Gutierrez.

Recommendations.-- Need to run levels in WY2014.

STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

CUCHARAS RIVER AT HARRISON BRIDGE NEAR LA VETA, CO

RATING TABLE-- CRHBLVCO02 USED FROM 01-OCT-2012 TO 26-OCT-2012  
CRHBLVCO03 USED FROM 26-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

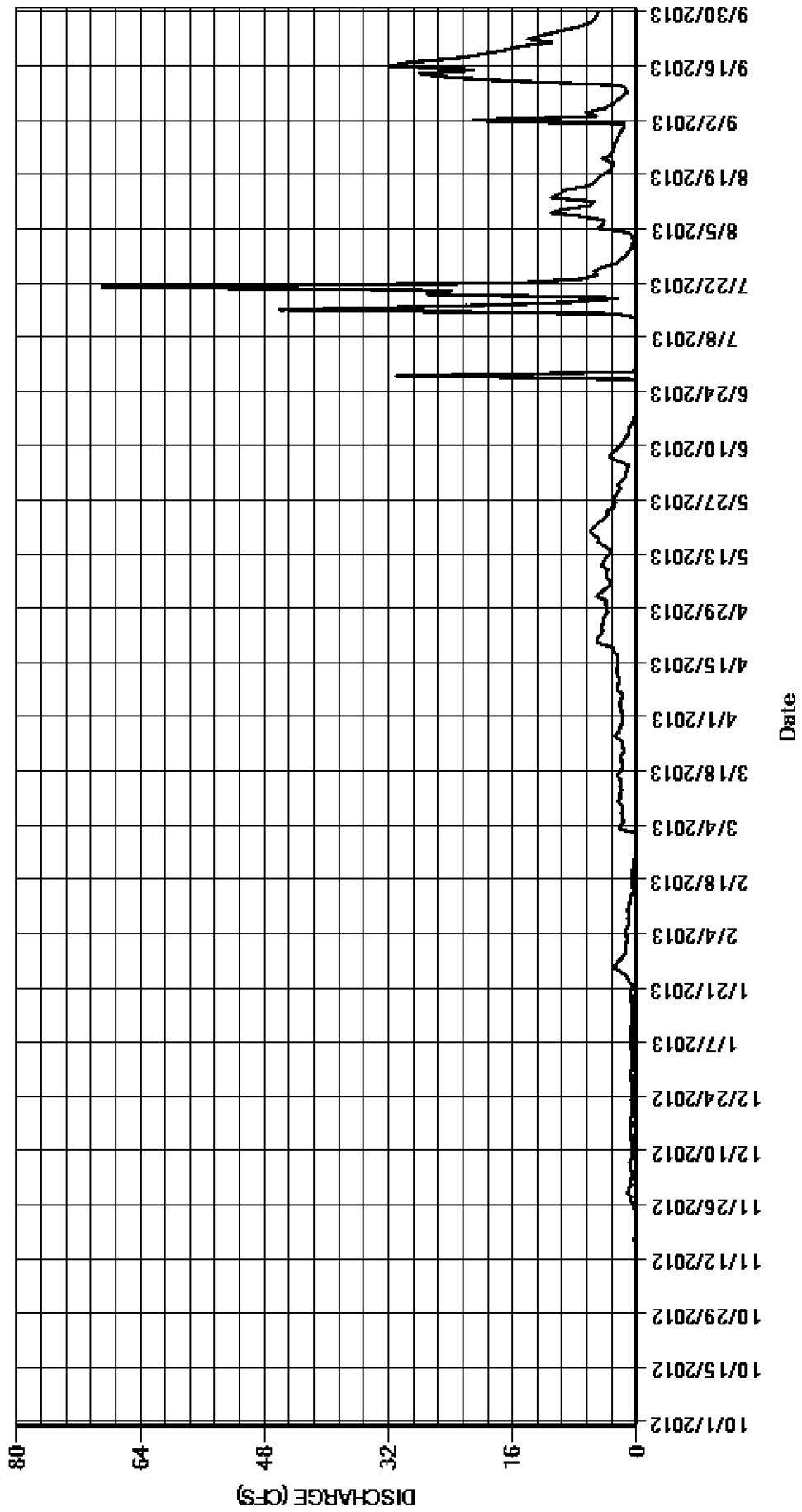
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.74	e0.65	e1.4	0.00	1.8	3.9	1.9	0.08	0.51	1.6
2	0.00	0.00	0.78	e0.65	e1.3	0.16	1.9	5.2	1.4	0.02	0.46	21
3	0.00	0.00	0.68	e0.65	e1.3	2.2	2.0	4.6	1.4	0.00	0.52	5.2
4	0.00	0.00	e0.63	e0.65	e1.4	e2.0	2.2	4.0	1.2	0.00	1.2	6.5
5	0.00	0.00	0.76	e0.69	e1.4	e1.7	2.1	3.4	1.1	0.00	4.9	4.2
6	0.00	0.00	0.84	e0.69	e1.1	e1.9	1.9	3.4	2.5	0.00	4.4	3.2
7	0.00	0.00	0.91	e0.69	e1.0	1.9	1.9	3.9	3.5	0.00	4.2	2.6
8	0.00	0.00	e0.60	e0.69	e1.1	1.8	2.5	3.9	3.3	0.00	6.7	1.9
9	0.00	0.00	e0.60	e0.69	e1.0	e1.9	e2.4	3.8	2.6	0.00	11	1.3
10	0.00	0.00	e0.60	e0.69	e1.2	e2.4	e2.3	4.5	2.1	0.00	9.5	1.4
11	0.00	0.00	e0.60	e0.70	e1.0	e2.1	e2.3	4.3	1.7	0.00	6.0	2.1
12	0.00	0.00	e0.65	e0.60	e0.90	e2.2	2.5	4.0	1.5	0.00	5.5	15
13	0.00	0.00	e0.72	e0.60	e0.80	e2.0	2.6	3.4	1.0	0.00	11	24
14	0.00	0.00	e0.75	e0.60	e0.70	2.1	2.5	3.4	1.1	2.9	10	28
15	0.00	0.00	e0.82	e0.60	e0.40	2.0	e2.4	4.1	0.87	46	9.2	21
16	0.00	0.23	e0.76	e0.65	e0.62	2.2	e2.5	5.0	0.52	22	6.2	32
17	0.00	0.36	e0.70	e0.70	e0.65	2.5	e2.5	4.9	0.33	8.5	5.4	29
18	0.00	0.21	e0.84	e0.70	e0.68	e2.0	e3.1	5.6	0.20	2.5	5.0	23
19	0.00	0.10	e0.60	e0.70	e0.59	e1.8	e3.2	6.0	0.11	27	4.3	20
20	0.00	0.10	e0.65	e0.80	e0.55	e1.9	5.1	5.5	0.09	24	3.4	17
21	0.00	0.15	e0.65	e0.65	e0.45	2.0	5.1	5.0	0.05	69	3.2	15
22	0.00	0.20	e0.68	e0.70	e0.40	2.0	4.7	4.2	0.02	15	3.1	11
23	0.00	e0.18	e0.70	e1.1	e0.36	e1.6	e4.4	3.8	0.00	7.1	4.4	14
24	0.00	e0.20	e0.68	e1.3	e0.08	e1.8	e4.5	3.8	0.00	5.1	3.4	12
25	0.00	e0.30	e0.60	e2.0	e0.04	e1.8	e4.4	3.0	0.00	5.4	3.1	10
26	0.00	e0.35	e0.50	2.9	0.00	e2.1	4.3	2.8	0.00	4.4	3.0	7.6
27	0.00	e0.85	e0.60	2.7	0.00	e2.9	4.1	2.9	0.03	2.6	2.8	6.1
28	0.00	e0.76	e0.70	e2.3	0.00	e2.3	3.8	2.8	31	2.0	2.5	5.5
29	0.00	1.2	e0.70	e1.8	---	2.2	3.9	2.4	0.38	1.4	2.3	5.2
30	0.00	1.0	e0.80	e1.4	---	1.9	4.0	2.1	0.14	1.0	2.0	4.9
31	0.00	---	e0.65	e1.4	---	1.8	---	2.4	---	0.69	1.7	---
TOTAL	0.00	6.19	21.49	31.64	20.42	59.16	92.9	122.0	60.04	246.69	140.89	351.3
MEAN	0.000	0.21	0.69	1.02	0.73	1.91	3.10	3.94	2.00	7.96	4.54	11.7
AC-FT	0	12	43	63	41	117	184	242	119	489	279	697
MAX	0.00	1.2	0.91	2.9	1.4	2.9	5.1	6.0	31	69	11	32
MIN	0.00	0.00	0.50	0.60	0.00	0.00	1.8	2.1	0.00	0.00	0.46	1.3

CAL YR	2012	TOTAL	3356.15	MEAN	9.17	MAX	159	MIN	0.00	AC-FT	6660
WTR YR	2013	TOTAL	1152.72	MEAN	3.16	MAX	69	MIN	0.00	AC-FT	2290

MAX DISCH: 801 CFS AT 00:30 ON JUN 28, 2013 GH 4.31 FT SHIFT 0.00 FT  
MAX GH: 4.31 FT AT 00:30 ON JUN 28, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**CUCHARAS RIVER AT HARRISON BRIDGE NEAR LA VETA, CO  
WY2013 HYDROGRAPH**



ARKANSAS RIVER BASIN  
OXFORD FARMERS DITCH COMPANY

Water Year 2013

Location.-- Lat. 38°10'36.06", Long. 104°08'39.66" NAD 83, in the NE¼ NW¼ SW¼ Sec.32, T21S, R60W Pueblo County, Hydrologic Unit 11020005, approximately 0.33 mi upstream from Arkansas River at Nepesta Rd. Bridge river gage.

Drainage Area and Period of Record.-- N/A.;

Equipment.-- Sutron SatLink DCP/logger with High Data Rate radio connected to a shaft encoder inside a wood frame shelter at a twelve-foot standard concrete Parshall flume. A float-activated A-35 graphic water-stage recorder is used for backup. Primary reference gage is outside staff gage installed in flume. No changes this water year.

Hydrologic Conditions.-- The Oxford Farmers ditch diverts water from the Arkansas River upstream from the Arkansas Rive at Nepesta Bridge gage approximately 0.40 miles. The ditch company owns a variety of direct flow water rights and receives Winter Water and Fry-Ark Project water from Pueblo Reservoir. Pueblo Reservoir regulates flows throughout the water year and is located approximately 43 river miles upstream from the gage with a travel time of approximately 18 hours. Non-regulated inflows to the Arkansas River below Pueblo Reservoir and above the gage include Fountain Creek, St. Charles River and the Huerfano River. The influence of urbanization provides the largest effect to the runoff regime. No hydrologic condition changes this water year

Gage-Height Record.-- Primary record is 15-minute satellite-monitored data with DCP log data and the graphic chart record used for backup purposes. Record is complete and reliable for this seasonally operated gage, except for the period from April 12, 2013 (1245-1300) when there were two missing data transmissions. Missing gage height data was interpolated from good data before and after the missing period. The period from November 15 to March 14, there is no flow in the ditch as the company participates in the Winter Water Storage Program in Pueblo Reservoir.

Datum Corrections.-- No levels were run to the flume this water year.

Rating.-- The control is a standard, 12-foot, concrete Parshall Flume in a maintained irrigation canal. A standard 12-ft Parshall Flume table was used all year. One discharge measurement was made this year in 2013. Measurement Number 16 (20.0 cfs) was made on April 12, 2013. The peak discharge of 196 cfs occurred at 0915 on August 4, 2013 at a gage height of 2.45 feet with a zero shift. The peak exceeded Measurement No.16 by 1.84 ft in stage.

Discharge.-- Shifting control method was used for the entire water year. Measurement 16 showed a shift of -0.02 ft but adjusted to zero, discounted by -5.66%. A shift of zero was used throughout the water year 2013.

Special Computations.--

Remarks.-- Record is considered fair due to the sand and moss buildup that occurs in the flume during the irrigation season, which would introduce uncertainty into the shifts, and also due to the poor precision of the gage heights (chatter) measured in the stilling well. Station was maintained by Anthony D Gutierrez. Station record was developed by Ashenafi Hydebo.

Recommendations.-- A complete flume inspection should be performed during the non irrigation season to confirm the floor elevations, the position of the staff gage and the overall flume geometry. A measurement bridge should be positioned at the outside staff gage. The flume should be measured a minimum of twice during the period of flow, with measurement made at higher gage-heights to verify shifts.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

OXFORD FARMERS DITCH COMPANY

RATING TABLE-- STD12FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

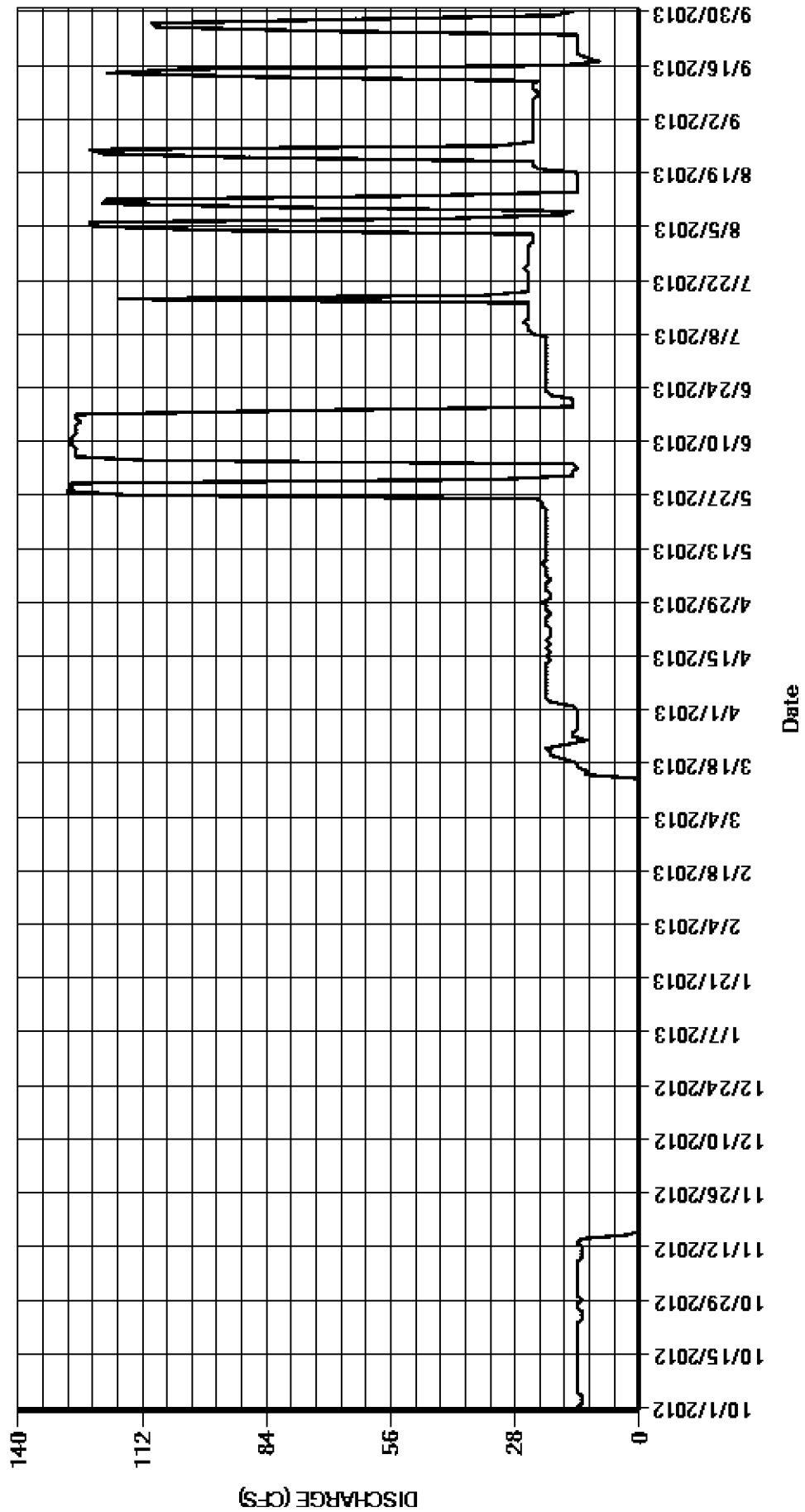
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	14	0.00	0.00	0.00	0.00	14	20	15	21	24	24
2	13	14	0.00	0.00	0.00	0.00	15	21	15	21	24	24
3	13	14	0.00	0.00	0.00	0.00	20	21	14	21	24	24
4	13	14	0.00	0.00	0.00	0.00	21	21	15	21	96	24
5	14	14	0.00	0.00	0.00	0.00	21	20	111	21	123	24
6	14	14	0.00	0.00	0.00	0.00	21	21	127	21	124	24
7	14	14	0.00	0.00	0.00	0.00	21	21	127	21	43	24
8	14	14	0.00	0.00	0.00	0.00	21	21	127	24	17	23
9	14	13	0.00	0.00	0.00	0.00	21	22	128	25	15	23
10	14	13	0.00	0.00	0.00	0.00	21	21	128	25	78	24
11	14	13	0.00	0.00	0.00	0.00	21	21	128	26	121	24
12	14	13	0.00	0.00	0.00	0.00	21	21	127	25	120	23
13	14	14	0.00	0.00	0.00	0.00	21	21	127	25	50	85
14	14	13	0.00	0.00	0.00	0.00	20	21	127	25	14	120
15	14	2.7	0.00	0.00	0.00	12	21	21	126	25	14	103
16	14	0.00	0.00	0.00	0.00	12	20	21	127	25	14	17
17	14	0.00	0.00	0.00	0.00	14	21	21	127	117	14	9.2
18	14	0.00	0.00	0.00	0.00	14	20	21	77	35	14	12
19	14	0.00	0.00	0.00	0.00	17	21	21	15	25	14	14
20	14	0.00	0.00	0.00	0.00	20	20	21	15	25	23	14
21	14	0.00	0.00	0.00	0.00	20	20	21	15	25	24	14
22	14	0.00	0.00	0.00	0.00	21	20	21	20	25	24	14
23	14	0.00	0.00	0.00	0.00	16	21	21	21	25	88	14
24	13	0.00	0.00	0.00	0.00	12	21	22	21	25	121	14
25	13	0.00	0.00	0.00	0.00	15	21	22	21	26	124	74
26	13	0.00	0.00	0.00	0.00	15	20	23	21	25	32	109
27	14	0.00	0.00	0.00	0.00	14	21	116	21	25	24	110
28	14	0.00	0.00	0.00	0.00	14	21	129	21	25	24	64
29	13	0.00	0.00	0.00	---	14	22	128	21	25	24	19
30	14	0.00	0.00	0.00	---	14	20	128	21	25	24	15
31	14	---	0.00	0.00	---	14	---	32	---	25	24	---
TOTAL	427	193.70	0.00	0.00	0.00	258.00	609	1082	2006	850	1499	1106.2
MEAN	13.8	6.46	0.000	0.000	0.000	8.32	20.3	34.9	66.9	27.4	48.4	36.9
AC-FT	847	384	0	0	0	512	1210	2150	3980	1690	2970	2190
MAX	14	14	0.00	0.00	0.00	21	22	129	128	117	124	120
MIN	13	0.00	0.00	0.00	0.00	0.00	14	20	14	21	14	9.2

CAL YR	2012	TOTAL	4883.70	MEAN	13.3	MAX	29	MIN	0.00	AC-FT	9690
WTR YR	2013	TOTAL	8030.90	MEAN	22.0	MAX	129	MIN	0.00	AC-FT	15930

MAX DISCH: 196 CFS AT 09:15 ON AUG 04, 2013 GH 2.45 FT SHIFT 0 FT  
 MAX GH: 2.45 FT AT 09:15 ON AUG 04, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**OXFORD FARMERS DITCH COMPANY  
WY2013 HYDROGRAPH**



## ARKANSAS RIVER BASIN

07117000 ARKANSAS RIVER AT NEPESTA BRIDGE NEAR NEPESTA, CO

Water Year 2013

**Location.--** Lat. 38°10'44", Long. 104°08'20", in the NE¼ SE¼ NW¼ Sec.32, T21S, R60W Pueblo County, Hydrologic Unit 11020005, on the left bank downstream side of the Nepesta Road Bridge crossing the Arkansas River, 0.8 mi downstream of Kramer Creek, 9 mi downstream from Huerfano River, 1 mile NNW of the Nepesta Cemetery. Oxford Farmers Ditch gage located approximately 0.25 miles upstream of Nepesta Bridge near right bank of Arkansas River. Note: Nepesta was originally a station on the AT&SF Railway, which was abandoned and razed several years ago. Present site of Nepesta is 0.6 miles SE of the railway station site.

**Drainage Area and Period of Record.--** 9,345 mi<sup>2</sup> of which 54 sq.mi. is probably noncontributing (furnished by the U.S Army Corp of Engineers). ; Established May 1, 1901. Intermittent record until June 1921 at various sites and datums above the current site. From June 1921 to September 30, 2000 at various sites within 2 miles of the present site. At present site October 1, 2000 through current water year.

**Equipment.--** A Sutron SatLink2 (DCP), constant flow bubbler (CFB) and radar water level sensor. The equipment is housed in a 4 ft x 4 ft x 8 ft steel shelter. The primary reference gage is a wire weight located in the same river section as the end of the orifice line with muffler and attached to the bridge approximately 120 ft south of the gage shelter. A temperature sensor is also monitored and logged by the DCP.

**Hydrologic Conditions.--** The gage is located at the Pueblo County Road 613 bridge over the Arkansas River on a fairly straight stretch of river that extends from 800 feet upstream to a half mile downstream of the gage. The gage elevation is 4380 ft MSL. The riverbed consists of moving sand at all stages. Upstream sluice outlets from the Colorado Canal, Rocky Ford Highline Canal and Oxford Farmers Ditch as well as Fountain Creek contribute a supply of loose sand, especially during the irrigation season and high water. The upper basin consists of mountain topography above Pueblo Reservoir. The lower basin consists of several unregulated tributaries below Pueblo (Fountain Creek, Salt Creek, the St. Charles River, Six Mile Creek, and the Huerfano River), large agricultural areas, and urban runoff from Pueblo and portions of the Colorado Springs area.

**Gage-Height Record.--** Primary record is 15-minute transmitted data with DCP log used as backup. The CFB log and radar gage are used as additional backup. For the record, the gage height data from the CFB (GH\_HT) from Oct 1, 2012 to Jun 30, 2013 was used, and the radar data (GH\_HT2) was used from July 31, 2013 to the end of the water year. Missing data for May 6, Aug 20, and Sept 13-14, 2013 was completed using data stored in the the DCP. Record is complete and reliable, except for the periods: December 10 - 14 & 20-31, 2012; January 1 – 31; and February 1 when ice at or near the gage affected the stage-discharge relationship. In April 18, 20, & 30, May 6, 14, the CFB data (GH\_HT) was replaced by data gathered by the radar (GH\_HT2) to smooth some of the outlier data. The primary gage record was changed to the radar on October 1, 2013.

**Datum Corrections.--** Levels were run April 11, 2012 to the wire-weight check bar, using RM No. 4 as base. Results were within allowable limits and no corrections were needed.

**Rating.--** The primary control at all stages is a shifting sand channel. At the gage, the channel is contained by the county road bridge and the railroad bridge. Flows of up to approximately 5000 cfs are contained in well-defined channel under the bridge. At higher flows, large riprap, which continues up to the bottom of the bridge, and heavy vegetation on both banks below the bridge, become part of the control. Backwater flow is negated by the elevation of the road and a large fan area below the gage. The rating is defined to 25,000 cfs by a high water mark on the bridge piers made during May 1999 flood and an indirect rating extension performed by the USGS. Discharge measurements of up to 1500 cfs can be made approximately 400 – 500 feet downstream of the bridge, with higher flows measured from the bridge. Extremely low discharge measurements (less than 50 cfs) are made as much as a quarter of a mile upstream, near the Oxford Farmers Ditch flume. Rating No. 16 was used the entire water year. This rating incorporated both high flow (USGS indirect measurement) and extreme low flows (due to drought conditions). Estimated PZF is 10.42 ft. Nineteen discharge measurements (Nos. 266 – 284) and five gage visit were made this water year ranging in discharge from 22.1 cfs to 2290 cfs. All measurements were made in open water by wading, except three measurements (No. 276, 277 & 283) which were made using bridge crane at side bridge. The peak discharge of 4950 cfs occurred at 2100 September 14, 2013 at a gage height of 15.62 ft with a shift of -0.15. It exceeded the gage height of Measurement No. 283 by 1.18 ft. The maximum discharge measured three days after the peak occurred.

**Discharge.--** Shifting-control method was used for the entire water year. Shifts were applied by measurements and distributed by time and stage. Shifts were applied by time from 1030 October 3, 2012 to 1430 May 21, 2013 and from 1545 September 17 to the end of the water year. Shifts were applied by stage using variable shift curve ARKNEPCOVSC13E which was applied from 1445 May 21, 2013 to 1530 September 17, 2013. Discharge measurements showed shifts ranging from -1.04 ft to -0.21 ft. All measurements were given full weight and applied directly except for measurement nos. 476, 478-283 which were discounted from -8.2% to 5.8% to smooth shift distribution.

**Special Computations.--** Estimated discharge during periods of ice was based on two discharge measurements (Nos. 270- 271) along with temperature record at the gage and comparison of the Arkansas River near Avondale hydrograph. The Colorado Canal near Boone was also used for comparison as it ran water from January 4 to February 7.

**Remarks.--** The record is considered good to fair except during the periods of ice effect, which are estimated and considered poor. The peak discharge is considered good as measurement No. 283 was made approximately three days after the peak occurred and was considered a good measurement. Gage operated and maintained by Garrett Markus, Anthony D. Gutierrez, and Ashenafi Hydebo. Record developed by Ashenafi Hydebo.



Recommendations.--

A new rating based on recent measurements and channel aggradations due to sand deposition should be developed. The new rating should tie into Rating 16 at a gage height of 14.80 ft.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

07117000 ARKANSAS RIVER AT NEPESTA BRIDGE NEAR NEPESTA, CO

RATING TABLE-- ARKNEPCO16 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

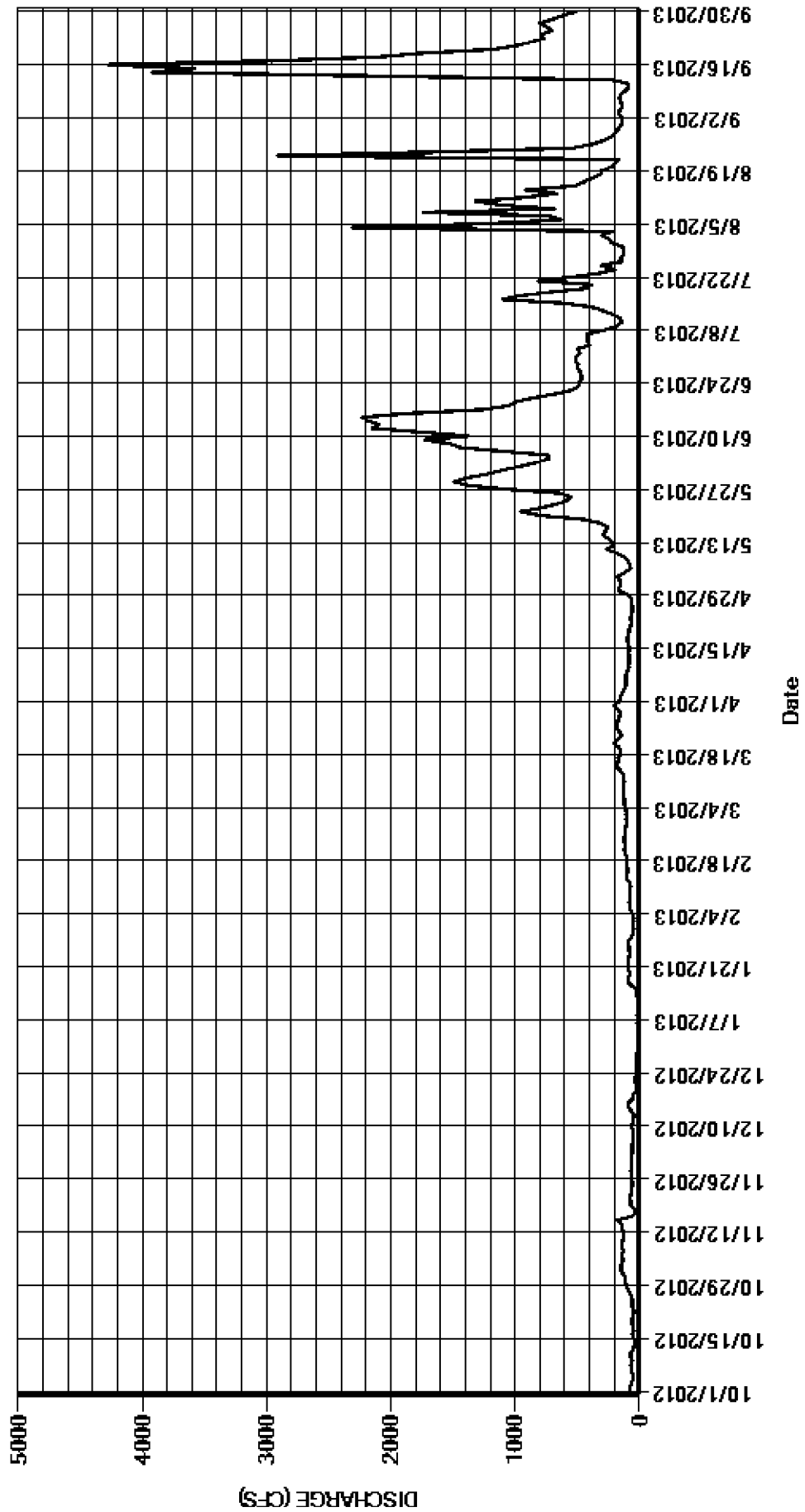
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	82	135	66	e9.9	e48	106	164	162	1100	508	242	141
2	76	148	66	e11	48	107	155	154	956	481	302	144
3	66	150	58	e14	48	106	141	160	832	496	224	165
4	50	138	56	e14	56	114	127	181	732	403	2310	161
5	52	135	57	e15	76	121	112	119	735	423	1250	139
6	61	141	54	e17	77	121	108	73	1090	412	635	148
7	62	128	53	e16	83	129	110	76	1440	420	723	162
8	69	143	53	e17	75	129	109	91	1520	281	1740	152
9	59	141	52	e14	75	130	97	117	1730	189	681	115
10	71	131	e68	e13	74	129	87	179	1380	145	1100	88
11	72	125	e52	e13	72	124	86	262	1740	152	1320	90
12	48	134	e47	e13	76	128	81	217	2150	208	923	206
13	42	142	e42	e17	103	136	84	222	2100	292	671	1980
14	38	143	e68	e22	103	161	86	252	2190	374	913	3920
15	48	180	88	e29	95	192	83	292	2230	595	521	3580
16	55	65	87	e65	99	172	88	274	1880	1100	451	4270
17	46	29	58	e94	102	170	98	253	1270	966	387	2960
18	54	35	54	e89	101	153	94	314	1060	719	312	2110
19	59	68	22	e75	102	150	85	444	996	428	310	1760
20	60	70	e21	e87	117	171	80	800	871	387	222	1180
21	50	78	e29	e87	123	200	69	950	693	810	196	989
22	43	68	e33	e87	112	172	67	791	552	540	174	875
23	57	63	e31	e88	124	144	72	668	496	316	2910	771
24	60	61	e27	e81	121	162	65	588	486	199	1630	787
25	57	56	e25	e82	115	189	56	547	465	306	538	703
26	64	64	e27	e84	113	184	59	648	467	147	384	744
27	80	65	e26	e86	109	170	64	1070	478	146	284	803
28	95	69	e24	e87	103	159	61	1380	503	126	221	693
29	109	66	e21	e60	---	155	85	1490	494	132	191	614
30	114	67	e15	e51	---	175	163	1380	517	133	170	505
31	116	---	e10	e47	---	200	---	1220	---	224	148	---
TOTAL	2015	3038	1390	1484.9	2550	4659	2836	15374	33153	12058	22083	30955
MEAN	65.0	101	44.8	47.9	91.1	150	94.5	496	1105	389	712	1032
AC-FT	4000	6030	2760	2950	5060	9240	5630	30490	65760	23920	43800	61400
MAX	116	180	88	94	124	200	164	1490	2230	1100	2910	4270
MIN	38	29	10	9.9	48	106	56	73	465	126	148	88

CAL YR	2012	TOTAL	62298.0	MEAN	170	MAX	793	MIN	10	AC-FT	123600
WTR YR	2013	TOTAL	131595.9	MEAN	361	MAX	4270	MIN	9.9	AC-FT	261000

MAX DISCH: 4950 CFS AT 21:00 ON SEP 14, 2013 GH 15.62 FT SHIFT -0.15 FT  
 MAX GH: 15.62 FT AT 21:00 ON SEP 14, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07117000 ARKANSAS RIVER AT NEPESTA BRIDGE NEAR NEPESTA, CO  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN

07117000 ARKANSAS RIVER AT NEPESTA ROAD BRIDGE NEAR NEPESTA, CO (COMBINED)

Water Year 2013

Location.-- Combined record from Arkansas River at Nepesta Rd. Bridge gage: Lat 38° 10' 44", Long 104° 8' 20", in the NE¼ SE¼ NW¼ Sec.32, T21S, R60W Pueblo County, Hydrologic Unit 11020005 and Oxford Farmers Ditch gage: Lat. 38°10'34",Long. 104°08'42", in the NE¼ NW¼ SW¼ Sec.32, T21S, R60W Pueblo County, Hydrologic Unit 11020005.

Drainage Area and Period of Record.-- 9,345 sq. mi. of which 54 sq. mi. is probably noncontributing (furnished by the Army Corp of Engineers).;

Equipment.-- See individual records for gage equipment descriptions.

Hydrologic Conditions.-- See individual station analyses.

Gage-Height Record.-- See individual records for gage height record analyses.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- The combined record of mean daily discharge was obtained by the addition of Oxford Farmers Ditch mean daily flows to the corresponding mean daily flows in the Arkansas River at Nepesta Road Bridge. Mean daily discharge was estimated on the following days: December 10 - 14, 20 - 31, 2012; January 1 - 31; and February 1, 2013 when ice at or near the gage affected the stage-discharge relationship.

Special Computations.-- See individual station analyses.

Remarks.-- Combined record is fair, except during periods of estimated flow, which should be considered poor. Record developed by Division 2 Staff.

The Arkansas River near Nepesta CO gaging station was moved from above the Oxford Farmers Ditch diversion to the Nepesta Road bridge below the diversion beginning October 1, 2000. For consistency and comparison with previously published historical record in this reach of the Arkansas River, the total Arkansas River flow is computed by combining the Oxford Ditch mean daily discharge with the mean daily discharge measured at Arkansas River at Nepesta Road Bridge near Nepesta CO gaging station.

Recommendations.-- See individual station analyses.

STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

07117000 ARKANSAS RIVER AT NEPESTA ROAD BRIDGE NEAR NEPESTA, CO (COMBINED)

RATING TABLE.--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

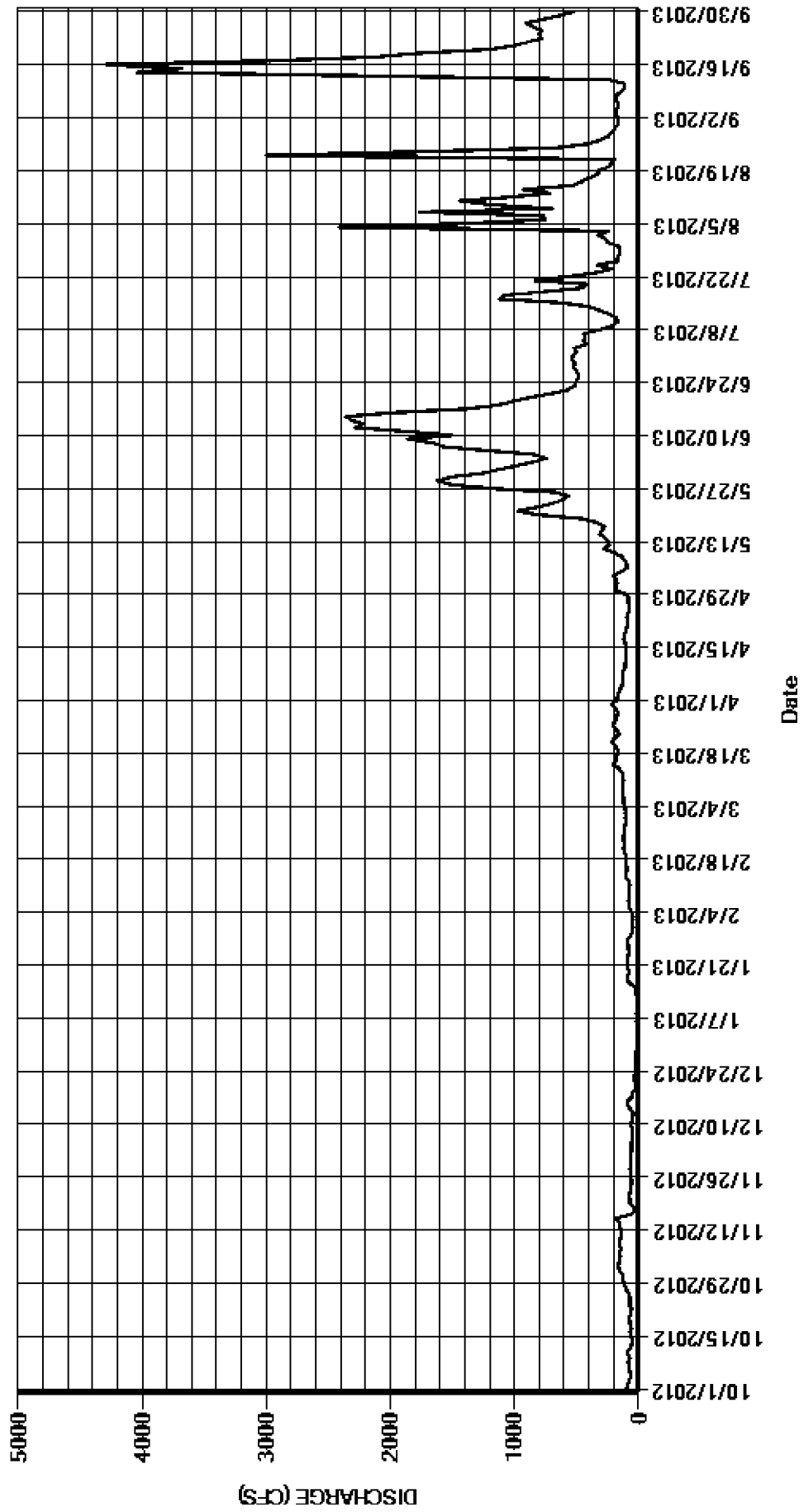
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	96	149	66	e9.9	e48	106	178	182	1120	529	266	165
2	89	162	66	e11	48	107	170	175	971	502	326	168
3	79	164	58	e14	48	106	161	181	846	517	248	189
4	63	152	56	e14	56	114	148	202	747	424	2410	185
5	66	149	57	e15	76	121	133	139	846	444	1370	163
6	75	155	54	e17	77	121	129	94	1220	433	759	172
7	76	142	53	e16	83	129	131	97	1570	441	766	186
8	83	157	53	e17	75	129	130	112	1650	305	1760	175
9	73	154	52	e14	75	130	118	139	1860	214	696	138
10	85	144	e68	e13	74	129	108	200	1510	170	1180	112
11	86	138	e52	e13	72	124	107	283	1870	178	1440	114
12	62	147	e47	e13	76	128	102	238	2280	233	1040	229
13	56	156	e42	e17	103	136	105	243	2230	317	721	2060
14	52	156	e68	e22	103	161	106	273	2320	399	927	4040
15	62	183	88	e29	95	204	104	313	2360	620	535	3680
16	69	65	87	e65	99	184	108	295	2010	1120	465	4290
17	60	29	58	e94	102	184	119	274	1400	1080	401	2970
18	68	35	54	e89	101	167	114	335	1140	754	326	2120
19	73	68	22	e75	102	167	106	465	1010	453	324	1770
20	74	70	e21	e87	117	191	100	821	886	412	245	1190
21	64	78	e29	e87	123	220	89	971	708	835	220	1000
22	57	68	e33	e87	112	193	87	812	572	565	198	889
23	71	63	e31	e88	124	160	93	689	517	341	3000	785
24	73	61	e27	e81	121	174	86	610	507	224	1750	801
25	70	56	e25	e82	115	204	77	569	486	332	662	777
26	77	64	e27	e84	113	199	79	671	488	172	416	853
27	94	65	e26	e86	109	184	85	1190	499	171	308	913
28	109	69	e24	e87	103	173	82	1510	524	151	245	757
29	122	66	e21	e60	---	169	107	1620	515	157	215	633
30	128	67	e15	e51	---	189	183	1510	538	158	194	520
31	130	---	e10	e47	---	214	---	1250	---	249	172	---
TOTAL	2442	3232	1390	1484.9	2550	4917	3445	16463	35200	12900	23585	32044
MEAN	78.8	108	44.8	47.9	91.1	159	115	531	1173	416	761	1068
AC-FT	4840	6410	2760	2950	5060	9750	6830	32650	69820	25590	46780	63560
MAX	130	183	88	94	124	220	183	1620	2360	1120	3000	4290
MIN	52	29	10	9.9	48	106	77	94	486	151	172	112

CAL YR	2012	TOTAL	67182.0	MEAN	184	MAX	813	MIN	10	AC-FT	133300
WTR YR	2013	TOTAL	139652.9	MEAN	383	MAX	4290	MIN	9.9	AC-FT	277000

MAX DISCH:  
MAX GH:

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07117000 ARKANSAS RIVER AT NEPESTA ROAD BRIDGE NEAR NEPESTA, CO (COMBINED)  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
07119700 ARKANSAS RIVER AT CATLIN DAM NEAR FOWLER  
Water Year 2013

Location.-- Lat. 38°07'33", Long. 103°54'41", in NW¼NW¼ sec. 21, T.22 S., R.58 W., Otero County, Hydrologic Unit 11020005, at Catlin Canal gage, on right bank 2.2 mi downstream from diversion dam for Catlin Canal, 2.3 mi downstream from Apishapa River, and 6.0 mi east of Fowler.

Drainage Area and Period of Record.-- 10,800 sq mi.; October 1964 to current water year.

Equipment.-- Sutron Satlink2 DCP with a Sutron Constant Flow Bubbler (CFB), Campbell Scientific radar, and USGS HydroLab in a 8 ft x 8 ft shelter. This DCP also monitors the Catlin Canal's flume gage height and USGS water quality sensors. The primary reference gage is an outside staff gage which is attached to a concrete flood block that holds the bubbler orifice, radar, and radar bracket. A cableway approximately 2 miles upstream of the gage was used for high flow measurements. The radar and cantilever bracket was installed on June 4-5, 2013. No other changes were made this water year.

Hydrologic Conditions.-- The drainage basin characteristics include elevation differences from Mt. Elbert at 14,433± ft to the gage at elevation 4,245± ft with vegetation ranging from alpine tundra to sparse pinon-juniper in the upper reaches and from irrigated farmland to rangeland in the lower reaches. The gage is located downstream from Pueblo Reservoir approximately 61 miles. Pueblo Reservoir regulates flows through the reservoir year round including the Winter Water Storage Program period of November 15 to March 15 when the gates are essentially closed and streamflow is stored for release during the irrigation season. Release of water from Pueblo Reservoir takes approximately 38 hours to reach the gage. Unregulated tributaries below Pueblo Reservoir that contribute to the gage include Fountain Creek, St. Charles River, Huerfano River and the Apishapa River. The Apishapa River's confluence with the Arkansas River is approximately 2.4 miles above the gage. Numerous irrigation diversion points exist above the gage including Catlin Canal operations which sluice approximately 0.24 miles above the gage and also divert from the river approximately 2.25 miles above the gage. All of these factors influence streamflow at the gage. Mean annual precipitation for the basin is 17.09± inches. No hydrologic conditions changes in the basin observed this water year.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted radar data, with CFB data and DCP log backup. Record is complete and reliable, except for the following periods: missing data: April 22 (1 value), June 4-5 (26 and 17 values, respectively) when the radar was being installed. Missing data periods of less than 4-hour duration were filled in using adjacent good record before and after each period without loss of accuracy. Missing data periods of 4 hours or more were denoted as a-days. During the periods of Dec 24-25,2012, Jan 16-31, Feb 1, 2,13-28, Mar 1, 2013 ice in the channel affected the stage-discharge relationship. Primary stage sensor calibration to the reference gage is supported by 30 visits made this water year.

Datum Corrections.-- Levels were last run on August 22, 2008. No corrections were made.

Rating.-- A shifting sand channel is the control at all stages with heavily vegetated bank areas contributing to the control at gage heights of 9.5 feet and above. Rating curve ARKCATCO11, dated June 26, 2003, was used for the entire water year. Twenty discharge measurements (Nos. 1254-1273) were made throughout the water year covering a range in discharge from 30.6 to 7750 cfs. The measurements cover the range in stage of all average daily flows during the water year. The peak discharge of 8060 cfs occurred at 1515 on September 16, 2013 at a gage height of 8.24 ft with a shift of -0.10 ft and gage height correction of 0.00 ft. It exceeded the stage of high Measurement No. 1273 made Sept 16, 2013 by 0.14 ft.

Discharge.-- Shifting channel control method was used all year. Shifts were applied as defined by measurements and distributed by time and stage. Shifts were distributed by stage using five variable stage-shift relationships: ARKLAJCOVSC13A, ARKLAJCOVSC13B, ARKLAJCOVSC13C, ARKLAJCOVSC13D, and ARKLAJCOVSC13E. WY2013 started with a time-prorated shift carried over from WY2012 and was continued in WY2013 to Msmt No.1254 on Oct 3. Shifts were distributed by stage for the period 1445 Oct 3 to 1645 Nov 19 for ARKLAJCOVSC13A, 1330 Jan 8 to 0300 May 26 for ARKLAJCOVSC13B, 1030 May 29 to 1315 Jun 25 for ARKLAJCOVSC13C, 1000 Jul 11 to 1415 Aug 4 for ARKLAJCOVSC13D, 1430 Aug 3 to end of the water year for ARKLAJCOVSC13E. Each variable stage-shift relationship was based on measurements made during the period of respective application. Measurement Nos. 1262, 1271 and 1274 were discounted from -3.98% to +2.47% to fit the trends and smooth respective variable shift curves. Shifts were distributed by time from 1700 Nov 19 to 1315 Jan 8, 0315 May 26 to 1015 May 29 and 1330 Jun 25 to 1415 Aug 4.

Special Computations.-- The potential for ice-affected gage heights were analyzed using on-site USGS water temperature data, air temperature data from the Arkansas River at Nepesta Road Bridge (ARKNEPCO) gage, gage height time series traces, field measurement notes, and up and downstream hydrographs. Discharges were estimated by using trends in flow before and after ice affected periods, and by hydrographic comparison with the Arkansas River at Nepesta (ARKNEPCO), Arkansas River near Rocky Ford (ARKROCCO), Arkansas River at La Junta (ARKLAJCO), and Ft Lyon Storage Canal (FLSCANCO) gages.

Remarks.-- Record is good, except the ice affected periods and missing data periods which are estimated and poor. The instantaneous peak discharge for the year is rated good. Station maintained and record developed by Garrett Markus.

Recommendations.--

Levels should be run in WY2014. All chiseled benchmarks should be replaced with either a brass cap or concrete pin for improved accuracy during levels. Measurement should be made at the established frequency for sand channel gages. Since this record is affected by sluice operations on the Catlin Canal, it is recommended that more measurements be taken at the sluice to verify the sluice structure rating CATSLUCO02.



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

07119700 ARKANSAS RIVER AT CATLIN DAM NEAR FOWLER

RATING TABLE-- ARKCATCO11 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

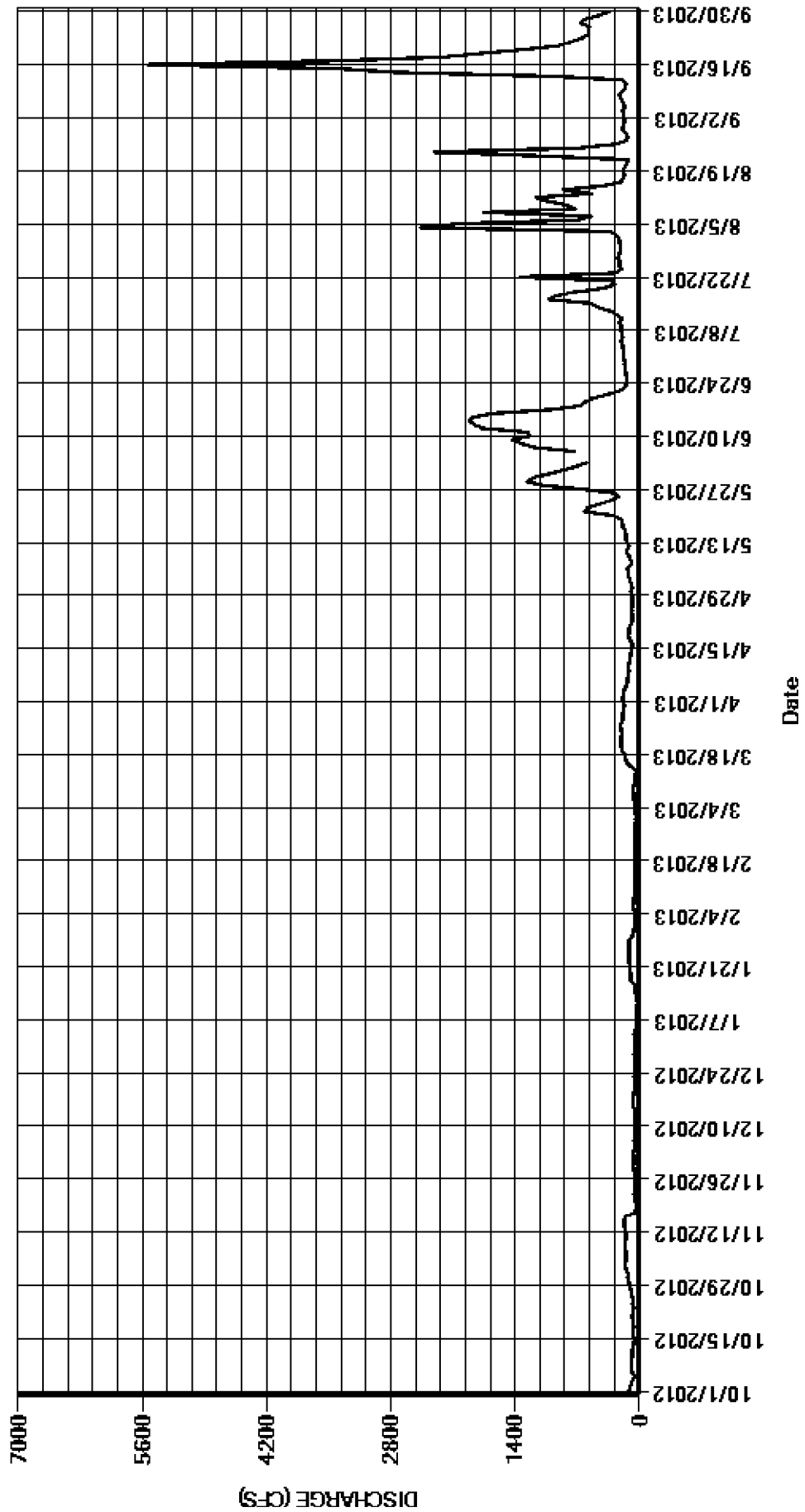
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	121	131	61	48	e60	e42	190	75	854	183	229	172
2	108	149	63	48	e50	42	186	91	702	179	262	173
3	91	166	68	59	50	46	177	105	595	187	324	181
4	72	157	56	55	45	46	170	126	---	192	2460	187
5	55	149	54	35	59	55	153	123	---	209	2030	164
6	82	154	59	39	73	65	135	141	736	190	686	182
7	88	154	55	36	62	61	135	96	1180	194	546	208
8	92	158	55	33	61	65	129	95	1320	212	1760	224
9	92	164	55	30	54	68	118	111	1430	203	726	188
10	79	156	56	30	51	63	123	137	1240	231	817	160
11	84	153	57	24	46	52	118	137	1260	199	1030	153
12	80	157	55	25	42	46	111	118	1770	251	1170	188
13	66	167	50	36	e50	41	98	146	1860	333	543	983
14	61	173	46	43	e55	46	97	155	1920	473	860	2730
15	58	172	72	46	e55	113	86	154	1880	544	418	3410
16	75	165	69	e50	e55	149	79	159	1660	1020	213	5530
17	74	54	68	e95	e55	158	99	186	1010	943	177	3440
18	64	41	66	e100	e55	168	122	193	672	734	170	2210
19	69	35	59	e100	e57	195	116	202	610	412	182	1770
20	78	43	47	e110	e57	205	119	293	525	281	165	1290
21	82	53	54	e110	e55	208	105	618	359	304	147	907
22	70	60	50	e115	e50	207	85	586	218	1350	126	772
23	63	58	60	e115	e50	203	79	454	156	277	1180	653
24	79	57	e55	e115	e50	202	81	325	148	204	2310	572
25	76	51	e55	e115	e48	210	85	239	144	227	690	572
26	83	49	55	e115	e48	212	83	287	150	219	282	568
27	87	54	56	e115	e45	185	77	639	155	247	142	663
28	98	61	57	e115	e42	191	81	1090	160	229	133	612
29	110	67	60	e80	---	188	81	1260	167	214	161	452
30	123	63	55	e65	---	178	97	1200	168	215	196	337
31	130	---	55	e60	---	169	---	1020	---	222	175	---
TOTAL	2590	3271	1783	2162	1480	3879	3415	10561	23049	10878	20310	29651
MEAN	83.5	109	57.5	69.7	52.9	125	114	341	823	351	655	988
AC-FT	5140	6490	3540	4290	2940	7690	6770	20950	45720	21580	40280	58810
MAX	130	173	72	115	73	212	190	1260	1920	1350	2460	5530
MIN	55	35	46	24	42	41	77	75	144	179	126	153

CAL YR	2012	TOTAL	41750	MEAN	114	MAX	390	MIN	9.9	AC-FT	82810
WTR YR	2013	TOTAL	113029	MEAN	311	MAX	5530	MIN	24	AC-FT	224200

MAX DISCH: 8060 CFS AT 15:15 ON SEP 16, 2013 GH 8.24 FT SHIFT -0.10 FT  
 MAX GH: 8.24 FT AT 15:15 ON SEP 16, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07119700 ARKANSAS RIVER AT CATLIN DAM NEAR FOWLER  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
07119705 CATLIN CANAL AT CATLIN DAM NEAR FOWLER  
Water Year 2013

Location.-- Lat 38° 07'27.11", Long 103° 54'43.30" (Elder, Colorado quadrangle, 1:24,000 scale, 1954) in NE¼ NE¼ Sec 20, T22S, R58W, Otero County, Hydrologic Unit 11020005, 2.2 mi downstream from Catlin Canal Diversion Dam, 2.3 mi. downstream from mouth of Apishapa River, and 6 miles east of Fowler, CO.

Drainage Area and Period of Record.-- NA, Canal;

Equipment.-- Float-activated graphic water-stage recorder and shaft encoder in 8 ft x 8 ft shelter with well (with equipment for Arkansas River below Catlin Dam near Fowler CO river gage). Shaft encoder is connected to satellite-monitored data collection platform (DCP) used for river gage. Fifteen-foot standard concrete Parshall flume is the control. Primary reference gage is outside staff gage installed in flume.

Hydrologic Conditions.-- The Catlin Canal diverts water from the Arkansas River just downstream from the confluence of the Apishapa River. The Catlin Canal Company owns a variety of both native and transmountain water rights and thus the hydrologic characteristics of the basins are highly variable. The influence of urbanization provides the largest affect to the runoff regime

Gage-Height Record.-- Primary record is 15-minute satellite data with the graphic chart recorder and DCP log used for backup purposes. Record is complete and reliable for this seasonally operated gage except for the following. Missing Data: April 22 and June 5 had 1 and 2 values missing respectively resulting from missed transmissions. With stable adjacent gage height, missing data was interpolated from adjacent good data. Erroneous Data: June 5 transmitted 3 wrong values along with 2 missed transmitted values. Eight shaft encoder calibration corrections ranging from -0.05 ft to +0.03 ft were made during periods of operation during the year. All corrections were applied by time proration from the previous visit.

Datum Corrections.-- Levels were last run 8 Oct 2003. No corrections needed. The 2003 level survey did identify the flume floor is not level and the floor at the upstream right corner was found to be 0.05 feet higher than the floor at the intakes/staff gage.

Rating.-- A standard 15-ft Parshall Flume table was used all year. The peak flow of 344 cfs occurred at 0645 on September 15, 2013 at a gage height of 3.05 ft with a shift of 0.00 ft. The peak exceeded the stage of measurement No. 21 (made on April 19, 2012) by 1.97 feet.

Discharge.-- There were no measurements completed in Water Year 2013. Adjusting measurements to the rating has been the historical practice at this structure. Discharge record was computed by direct application of the standard 15-ft Parshall flume rating.

Special Computations.-- There were no special computations this year.

Remarks.-- The record is good except for missing data in periods of flow, which were considered fair. The peak gage height and discharge are considered good in relation to the standard rating. Station maintained and record developed by Garrett Markus.

Recommendations.-- A levels survey and flume inspection should be performed during the non irrigation season to confirm the floor elevations and the position of the staff gage.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

07119705 CATLIN CANAL AT CATLIN DAM NEAR FOWLER

RATING TABLE-- STD15FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

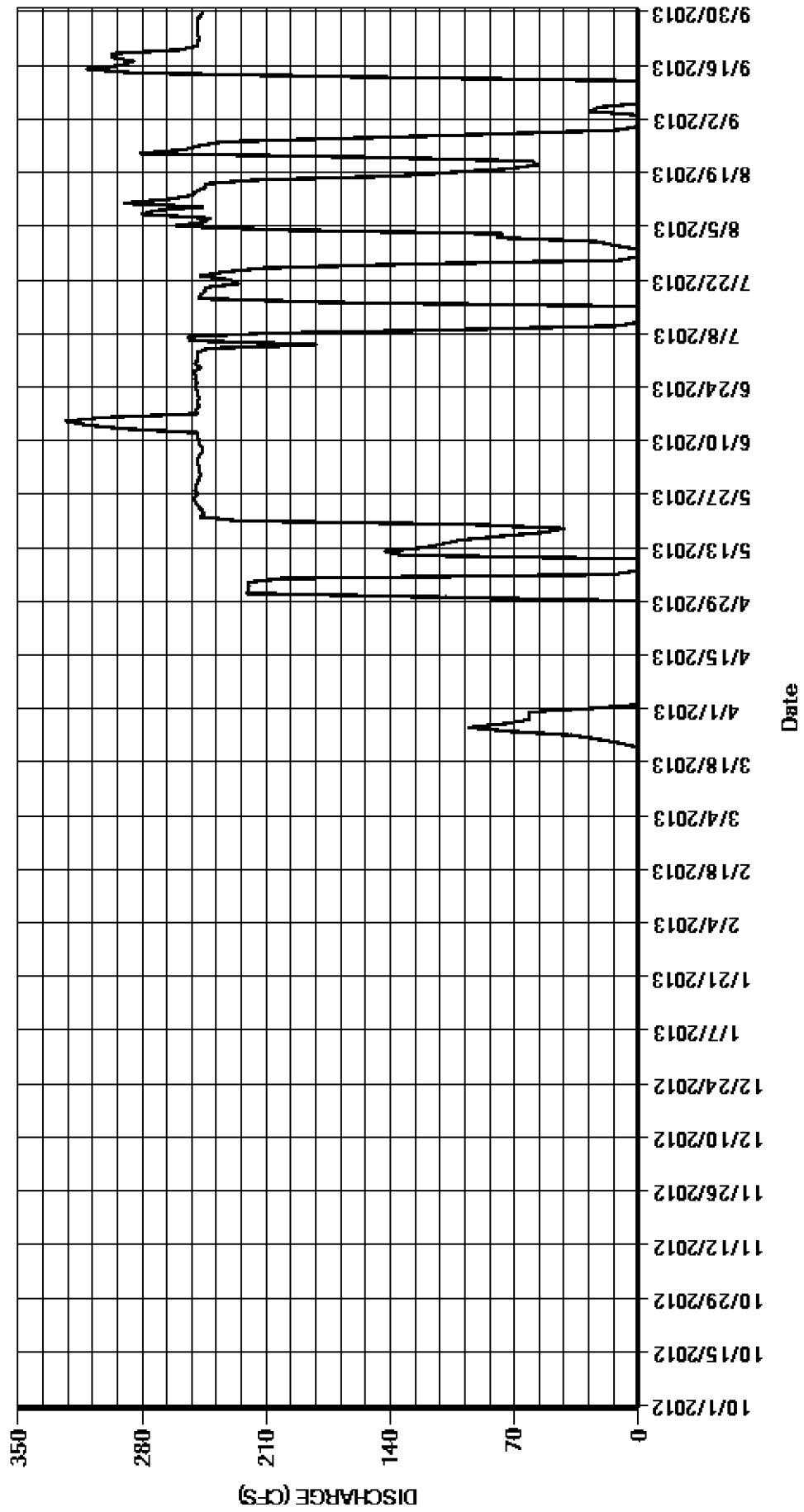
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	28	221	247	249	24	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.17	220	248	249	80	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.03	220	248	249	77	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	220	249	243	205	27
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	201	249	182	261	23
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15	248	253	245	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	246	254	242	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	246	211	280	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	248	98	274	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	248	10	246	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	134	249	0.01	290	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	143	249	0.00	266	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	120	290	0.00	252	157
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	110	312	0.00	250	284
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	101	323	0.00	245	311
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	78	302	174	244	292
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	53	249	248	216	285
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	42	250	247	136	297
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	92	248	245	104	297
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	226	249	244	72	259
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	247	248	226	57	249
22	0.00	0.00	0.00	0.00	0.00	1.5	0.00	245	249	231	60	249
23	0.00	0.00	0.00	0.00	0.00	11	0.00	247	249	247	151	248
24	0.00	0.00	0.00	0.00	0.00	23	0.00	249	250	234	281	249
25	0.00	0.00	0.00	0.00	0.00	38	0.00	250	249	211	256	249
26	0.00	0.00	0.00	0.00	0.00	72	0.00	251	250	131	248	249
27	0.00	0.00	0.00	0.00	0.00	96	0.00	249	250	11	234	249
28	0.00	0.00	0.00	0.00	0.00	75	0.00	250	251	0.08	155	249
29	0.00	0.00	0.00	0.00	---	62	0.00	250	247	0.08	80	247
30	0.00	0.00	0.00	0.00	---	62	109	249	250	0.01	12	246
31	0.00	---	0.00	0.00	---	62	---	248	---	14	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	502.50	137.20	4931.03	7691	4461.18	5543.00	4716.00
MEAN	0.000	0.000	0.000	0.000	0.000	16.2	4.57	159	256	144	179	157
AC-FT	0	0	0	0	0	997	272	9780	15260	8850	10990	9350
MAX	0.00	0.00	0.00	0.00	0.00	96	109	251	323	254	290	311
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	246	0.00	0.00	0.00

CAL YR	2012	TOTAL	18122.34	MEAN	49.5	MAX	259	MIN	0.00	AC-FT	35950
WTR YR	2013	TOTAL	27981.91	MEAN	76.7	MAX	323	MIN	0.00	AC-FT	55500

MAX DISCH: 344 CFS AT 06:45 ON SEP 15, 2013 GH 3.05 FT SHIFT 0.00 FT  
 MAX GH: 3.05 FT AT 06:45 ON SEP 15, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07119705 CATLIN CANAL AT CATLIN DAM NEAR FOWLER  
 WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
ARKANSAS RIVER AND CATLIN CANAL (COMBINED)  
Water Year 2013

Location.-- Combined record from Arkansas River below Catlin Dam and Catlin Canal gages both located at Lat 38°07'33", long 103°54'41", in NW¼NW¼ sec. 21, T.22 S., R.58 W., Otero County.

Drainage Area and Period of Record.-- 10,800 mi<sup>2</sup>;

Equipment.-- See individual records for gage equipment descriptions.

Hydrologic Conditions.-- See individual station analyses.

Gage-Height Record.-- See individual records for gage height record analyses.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- The combined record of discharges was obtained by the addition of Catlin Canal daily flows to the corresponding daily flows in the Arkansas River below Catlin Dam. The peak unit value discharge for the year was 8340 cfs at 1545 on September 16, 2013. See individual station analyses.

Special Computations.--

Remarks.-- Combined record is good, except during periods of estimated flow, which should be considered poor. Record developed by Div. 2 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

ARKANSAS RIVER AND CATLIN CANAL (COMBINED)

RATING TABLE.--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

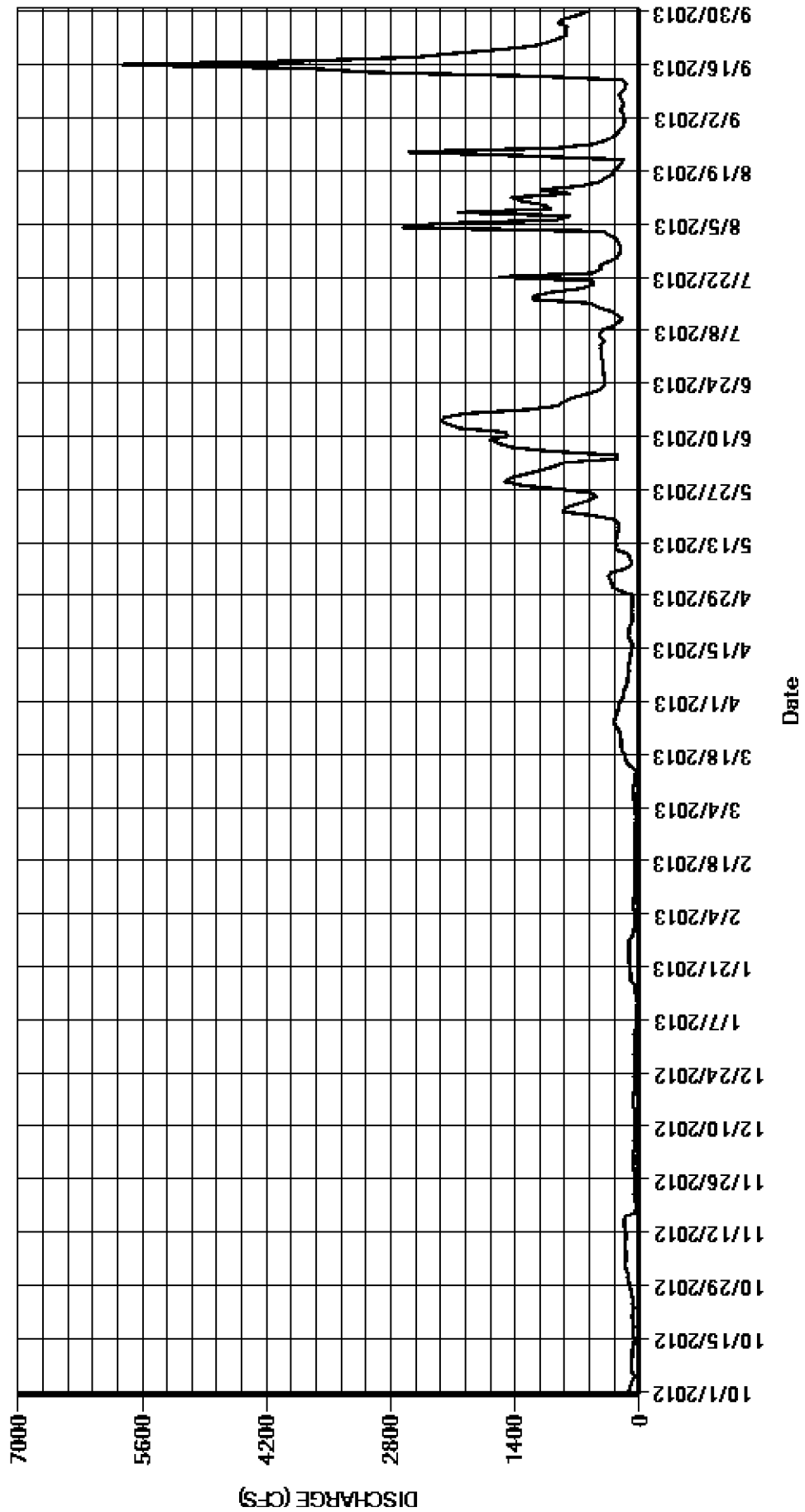
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	121	131	61	48	e60	e42	218	296	1100	432	253	172
2	108	149	63	48	e50	42	186	311	950	428	342	173
3	91	166	68	59	50	46	177	325	843	436	401	181
4	72	157	56	55	45	46	170	346	249	435	2660	214
5	55	149	54	35	59	55	153	324	249	391	2290	187
6	82	154	59	39	73	65	135	156	984	443	931	182
7	88	154	55	36	62	61	135	96	1430	448	788	208
8	92	158	55	33	61	65	129	95	1570	423	2040	224
9	92	164	55	30	54	68	118	111	1680	301	1000	188
10	79	156	56	30	51	63	123	137	1490	241	1060	160
11	84	153	57	24	46	52	118	271	1510	199	1320	153
12	80	157	55	25	42	46	111	261	2020	251	1440	188
13	66	167	50	36	e50	41	98	266	2150	333	795	1140
14	61	173	46	43	e55	46	97	265	2230	473	1110	3010
15	58	172	72	46	e55	113	86	255	2200	544	663	3720
16	75	165	69	e50	e55	149	79	237	1960	1190	457	5820
17	74	54	68	e95	e55	158	99	239	1260	1190	393	3720
18	64	41	66	e100	e55	168	122	235	922	981	306	2510
19	69	35	59	e100	e57	195	116	294	858	657	286	2070
20	78	43	47	e110	e57	205	119	519	774	525	237	1550
21	82	53	54	e110	e55	208	105	865	607	530	204	1160
22	70	60	50	e115	e50	208	85	831	467	1580	186	1020
23	63	58	60	e115	e50	214	79	701	405	524	1330	901
24	79	57	e55	e115	e50	225	81	574	398	438	2590	821
25	76	51	e55	e115	e48	248	85	489	393	438	946	821
26	83	49	55	e115	e48	284	83	538	400	350	530	817
27	87	54	56	e115	e45	281	77	888	405	258	376	912
28	98	61	57	e115	e42	266	81	1340	411	229	288	861
29	110	67	60	e80	---	250	81	1510	414	214	241	699
30	123	63	55	e65	---	240	206	1450	418	215	208	583
31	130	---	55	e60	---	231	---	1270	---	236	175	---
TOTAL	2590	3271	1783	2162	1480	4381	3552	15495	30747	15333	25846	34365
MEAN	83.5	109	57.5	69.7	52.9	141	118	500	1025	495	834	1146
AC-FT	5140	6490	3540	4290	2940	8690	7050	30730	60990	30410	51270	68160
MAX	130	173	72	115	73	284	218	1510	2230	1580	2660	5820
MIN	55	35	46	24	42	41	77	95	249	199	175	153

CAL YR	2012	TOTAL	59866	MEAN	164	MAX	649	MIN	23	AC-FT	118700
WTR YR	2013	TOTAL	141005	MEAN	386	MAX	5820	MIN	24	AC-FT	279700

MAX DISCH: 8340 CFS AT 15:45 ON SEP 16, 2013  
 MAX GH:

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ARKANSAS RIVER AND CATLIN CANAL (COMBINED)  
WY2013 HYDROGRAPH





ARKANSAS RIVER BASIN  
ARKANSAS RIVER NEAR ROCKY FORD  
Water Year 2013

Location.-- Lat. 38°03'52", Long. 103°41'24" in SE ¼, NW ¼, Sec. 9, T23S, R56W, Hydrologic Unit 11020005, Otero County, on right bank of Arkansas River, approximately 250 feet upstream from State Highway 266, and approximately 1.6 miles NE of Rocky Ford, Colorado.

Drainage Area and Period of Record.-- 11,438 sq. mi. ; Oct 1, 1999 to present.

Equipment.-- Sutron Satlink2 DCP with a Sutron Constant Flow Bubbler (CFB), Campbell Scientific radar, and USGS HydroLab in a 4 ft x 4 ft steel gage shelter with a tipping bucket rain gage. The CFB orifice line and radar are fixed on a concrete floodblock situated on the right edge of water below the shelter. The primary reference gage is the top of an angle iron installed on the floodblock with a drop tape reference point. The radar and cantilever bracket was installed on June 5-6, 2013. No other changes were made this water year.

Hydrologic Conditions.-- The drainage basin, which contributes to the gage encompasses approximately 11,300 square miles. Basin characteristics include elevation differences from Mt. Elbert at 14,433 ft to the gage at elevation 4,131 ft with vegetation ranging from alpine tundra to sparse pinyon-juniper in the upper reaches and from irrigated farmland to rangeland in the lower reaches. The gage is located downstream from Pueblo Reservoir approximately 79 miles. Pueblo Reservoir regulates flows through the reservoir year round including the Winter Water Storage Program period of November 15 to March 15 when the gates are essentially closed and streamflow is stored for release during the irrigation season. Release of water from Pueblo Reservoir takes approximately 42 hours to reach the gage. Unregulated tributaries that contribute to the gage include Fountain Creek, St. Charles River, Huerfano River and the Apishapa River, and several other small streams. Numerous irrigation diversion points exist above the gage but contribute to the river with return flows. All of these factors influence steamflow at the gage. Mean annual precipitation for the basin is 16.87± inches. No hydrologic conditions changes in the basin observed this water year.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted radar data, with CFB data and DCP logs as backup. Record is complete and reliable, except for the period of June 5-6, (14 and 3 values, respectively) when the radar was being installed. Missing data was replaced using the relatively flat gage height trend surrounding the missing periods without appreciable loss of accuracy. During the periods of Nov 27-29, Dec 8-11, 13-14, Dec 16-Jan 26, and Jan 29-Feb 2 ice in the channel affected the stage-discharge relationship.

Datum Corrections.-- Levels were run on Apr. 10, 2012 using BM1 as base. The elevation of the tapedown RP on the flood block was found to be 0.021 ft low (elev 7.400 ft versus est. elev. of 7.421 ft). Tape length was not checked at this levels run. Two new reference marks: RM7, elev 15.243 ft, and RM8 4.294 ft were established. No corrections were made. A full set of levels needs to be run in WY2014 to check and verify these results.

Rating.-- The control is a shifting sand channel with earthen banks at low to medium flows and medium to high flows are controlled by tamarisk and bank vegetation and the abutments of the downstream bridge. Rating No. 2, dated Oct. 1, 2003, was used the entire water year. Twenty-two discharge measurements (Nos. 425-446) were made this water year, ranging in discharge from 20.1 cfs to 3110 cfs. WY2013 measurements covered the range in stage experienced except for lower mean daily flows on Feb 18-19, Feb 25-Mar 9, Mar 11-14; and the higher mean daily flows of Sept 16-17. The instantaneous peak flow of 7040 cfs occurred at 2345 September 16, 2013 at a gage height of 6.24 ft with a shift of -0.36 ft. The peak exceeded the stage of Measurement No. 445, made August 17, 2013, by 1.54 feet.

Discharge.-- Shifting channel control method was used all year. Shifts were applied as defined by measurements and distributed by time and stage. Shifts were distributed by stage using six variable stage-shift relationships: ARKROCCOVSC13A, ARKROCCOVSC13B, ARKROCCOVSC13C, ARKROCCOVSC13D, ARKROCCOVSC13E, and ARKROCCOVSC13F. WY2013 started with a time-prorated shift carried over from WY2012 and was continued in WY2013 to Msmt No.425 on Oct 2. Shifts were distributed by stage for the period 1045 Oct 2 to 1045 Nov 20 for ARKROCCOVSC13A, 1445 Feb 19 to 1330 April 25 for ARKROCCOVSC13B, 1345 April 25 to 1815 May 30 for ARKROCCOVSC13C, 1830 May 30 to 1445 Aug 5 for ARKROCCOVSC13D, 1500 Aug 5 to 0930 Sept 17 for ARKROCCOVSC13E, and 0945 Sept 17 to end of the water year for ARKLAJCOVS13F. Each variable stage-shift relationship was based on measurements made during the period of respective application. Measurement Nos. 425-426 and 440 were discounted from -6.25% to +2.48% to fit the trends and smooth respective variable shift curves. Shifts were distributed by time from 1100 Nov 20 to 1430 Feb 19.

Special Computations.-- The potential for ice-affected gage heights was analyzed using water temperatures from the site based HydroLab and air temperature data from the ROCKY FORD 2 SE approximately 2 miles away. Discharges on ice affected days and days of missing data were estimated using good record before and after the affected periods and by comparison to up and downstream hydrographs using the Arkansas River below Catlin Dam and Arkansas River at La Junta.

Remarks.-- Record is good, except for periods of ice affect, which were estimated and are considered poor. Periods of missing data are estimated and fair. Peak gage height and discharge are considered fair. Station maintained and record developed by Garrett Markus.

Recommendations.-- A full set of levels needs to be run in WY2014 to check and verify the results of WY12 levels.

STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
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ARKANSAS RIVER NEAR ROCKY FORD

RATING TABLE-- ARKROCCO02 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

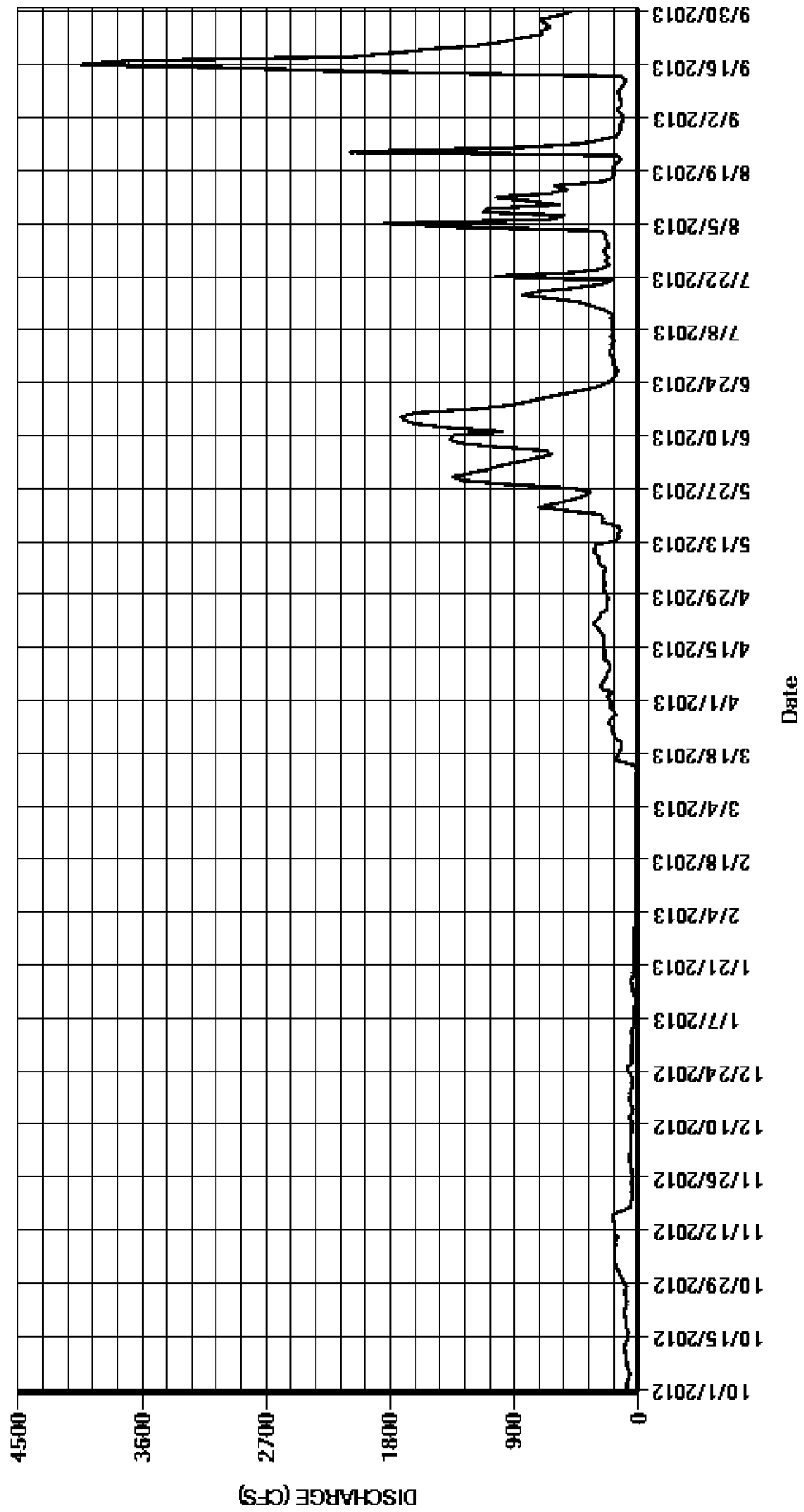
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	88	144	63	e45	e26	19	204	250	1080	198	244	121
2	87	159	63	e45	e25	19	229	247	1000	210	239	114
3	79	170	61	e55	24	19	182	254	864	195	266	126
4	70	174	59	e48	24	18	268	251	751	201	1280	153
5	59	173	57	e33	23	18	272	248	635	174	1840	131
6	74	173	57	e36	24	17	254	242	672	201	652	129
7	88	173	57	e33	22	17	237	285	1040	185	540	134
8	87	167	e51	e31	22	16	231	285	1300	190	1130	142
9	94	170	e51	e28	22	18	210	294	1370	198	1100	145
10	94	155	e52	e28	22	22	206	315	1340	192	576	123
11	101	171	e53	e22	22	18	219	315	990	199	801	102
12	104	172	70	e23	23	16	250	310	1380	183	1030	95
13	94	172	e47	e33	22	16	248	184	1620	246	638	128
14	83	176	e43	e40	21	15	249	142	1700	324	526	1790
15	79	182	57	e43	21	46	250	149	1720	404	614	2820
16	75	189	e64	e49	22	159	252	131	1610	593	269	4040
17	90	126	e63	e59	21	158	254	149	1180	844	187	3700
18	90	64	e61	e38	19	141	257	264	927	728	178	2100
19	95	57	e55	e38	20	133	274	261	788	465	178	1790
20	99	51	e44	e37	22	126	299	275	676	262	180	1530
21	103	48	e50	e37	23	126	324	517	532	195	161	1170
22	100	50	e47	e37	24	170	309	719	394	1030	131	993
23	89	50	e56	e37	24	177	276	594	281	477	153	868
24	88	51	e84	e36	21	197	276	487	221	268	2090	709
25	94	51	e84	e36	20	193	230	395	182	212	923	701
26	98	50	e51	e33	22	216	231	350	165	239	436	643
27	100	e50	e52	31	22	201	232	463	153	218	287	685
28	88	e54	e53	30	21	167	222	917	167	244	163	713
29	104	e58	e52	e30	---	175	235	1270	182	252	139	577
30	120	62	e51	e29	---	204	252	1350	177	222	133	492
31	134	---	e51	e28	---	198	---	1220	---	226	135	---
TOTAL	2848	3542	1759	1128	624	3035	7432	13133	25097	9775	17219	26964
MEAN	91.9	118	56.7	36.4	22.3	97.9	248	424	837	315	555	899
AC-FT	5650	7030	3490	2240	1240	6020	14740	26050	49780	19390	34150	53480
MAX	134	189	84	59	26	216	324	1350	1720	1030	2090	4040
MIN	59	48	43	22	19	15	182	131	153	174	131	95

CAL YR	2012	TOTAL	37533	MEAN	103	MAX	583	MIN	9.1	AC-FT	74450
WTR YR	2013	TOTAL	112556	MEAN	308	MAX	4040	MIN	15	AC-FT	223300

MAX DISCH: 7040 CFS AT 23:45 ON SEP 16, 2013 GH 6.24 FT SHIFT -0.36 FT  
MAX GH: 6.24 FT AT 23:45 ON SEP 16, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ARKANSAS RIVER NEAR ROCKY FORD  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
07122400 CROOKED ARROYO NEAR SWINK, CO  
Water Year 2013

Location.-- Lat. 37°58'56.17", Long. 103°35'53.52" NAD83, in SW¼SW¼ sec. 5, T.24 S., R.55 W., Otero County, on right bank 54 ft. downstream from bridge on State Highway 10, 2.0 mi. upstream from mouth, and 2.8 mi. southeast of Swink.

Drainage Area and Period of Record.-- 108 mi<sup>2</sup>.; Gage established at present site and datum by USGS February 1, 1968. Operated by USGS until September 30, 1993. Operated and maintained by State of Colorado Division of Water Resources from October 1, 1993 to present.

Equipment.-- High data rate Sutron Satlink 2 DCP and Sutron Constant Flow Bubbler (CFB) installed in a 4 ft x 4 ft steel shelter. Primary reference gage is a staff gage in the channel. No changes were made this water year.

Hydrologic Conditions.-- Drainage basin characteristics include land uses primarily of rangeland with the lower portion of the basin used as irrigated agricultural land. Surface cover in the rangeland area is primarily native grasses and weeds. Streamflow exhibits considerable seasonal variability with the majority of the total annual streamflow resulting from short duration summer thunderstorms and snowmelt runoff contributing in the minor. Flows at the gaging station can be affected by minor irrigation diversions from the channel and highly variable irrigation return flows from the Catlin Canal. Flows can also be regulated by two reservoirs in the upstream basin as well as by beaver dams. No hydrologic conditions changes in the basin observed this water year.

Gage-Height Record.-- Primary record is 15-minute satellite-monitored constant flow bubbler data with DCP log backup. Record is complete and reliable, except for the following periods: February 1 – 28; March 1, 2, 5, 10, and 11, when ice was in the stream; December 1 – 31, 2012; January 1 – 31, when zero flow or near zero. Missing data: March 10 DST was back filled, August 26 two hours were manually filled in, after the gage house was hit by a car, and September 24 when there were nine hours of bad gage-height, which was estimated. The stage-discharge relationship was affected by backwater from downstream beaver dams October 10 – November 27, removed November 27, 2012 and September 15 through the end of the water year, dam was still in place into October. Eleven gage height corrections were made during the water year, ranging from -3.34 ft to +0.04 ft; these were made as the result of a combination of 10 discharge measurement and seven gage visits.

Datum Corrections.-- No levels were run this water year. Levels were last run August 22, 2008. No corrections were made.

Rating.-- The control is a sand, gravel, clay, and mud channel with earthen banks. Bank vegetation of variable density affects medium to high flows considerably. During low flow periods in the winter months, considerable moss/algae growth often occurs in the channel bottom affecting the stage-discharge relationship. This water year no algae growth was noted. Rating CANSWKCO07 was used the entire water year and is well defined to approximately 100 cfs. Ten discharge measurements (Nos. 309-318) were made this water year ranging in discharge from 0.12 to 13.2 cfs. They cover the range in stage experienced except for the lower daily flows of November 28 – 30; December 1 – 31, 2012; January 1 – 31; March 19 – 31; April 1 – 30; May 7 – 11, 18; July 28 – 31; August 1 – 23; September 2; and higher daily flows of July 7; August 7 – 11; September 15 – 30. The peak flow of 39.6 cfs occurred at 0030 on August 12, 2013 at a gage height of 3.73 ft with a shift of -1.08 ft. The peak exceeded the measurement no. 316 by 0.86 ft. The peak stage was 5.38 ft. occurred at 1030 on September 3, 2013 was caused by backwater from a beaver dam.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by time from 0000 to 0845 October 1 and from 1045 November 27, 2012 to 1515 April 8. Two variable shift curves were developed for use: CANSWKCOVSC13A from 0900 October 1 to 1030 November 27, in use for the beaver dams; and CANSWKCOVSC13C from 1530 April 8 to 1715 October 2, 2013, which includes the beaver dam through the end of the water year, and uses measurement No 319 from water year 2014. All measurements were given full weight with the exception of No 315, which was discounted 8.76% for smoothing purposes. Measurements No 310 and 318 were not used as they both fell well out of their respective shift curves.

Special Computations.-- Winter ice period was estimated from three measurements (No 310 – 312) and temperature data from the Arkansas River at La Junta (ARKLAJCO) gaging station. Zero flow periods were a result of the known shifts causing negative gage heights. The large negative shift used for VSC13A was calculated from the gage height before the beaver dam was removed by someone and measurement No 312 which was made six hours later.

Remarks.-- Record is poor due to the in part to backwater caused by beaver dams and the number of measurements made. The peak flow is considered poor due to the lack of discharge measurements made near the peak or of similar gage-height. Gage record developed by Anthony D. Gutierrez PS/ET 2. Station maintained by Garrett Markus.

Recommendations.-- More discharge measurements need to be made at this gage to improve the quality of the record. Winter visits should give an estimate of discharge if there is not enough to measure. Levels need to be run in WY14 and establish either a brass cap or concrete pin benchmark to replace the current chiseled benchmarks for improved accuracy during levels. Rating CANSWKCO07 needs to be updated to correct a negative shift trend. Beaver dam activity needs to be more closely monitored and beaver dams removed as soon as practical.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

07122400 CROOKED ARROYO NEAR SWINK, CO

RATING TABLE-- CANSWKCO07 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

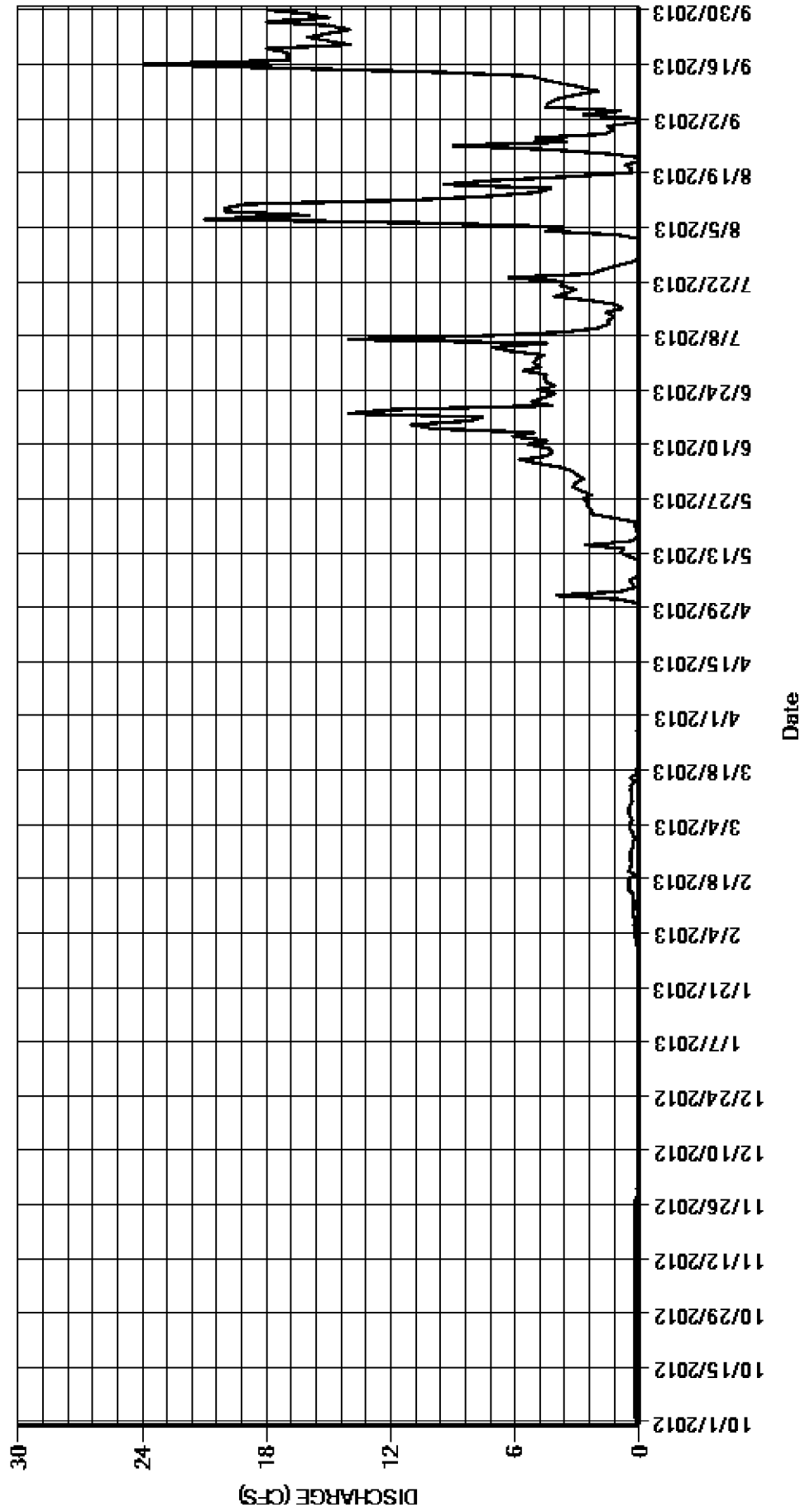
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.18	0.24	0.01	0.00	e0.15	e0.27	0.01	1.0	2.7	5.1	0.00	0.18
2	0.18	0.24	0.01	0.00	e0.17	e0.35	0.00	4.0	3.0	5.0	0.00	0.00
3	0.23	0.24	0.00	0.00	e0.20	0.46	0.01	0.88	3.2	4.6	1.0	2.7
4	0.24	0.24	0.03	0.00	e0.21	0.48	0.03	0.26	3.8	6.2	4.5	0.91
5	0.24	0.24	0.05	0.00	e0.24	e0.35	0.03	0.33	4.9	7.1	3.7	4.5
6	0.24	0.24	0.01	0.00	e0.26	0.45	0.03	0.47	5.8	4.5	9.7	4.4
7	0.24	0.24	0.00	0.00	e0.24	0.50	0.04	0.06	4.5	14	21	4.0
8	0.24	0.24	0.00	0.00	e0.27	0.52	0.04	0.04	4.2	7.3	16	3.2
9	0.24	0.24	0.00	0.00	e0.30	0.44	0.00	0.05	4.4	3.6	20	2.0
10	0.24	0.24	0.02	0.00	e0.28	e0.36	0.00	0.04	5.4	2.0	20	2.8
11	0.24	0.24	0.01	0.00	e0.27	e0.37	0.03	0.06	4.5	1.5	19	3.7
12	0.24	0.24	0.00	0.00	e0.27	0.38	0.02	0.44	6.1	1.5	11	4.6
13	0.24	0.24	0.00	0.00	e0.29	0.42	0.04	0.89	5.1	1.2	7.3	5.2
14	0.24	0.24	0.00	0.00	e0.29	0.41	0.04	0.76	10	1.6	4.9	9.7
15	0.24	0.24	0.00	0.01	e0.50	0.20	0.03	2.6	11	0.83	4.3	17
16	0.24	0.24	0.00	0.02	e0.49	0.43	0.01	0.47	8.1	1.1	9.4	24
17	0.24	0.24	0.00	0.01	e0.50	0.17	0.00	0.10	7.6	2.3	7.1	17
18	0.24	0.24	0.00	0.03	e0.49	0.12	0.01	0.07	14	4.1	3.3	17
19	0.24	0.24	0.00	0.02	e0.19	0.09	0.02	0.15	12	3.5	0.39	17
20	0.24	0.24	0.00	0.01	e0.52	0.08	0.02	0.19	4.2	3.1	0.41	18
21	0.24	0.24	0.01	0.01	e0.43	0.10	0.03	0.22	5.2	3.8	0.69	14
22	0.24	0.24	0.01	0.00	e0.40	0.08	0.02	1.3	4.6	3.7	0.09	15
23	0.24	0.24	0.01	0.01	e0.43	0.07	0.00	2.3	4.1	6.3	0.05	16
24	0.24	0.24	0.01	0.00	e0.42	0.05	0.03	2.3	4.9	2.3	1.6	e15
25	0.24	0.24	0.00	0.01	e0.42	0.05	0.04	2.5	4.1	1.8	4.3	14
26	0.24	0.24	0.00	0.02	e0.30	0.05	0.04	2.5	4.5	1.1	9.0	15
27	0.24	0.23	0.00	0.04	e0.32	0.09	0.05	2.7	4.6	0.37	3.5	18
28	0.24	0.09	0.00	0.05	e0.25	0.11	0.06	2.3	4.5	0.00	5.0	15
29	0.24	0.02	0.00	0.03	---	0.09	0.06	2.8	5.6	0.00	1.6	16
30	0.24	0.11	0.00	0.02	---	0.06	0.05	3.2	4.8	0.00	1.3	18
31	0.24	---	0.00	0.01	---	0.04	---	3.1	---	0.00	1.5	---
TOTAL	7.31	6.69	0.18	0.30	9.10	7.64	0.79	38.08	171.4	99.50	191.63	313.89
MEAN	0.24	0.22	0.006	0.010	0.32	0.25	0.026	1.23	5.71	3.21	6.18	10.5
AC-FT	14	13	0.4	0.6	18	15	1.6	76	340	197	380	623
MAX	0.24	0.24	0.05	0.05	0.52	0.52	0.06	4.0	14	14	21	24
MIN	0.18	0.02	0.00	0.00	0.15	0.04	0.00	0.04	2.7	0.00	0.00	0.00

CAL YR	2012	TOTAL	1420.00	MEAN	3.88	MAX	27	MIN	0.00	AC-FT	2820
WTR YR	2013	TOTAL	846.51	MEAN	2.32	MAX	24	MIN	0.00	AC-FT	1680

MAX DISCH: 39.6 CFS AT 00:30 ON AUG 12, 2013 GH 3.73 FT SHIFT -1.08 FT  
 MAX GH: 5.38 FT AT 10:30 ON SEP 03, 2013 (Backwater from beaver dam)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07122400 CROOKED ARROYO NEAR SWINK, CO  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
07123000 ARKANSAS RIVER AT LA JUNTA  
Water Year 2013

Location.-- Lat. 37°59'26", Long. 103°31'55", in SE¼NE¼ sec. 2, T.24 S., R.55 W., Otero County, Hydrologic Unit 11020005, on right bank at upstream side of bridge on State Highway 109 in La Junta, 450 ft upstream from King Arroyo.

Drainage Area and Period of Record.-- 12,210 mi<sup>2</sup>.; Water stage recorder in use since Oct. 1933 at several locations. Gage site in continuous use since then.

Equipment.-- Satellite-monitored data collection platform (high data rate Sutron Satlink 2 DCP) in 4 ft x 4 ft steel shelter with two water level sensors: Sutron Constant Flow Bubbler (CFB) and a Campbell Scientific Water-Level Radar. An air temperature sensor is attached to the mast and is also connected to the DCP. A wire-weight gage on the Hwy 109 Bridge serves as the primary reference gage. No changes were made this water year.

Hydrologic Conditions.-- Drainage basin characteristics include elevation differences from Mt. Elbert at 14,433 ft to the gage at elevation 4,041 ft with vegetation ranging from alpine tundra to sparse pinion-juniper in the upper reaches and from irrigated farmland to rangeland in the lower reaches. The gage is located downstream from Pueblo Reservoir approximately 92 miles. Pueblo Reservoir regulates flows through the reservoir year round including the Winter Water Storage Program period of November 15 to March 15 when the gates are essentially closed and streamflow is stored for release during the irrigation season. Release of water from Pueblo Reservoir takes approximately 46 hours to reach the gage. Unregulated tributaries that contribute to the gage include Fountain Creek, St. Charles River, Huerfano River, Apishapa River, Timpas Creek, and Crooked Arroyo. Numerous irrigation diversion points exist above the gage. All of these factors influence streamflow at the gage. The heavy vegetation was removed and maintained on both banks up and downstream of the gage. No other observed hydrologic conditions changes in the basin this water year.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log as backup. Data from the CFB was used from the beginning of the water year until 0200 on Nov. 15, 2012 and 1115 on Sep. 1 until 1130 on Sep. 10 (when the radar was reading sand). Data from the radar sensor was used from 0215 Nov. 15, 2012 to the end of the water year. Record is complete and reliable, except for the following period when ice affected the stage-discharge relationship on Dec. 10-12 and Dec. 20-Jan. 24. Twenty-six visits to the gage supported eight instrument calibration corrections ranging from -0.04 ft to 0.07 ft.

Datum Corrections.-- Levels were last run on April 10, 2012. No corrections were made.

Rating.-- A shifting sand channel is the primary control at low stages with bridge piers, abutments, lightly vegetated banks and islands contributing at medium flows and above. At high flows (flooding stage) river will flow out of bank on the north side approximately 150 to 200 feet upstream of the gage. Rating No. 42, implemented on May 13, 2009, was extended to cover flows experienced and used during the entire water year. Twenty-one discharge measurements (Nos. 1215-1235), ranging in discharge from 4.82 to 3570 cfs, were made during the water year. They cover the range in stage experienced except for the lower daily flows of Nov 1-4, 6-9, and Mar 18-21. No daily flows exceeded Msmt No.1234. The peak flow of 4340 cfs occurred at 0845 on Sept 17, 2013 at a gage-height of 12.21 ft with a shift of 1.93 ft. It exceeded the stage of high flow Measurement No. 1234 by 0.80 feet.

Discharge.-- Shifting channel control method was used all year. Shifts were applied as defined by measurements and distributed by time and stage. Shifts were distributed by stage using six variable stage-shift relationships: ARKLAJCOVSC1203, ARKLAJCOVSC13A, ARKLAJCOVSC13B1, ARKLAJCOVSC13C, ARKLAJCOVSC13D, and ARKLAJCOVSC13E. WY2012 ended with VSC1203 and it was continued in WY2013 to Msmt No.1215 on Oct 2. Shifts were distributed by stage for the period 1600 Oct 25 to 1515 Nov 20 for ARKLAJCOVSC13A, 1300 Feb 14 to 1245 May 30 for ARKLAJCOVSC13B1, 1300 May 30 to 1730 Jul 3 for ARKLAJCOVSC13C, 1745 Jul 3 to 1545 Aug 13 for ARKLAJCOVSC13D, and 1600 Aug 13 to end of the water year for ARKLAJCOVSC13E. Each variable stage-shift relationship was based on measurements made during the period of respective application. Measurement Nos. 1220-1222 and 1224 were discounted from -3.18% to +7.30% to fit the trends and smooth ARKLAJCOVSC13B1. Shifts were distributed by time from 1530 Oct 2 to 1545 Oct 25 and 1530 Nov 20 to 1245 Feb 14.

Special Computations.-- Flows were estimated on ice affected days using ARKLAJCO temperature data and good partial day record and good record before and after periods of ice effect. A hydrograph was used and daily average flows were compared to upstream gage: Arkansas River near Rocky Ford. Rapid increases/decreases in gage height observed at the gage during the irrigation season can be due to the effects of Ft. Lyon Canal gage changes and sluice gate operations, both of which are within three miles upstream of the gage. Two values on July 3 had faulty gage height and were corrected by adjacent data.

Remarks.-- The record is considered good. Record during periods of ice-affected gage height should be considered poor. The peak is rated good considering the high flow measurement this year was 82.5% of the magnitude of the peak flow. Station maintained and record developed by Garrett Markus.

Recommendations.-- A new rating should be developed to more accurately reflect the channel.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

07123000 ARKANSAS RIVER AT LA JUNTA

RATING TABLE-- ARKLAJCO42 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	49	4.4	72	e59	36	33	15	6.3	758	66	26	18
2	62	3.7	73	e58	35	33	27	14	620	78	18	14
3	66	3.9	72	e58	34	32	34	8.6	448	69	28	11
4	68	4.5	72	e57	34	31	30	6.8	363	54	211	12
5	63	7.3	69	e56	34	31	26	7.1	351	52	924	14
6	64	4.8	67	e56	34	32	23	7.1	400	51	179	9.4
7	72	4.2	66	e55	33	32	34	9.0	558	63	182	8.6
8	79	4.6	66	e55	32	30	37	9.6	543	59	171	9.5
9	83	4.3	68	e54	32	32	32	7.9	537	57	529	16
10	78	6.1	e68	e53	33	37	30	7.0	549	37	50	7.8
11	56	4.8	e68	e53	31	33	29	6.6	465	45	167	8.5
12	55	5.5	e68	e52	31	30	37	6.5	674	27	340	7.6
13	56	5.4	68	e52	31	29	35	6.4	806	36	384	9.2
14	51	11	64	e51	31	29	38	23	846	48	324	809
15	40	119	62	e50	31	7.1	30	35	953	109	227	2050
16	36	146	67	e50	31	5.1	25	24	879	146	252	2450
17	41	151	68	e49	32	6.2	26	9.8	688	488	157	3450
18	38	96	68	e48	31	4.6	29	11	384	499	104	1900
19	38	75	68	e48	30	4.4	29	15	557	342	67	1330
20	42	72	e66	e47	32	4.2	24	35	554	170	47	875
21	55	69	e66	e47	34	4.3	27	55	472	72	35	645
22	58	69	e65	e46	34	15	26	56	328	334	24	695
23	55	74	e65	e45	34	32	22	55	222	375	20	684
24	49	75	e64	e45	34	39	9.3	49	149	133	1030	558
25	48	72	e63	45	33	34	7.9	47	96	43	666	526
26	41	71	e63	42	32	39	7.3	45	77	42	430	501
27	23	69	e62	42	34	36	6.9	49	43	30	248	517
28	14	72	e61	40	33	15	6.7	254	50	35	112	569
29	8.5	73	e61	39	---	23	6.6	880	45	49	65	495
30	6.5	75	e60	38	---	21	6.0	985	67	21	39	424
31	5.3	---	e60	38	---	6.9	---	885	---	20	27	---
TOTAL	1500.3	1452.5	2050	1528	916	740.8	715.7	3615.7	13482	3650	7083	18623.6
MEAN	48.4	48.4	66.1	49.3	32.7	23.9	23.9	117	449	118	228	621
AC-FT	2980	2880	4070	3030	1820	1470	1420	7170	26740	7240	14050	36940
MAX	83	151	73	59	36	39	38	985	953	499	1030	3450
MIN	5.3	3.7	60	38	30	4.2	6.0	6.3	43	20	18	7.6

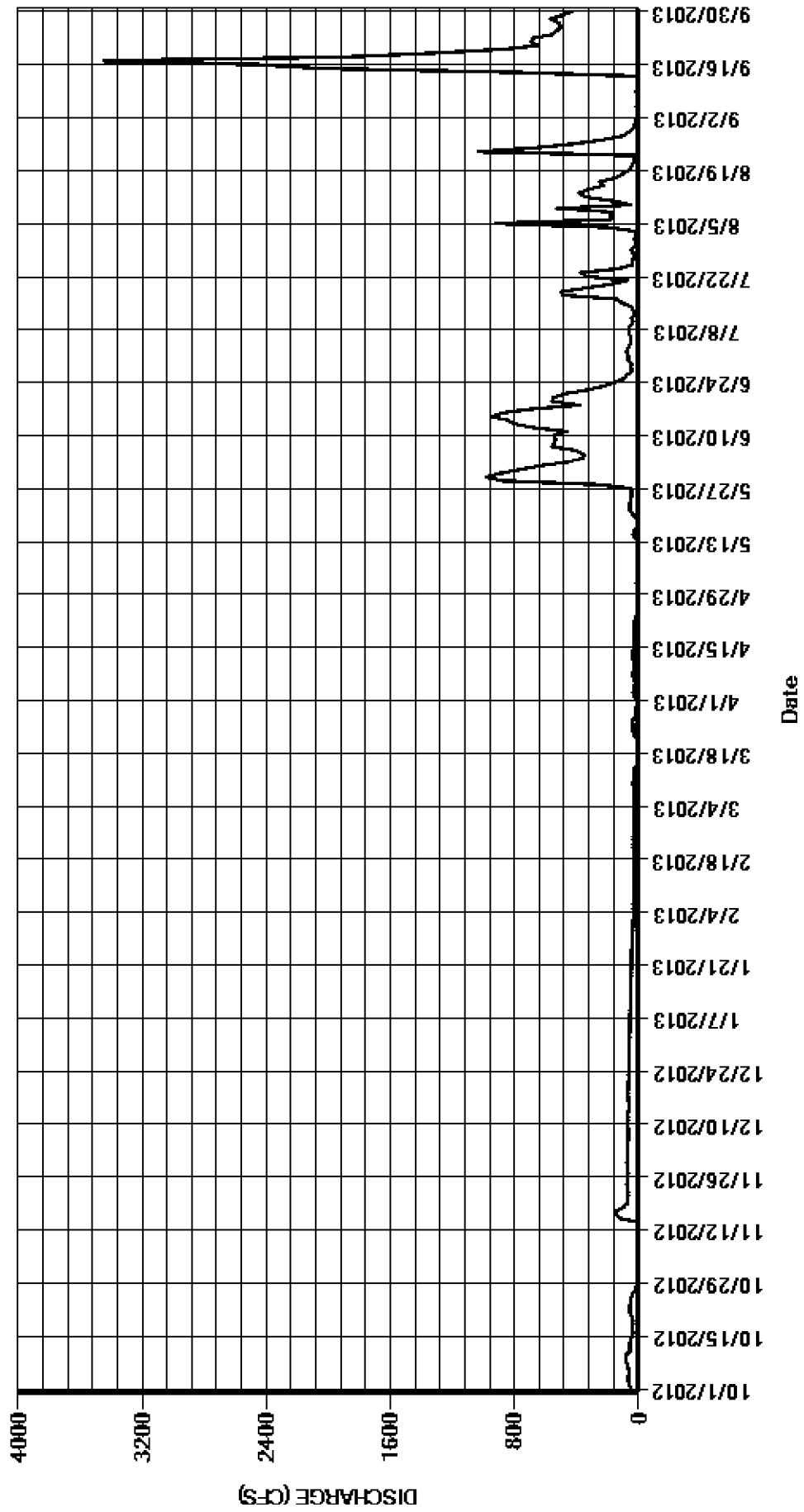
CAL YR	2012	TOTAL	22213.8	MEAN	60.7	MAX	334	MIN	3.7	AC-FT	44060
WTR YR	2013	TOTAL	55357.6	MEAN	152	MAX	3450	MIN	3.7	AC-FT	109800

MAX DISCH: 4340 CFS AT 08:45 ON SEP 17, 2013 GH 12.21 FT SHIFT 1.93 FT  
 MAX GH: 12.21 FT AT 08:45 ON SEP 17, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



07123000 ARKANSAS RIVER AT LA JUNTA  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
HORSE CREEK AT HIGHWAY 194  
Water Year 2013

Location.-- Lat. 38°05'06", Long. 103°21'12", in SE1/4,SW1/4, sec. 33, T.22S., R.53 W., Bent County, Hydrological Unit 11020008, on right bank 15 ft upstream from right end of box culverts on State Highway 194, 3.2 mi upstream from mouth, 3.4 mi downstream from Ft. Lyon Canal Aqueduct, and 7.5 mi west of Las Animas, Co.

Drainage Area and Period of Record.-- 1403 sq.mi.; Established and operated Oct. 19, 1979 to Sep. 30, 1993 by USGS. Operated and maintained by State of Colorado Oct. 1, 1993 to present.

Equipment.-- Sutron Satlink 2 high data rate satellite-monitored data collection platform (DCP) with a Sutron constant flow bubbler sensor (CFB) in a 4 ft x 4 ft steel shelter. Primary reference gage is a staff gage on the right side of the channel just upstream of the concrete weir control. A Texas Electronics Series 525 tipping bucket rain gage is operated at the site. Control is a compound 2-stage weir: Cipolletti weir for lower flows and rectangular broad crested weir for higher flows. No changes were made this water year.

Hydrologic Conditions.-- The Horse Creek watershed above the gage is approximately 1,420 sq miles and consists primarily of rangeland with native grasses and weeds dotted with the occasional cacti. Grazing along with irrigated and non-irrigated farming comprise the major land uses. Mean annual precipitation is 13.79 inches with soils moderately contributing to runoff. Streamflow exhibits seasonal variation with the majority of the natural flow resulting from high intensity – short duration summer thunderstorms. The Fort Lyon canal extends over the creek in a large diameter pipe approximately 3.4 miles above the gage and is capable of discharging canal water into the creek for overflow and augmentation. The Fort Lyon augmentation station at Horse Creek (FLY AUGCO located 3.4 mi. above gage) will contribute to flows of 15 cfs to the gage during augmentation.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP and CFB logs as backup. Record is complete and reliable except for the following period: June 12, 2013, four values from a missed transmission. The 15-minute missing values were filled in using downloaded log data that failed to transmit, or was replaced or filled using observed stable and adjacent gage height data, or from the previous and following records without loss of accuracy. No equipment problem reported.

Datum Corrections.-- Levels were last performed on October 4, 2007. On Nov. 27, 2007, a short level loop was re-run from RM7 in order to verify the Cipolletti weir crest and the staff gage elevations. There were no datum corrections needed or made in the WY 2013.

Rating.-- The compound Cipolletti - rectangular 2-stage weir control was installed in April 2005. The stainless steel Cipolletti weir controls low flows up to a head of 1 foot or approximately 14.4 cfs. Medium flows are controlled by the rectangular second stage of the compound weir with flows up to approximately 137 cfs. The high flows are controlled by the box culverts under Highway 194 and bank vegetation. Rating No. 7 was used for the 2013 water year. Eleven discharge measurements (Nos. 338-348) were made during this water year, ranging in discharge from 0 to 18.2 cfs. The peak discharge of 21.4 cfs occurred at 2030 on August 25, 2013 at a gage height of 1.18 ft, with a shift of +0.06 ft. The peak exceeded the stage of discharge measurement (#348) by 0.07 ft.

Discharge.-- Shifting-control method was used for the entire water year. Shifts were distributed by time and stage throughout the water year. Shifts were applied as defined by measurements and distributed by time from the beginning of the water year to 1145 March 17, 2013 and 1615 on September 6 to 1615 on September 18, 2013. A variable stage-shift curve, HRC194COVSC13A, was developed and used from 1200 March 17, 2013 to 0515 on September 6, 2013 and 1630 on September 18, 2013 to the end of the water year. In this water year, over 95% of the recorded gage heights flowed through the Cipolletti weir and all discharge measurements except measurement # 348, flowed through the Cipoletti weir section of the compound weir. Discharge measurements showed raw shifts ranging from -0.04 to 0.06 ft. Shifting is due to the upstream weir pool needing to be cleaned combined with depth measurement errors on the wading rod due to the creek's soft bottom. All measurements were given full weight and applied directly except measurement no. 341, 342, 344, 346 and 347, which were adjusted by -14% to 6% for smoothing purposes.

Special Computations.-- No special computation done this water year

Remarks.-- Record is good except for periods of missing data which were estimated And should be considered poor. The peak gage height and discharge are rated good. Station maintained by Garrett Markus and record developed by Ashenafi Hydebo

Recommendations.-- It's recommended that the weir pool in front of the weir be free of silt for proper weir mechanics. A clean and un-submerged weir crest should be sought and remedied every gage visit.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

HORSE CREEK AT HIGHWAY 194

RATING TABLE-- HRC194CO07 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

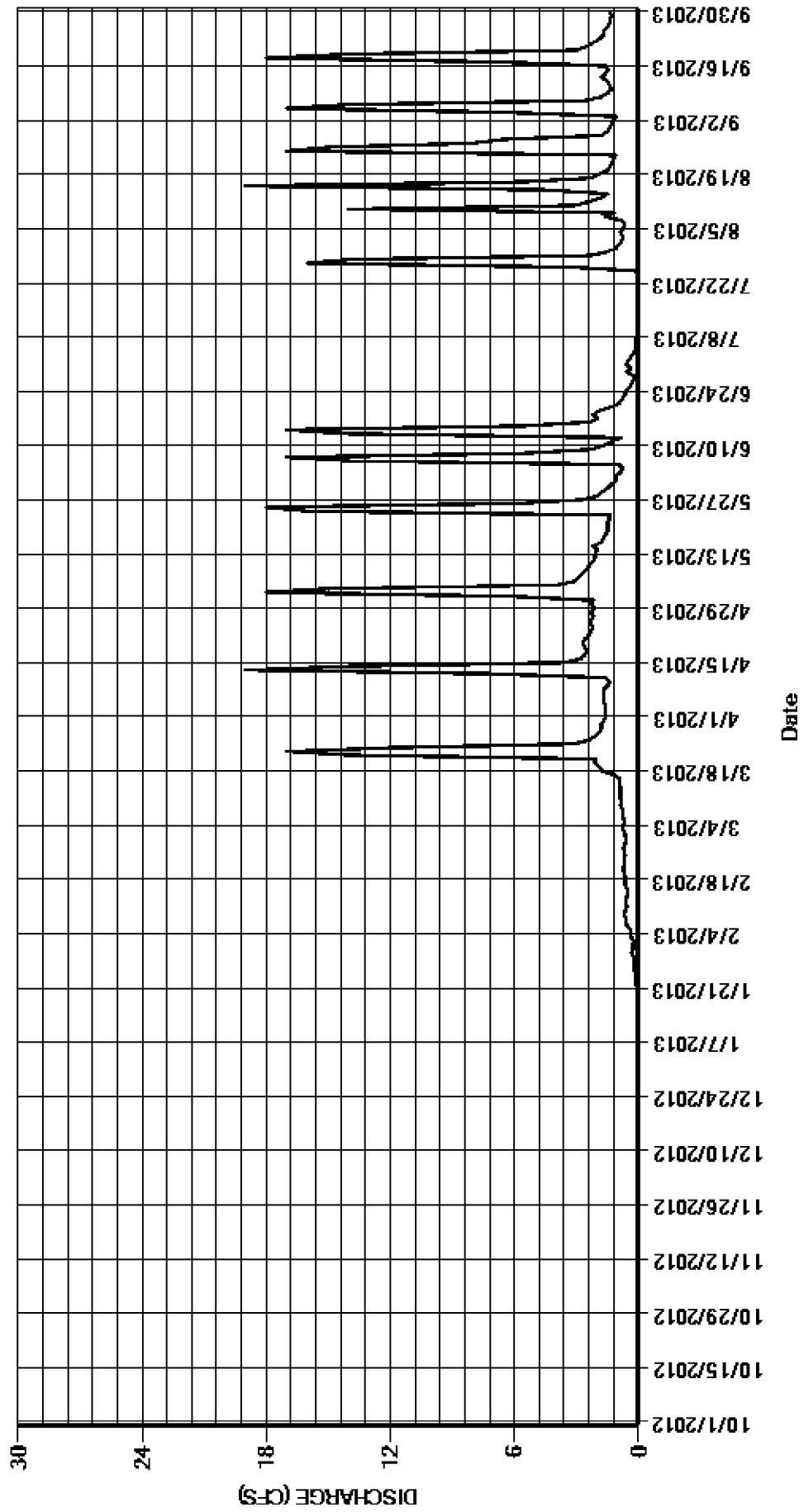
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.29	0.64	1.6	2.2	1.1	0.58	0.91	1.3
2	0.00	0.00	0.00	0.00	0.22	0.67	1.6	6.1	1.1	0.49	0.82	1.2
3	0.00	0.00	0.00	0.00	0.36	0.78	1.6	18	0.88	0.37	0.75	1.1
4	0.00	0.00	0.00	0.00	0.37	0.75	1.6	15	0.76	0.23	0.88	6.3
5	0.00	0.00	0.00	0.00	0.39	0.69	1.7	3.9	0.96	0.15	0.74	17
6	0.00	0.00	0.00	0.00	0.56	0.75	1.7	3.1	14	0.15	0.68	14
7	0.00	0.00	0.00	0.00	0.63	0.77	1.7	2.9	17	0.15	0.80	2.6
8	0.00	0.00	0.00	0.00	0.62	0.78	1.7	2.7	5.6	0.08	1.6	1.8
9	0.00	0.00	0.00	0.00	0.69	0.88	1.5	2.5	2.3	0.07	1.2	1.5
10	0.00	0.00	0.00	0.00	0.64	0.86	1.4	2.4	1.7	0.00	14	1.3
11	0.00	0.00	0.00	0.00	0.57	0.89	1.6	2.2	1.3	0.00	3.1	1.4
12	0.00	0.00	0.00	0.00	0.61	0.88	7.2	2.1	0.88	0.00	2.4	1.5
13	0.00	0.00	0.00	0.00	0.60	0.89	19	2.1	14	0.00	1.8	1.8
14	0.00	0.00	0.00	0.00	0.55	0.89	14	2.0	17	0.00	1.5	1.6
15	0.00	0.00	0.00	0.00	0.54	0.93	3.5	2.2	5.6	0.00	4.6	1.5
16	0.00	0.00	0.00	0.00	0.61	0.92	2.8	1.8	2.3	0.00	19	1.6
17	0.00	0.00	0.00	0.00	0.67	1.2	2.6	1.7	2.0	0.00	5.7	6.8
18	0.00	0.00	0.00	0.00	0.64	1.8	2.5	1.6	2.2	0.00	2.3	18
19	0.00	0.00	0.00	0.00	0.67	1.9	2.6	1.5	1.9	0.00	1.9	14
20	0.00	0.00	0.00	0.00	0.72	2.1	2.7	1.5	1.3	0.04	1.5	3.0
21	0.00	0.00	0.00	0.05	0.73	2.1	2.6	1.5	0.91	0.02	1.4	2.5
22	0.00	0.00	0.00	0.17	0.68	14	2.4	1.4	0.80	0.00	1.3	2.2
23	0.00	0.00	0.00	0.17	0.71	17	2.3	1.4	0.67	0.00	1.2	1.9
24	0.00	0.00	0.00	0.15	0.66	12	2.2	16	0.63	0.00	1.1	1.7
25	0.00	0.00	0.00	0.18	0.69	3.1	2.3	18	0.44	0.00	17	1.7
26	0.00	0.00	0.00	0.24	0.73	2.4	2.3	5.7	0.33	3.2	15	1.5
27	0.00	0.00	0.00	0.24	0.67	2.1	2.2	2.7	0.22	16	8.1	1.4
28	0.00	0.00	0.00	0.23	0.63	1.9	2.3	2.0	0.25	14	6.5	1.4
29	0.00	0.00	0.00	0.21	---	1.8	2.1	1.8	0.57	2.3	1.8	1.3
30	0.00	0.00	0.00	0.35	---	1.8	2.3	1.5	0.39	1.5	1.5	1.4
31	0.00	---	0.00	0.25	---	1.7	---	1.3	---	1.1	1.4	---
TOTAL	0.00	0.00	0.00	2.24	16.45	79.87	97.6	130.8	99.09	40.43	122.48	116.3
MEAN	0.000	0.000	0.000	0.072	0.59	2.58	3.25	4.22	3.30	1.30	3.95	3.88
AC-FT	0	0	0	4.4	33	158	194	259	197	80	243	231
MAX	0.00	0.00	0.00	0.35	0.73	17	19	18	17	16	19	18
MIN	0.00	0.00	0.00	0.00	0.22	0.64	1.4	1.3	0.22	0.00	0.68	1.1

CAL YR	2012	TOTAL	971.54	MEAN	2.65	MAX	26	MIN	0.00	AC-FT	1930
WTR YR	2013	TOTAL	705.26	MEAN	1.93	MAX	19	MIN	0.00	AC-FT	1400

MAX DISCH: 21.4 CFS AT 20:30 ON AUG 25, 2013 GH 1.18 FT SHIFT 0.06 FT  
 MAX GH: 1.18 FT AT 20:30 ON AUG 25, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

HORSE CREEK AT HIGHWAY 194  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
RATON CREEK ABOVE STARKVILLE, CO

Water Year 2013

Location.-- Lat. 37°07'35.5", Long. -104°31'24.8" in NW¼, NE¼, NE¼, Section 35,T33S, R64W, Las Animas County, 20 feet away from the creek on the left upstream side of bridge for County Road 18.3 approximately half a mile south of Interstate 25 exit 8 south of Trinidad.

Drainage Area and Period of Record.-- 54.49 sq.mi.;

Equipment.-- Sutron SatLink2 data collection platform (DCP) with High Data Rate (HDR) radio and shaft encoder. The data logger is housed inside a 4 ft x 4 ft x 8 ft metal shelter about 20 feet from the creek, while the shaft encoder is in a 20 in x 30 in metal "half" shelter atop an armored 18 inch corrugated metal pipe stilling well attached to the left wing wall on the upstream side of the bridge. A Texas Instruments tipping bucket rain gage is mounted on the antenna mast. The shaft encoder is set to an electric drop tape inside the half shelter and well. No changes this water year.

Hydrologic Conditions.-- The gage is situated in a valley at the town of Starkville approximately two miles above the Purgatoire at Trinidad gage. The gage is subject to flash flooding from the higher mountainous area above the gage with several smaller tributary streams. The channel is contained on the left side by railroad tracks set higher and a sheer wall several feet higher, the right side is contained by the county road for about a hundred feet and then the valley wall. Channel work done by Las Animas County as part of bridge repair changed the shape of the channel in 2010 and again in May 2011.

Gage-Height Record.-- Primary record is the fifteen minute satellite data with the DCP log data used for back-up purposes. Record is complete and reliable for the entire water year. The creek was dry from October 1, 2012 to July 11, 2013 with sporadic partial day flows starting in June due to rain events.

Datum Corrections.-- No levels were run this year. Previous levels were run September 18, 2007. No corrections were needed.

Rating.-- The control at low flows up to approximately 20cfs is a gravel/cobble riffle in the creek channel as the result of a rain event on April 19 – 20, 2013. The control at higher flows up to 4500 cfs is the channel with the bridge confining flows. Extreme high flows can go out of the channel on the right bank into an area upstream and extending approximately 30 feet south of the bridge and on the left bank 30 feet to the north which is at a slightly lower elevation than the gage. The extreme high flow would bypass the gage on the left side. Rating No 5 was used the entire water year and is fairly well defined to about 40 cfs. Fourteen discharge measurements (Nos. 160 – 173) were made during the water year. Measurements 160 – 169 were observations of zero flow. Measurements ranged in discharge from 0.00 to 1.91 cfs. They cover the range in stage experienced, except for the higher daily flows of July 20, 25, 26, 30, 31; August 1, 4, 6 – 8, 11, 15; September 13, 15, 2013. The peak discharge of 202 cfs occurred at 0000 July 20, 2013 at a gage height of 5.26 ft with a shift of -0.52 ft. It exceeded Measurement No 170, made July 30 by 1.96 feet in stage.

Discharge.-- Shifting control method was used the entire water year. Shifts were applied by time from the beginning of the water year until 1300 on June 26, during this period there was no flow. Shift curve RACRSTCOVSC13A was used from 1315 on June 26 (when the rainy season began) to end of the water year. Open water measurements show shifts ranging from -0.52 to 0.00, all shifts were given full weight.

Special Computations.-- The rain event at the end of WY 2012 started a "riffle" buildup under the bridge that continued when rain started in June of 2013. This appears to have stabilized with a stilling pool at the well. Additional measurement will be needed to confirm this.

Remarks.-- The record should be considered fair to poor due to the quality of the measurements and the small discharges measured. The peak should be considered poor due to the lack of rating definition above flows of 40 cfs and large changes in channel conditions. Station maintained and record developed by Anthony D. Gutierrez.

Recommendations.-- Levels are scheduled to to be run in November 2013, due to the changes in the creek channel over the past two years. A new pzf will be established along with evaluation of a new rating. Need to possibly install an artificial control to stabilize the channel and keep the well from isolating.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

RATON CREEK ABOVE STARKVILLE, CO

RATING TABLE-- RACRSTCO05 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

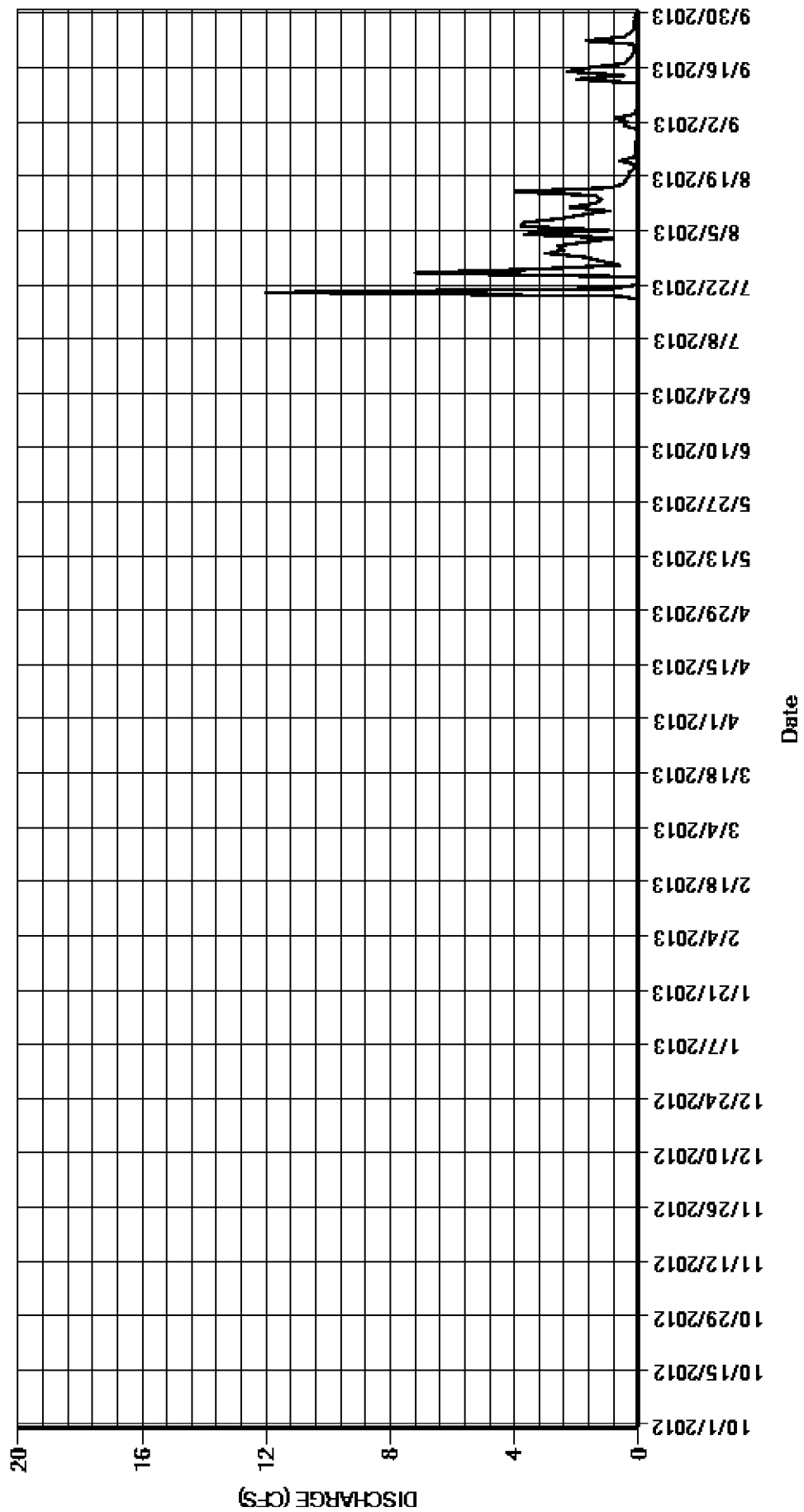
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	0.47
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.7	0.37
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.81	0.75
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.7	0.15
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.07
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	0.02
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.7	0.02
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.5	0.02
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.02
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.93	0.02
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	2.2	0.02
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.02
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	2.0
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.48
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	4.0	2.3
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.87	1.6
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.47
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.36
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.33	0.22
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	0.29	0.16
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.86	0.14	0.15
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.11	0.17
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.60	1.7
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.12	0.45
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.2	0.09	0.28
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.2	0.08	0.16
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.08	0.13
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	0.07	0.12
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	1.7	0.06	0.12
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	3.0	0.06	0.11
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	2.4	0.05	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.80	36.58	12.93
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.06	1.18	0.43
AC-FT	0	0	0	0	0	0	0	0	0	65	73	26
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	4.0	2.3
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.02

CAL YR	2012	TOTAL	161.70	MEAN	0.44	MAX	25	MIN	0.00	AC-FT	321
WTR YR	2013	TOTAL	82.31	MEAN	0.23	MAX	12	MIN	0.00	AC-FT	163

MAX DISCH: 220 CFS AT 00:00 ON JUL 20, 2013 GH 5.26 FT SHIFT -0.52 FT  
 MAX GH: 5.26 FT AT 00:00 ON JUL 20, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

RATON CREEK ABOVE STARKVILLE, CO  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
07124500 PURGATOIRE RIVER AT TRINIDAD  
Water Year 2013

Location.-- Lat. 37°10'21", Long. 104°30'27", in NW¼SE¼ sec. 13, T.33 S., R.64 W., Las Animas County, in city of Trinidad, on left bank. This is at the west end of the Commercial Street Bridge 20 feet upstream.

Drainage Area and Period of Record.-- 795 mi<sup>2</sup> (furnished by the US Army Corp of Engineers); Staff gage first established May 1, 1896. Partial records from May 1896 - Nov 1912. Continuous record from Nov 1921 to present.

Equipment.-- Sutron SatLink 2 data collection platform (DCP) with high-data rate (HDR) radio, which monitors a Sutron Constant Flow Bubbler Gage (CFB) inside a 4 ft x 4 ft steel shelter on the left bank above the main channel. The CFB is connected to an orifice line inside a 1.5-inch galvanized pipe, which is anchored to the bank extending down and into the channel. The primary reference is a wire weight gage on the Commercial Street Bridge immediately downstream and in line with the orifice line and staff gage set in the streambed near the orifice. A Texas Electronics Series 525 rainfall sensor is monitored by the DCP. A temperature sensor was installed April 24, 2013 and is monitored by the DCP. No other changes were made this year.

Hydrologic Conditions.-- The gage is located in the city of Trinidad approximately 3.5 miles downstream of the Trinidad Lake Reservoir and 2.65 miles downstream from the confluence with Raton Creek. It is on a fairly straight section of channel above and below the gage at an elevation of 5992 feet above MSL. The left side of the channel consists of gravel and small cobble at the orifice pool with the right side having fairly heavy vegetation consisting of grass to trees above and below the bridge. The regulation of Trinidad reservoir greatly influences the flow at the gage in town, while Raton Creek is subject to flash flooding. A small amount of irrigation is above the gage as well as the intake pipes for the city of Trinidad water supply. Urban runoff can affect the gage.

Gage-Height Record.-- Primary record is the 15-minute transmitted data with DCP and CFB logs as backup. The CFB log is in five-minute interval and is used for WMGH during gage-height changes during measurements. Record is complete and reliable, except for the following periods: October 29 - 31; November 1 - 20; December 7 - 31, 2012; January 1 - 31; February 1-28; and March 1 -12, 18 -28, 2013 when ice at or near the gage affected the stage-discharge relationship. October 29 to November 22, 2012 beaver dam construction across the control and November 21 - 27, 2012 leaves and trash on the control contributed to the artificial high gage-heights. Missing hourly data on October 3, 4, 11, 12, 14; Dec 16, 2012; January 13, 15; March 10; April 24, 25; May 15 - 20, 31; June 1, 5 - 7, 9, 12, 14, 16, 19, 22, 26, 28, 29; July 1, 3, 4, 8, 9, 13, 14, 16, 18 - 25. 28 - 31; and September 1, 3 - 5, 7, 8, 16, 17, 19, 27, 28, 30, 2013; was filled in from the CFB data log.

Datum Corrections.-- Levels were run November 12, 2013 to BM1 the USGS Brass Cap at the center of the Commercial Street Bridge. Level results were within acceptable limits, with the exception of the outside staff gage which failed. No corrections were made and levels need to be rerun to determine if the osg has moved. Previous levels were run June 21, 2007.

Rating.-- The river channel consists of gravel to small cobble from the reservoir down to a diversion dam 500 feet below the gage. The control for low flows is a gravel riffle below the gage under the bridge. Medium flows of up to 400 - 500 cfs are controlled by the channel, with dense vegetation on either side, or the center pier of the bridge. High flows are confined on the right bank by a stone and masonry wall with dense vegetation starting 250 feet above the gage and downstream of the bridge and on the left bank by a gunite and rock wall up to the bridge to an elevation of 11.00 feet (9000 cfs by USGS extension). The right side of the channel has a three-foot high "river walk" wall under the bridge across from the gage, which can submerge during high flow. Discharge of up to 9000 cfs can be contained under the Commercial Street Bridge, with higher flow coming out of the left bank and flooding the area immediately next to the river including the railroad tracks less than 40 feet from the river. Rating 28 was used the entire water year. Seventeen measurements (Nos. 1329 - 1345) made during the water year ranged from 0.4 to 158 cfs. They cover the range in stage except for the lower daily flows on December 5 - 9, 11 -31, 2012; January 1, 2, 9 - 17, 19 - 31; February 1 - 17, 2013 and the higher daily flows of July 15 - 17, 23 - 25; August 4 - 11; September 2 - 4, 15 - 19, 2013. The peak discharge of 792 cfs occurred at 1145 on July 16, 2013 at a gage height of 3.91 ft with a shift of -0.09 ft. It exceeded measurement No. 1345 made September 19, 2013 by 1.35 feet in stage.

Discharge.-- Shifting control method was used all year. Shifts were applied as defined by measurements and were distributed by time and event from 0000 October 1, 2012 to 1015 July 15, 2013. One variable shift curve (PURTRICOVSC13A) was used from 1030 July 15 to the end of the water year. All measurements were made in open channel and were given full weight with the exception of Msmt Nos. 1341, 1342 and 1343, which were discounted -1.24%, 3.85,% and -2.56% respectively for smoothing purposes. Measurements 1331 to 1332 were made after removal of beaver dams. Measurements this year showed shifts ranging from -0.19 feet to -0.06 feet.

Special Computations.-- Discharge during periods of ice, beaver dams and trash on the control were estimated using six measurements (nos. 1331 - 1336), temperature data from the NWS Trinidad Station, and hydrographic comparison with the Purgatoire River below Trinidad Reservoir gage. The beginning of the water year was started with an incorrect shift (-0.17) that ran from October 1 to 10, corrected discharges were entered by taking the corrected shift (-0.16) prorated and subtracted from the mean gage-height for the day. Shift changes made on April 18 and May 6 were the result of gate changes at Trinidad Reservoir.

Remarks.-- Record is considered good during periods of open channel and fair to poor during periods of ice affected gage height record, beaver dams, and trash on the control. Winter releases from Trinidad Reservoir often help reduce the amount of ice in the channel. The peak should be considered fair to poor due to the lack of a measurement during the peak period (see gage visit made July 16) and the vegetation growth above and below the bridge. This gage is reported in the State Surface Water Supply Index Monthly Report, this report is used as an indicator of mountain-based water supply conditions in the major river basins of the state. Station maintained and record developed by Anthony D. Gutierrez PS/ET II.

Recommendations.--



Shifts have continued to be negative this water year, probably due to increased gage-height of the riffle because of beaver activity and trash accumulation. After dam and trash removal, the shifts become less negative with opening of the Trinidad Reservoir Gate and runoff from Raton Creek. Arrangements should be made to mitigate the amount of beaver "influence" in the river and trash removal. During periods of good record and measurements, a new rating should be considered.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

07124500 PURGATOIRE RIVER AT TRINIDAD

RATING TABLE-- PURTRICO28 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

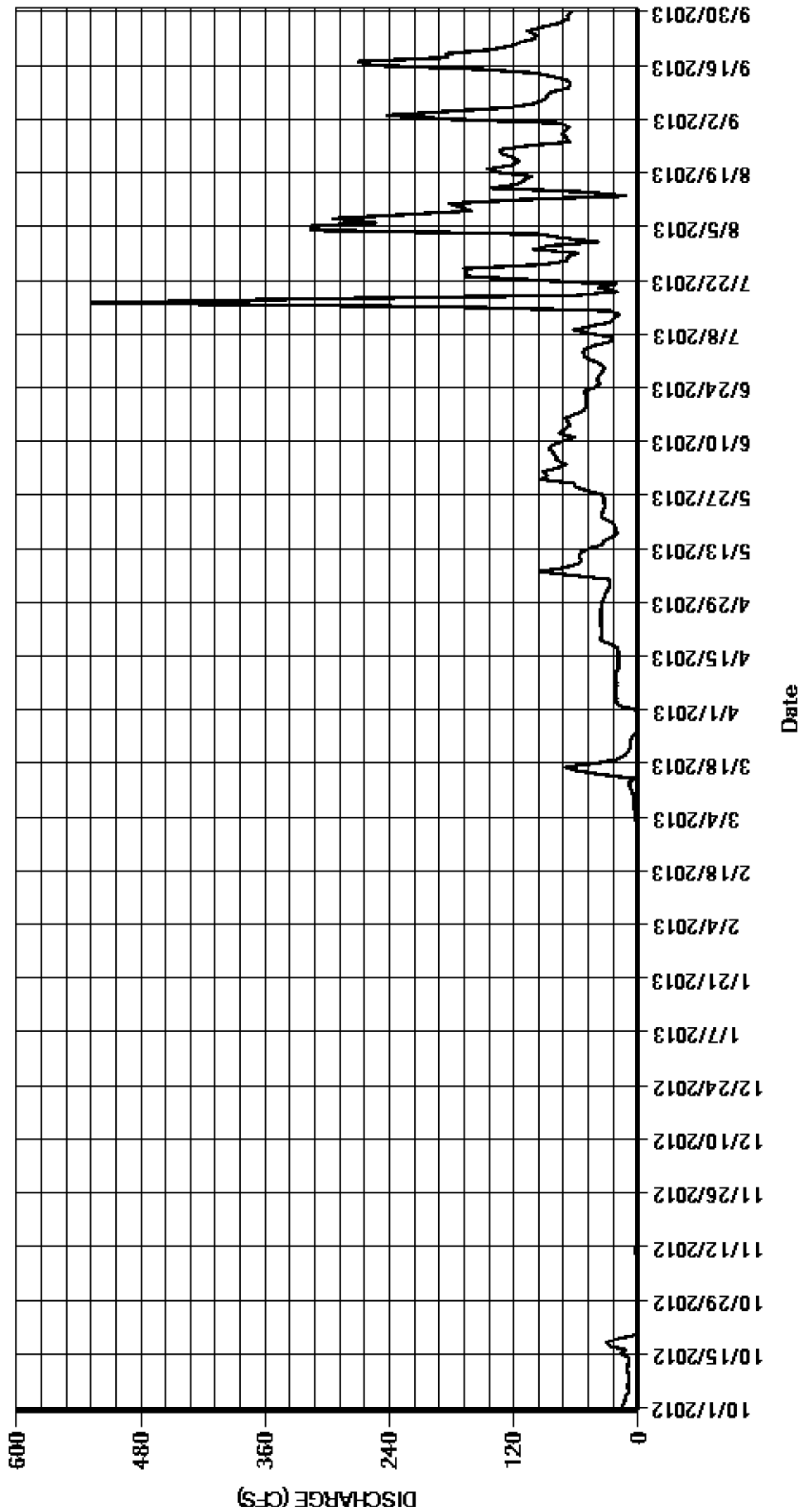
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e16	e0.85	0.72	e0.41	e0.36	e0.72	2.7	32	88	44	39	75
2	e14	e0.80	0.62	e0.44	e0.35	e1.3	18	30	92	52	72	181
3	e13	e0.80	0.49	e0.46	e0.35	e2.1	21	28	77	53	97	242
4	12	e0.78	0.45	e0.47	e0.37	e3.0	21	28	70	52	316	184
5	9.4	e0.72	0.44	e0.46	e0.36	e2.8	21	28	79	41	316	125
6	e10	e0.70	0.44	e0.50	e0.38	e4.0	22	63	79	25	254	101
7	e10	e0.70	0.43	e0.48	e0.48	e4.6	21	95	82	26	294	91
8	e9.0	e0.70	0.43	e0.46	e0.37	e4.9	21	72	86	44	227	88
9	e9.0	1.8	0.45	e0.42	e0.37	e4.6	22	58	83	62	161	84
10	e10	2.1	e0.45	e0.42	e0.36	e5.4	22	55	73	47	170	68
11	11	2.2	e0.43	e0.38	e0.40	e6.6	21	57	62	27	182	66
12	10	2.3	e0.42	e0.40	e0.38	e8.1	19	55	76	24	113	67
13	9.6	1.9	e0.41	e0.36	e0.39	9.0	19	47	72	18	13	81
14	9.7	1.5	e0.42	e0.33	e0.39	3.5	19	35	66	28	52	98
15	17	1.3	e0.40	e0.37	e0.39	34	19	33	68	186	141	153
16	12	e0.60	0.42	e0.42	e0.40	59	19	25	71	528	117	257
17	28	e0.60	0.43	e0.44	e0.42	70	20	20	62	323	110	270
18	30	e0.55	0.43	e0.45	e0.45	e40	26	22	52	59	103	185
19	19	e0.48	0.45	e0.41	e0.47	e20	36	23	51	21	134	185
20	1.5	e0.45	e0.42	e0.42	e0.51	e13	36	27	50	38	145	144
21	1.5	e0.50	e0.41	e0.40	e0.52	e10	35	35	51	22	122	123
22	1.2	e0.59	e0.40	e0.40	e0.53	e8.0	35	35	51	98	115	114
23	1.1	e0.62	e0.42	e0.41	e0.50	e8.0	36	34	52	166	121	100
24	0.94	e0.62	e0.42	e0.37	e0.55	e8.0	36	32	42	166	132	99
25	1.2	e0.65	e0.42	e0.37	e0.58	e5.5	36	33	37	168	134	107
26	1.3	e0.65	e0.44	e0.37	e0.60	e1.0	36	33	40	92	108	93
27	0.97	e0.66	e0.40	e0.37	e0.61	e0.97	36	34	38	69	66	77
28	0.86	0.94	e0.39	e0.34	e0.61	e0.93	35	48	35	68	69	68
29	e1.0	1.2	e0.40	e0.36	---	0.90	36	60	33	58	73	68
30	e1.1	1.4	e0.40	e0.37	---	0.65	33	62	36	101	70	64
31	e1.1	---	e0.38	e0.36	---	0.87	---	94	---	86	67	---
TOTAL	272.47	29.66	13.63	12.62	12.45	341.44	779.7	1333	1854	2792	4133	3658
MEAN	8.79	0.99	0.44	0.41	0.44	11.0	26.0	43.0	61.8	90.1	133	122
AC-FT	540	59	27	25	25	677	1550	2640	3680	5540	8200	7260
MAX	30	2.3	0.72	0.50	0.61	70	36	95	92	528	316	270
MIN	0.86	0.45	0.38	0.33	0.35	0.65	2.7	20	33	18	13	64

CAL YR	2012	TOTAL	11392.98	MEAN	31.1	MAX	240	MIN	0.30	AC-FT	22600
WTR YR	2013	TOTAL	15231.97	MEAN	41.7	MAX	528	MIN	0.33	AC-FT	30210

MAX DISCH: 792 CFS AT 11:45 ON JUL 16, 2013 GH 3.91 FT SHIFT -0.09 FT  
 MAX GH: 3.91 FT AT 11:45 ON JUL 16, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07124500 PURGATOIRE RIVER AT TRINIDAD  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
07126500 PURGATOIRE RIVER AT NINEMILE DAM NEAR HIGBEE  
Water Year 2013

Location.-- Lat. 37°42'53", Long. 103°30'38", in NW1/4, NW¼, sec. 7, T.27 S., R.54 W., Otero County, Hydrologic Unit 11020010, on left bank at Ninemile Canal Diversion Dam, 4 mi southwest of Higbee, and 5.5 mi upstream from Smith Canyon. Prior to Apr. 21, 1978 gage located 850 ft, upstream.

Drainage Area and Period of Record.-- 2,752 mi<sup>2</sup>.; 1924-present

Equipment.-- Sutron Satlink 2 high data rate satellite-monitored data collection platform (DCP) with a Sutron constant flow bubbler sensor (CFB) in a 4 ft x 4 ft steel shelter. The primary gage is an outside drop tape from a reference point on a steel "I" beam on the wall face between Ninemile Dam and the Ninemile Canal headgate. Control is the Ninemile Diversion Dam. No changes were made this water year.

Hydrologic Conditions.-- Characteristics within the basin include uplands and hills forested with pine and juniper trees. Rolling short-grass prairie lies between the uplands and the canyons. Livestock grazing exists in the watershed. Rock cliffs are exposed along the 400- to 500- foot deep Purgatoire River canyon, and riparian vegetation grows along the bottom of incised reaches of the major tributaries near their confluence with the Purgatoire River. The months of November through March tend to produce little runoff because precipitation is mainly snow. Sublimation and slow melting remove water from the snowpack during warm periods of the winter. These processes might increase soil moisture but they also decrease the volume of surface water. Precipitation from April through October generally is in the form of snow that melts rapidly or high intensity-short duration rainfall, which produces the vast majority of the stream flow in the tributaries. Snowmelt from the mountains generally produces high flow in the Purgatoire River during the months May through June and storm runoff also generates stream flow. The Purgatoire River will generally convey the most stream flow in August. Typically, the increased streamflows in August were a result of mountain snowmelt stored in upstream reservoirs that was subsequently released for downstream irrigation needs. The August increased stream flows also may be a result of convective storms that commonly occur during the late July through August summer monsoon. The influence of urbanization and over grazing provides the largest affect to the runoff regime.

Gage-Height Record.-- Primary record is 15-minute satellite-monitored constant flow bubbler data with DCP log backup. Record is complete and reliable, except for the following period: June 12, due to missing transmissions. Missing data was filled in using observed stable and adjacent gage height data without loss of accuracy. From the period of July 19 to August 4, there was a 48 ft wide pile of debris on the dam crest. These days were denoted as "c" day or other backwater effect. Primary stage sensor calibration to reference gage was supported by 14 site visits this water year, of which 11 discharge measurements and 3 gage visits. From 11 discharge measurements, 7 of them were zero flow measurements.

Datum Corrections.-- Levels were last run Aug 22, 2008.

Rating.-- The control is the Ninemile Canal diversion dam which is constructed of wood timbers. Data for the stage-discharge relationship at this location is based on stage data collected on the upstream side of the diversion dam and discharge measurements made below the dam. Observations of zero flow past the dam are confirmed by measurements in the channel below the dam. Upstream from the dam, water will pond in bedrock pockets and holes. At low to medium flows, debris will collect along the dam and will clear at higher flows, thus changing the shift. Rating No.17 was developed on October 5, 1998 and was used the entire water year. Rating No. 17 is well defined to about 500 cfs. Eleven discharge measurements (Nos. 1053-1063) were made ranging in discharge from 0 to 276 cfs. WY2013 measurements covered the range in stage experienced except for the higher daily flows of August 4, 8-10, 14-15 and September 2-3, 2013. The instantaneous peak flow of 4370 cfs occurred at 2230 on August 9, 2013 at a gage height of 5.76 ft with a shift of 0.06 ft. It exceeded the stage of measurement No. 1060, made July 26, 2013, by 1.88 feet.

Discharge.-- Shifting control method was used for the entire water year. Variable shift curve from last water year PURNINCOVSC12B was continued until Oct. 9, 2012. Shifts were distributed by time for the period Oct 9 to Jun 6 and again on Aug. 4. Shifts were distributed by stage the remaining part of the water year utilizing two variable shift curves 13A and 13B. Variable shift curve 13A was used to model the period when trash collected on the control. All measurements were given full weight and applied directly except for measurement no. 1063 which was discounted 7.39% to smooth shift distribution.

Special Computations.-- Variable shift curve 13A was used to estimate the flows when trash collected on the control.

Remarks.-- Record fair, except during periods flows over 500 cfs and days of backwater affect gage height, which should be considered poor. Since the peak was above 500 cfs and no recent measurements have been conducted at similar flows, the peak was rated poor. Station maintained and record developed by Garrett Markus.

Recommendations.-- High flows have not been measured at or near the gage due to a lack of facilities. Recommend installation of a bank operated cableway. Periods of trickle flows can occur when water elevation is below Constant Flow Bubbler orifice line. Recommend that orifice conduit and line be lowered to accommodate these circumstances. Run levels in WY2014.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

07126500 PURGATOIRE RIVER AT NINEMILE DAM NEAR HIGBEE

RATING TABLE-- PURNINCO17 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

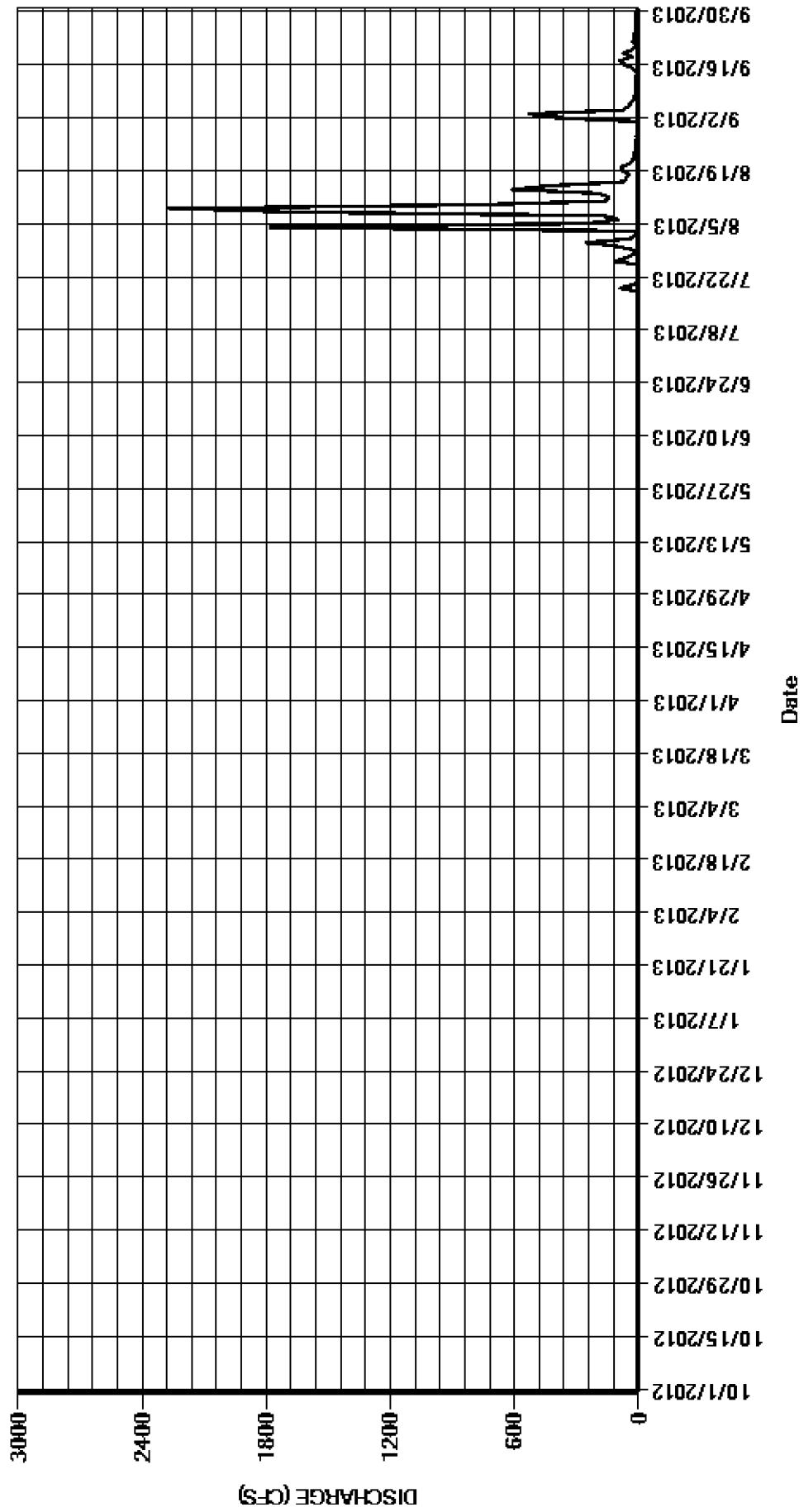
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e40	8.0	
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e17	400	
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e18	528	
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e1780	75	
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	249	49	
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100	36	
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	164	23	
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1690	17	
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2270	14	
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	784	12	
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	157	12	
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	144	11	
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	196	11	
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	611	9.8	
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	421	28	
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	75	69	
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	59	92	
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49	31	
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e88	81	73
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e14	85	29
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e5.6	42	11
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.00	27	29
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.00	21	24
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.00	17	19
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.00	14	16
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e114	13	14
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e53	11	13
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e20	10	12
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	e21	9.2	13
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	e103	8.5	15
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	e254	7.8	---	
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	672.60	9170.5	1693.8	
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	21.7	296	56.5	
AC-FT	0	0	0	0	0	0	0	0	0	1330	18190	3360	
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	254	2270	528	
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.8	8.0	

CAL YR	2012	TOTAL	1641.13	MEAN	4.48	MAX	175	MIN	0.00	AC-FT	3260
WTR YR	2013	TOTAL	11536.90	MEAN	31.6	MAX	2270	MIN	0.00	AC-FT	22880

MAX DISCH: 4370 CFS AT 22:30 ON AUG 09, 2013 GH 5.76 FT SHIFT 0.06 FT  
 MAX GH: 5.76 FT AT 22:30 ON AUG 09, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07126500 PURGATOIRE RIVER AT NINEMILE DAM NEAR HIGBEE  
 WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
NINEMILE CANAL AT NINEMILE DAM NEAR HIGBEE  
Water Year 2013

Location.-- Lat. 37°42'53", Long. 103°30'38", in NW¼ sec. 7, T.27 S., R.54 W., Otero County.

Drainage Area and Period of Record.-- N/A.;

Equipment.-- Float-activated graphic water-stage recorder, SDI shaft encoder, and a High Data Rate Sutron SatLink 2 V2 DCP in a 3 ft by 3 ft steel shelter with well. Six-foot standard concrete Parshall flume is the control. Primary reference gage is outside staff gage installed in flume. No changes were made this water year.

Hydrologic Conditions.-- The Ninemile Canal diverts water from the Purgatoire River approximately 75 miles downstream from Trinidad Reservoir. The basin as a whole encompasses approximately 2752 square miles with nearly 18 percent of the basin above 7500 feet in elevation and the mean elevation at 6270 feet. Mean annual precipitation for the basin is approximately 16.8 inches. The influence of urbanization in the basin along with reservoir operations and irrigation practices provides the largest affect to the runoff regime. No changes evident this water year.

Gage-Height Record.-- Primary record is 15-minute satellite data with the graphic chart recorder and DCP log used for backup purposes. Record is complete and reliable, except January 15-16, 2013. The missing gage height data were filled using the flat gage height record trend before and after each period, without loss of accuracy. The shaft encoder float was affected by silt and mud accumulation in the bottom of the stilling well at a gage height of 0.07 and 0.31 ft or below during July 21 to August 4, 2013 and August 5 to September 30, 2013, respectively.

Datum Corrections.-- No levels were run to the flume this water year. The last time levels were run was April 4, 2007.

Rating.-- Control is a standard 6-ft concrete Parshall Flume. A standard 6-foot Parshall flume rating was used the entire water year. No discharge measurements were made this water year. The peak discharge of 43.4 cfs occurred at 1200 on August 10, 2013 at a gage height of 1.45 ft with a shift of 0.00 ft.

Discharge.-- No discharge measurements were made this water year. Historically, measurements have been adjusted to a zero shift at this structure. Discharge record was computed by direct application of the rating to the corrected gage height record.

Special Computations.-- Gage heights for periods after high flows, from July 21 to August 4, 2013 and August 5 to September 30, 2013, when the bottom of stilling well was silted-in or mud had accumulated, the shaft encoder read gage heights of 0.07 and 0.31 ft or below and it looks water was flowing through the canal when in reality there was no flow. Operationally, at these times and gage heights, the flow is zero. Therefore, conditional equations (if  $GH \leq 0.07$  and  $GH \leq 0.31$ , zero) were used when the telemetry data are imported to CoHMS in the stated period, respectively. Conditional equations are also used to avoid negative gage height records and made to read zero when imported to CoHMS.

Remarks.-- Record is poor due to lack of measurements, few number of gage visit. Also, record is poor during the time of silt or mud accumulation in the stilling well, which are conditionally computed to read accurately. The peak flow and gage height are rated poor due to lack of field measurements to compare. Station maintained by Garrett Markus and record developed by Ashenafi Hydebo.

Recommendations.-- Discharge measurements should be scheduled once per year during the irrigation season to verify the accuracy of the standard rating table. Additionally, a levels survey and flume inspection and maintenance should be completed to verify the condition of the flume.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

NINEMILE CANAL AT NINEMILE DAM NEAR HIGBEE

RATING TABLE-- STD06FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	1.1	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.01	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	7.0	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.00	0.00	0.00	17	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	17	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	10	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	16	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	15	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	17	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	18	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.1	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	e0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	0.00
16	0.00	0.00	0.00	e0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.9	0.00
17	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.00	0.00	0.00	0.00	8.0
18	0.00	0.00	0.00	0.00	0.00	0.79	0.00	0.00	0.00	0.00	0.00	18
19	0.00	0.00	0.00	0.00	0.00	0.45	0.00	0.00	0.00	0.00	0.00	9.7
20	0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.00	0.00	4.5
21	0.00	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	2.6	0.00	17
22	0.00	0.00	0.00	0.00	0.00	1.3	0.00	0.00	0.00	3.9	0.00	6.7
23	0.00	0.00	0.00	0.00	0.00	1.6	0.00	0.00	0.00	0.95	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	2.0	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	1.9	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	1.6	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	1.3	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	1.3	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	1.4	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	1.6	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	2.2	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	19.03	4.43	0.00	0.00	7.45	140.01	63.90
MEAN	0.000	0.000	0.000	0.000	0.000	0.61	0.15	0.000	0.000	0.24	4.52	2.13
AC-FT	0	0	0	0	0	38	8.8	0	0	15	278	127
MAX	0.00	0.00	0.00	0.00	0.00	2.2	1.8	0.00	0.00	3.9	18	18
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

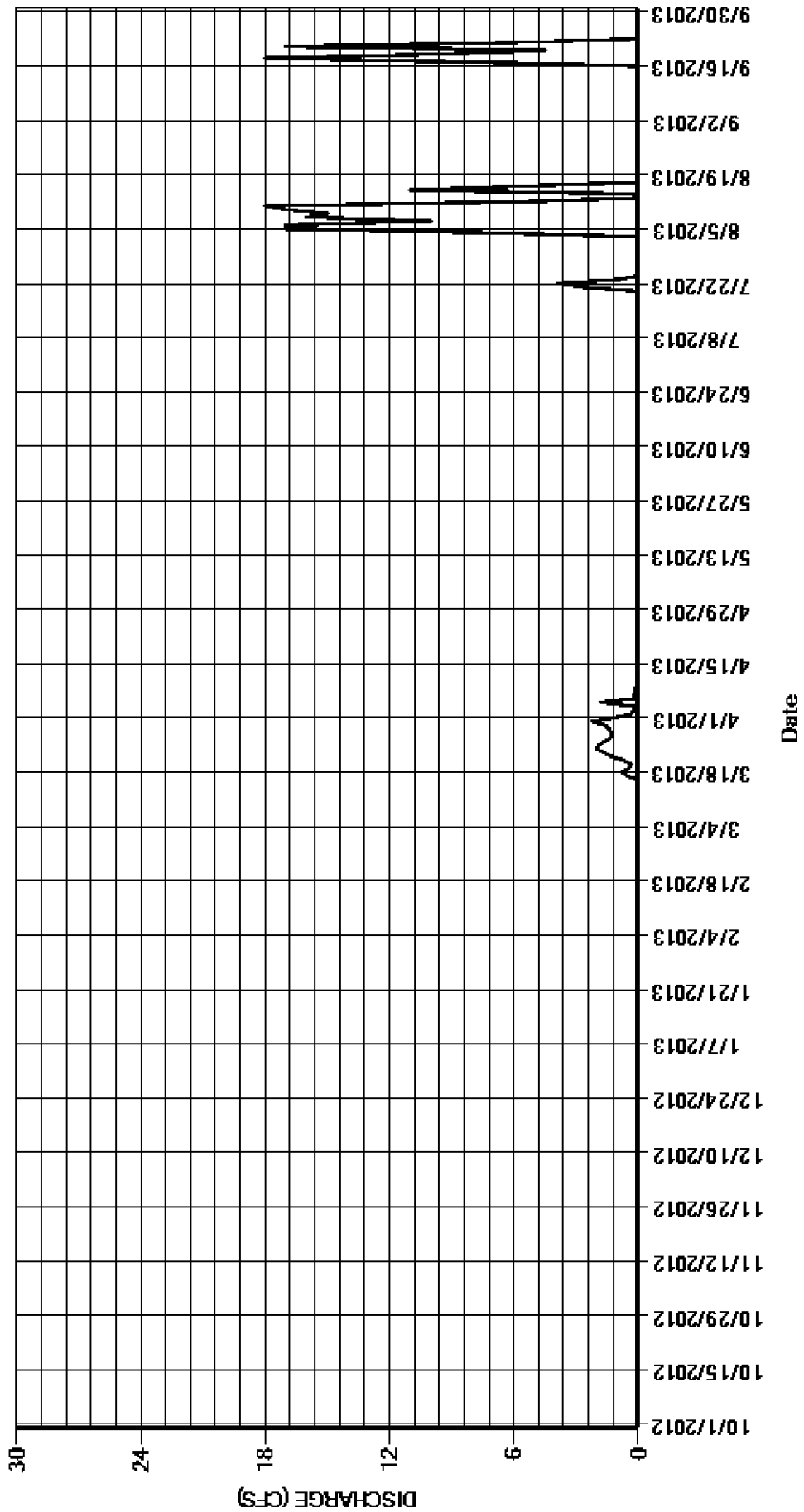
CAL YR	2012	TOTAL	962.51	MEAN	2.63	MAX	34	MIN	0.00	AC-FT	1910
WTR YR	2013	TOTAL	234.82	MEAN	0.64	MAX	18	MIN	0.00	AC-FT	466

MAX DISCH: 43.4 CFS AT 12:00 ON AUG 10, 2013 GH 1.45 FT SHIFT 0 FT  
 MAX GH: 1.45 FT AT 12:00 ON AUG 10, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



**NINEMILE CANAL AT NINEMILE DAM NEAR HIGBEE  
WY2013 HYDROGRAPH**



ARKANSAS RIVER BASIN  
PURGATOIRE RIVER AT NINEMILE DAM, NEAR HIGBEE (C)  
Water Year 2013

Location.-- Combined record from Purgatoire River at Ninemile Dam and Ninemile Canal below Ninemile Dam gages both located at Lat 37°42'53", long 103°30'38", in NW¼ sec. 7, T.27 S., R.54 W., Otero County, Hydrologic Unit 11020010, on left bank at Ninemile Dam, 4 mi southwest of Higbee, and 5.5 mi upstream from Smith Canyon.

Drainage Area and Period of Record.-- 2,752 mi<sup>2</sup>;

Equipment.-- See individual records for gage equipment descriptions.

Hydrologic Conditions.-- See individual station analyses.

Gage-Height Record.-- See individual records for gage height record analyses.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- The combined record of discharges was obtained by the addition of daily flows from the Ninemile Canal to the corresponding daily flows in the Purgatoire River at Ninemile Dam. A day is considered estimated when both channels are estimated or the estimated daily value for either the river or ditch is greater than 10% of the combined daily sum of both channels. The following days were considered estimated: Jan. 15, 16; Jul. 19-21, 24-30; Aug. 1-4, 2013. See individual station analyses.

Special Computations.--

Remarks.-- Combined record is fair, except record should be considered poor during periods of estimated flow and during periods where discharge in the river exceeds 500 cfs, above which the rating has not been verified by measurements. See individual records for more details. Record developed by Div. 2 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

PURGATOIRE RIVER AT NINEMILE DAM, NEAR HIGBEE (C)

RATING TABLE.--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

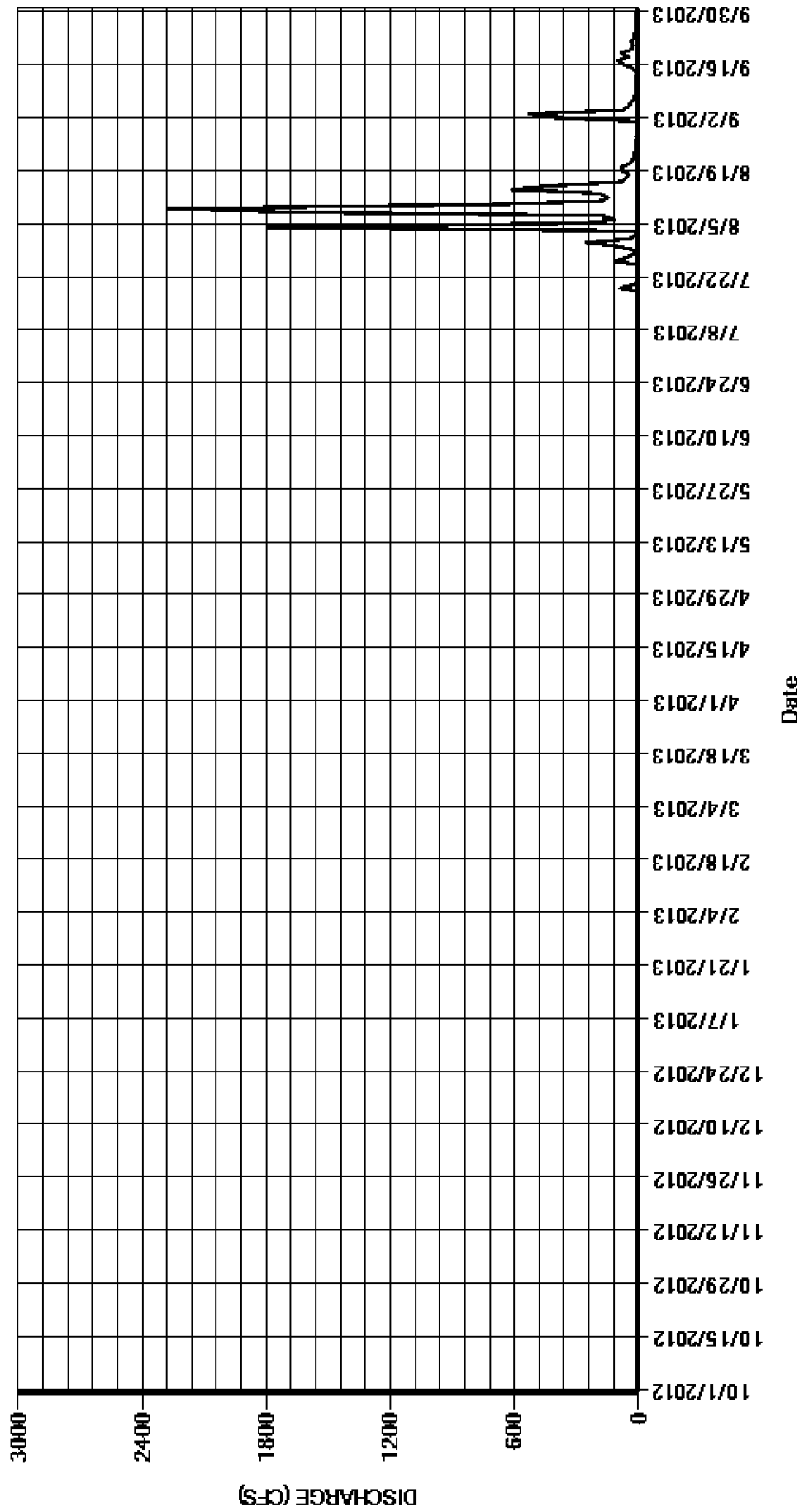
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	1.1	0.00	0.00	0.00	e40	8.0
2	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.00	0.00	0.00	e17	400
3	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	e18	528
4	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	e1790	75
5	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.00	0.00	0.00	266	49
6	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	117	36
7	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	174	23
8	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	1710	17
9	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	2280	14
10	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	801	12
11	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	175	12
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	150	11
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	196	11
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	611	9.8
15	0.00	0.00	0.00	e0.00	0.00	0.00	0.00	0.00	0.00	0.00	432	28
16	0.00	0.00	0.00	e0.00	0.00	0.00	0.00	0.00	0.00	0.00	81	69
17	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.00	0.00	0.00	59	100
18	0.00	0.00	0.00	0.00	0.00	0.79	0.00	0.00	0.00	0.00	49	49
19	0.00	0.00	0.00	0.00	0.00	0.45	0.00	0.00	0.00	e88	81	83
20	0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.00	e14	85	34
21	0.00	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	e8.2	42	28
22	0.00	0.00	0.00	0.00	0.00	1.3	0.00	0.00	0.00	3.9	27	36
23	0.00	0.00	0.00	0.00	0.00	1.6	0.00	0.00	0.00	0.95	21	24
24	0.00	0.00	0.00	0.00	0.00	2.0	0.00	0.00	0.00	e0.00	17	19
25	0.00	0.00	0.00	0.00	0.00	1.9	0.00	0.00	0.00	e0.00	14	16
26	0.00	0.00	0.00	0.00	0.00	1.6	0.00	0.00	0.00	e114	13	14
27	0.00	0.00	0.00	0.00	0.00	1.3	0.00	0.00	0.00	e53	11	13
28	0.00	0.00	0.00	0.00	0.00	1.3	0.00	0.00	0.00	e20	10	12
29	0.00	0.00	0.00	0.00	---	1.4	0.00	0.00	0.00	e21	9.2	13
30	0.00	0.00	0.00	0.00	---	1.6	0.00	0.00	0.00	e103	8.5	15
31	0.00	---	0.00	0.00	---	2.2	---	0.00	---	e254	7.8	---
TOTAL	0.00	0.00	0.00	0.00	0.00	19.03	4.43	0.00	0.00	680.05	9312.5	1758.8
MEAN	0.000	0.000	0.000	0.000	0.000	0.61	0.15	0.000	0.000	21.9	300	58.6
AC-FT	0	0	0	0	0	38	8.8	0	0	1350	18470	3490
MAX	0.00	0.00	0.00	0.00	0.00	2.2	1.8	0.00	0.00	254	2280	528
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.8	8.0

CAL YR	2012	TOTAL	2603.31	MEAN	7.11	MAX	175	MIN	0.00	AC-FT	5160
WTR YR	2013	TOTAL	11774.81	MEAN	32.3	MAX	2280	MIN	0.00	AC-FT	23360

MAX DISCH:  
 MAX GH: 0.00 FT

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PURGATOIRE RIVER AT NINEMILE DAM, NEAR HIGBEE (C)  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
PURGATOIRE RIVER BLW HIGHLAND DAM NR LAS ANIMAS  
Water Year 2013

Location.-- Lat. 37°54'03", Long. 103°17'56" (Hackamore Ranch, CO Quadrangle, Scale 1:24,000), NE1/4, SW1/4, Section 1, T25S, R53W. On the left bank approximately ¼ mile downstream of the Highland Canal Diversion Dam, Bent County, 11 mi southwest of Las Animas, Colorado.

Drainage Area and Period of Record.-- 3320 sq.mi.; WY2001 to present.

Equipment.-- Sutron Constant Flow Bubbler (CFB) water level sensor and a Satlink 2 satellite-monitored DCP installed in a 4 ft x 4 ft steel shelter. Primary reference gage is a drop tape gage referenced to the top of "C" channel attached to face of concrete flood block on left channel bank holding bubbler orifice line. No changes were made this water year.

Hydrologic Conditions.-- Drainage basin characteristics within the basin include uplands and hills forested with pine and juniper trees. Rolling short-grass prairie lies between the uplands and the canyons. Livestock grazing exists in the watershed. Rock cliffs are exposed along the 400- to 500- foot deep Purgatoire River canyon, and riparian vegetation grows along the bottom of incised reaches of the major tributaries near their confluence with the Purgatoire River. The months of November through March tend to produce little runoff because precipitation is mainly snow. Sublimation and slow melting remove water from the snowpack during warm periods of the winter. These processes might increase soil moisture but they also decrease the volume of surface water. Precipitation from April through October generally is in the form of snow that melts rapidly or high intensity-short duration rainfall, which produces the vast majority of the streamflow in the tributaries. Snowmelt from the mountains generally produces high flow in the Purgatoire River during the months May through June and storm runoff also generates streamflow. The Purgatoire River will generally convey the most streamflow in August. Typically, the increased streamflows in August were a result of mountain snowmelt stored in upstream reservoirs that was subsequently released for downstream irrigation needs. The August increased streamflows also may be a result of convective storms that commonly occur during the late July through August summer monsoon. The influence of urbanization and over grazing provides the largest affect to the runoff regime.

Gage-Height Record.-- Primary record is 15-minute CFB data downloaded from the DCP with satellite telemetry used for backup purposes. The gage was visited on 18 separate occasions this water year to verify the sensor remained calibrated to the primary reference gage. The CFB was adjusted 9 times. Adjustments ranged from -0.34 ft. to +0.29 ft. Record is complete and reliable.

Datum Corrections.-- Levels were not run this water year. Levels were last run August 22, 2008 to the water surface and the drop tape RP using RM No. 1 as base. No corrections were required.

Rating.-- The control at low to medium flows (up to 500 cfs) is the primary channel with silt, sand, gravel and cobble bed and earthen banks. Bank vegetation of variable density in secondary overbank areas (primarily left side) affects flows above 500 cfs considerably. Rating No. 4 was used for the entire water year and was identical to Rating No. 3 except for it was extended to capture higher flows experienced during the water year. Rating No. 4 is well-defined to approximately 500 cfs, which is considered to be the primary channel capacity. Above 500 cfs, flow spills out of the channel and the control changes – this portion of the rating is based on a channel survey. Four discharge measurements (Nos. 209 – 212) with 9 observations of 0 flow were made during the water year. The discharge measurements ranged from 5.76 to 238 cfs. Measurements cover the range in stage experienced except for the higher average daily flows of Aug 4-5, 7-11, 14-15 and Sept 3, 2013. The peak discharge of 4540 cfs occurred at 1815 on August 4, 2013 at a gage height of 9.50 ft with a shift of -0.51 ft. It exceeded the stage of maximum flow measurement for the water year (No. 209 made on July 29, 2013) by 6.39 ft.

Discharge.-- Shifting control method was used for the entire water year. Shifts were distributed by stage for the entire water year, using variable stage-shift relationship PURHILCOVSC13A, which is based on measurements made during the period of application. Measurement No. 210 was discounted from -3.52% to fit the trends and smooth the variable stage-shift relationship. All other measurements were given full weight and applied directly.

Special Computations.-- Missing data was replaced in most cases with DCP log data. On days when the log data was missing, the unit values were interpolated between adjacent good values during stable periods of gage height. Long periods of zero flow were flagged as zero flow days.

Remarks.-- Record was considered fair except during periods when flows were estimated and when flows exceed 500 cfs. Flows above 500 cfs are unmeasurable at this gage and should be considered poor. The peak flow for the water year is poor due to the lack of rating definition. Station maintained and record developed by Garrett Markus.

Recommendations.-- High flows have not been measured at or near the gage due to a lack of facilities. Recommend installation of a bank operated cableway. Survey at gage is also recommended for water year 2014.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

PURGATOIRE RIVER BLW HIGHLAND DAM NR LAS ANIMAS

RATING TABLE-- PURHILCO04 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

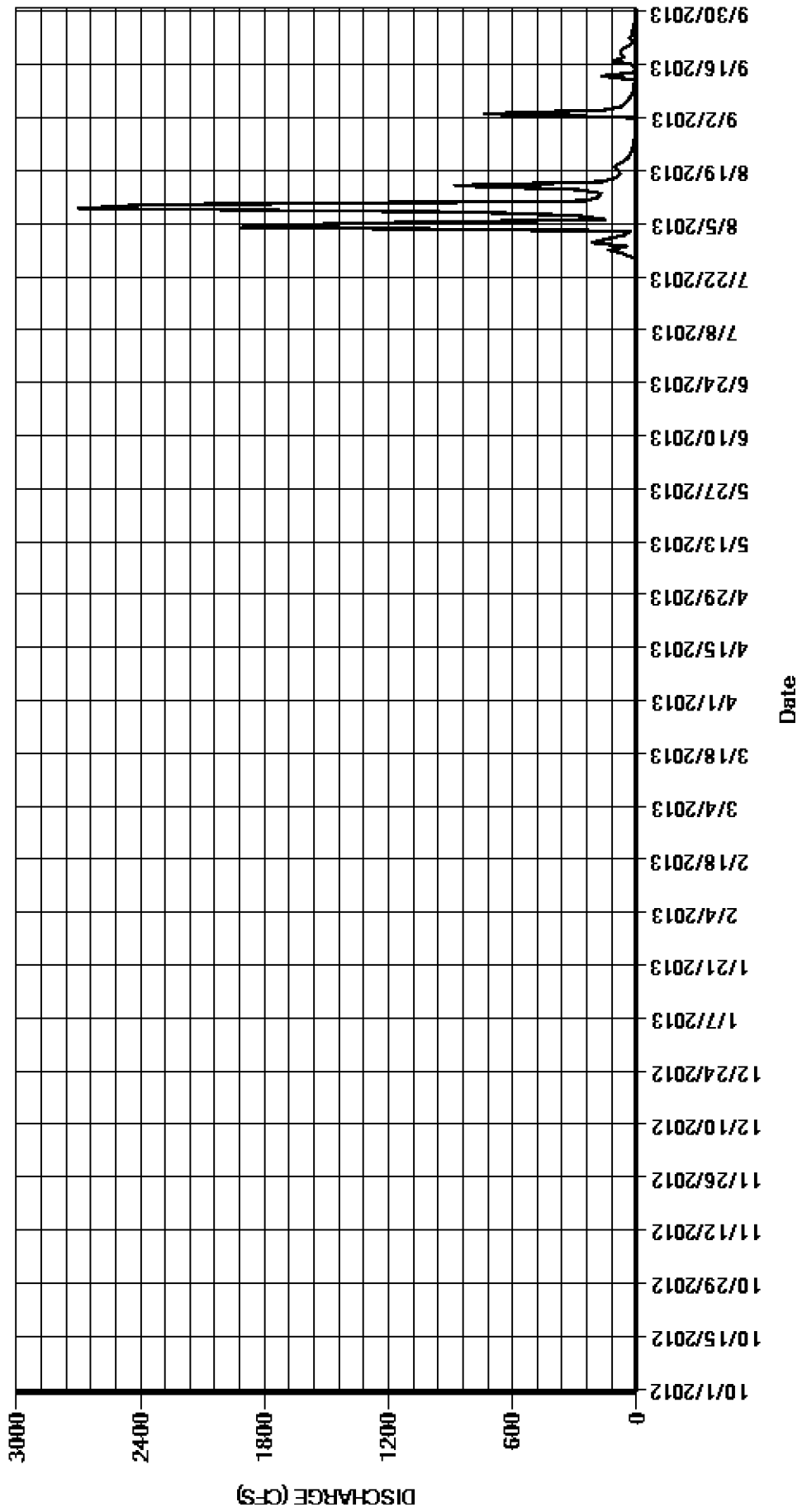
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	137	1.2
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57	0.54
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32	734
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1910	154
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1400	71
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	156	53
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	279	37
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	802	24
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2700	16
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2380	12
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	247	10
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	184	8.3
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	174	169
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	291	9.6
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	878	7.4
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	170	22
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	105	111
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	82	61
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	90	78
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	111	71
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	80	34
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49	20
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34	34
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26	23
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	18
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15	14
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21	11	9.8
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	67	7.7	7.0
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	136	5.5	6.9
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	51	3.9	6.0
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	215	2.3	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	490.00	12438.4	1822.74
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	15.8	401	60.8
AC-FT	0	0	0	0	0	0	0	0	0	972	24670	3620
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	215	2700	734
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.3	0.54

CAL YR	2012	TOTAL	4393.36	MEAN	12.0	MAX	2250	MIN	0.00	AC-FT	8710
WTR YR	2013	TOTAL	14751.14	MEAN	40.4	MAX	2700	MIN	0.00	AC-FT	29260

MAX DISCH: 4540 CFS AT 18:15 ON AUG 04, 2013 GH 9.50 FT SHIFT -0.51 FT  
 MAX GH: 9.50 FT AT 18:15 ON AUG 04, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PURGATOIRE RIVER BLW HIGHLAND DAM NR LAS ANIMAS  
WY2013 HYDROGRAPH



# ARKANSAS RIVER BASIN

## HIGHLAND CANAL

Water Year 2013

Location.-- Lat. 37°54'03", Long. 103°17'56" (Hackamore Ranch, CO Quadrangle, Scale 1:24,000), NE1/4, SW1/4, Section 1, T25S, R53W. On the left bank approximately ¼ mile downstream of the Highland Canal Diversion Dam, Bent County, 11 mi southwest of Las Animas, Colorado.

Drainage Area and Period of Record.-- N/A;

Equipment.-- Float-activated graphic water-stage recorder and shaft encoder in small shelter over CMP stilling well. Shaft encoder wired to satellite-monitored data collection platform (Sutron Satlink 2 HDR DCP) located in Purgatoire River below Highland Dam gage shelter. Standard 5-ft steel Parshall flume is the control. Primary reference gage is outside staff gage installed in flume. No changes were made this water year.

Hydrologic Conditions.-- The Highland Canal diverts water from the Purgatoire River, which has a drainage basin of approximately 3320 square miles.

Gage-Height Record.-- Primary record is 15-minute satellite data with the graphic chart record and DCP log used for backup purposes. Record is complete and reliable for this seasonally operated gage except for the following periods. October 1-7, when silt in stilling well affected gage height reliability but was at zero flow and denoted as a "z-day". June 16-18 and July 10-15 was also denoted as "z-days" due to the backwater affect from the downstream Rock Arroyo during a zero flow period. September 13 had the same backwater effect but the tape came off the shaft encoder and produced erroneous data. This day was denoted as an "e-day" and corrected with little to no loss of accuracy.

Datum Corrections.-- Levels were last run to the flume on August 5, 2003. No corrections needed.

Rating.-- The control is a standard, 5-foot, steel Parshall flume. A standard 5-ft Parshall flume rating in use since May 23, 2001 was used during the entire water year. The peak discharge of 8.2 cfs occurred at 0500 on July 28, 2013, at a gage height of 0.57 ft with a shift of 0.00 ft. The peak gage height occurred on September 13, 2013 was caused by backwater but the actual stage is unknown as the SDR float tape came off the SDR wheel.

Discharge.-- The rating was directly applied to the gage height record to compute discharge.

Special Computations.-- High flows from Rock Arroyo downstream of the gage inundated the Highland Canal and caused false gage height readings. The backwater affected gage was observed by District 17 water commissioners. Backwater days where the shaft encoder tape fell into the well during a period of water diversion were denoted as an "e-day" or gage height was not representative of the average for the day and were adjusted accordingly. Backwater days where there was zero flow in the canal were denoted as "z-days" or zero-flow days. Days the stilling well was silted with mud causing non-zero gage heights to exist with zero flow. These days were denoted as "z-days" or zero-flow days.

Remarks.-- Record is fair due to lack of measurements since WY2010. Periods of low flow when the shaft encoder was affected by silt in the stilling well are considered fair since the well was not affected during zero flow. Record with backwater affects during zero flow should be considered fair; and should be considered poor during periods of canal diversion. Station maintained and record developed by Garrett Markus.

Recommendations.-- Discharge measurements should be made every year. A levels survey and flume inspection should be conducted before the 2014 irrigation season.



STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

HIGHLAND CANAL

RATING TABLE-- STD05FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

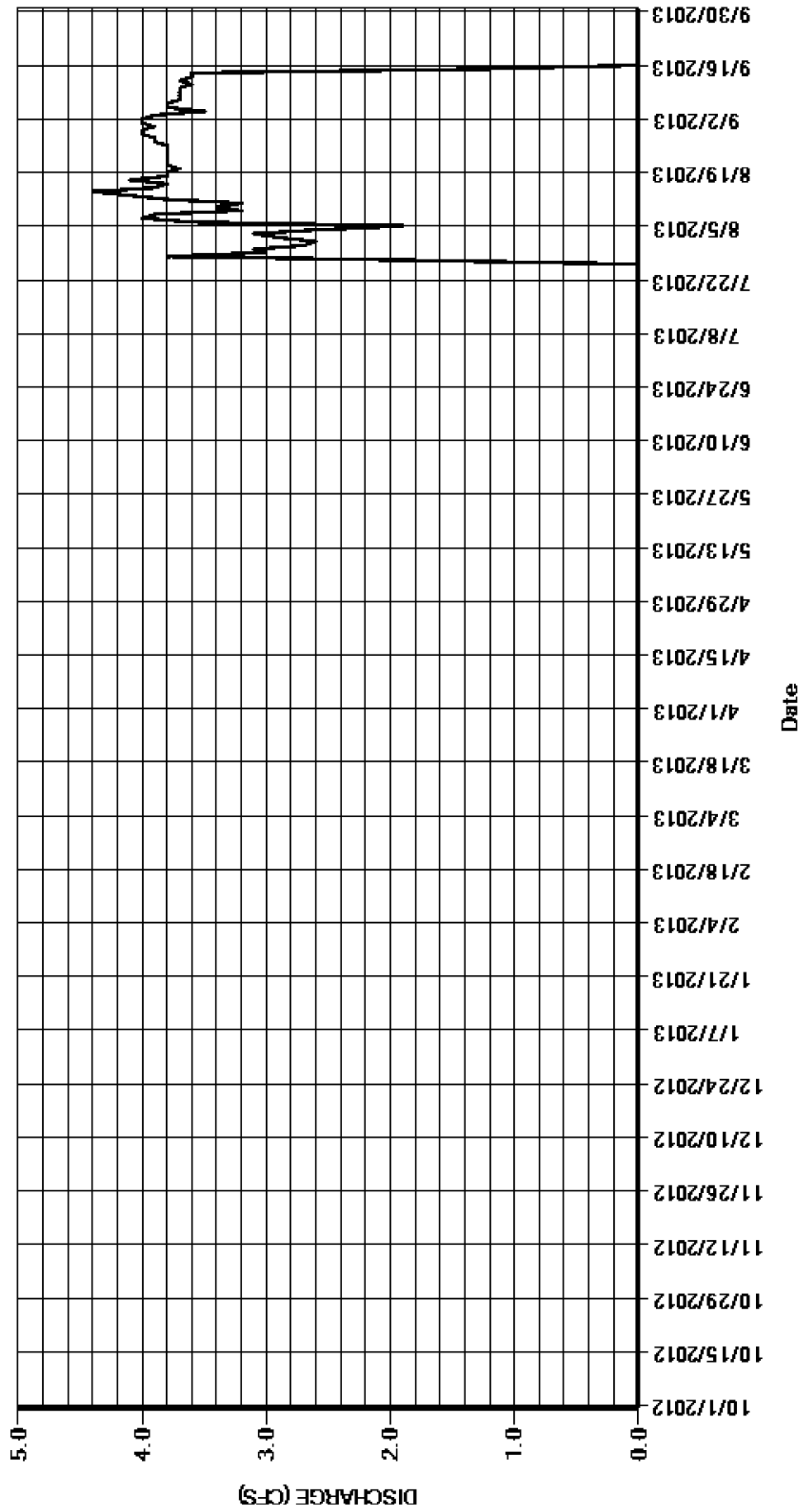
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	4.0
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9	4.0
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	3.9
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	3.5
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	3.8
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	3.8
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.0	3.7
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.9	3.7
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.2	3.7
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	3.7
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.2	3.6
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	3.7
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.1	e3.6
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.4	3.6
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.9	1.3
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	0.01
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.1	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.7	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	3.9	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	3.9	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	3.0	4.0	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	3.1	4.0	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	2.7	3.9	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.40	112.3	53.61
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.46	3.62	1.79
AC-FT	0	0	0	0	0	0	0	0	0	29	223	106
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	4.4	4.0
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	0.00

CAL YR	2012	TOTAL	127.94	MEAN	0.35	MAX	4.3	MIN	0.00	AC-FT	254
WTR YR	2013	TOTAL	180.31	MEAN	0.49	MAX	4.4	MIN	0.00	AC-FT	358

MAX DISCH: 8.20 CFS AT 05:00 ON JUL 28, 2013 GH 0.57 FT SHIFT 0.00 FT  
MAX GH: (Unknown)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

HIGHLAND CANAL  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMA  
Water Year 2013

Location.-- Combined record from Purgatoire River below Highland Dam and Highland Canal below Highland Dam gages located Lat 37°54'03", Long 103°17'56" (Hackamore Ranch, CO Quadrangle, Scale 1:24,000), NE1/4, SW1/4, Section 1, T25S, R53W. On the left bank approximately ¼ mile downstream of the Highland Canal Diversion Dam, Bent County, 11 mi southwest of Las Animas, Colorado.

Drainage Area and Period of Record.-- 3320 square miles.; WY2001 to present.

Equipment.-- See individual records for gage equipment descriptions.

Hydrologic Conditions.-- See individual station analyses.

Gage-Height Record.-- See individual station analyses.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- The combined record of discharges was obtained by the addition of Highland Canal daily flows to the corresponding daily flows in the Purgatoire River below Highland Dam. The peak unit value combined discharge for the water year was 4540 cfs at 1815 on August 4, 2013. See individual station analyses.

Special Computations.-- None.

Remarks.-- Combined record is fair, except during periods of estimated flow and flows greater than 500 cfs, which should be considered poor. See individual station analyses for the two gages for more details. Record developed by Div. 2 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMA

RATING TABLE.--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

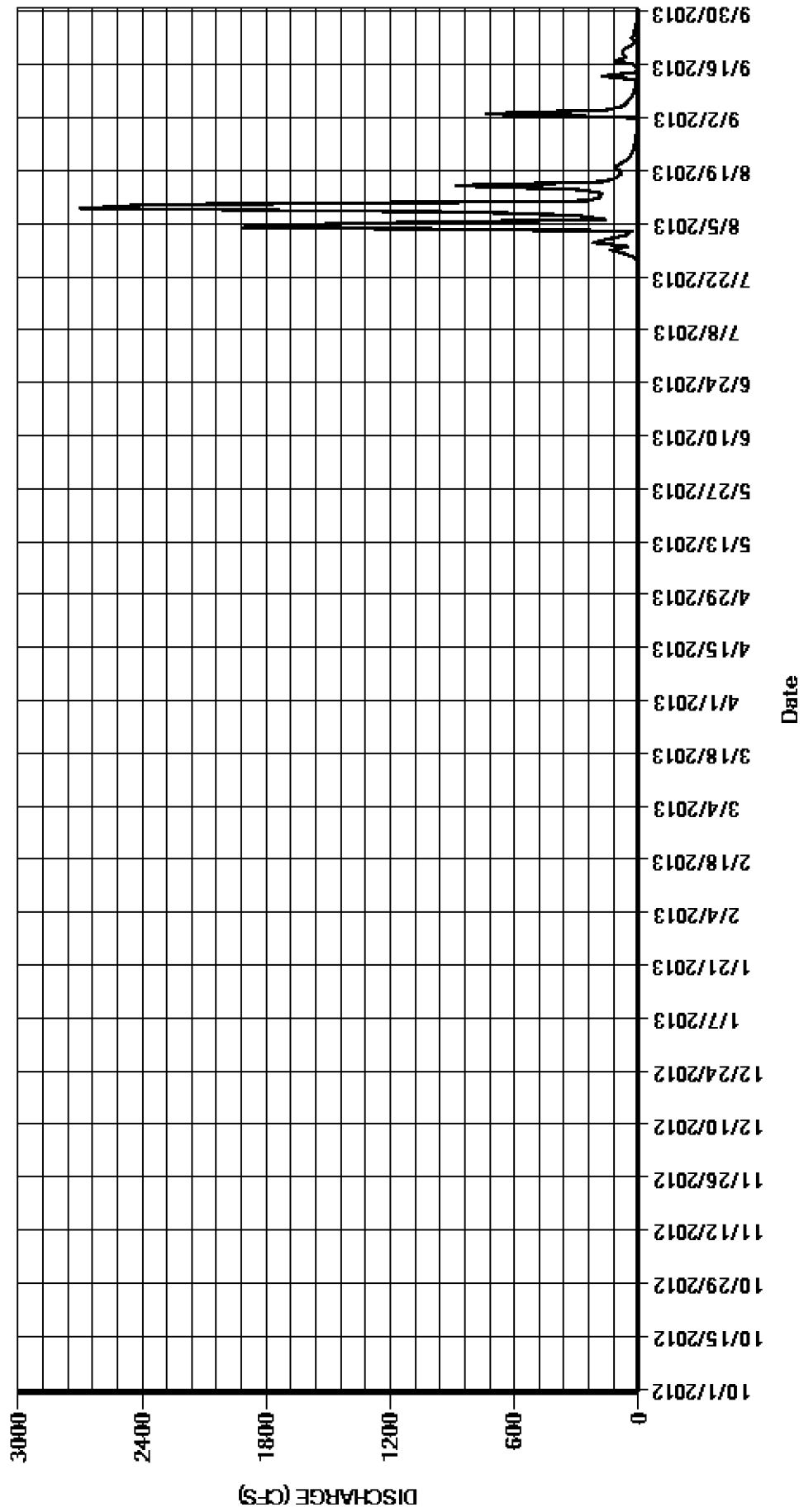
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	140	5.2
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	60	4.5
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35	738
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1910	158
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1400	75
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	160	57
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	283	41
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	806	28
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2700	20
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2380	16
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	250	14
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	188	12
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	178	173
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	295	13
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	882	8.7
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	174	22
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	109	111
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	86	61
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	94	78
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	115	71
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	84	34
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	53	20
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38	34
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30	23
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23	18
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	14
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23	15	9.8
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	71	12	7.0
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	139	9.5	6.9
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	54	7.9	6.0
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	218	6.2	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	505.00	12542.6	1879.1
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	16.3	405	62.6
AC-FT	0	0	0	0	0	0	0	0	0	1000	24880	3730
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	218	2700	738
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.2	4.5

CAL YR	2012	TOTAL	4521.13	MEAN	12.4	MAX	2250	MIN	0.00	AC-FT	8970
WTR YR	2013	TOTAL	14926.70	MEAN	40.9	MAX	2700	MIN	0.00	AC-FT	29610

MAX DISCH:  
 MAX GH:

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMA  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
MUDDY CREEK BELOW MUDDY CR DAM NR TOONERVILLE, CO  
Water Year 2013

Location.-- Lat. 37°45'46", Long. 103°14'36" (Toonerville, Colorado quadrangle, 1:24000 scale) in the SE¼ SE¼ Sec.21, T26S, R52W, Bent County on the north bridge abutment at the crossing of CR 11 and Muddy Creek.

Drainage Area and Period of Record.-- 154 sq. mi.; 1970's for some unknown period of time. 2004 to present.

Equipment.-- High data rate Sutron SatLink2 data collection platform (DCP) and shaft encoder in a steel "half shelter" mounted on top of a 24-inch corrugated metal stilling well. Shaft encoder is referenced to wire weight gage attached to the downstream bridge rail to replace the drop tape. Precipitation recorded with a Texas Instrument tipping bucket gage. No other changes were made this water year.

Hydrologic Conditions.-- The Muddy Creek gaging station has a drainage basin of approximately 154 square miles. Characteristics within the basin include rolling short-grass prairie rangelands with weeds and cacti. Livestock grazing exists in the watershed. Ephemeral or intermittent stream channels are common and these normally dry arroyos typically convey water as the result of convective storms that commonly occur during the late July through August summer monsoon. The influence of over grazing provides the largest affect to the runoff regime. No hydrologic condition changes this water year.

Gage-Height Record.-- Primary record is 15-minute satellite-monitored data with DCP log backup. Record is complete and reliable except for the following periods; Missing Data: May 1-2 from bad data transmission. Missing data was filled in from adjacent data without loss of accuracy and was not flagged. Erroneous Data: Mar 24 and May 8-9 had a combination of missing and non representative values due to data collection and transmission failure and were denoted as "a-days" (missing data). Jun 6-15, Jun 18-Jul 27, 30-31, Aug 10-Sept 12, and Sept 15-30 had false flows due to mud in the stilling well. These days were denoted as a "z-day" (zero-flow day).

Datum Corrections.-- Levels were ran on October 1, 2012 this water year. No corrections were noted.

Rating.-- The control at low and medium flows is the sand and mud channel along with vegetation in the channel. Control at higher stages includes the creek banks and brush lining the edges of the channel. High flows are contained by the bridge immediately upstream of the gage. Rating No. 3 dated June 17, 2010 was used untill the gage visit on Oct 1. Rating No. 4 was developed from analysis of HEC-RAS modeling and field measurements and implemented January 19, 2014 and used for the remainder of the water year. One discharge measurements was made this water year – Msmt No. 69 which measured 705 cfs. All gage visits observed zero flow. The measurement is representative of the middle range of stage of the WY. The peak exceeded maximum flow Msmt No. 69, made Aug 8, 2013, by 4.00 ft. in stage. Peak flow of 3230 cfs occurred at 0345 on August 4, 2013 at gage height of 12.72 feet with a 0.00 ft shift.

Discharge.-- Rating No. 3 had a 0.02 shift and was carried over from WY 2012 to 1430 Oct 1. Rating No. 4 was applied directly with 0.00 shifts for the remainder of the year. Since Rating No. 4 was based off of the only measurement of the year and the largest stage to be measured, the rating matched Msmt No. 69 with no shift.

Special Computations.-- Days with 16 missing unit values or more and over 16 inaccurately collected data values, "a-days" were applied. Days when the stilling well silted in and no flow were given "z-days". Data flagged "e-days" were days that had both flow and a silted in stilling well. Averaged daily flows were calculated by forcing silted well days to zero and re-averaged. Datum corrections for the year were based on the Msmt No.69 and gage readings. Since no datum corrections were made in the field, these corrections were carried for the entire water year.

Remarks.-- Overall, the record during periods of zero flow are good, but the record during periods of flow is poor due to lack of rating and point of zero flow (PZF) definition. The peak flow for the water year is also rated poor. The flashy nature and remote location of the gage make it extremely difficult to maintain an accurate stage-discharge rating and PZF. Station maintained and record developed by Garrett Markus.

Recommendations.-- To establish a solid point of zero flow, the installation of a concrete structure such as a compound weir or broad crested weir would be beneficial for monitoring low flow periods and large, bed scouring events. Eliminating the stilling well with a radar would help determine PZF given the sediment load of the flows experienced at the gage.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

MUDDY CREEK BELOW MUDDY CR DAM NR TOONERVILLE, CO

RATING TABLE-- MUDTOOCO03 USED FROM 01-OCT-2012 TO 01-OCT-2012  
 MUDTOOCO04 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

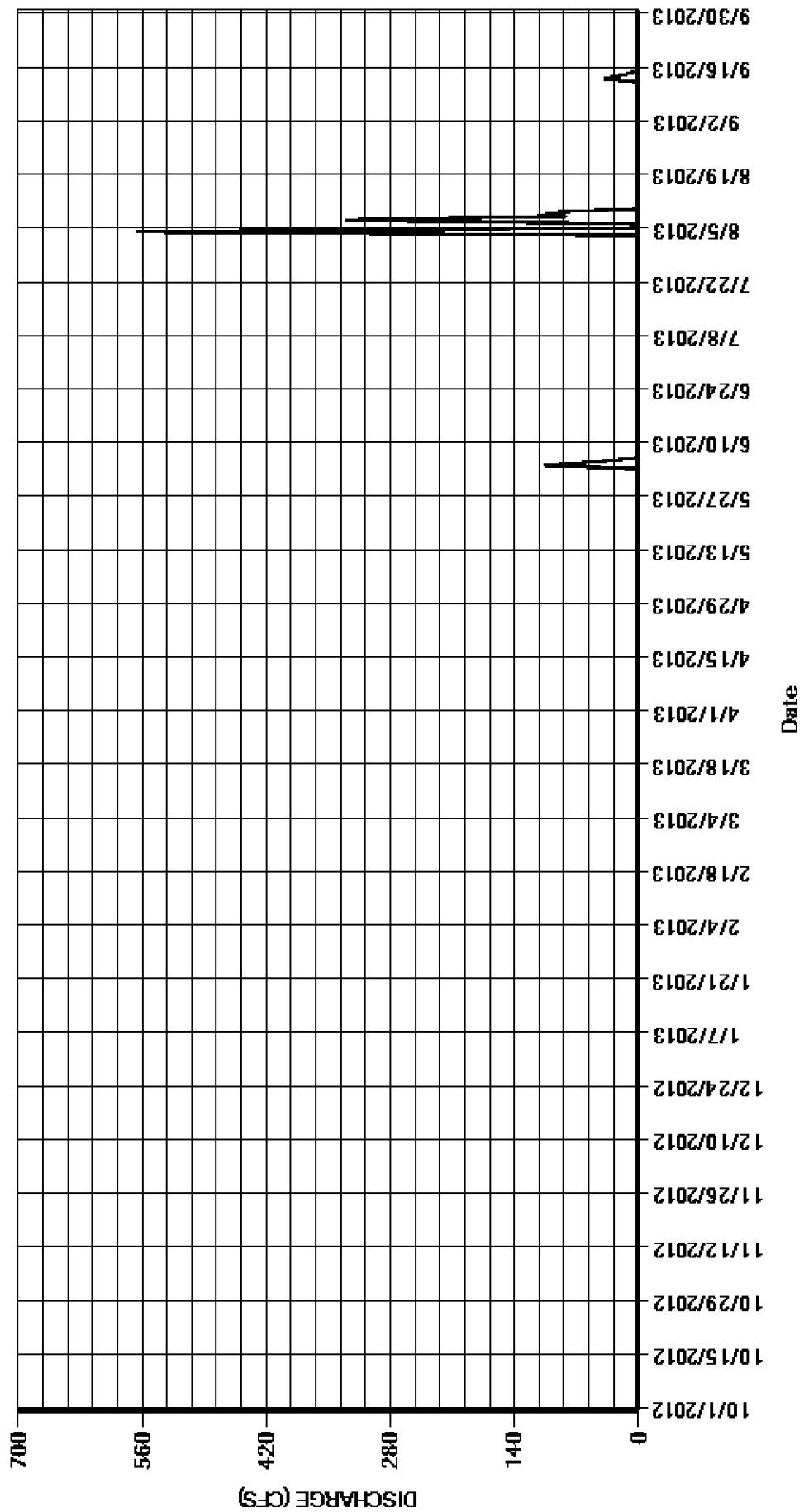
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e1.1	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	105	0.00	565	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	44	0.00	3.4	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	329	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.00	0.00	0.00	83	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.00	0.00	0.00	103	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e38
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.21	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.92	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	151.79	1.13	1088.35	55.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.06	0.036	35.1	1.83
AC-FT	0	0	0	0	0	0	0	0	301	2.2	2160	109
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	105	0.92	565	38
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CAL YR	2012	TOTAL	312.41	MEAN	0.85	MAX	161	MIN	0.00	AC-FT	620
WTR YR	2013	TOTAL	1296.27	MEAN	3.55	MAX	565	MIN	0.00	AC-FT	2570

MAX DISCH: 3230 CFS AT 03:45 ON AUG 04, 2013 GH 12.72 FT SHIFT 0.00 FT  
 MAX GH: 12.72 FT AT 03:45 ON AUG 04, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**MUDDY CREEK BELOW MUDDY CR DAM NR TOONERVILLE, CO  
WY2013 HYDROGRAPH**





ARKANSAS RIVER BASIN  
RULE CREEK AT HWY 101 NEAR TOONERVILLE, CO  
Water Year 2013

Location.-- Lat. 37°49'12", Long. 103°10'55" (Toonerville, Colorado quadrangle, 1:24000 scale) in the NW¼ Sec.6, T26S, R51W, Bent County on the downstream side of a bridge abutment at the crossing of Highway 101 and Rule Creek approximately 920 feet below the confluence of Muddy and Rule Creek.

Drainage Area and Period of Record.-- 364 sq. mi.; The gage was established in the 1970's. It is unknown at this time how long the station was operated before it was abandoned.

The gage was reestablished in June 2006 to present.

Equipment.-- High data rate Sutron SatLink DCP and Sutron CFB mounted inside NEMA type boxes on steel posts on the north side of the Highway 101 bridge over Rule Creek. Primary reference gage is a wire weight gage on the Hwy 101 bridge over the channel on the downstream side. A crest gage captures instantaneous peaks via high water mark. No changes were made this water year.

Hydrologic Conditions.-- The Rule Creek gaging station has a drainage basin of approximately 364 square miles. Characteristics within the basin include rolling short-grass prairie rangelands with weeds and cacti. Livestock grazing exists in the watershed. Ephemeral or intermittent stream channels are common and these normally dry arroyos typically convey water as the result of convective storms that commonly occur during the late July through August summer monsoon. The influence of over grazing provides the largest affect to the runoff regime.

Gage-Height Record.-- Primary record is 15-minute satellite-monitored CFB data with DCP backup log. Record is complete and reliable Missing data was filled in from adjacent data without loss of accuracy. Primary stage sensor calibration to reference gage was supported by 11 site visits this water year, of which 9 discharge measurements and 2 gage visits. From 9 discharge measurements, 7 of them were zero flow measurements.

Datum Corrections.-- Levels were last run on October 1, 2012. No corrections were needed or made.

Rating.-- Control is a downstream riffle or earthen berm which creates a small pool at the gage. At higher stages, the control becomes the channel and includes the brush-lined riverbanks. Flows are contained by the bridge immediately upstream of the gage. Rating No. 3 was developed April 13, 2012 and was an extended version of Rating No. 2. Both are poorly defined due to a lack of discharge measurements. Rating No. 3 was continued from the previous water year up to Msmt. 66 at 1300 on Oct 1, 2012. Rating No. 6 was developed from a cross-sectional survey made on September 26, 2013 and refined by past measurements. It was used from the remainder of the water year. Nine discharge measurements (Nos. 66-74) were made this water year all of which were zero flow observations except for Msmt No. 72 and 73 which measured 46 cfs and 3960 cfs respectively. The peak discharge of 10300 cfs occurred at 0630 August 4, 2013 at a gage height of 17.52 ft with a shift of 0.00 ft. It exceeded the stage of Measurement No. 73 made at 0145 on August 8, 2013 by 4.04 feet.

Discharge.-- Shifting control method was used for the entire water year. Shifts were distributed by time for the entire water year. Shifts were applied directly and given full weight.

Special Computations.-- Air temperature data was examined using Las Animas NOAA temperature data to assist with winter period ice formation on the gage pool. Discharge and precipitation data from the Muddy Creek near Toonerville gage upstream were used to assist with definition of flow periods. A survey was completed on September 26, 2013 to aid in rating development for flow modeling. From Msmt No. 66 to last day before a flood event (June 3, 2013) were denoted as 'z' days or zero flow days. Since RULTOOCO06 was based off the two msmts made this WY, anything above gage height 3.25 was shifted to 0.00 ft. Gage heights below were shifted over time to maintain PZF.

Remarks.-- Record is poor for the entire water year due to the lack of rating definition and an estimated point of zero flow. The peak flow for the water year is also rated poor. The flashy nature and remote location of the gage make it extremely difficult to maintain a reliable stage-discharge relationship. Station maintained and record developed by Garrett Markus.

Recommendations.-- Measure flows to better define rating RULTOOCO06 at various gage heights.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

RULE CREEK AT HWY 101 NEAR TOONERVILLE, CO

RATING TABLE-- RULTOOCO03 USED FROM 01-OCT-2012 TO 01-OCT-2012  
 RULTOOCO06 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

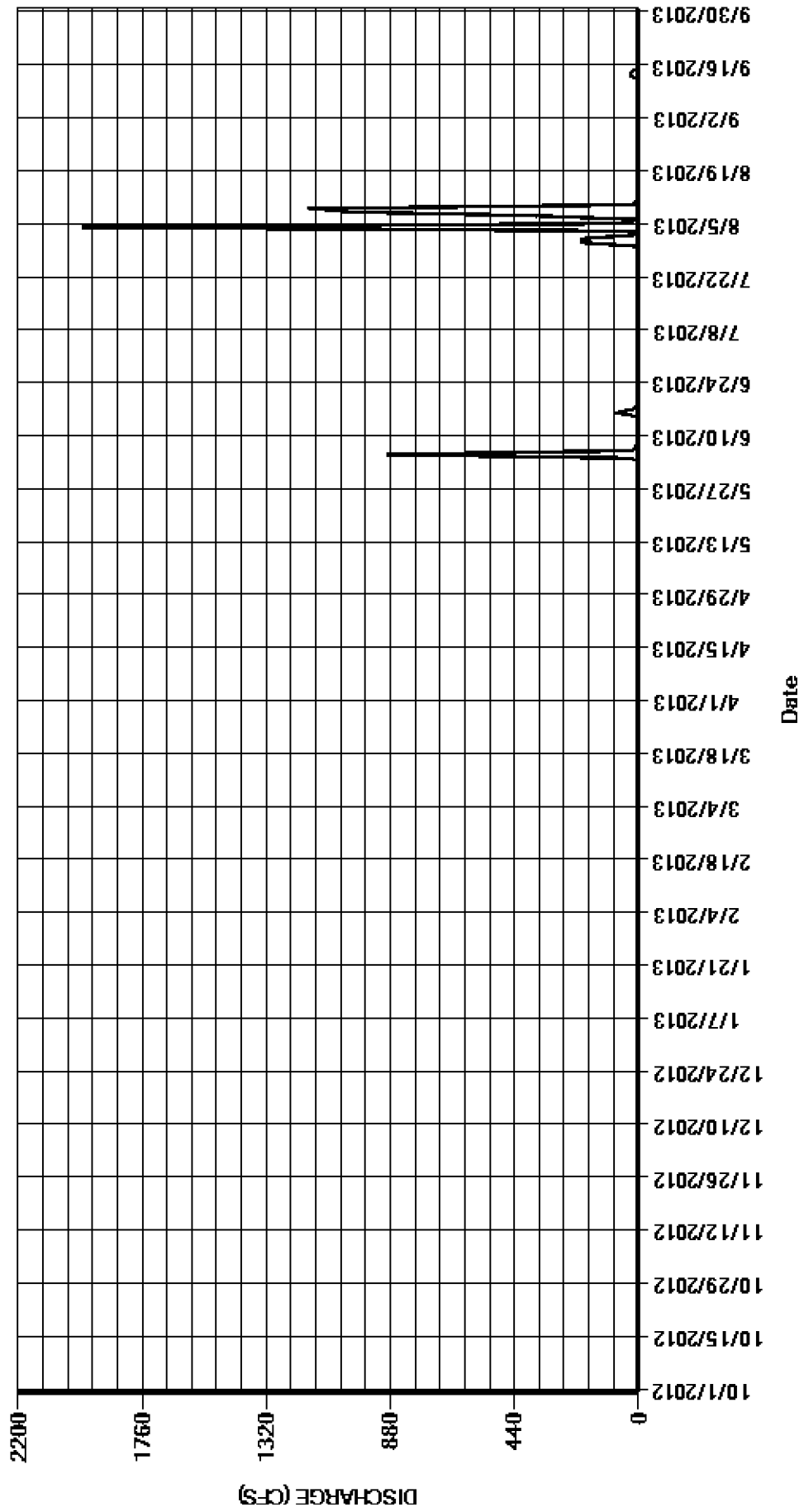
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	200	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26	0.00	1970	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	890	0.07	39	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22	0.05	11	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.9	0.21	363	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	0.36	1020	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.48	1170	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	21	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.31	6.1	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.15	0.51	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.15	0.00	27
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.48	0.00	27
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	3.7
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	80	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	0.01	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.6	0.28	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.5	0.90	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	2.0	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.86	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.01	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.16	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.04	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	204	0.00	---
TOTAL	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1061.19	210.08	4832.61	57.70
MEAN	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	35.4	6.78	156	1.92
AC-FT	.08	0	0	0	0	0	0	0	2100	417	9590	114
MAX	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	890	204	1970	27
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CAL YR	2012	TOTAL	313.77	MEAN	0.86	MAX	248	MIN	0.00	AC-FT	622
WTR YR	2013	TOTAL	6161.62	MEAN	16.9	MAX	1970	MIN	0.00	AC-FT	12220

MAX DISCH: 10300 CFS AT 06:30 ON AUG 04, 2013 GH 17.52 FT SHIFT 0.00 FT  
 MAX GH: 17.52 FT AT 06:30 ON AUG 04, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**RULE CREEK AT HWY 101 NEAR TOONERVILLE, CO  
WY2013 HYDROGRAPH**



ARKANSAS RIVER BASIN  
09061500 COLUMBINE DITCH NEAR FREMONT PASS  
Water Year 2013

Location.-- Lat. 39°22'25", Long. 106°13'38". Columbine ditch diverts water from tributaries of Eagle River in sec. 5, T.8 S., R. 79 W., in Colorado River basin to Chalk Creek (tributary to East Fork Arkansas River) in NW¼ sec. 9, T.8 S., R. 79 W., in Arkansas River basin.

Drainage Area and Period of Record.-- 1,170 Acres; Record published continuously from 1947 through current year.

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform high data rate DCP and Stage Discharge Recorder (SDR) in a 30-inch diameter metal pipe shelter and well. SDR and chart are set to outside staff gage. Control is a 6-foot steel Parshall flume.

Hydrologic Conditions.-- The Columbine Ditch is categorized as a transmountain diversion structure which intercepts runoff from a drainage basin of approximately 1,170 acres in the headwaters of the Eagle River basin and empties into Chalk Creek, a tributary of the east fork of the Arkansas River. The conveyance of water across the Continental Divide is accomplished through saddles which traverse the divide. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except for the occasional low volume trail road. No hydrologic condition changes were apparent this water year.

Gage-Height Record.-- The primary record is 15-minute satellite data with chart record and DCP log as backup. The record is complete and reliable except for May 16, 2013 when gage was initially started up and May 17-20, 24, 2013 when gage height record was affected by ice conditions. Diversion occurred this water year from May 16 through Sep 30, 2013.

Datum Corrections.-- Levels were last run on July 31, 2007. The gage was found to be reading within allowable limits, so no corrections were needed/taken. The level survey did confirm the floor of the flume slopes toward the staff gage away from the inlet.

Rating.-- Control is a 6-foot steel Parshall flume. A standard 6 ft. Parshall flume table (COLDITCO01, dated June 22, 1971) was used this water year. One discharge measurement (No. 87) at a flow of 3.68 cfs was made this water year. The peak discharge of 81.4 cfs occurred at 1730 on June 9, 2013 at a gage height of 2.12 ft. with a shift of +0.03 ft. It exceeded Measurement 87 by 1.84 feet in stage. The peak instantaneous gage height 3.09 ft. occurred at 0530 on May 24, 2013 was caused by backwater from ice on the control.

Discharge.-- Measurements are made from a walkway across the flume at a position where the meter axis is even with the staff gage. Shifts were distributed by stage using a shift curve (COLDITCOVS13) developed from current and previous water year measurements. This flume does have a considerable amount of lateral settling toward the staff gage and away from the inlet. This is the reasoning for the lower end of the shift curve as the stilling well very seldom drains and retains approximately 0.05 ft of gage height when there is no flow in the flume.

Special Computations.-- Variable curve COLDITCOVS13 is considered a valid alternative for calculating flows. As noted above the flume has a considerable amount of lateral settling away from the gage house and inlet, this can be seen while measuring and when flume is empty. At 0.05 ft gage height and below there is no flow. This flume does appear to be stable from historical comments that agree with the current situation. Ice effect days were determined using chart data, site visit comments, and air temperature data from Climax Mine.

Remarks.-- Owner, Aurora/Freeport-McMoRan, operated the gage differently than the previous owner. Flows are diverted for replacement of stream depletions caused by operations associated with Climax Mine. Flow patterns through the flume this water year differ than in past water years. Record is rated good except of days of missing log data and ice effected days which are poor. The instantaneous peak discharge for the year is rated poor based upon the lack of related site visits and very few historical measurements at that GH. Station maintained and record developed by Cheston Hart.

Recommendations.-- Depending on the future of this flume it is recommended the flume be reevaluated to either reinstall the flume or pour a false bottom in the flume to level the floor. It should be attempted to get more measurements to better define the hydraulic conditions of this site.

STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

09061500 COLUMBINE DITCH NEAR FREMONT PASS

RATING TABLE-- COLDITCO01 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

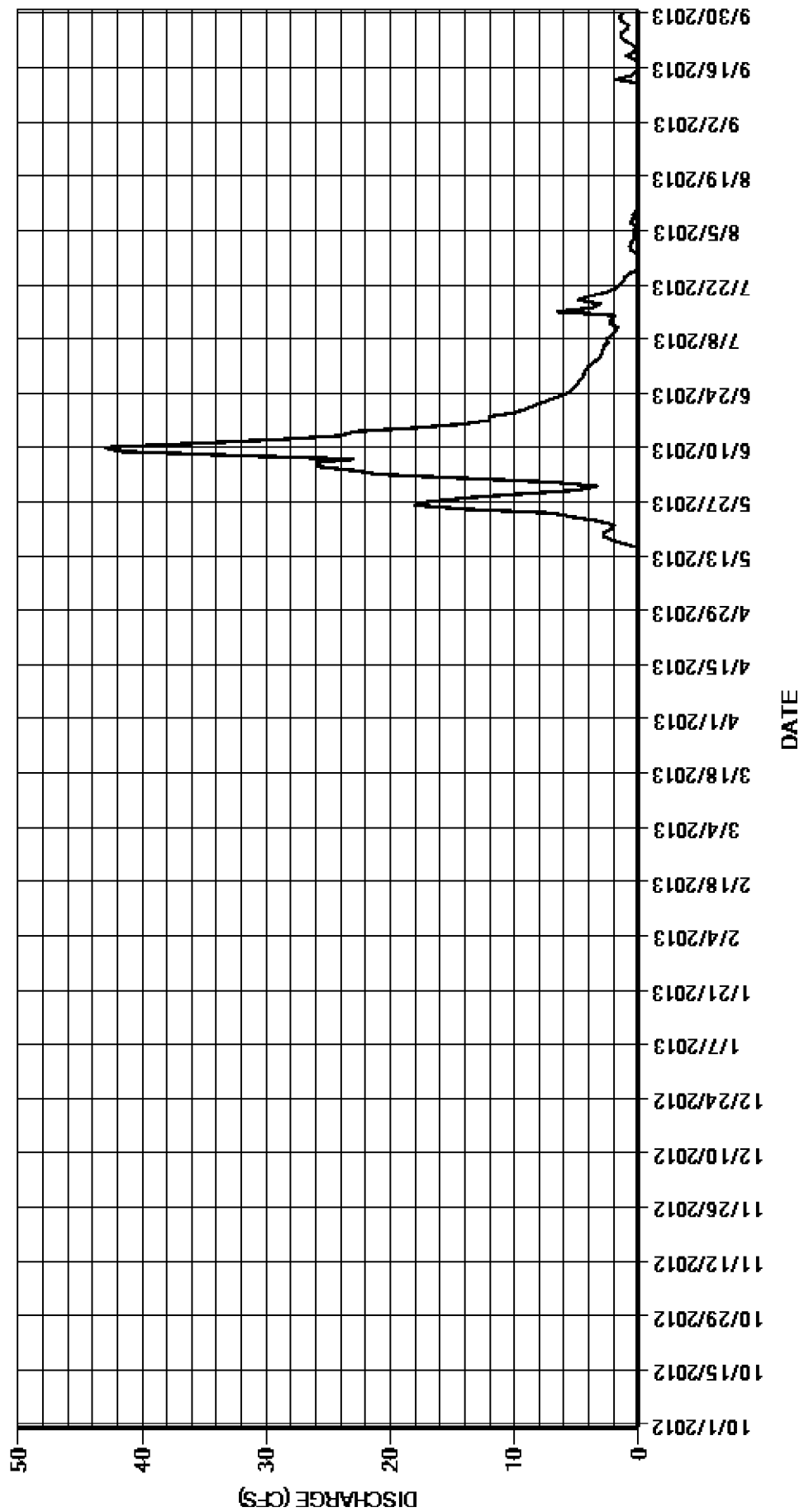
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.8	4.0	0.68	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	3.6	0.57	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21	3.2	0.37	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23	3.0	0.32	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26	2.9	0.34	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26	2.8	0.27	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23	2.5	0.65	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33	2.6	0.43	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	42	2.1	0.42	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43	1.9	0.25	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36	1.7	0.01	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29	2.3	0.00	0.06
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24	2.2	0.00	1.8
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23	1.9	0.00	0.54
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18	6.5	0.00	0.23
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e1.0	14	3.7	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e2.0	12	3.1	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e2.8	12	4.9	0.00	0.33
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e2.8	10	4.0	0.00	1.0
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e2.2	9.0	2.6	0.00	0.38
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	8.3	1.9	0.00	0.20
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.3	7.4	1.5	0.00	0.52
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.3	6.5	1.2	0.00	1.1
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e7.0	5.7	1.1	0.00	1.4
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	5.3	0.65	0.00	1.4
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18	5.0	0.00	0.00	0.95
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17	4.8	0.00	0.00	0.85
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	4.5	0.00	0.00	1.4
29	0.00	0.00	0.00	0.00	---	0.00	0.00	9.6	4.4	0.00	0.00	1.5
30	0.00	0.00	0.00	0.00	---	0.00	0.00	4.9	4.3	0.14	0.00	1.3
31	0.00	---	0.00	0.00	---	0.00	---	3.4	---	0.66	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	109.30	501.0	68.65	4.31	14.96
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.53	16.7	2.21	0.14	0.50
AC-FT	0	0	0	0	0	0	0	217	994	136	8.5	30
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18	43	6.5	0.68	1.8
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.3	0.00	0.00	0.00

CAL YR	2012	TOTAL	339.52	MEAN	0.93	MAX	15	MIN	0.00	AC-FT	673
WTR YR	2013	TOTAL	698.22	MEAN	1.91	MAX	43	MIN	0.00	AC-FT	1380

MAX DISCH: 81.4 CFS AT 17:30 ON JUN 09, 2013 GH 2.12 FT SHIFT 0.03 FT  
MAX GH: 3.09 FT AT 05:30 ON MAY 24, 2013 (Backwater from ice.)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09061500 COLUMBINE DITCH NEAR FREMONT PASS  
 WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
09062000 EWING DITCH AT TENNESSEE PASS  
Water Year 2013

Location.-- Lat. 39°21'40", Long. 106°18'22", diverts water from Piney Creek in sec. 11, T.8 S., R.80 W., in Eagle River basin, to Thayer Gulch (tributary to Tennessee Creek) in Sec. 11, T. 8 S., R.80 W., in Arkansas River basin.

Drainage Area and Period of Record.-- N/A; 1948-present.

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform (High data rate DCP and logger) and Stage Discharge Recorder (SDR) in a 30-inch diameter metal pipe shelter and well. SDR and chart are set to outside staff gage. Control is a 4-foot steel Parshall flume. No changes this water year.

Hydrologic Conditions.-- The Ewing Ditch diverts water from the headwaters of Piney Creek, a tributary of the Eagle River, over Tennessee Pass at an elevation of 10,500 feet, and into the headwaters of Tennessee Creek, a tributary of the Arkansas River. The basin consists primarily of high mountain terrain with very little development. The ditch is approximately 1.5 miles long, and intercepts runoff from a drainage area of 2,400 acres. No hydrologic condition changes were apparent this water year.

Gage-Height Record.-- Primary record is 15-minute transmitted data with SDR log and chart record as backup. The record is complete and reliable, except for Apr. 25-28, 2013 when GH was incorrectly setup and ice affected; Apr. 29-30, 2013 where there was equipment failure; and May 1-6, 2013 when the gage height was affected by ice and/or the stilling well was frozen. Diversion this water year occurred Oct. 1-18, 2012; and Apr. 25 - Sept 30, 2013.

Datum Corrections.-- Levels were last run on July 11, 2006. The gage was found to be reading within established tolerance and no datum corrections were made.

Rating.-- Control is a 4-foot steel Parshall flume. A standard 4-ft. Parshall flume table (STD04FTPF dated June 22, 1971) was used this water year. Three discharge measurements (No. 112-114) were made during the year ranging from 0.70 cfs to 7.31 cfs. These measurements cover the range of stage experienced for the water year except for lower flows of Oct. 1-18, 2012; Apr. 25, 26; Aug. 12, 13, 26; Sep. 8, 2013 and higher flows of May 23-28; Jun. 5-11, 2013. The peak discharge of 15.7 cfs occurred at 1800 on May 26, 2013 at a gage height of 1.02 ft with a shift of -0.03 ft. It exceeded the stage of Measurement 113 by 0.39 feet in stage. The peak instantaneous gage height 1.10 ft. occurred at 1045 on Apr. 28, 2013 was caused by backwater from ice on the control.

Discharge.-- Measurements are made from a walkway across the flume at a position where the meter axis is even with the staff gage. Shifts were distributed by stage using shift curve EWIDITOCOV09 developed from current and previous water year measurements. Measurements were discounted from 2.24% to -12.72% for smoothing purposes in the variable shift curve.

Special Computations.-- Ice affected flows and days where the well was frozen were estimated using trends in good record before and after ice effect and by eliminating ice spikes caused by freezing in flume. During the period April 25-29, 2013, the Satlink was incorrectly set and estimated using chart data. There are no available gages to use for comparison. Weather data trends were supplied by a weather station located at Climax Mine.

Remarks.-- Record is considered good, except for periods of ice effect and missing data, which are estimated and poor. The instantaneous peak discharge is rated good given the related measurement and site visits, the instantaneous peak GH occurred during an ice event and subsequently is rated poor. Station maintained and record developed by Cheston Hart.

Recommendations.-- It is recommend to continue measuring throughout the running water season to establish a better range in stage. A flume inspection should be performed in WY2014. A custom rating curve should be considered which incorporates the values from the shift curve which is being used throughout the year. Levels should be confirmed in the next water year.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09062000 EWING DITCH AT TENNESSEE PASS

RATING TABLE-- STD04FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.42	0.00	0.00	0.00	0.00	0.00	0.00	e0.80	5.5	2.2	1.1	0.90
2	0.42	0.00	0.00	0.00	0.00	0.00	0.00	e0.80	6.3	2.1	1.0	0.85
3	0.42	0.00	0.00	0.00	0.00	0.00	0.00	e0.90	7.0	2.1	0.96	0.79
4	0.42	0.00	0.00	0.00	0.00	0.00	0.00	e1.0	7.1	1.9	0.96	0.80
5	0.44	0.00	0.00	0.00	0.00	0.00	0.00	e1.0	7.6	1.9	0.96	0.75
6	0.43	0.00	0.00	0.00	0.00	0.00	0.00	e1.1	7.7	1.9	0.94	0.74
7	0.43	0.00	0.00	0.00	0.00	0.00	0.00	1.1	7.7	1.7	1.1	0.75
8	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.70	7.6	1.7	0.97	0.69
9	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.75	7.5	1.5	1.1	0.71
10	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.98	7.5	1.5	0.95	0.75
11	0.43	0.00	0.00	0.00	0.00	0.00	0.00	1.1	7.5	1.5	0.86	0.79
12	0.51	0.00	0.00	0.00	0.00	0.00	0.00	1.3	7.2	1.5	0.52	0.82
13	0.48	0.00	0.00	0.00	0.00	0.00	0.00	2.3	7.0	1.5	0.21	1.3
14	0.47	0.00	0.00	0.00	0.00	0.00	0.00	3.1	6.6	1.6	0.85	0.93
15	0.51	0.00	0.00	0.00	0.00	0.00	0.00	3.8	6.2	2.1	0.83	0.83
16	0.46	0.00	0.00	0.00	0.00	0.00	0.00	4.8	5.8	1.7	0.77	0.83
17	0.45	0.00	0.00	0.00	0.00	0.00	0.00	6.3	5.5	1.5	0.76	0.77
18	0.14	0.00	0.00	0.00	0.00	0.00	0.00	6.0	5.1	2.2	0.79	0.83
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.0	4.7	1.8	0.75	0.90
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9	4.4	1.4	0.74	0.77
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9	4.0	1.3	0.70	0.72
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.9	3.8	1.2	0.80	0.85
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.6	3.6	1.2	0.80	0.97
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.9	3.3	1.2	0.71	0.90
25	0.00	0.00	0.00	0.00	0.00	0.00	e0.00	9.1	3.1	1.2	0.72	0.83
26	0.00	0.00	0.00	0.00	0.00	0.00	e0.00	9.7	2.9	1.1	0.69	0.78
27	0.00	0.00	0.00	0.00	0.00	0.00	e0.98	9.1	2.7	1.1	0.72	0.86
28	0.00	0.00	0.00	0.00	0.00	0.00	e3.5	8.3	2.5	1.4	0.71	0.85
29	0.00	0.00	0.00	0.00	---	0.00	e1.4	7.3	2.4	1.3	0.77	0.86
30	0.00	0.00	0.00	0.00	---	0.00	e1.0	6.2	2.4	1.1	1.1	0.77
31	0.00	---	0.00	0.00	---	0.00	---	5.4	---	1.0	1.0	---
TOTAL	7.72	0.00	0.00	0.00	0.00	0.00	6.88	124.13	162.2	48.4	25.84	24.89
MEAN	0.25	0.000	0.000	0.000	0.000	0.000	0.23	4.00	5.41	1.56	0.83	0.83
AC-FT	15	0	0	0	0	0	14	246	322	96	51	49
MAX	0.51	0.00	0.00	0.00	0.00	0.00	3.5	9.7	7.7	2.2	1.1	1.3
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	2.4	1.0	0.21	0.69

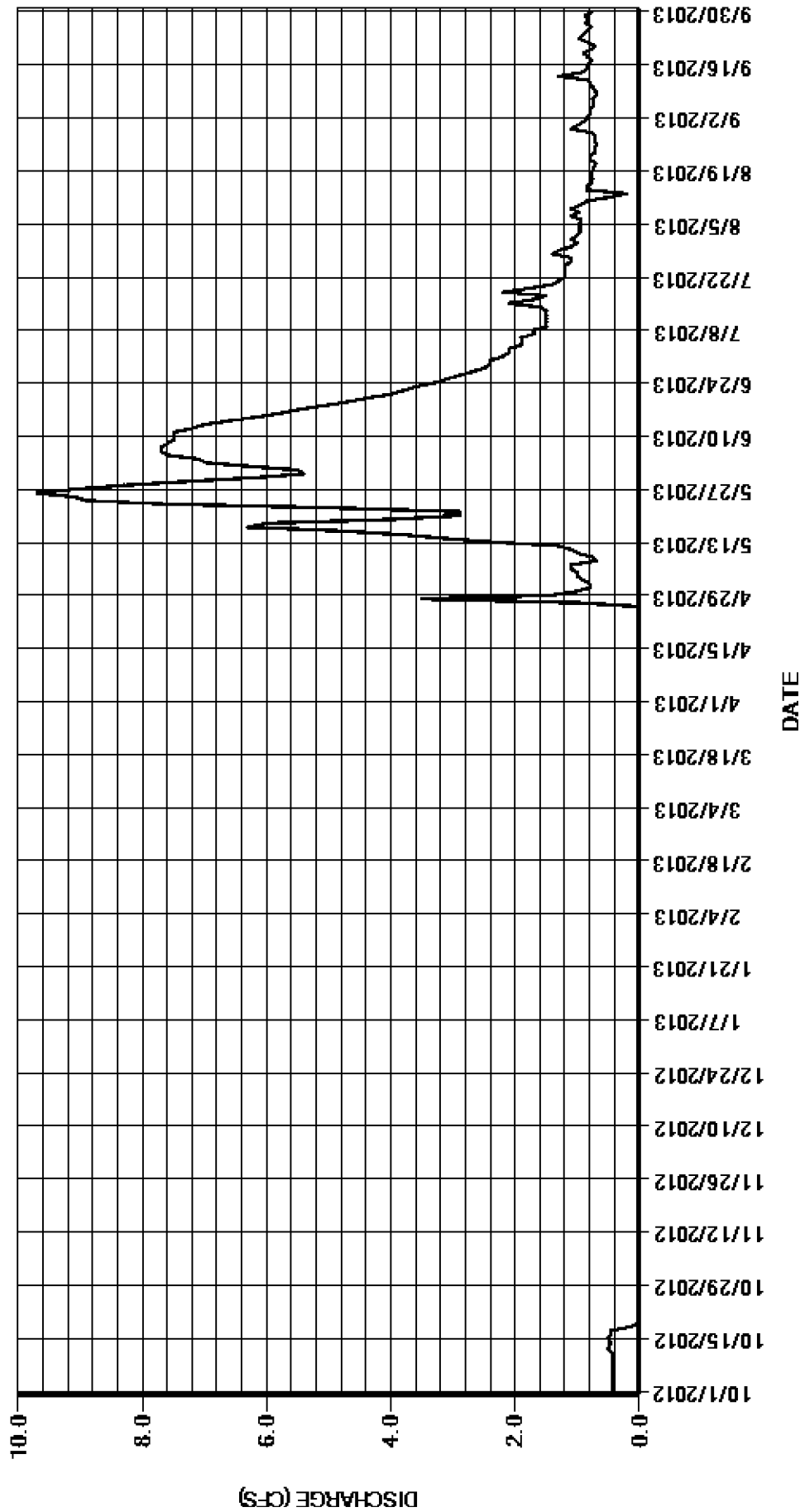
CAL YR	2012	TOTAL	137.30	MEAN	0.38	MAX	1.6	MIN	0.00	AC-FT	272
WTR YR	2013	TOTAL	400.06	MEAN	1.10	MAX	9.7	MIN	0.00	AC-FT	794

MAX DISCH: 15.7 CFS AT 18:00 ON MAY 26, 2013 GH 1.02 FT SHIFT -0.03 FT  
 MAX GH: 1.10 FT AT 10:45 ON APR 28, 2013 (Backwater from ice.)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



090062000 EWING DITCH AT TENNESSEE PASS  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
09062500 WURTZ DITCH NEAR TENNESSEE PASS  
Water Year 2013

Location.-- Lat. 39°21'15", Long. 106°21'09"; diverts water from tributaries of Eagle River in Colorado River basin to West Tennessee Creek (tributary to Tennessee Creek) in sec. 17, T.8 S., R.80 W., in Arkansas River basin.

Drainage Area and Period of Record.-- 5,840 acres; 1947-present.

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform and shaft encoder in a 30-inch diameter metal pipe shelter and well. Shaft encoder and chart are set to outside staff gage. Control is a 6-foot steel/concrete Parshall flume.

Hydrologic Conditions.-- The Wurtz Ditch, in combination with the Wurtz Ditch Extension, are categorized as transmountain diversion structures which intercept runoff from a drainage basin of approximately 5840 acres in the headwaters of the Eagle River basin and empties into West Tennessee Creek, a tributary of the Arkansas River. The conveyance of water across the Continental Divide is accomplished through saddles which traverse the divide. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except for the occasional low volume trail road. No hydrologic condition changes were apparent this water year.

Gage-Height Record.-- The primary record is 15-minute satellite data with chart record and DCP log as backup. The record is complete and reliable except May 5-7, 2013 when there was no satlink data during start up. Diversions this water year occurred from May 5 through Sep 30, 2013.

Datum Corrections.-- Levels were last run Sept 23, 2008. Some unevenness along the flume floor at the staff gage along with upstream apron elevation were noted.

Rating.-- Control is a 6-foot steel Parshall flume. A standard 6-ft. Parshall flume table (WURDITCO01 dated June 22, 1971) was used this water year. Three discharge measurements (Nos.105-107) were made during this water year. Measurements ranged in discharge from 2.48 to 21.2 cfs. These measurements cover the range of stage experienced for the water year except for lower flows of May 5-12, Jul 3-18, 20-31, Aug 1-31, Sept 1-12, 14-22, 24-30, 2013; and higher flows of May 24-29, Jun 3-12, 2013. The peak discharge of 48.3 cfs occurred at 2100 on Jun 5, 2013 at a gage height of 1.51 ft with a shift of +0.04 ft. It exceeded the stage of measurement 106, made May 12, 2013, by 0.62 feet.

Discharge.-- Measurements are made in the flume at the staff gage. Shifts were distributed using variable stage shift relationship WURDITCOVS12 which was developed by analysis of current and historical measurements. Measurements were adjusted between 3.57 and 7.83% to smooth shift distribution.

Special Computations.-- Hydrographic comparison was made with the upstream gage Wurtz Ditch Extension (WUREXTCO) to verify trends in flow. Missing data during May 5-7, 2013 was estimated based on available chart data.

Remarks.-- Record is considered good. The peak instantaneous discharge is rated good due to a related hydrographic measurement and site visits with no anomalies noted. Station maintained and record developed by Cheston Hart.

Recommendations.-- A new rating curve should be considered.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09062500 WURTZ DITCH NEAR TENNESSEE PASS

RATING TABLE-- WURDITCO01 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

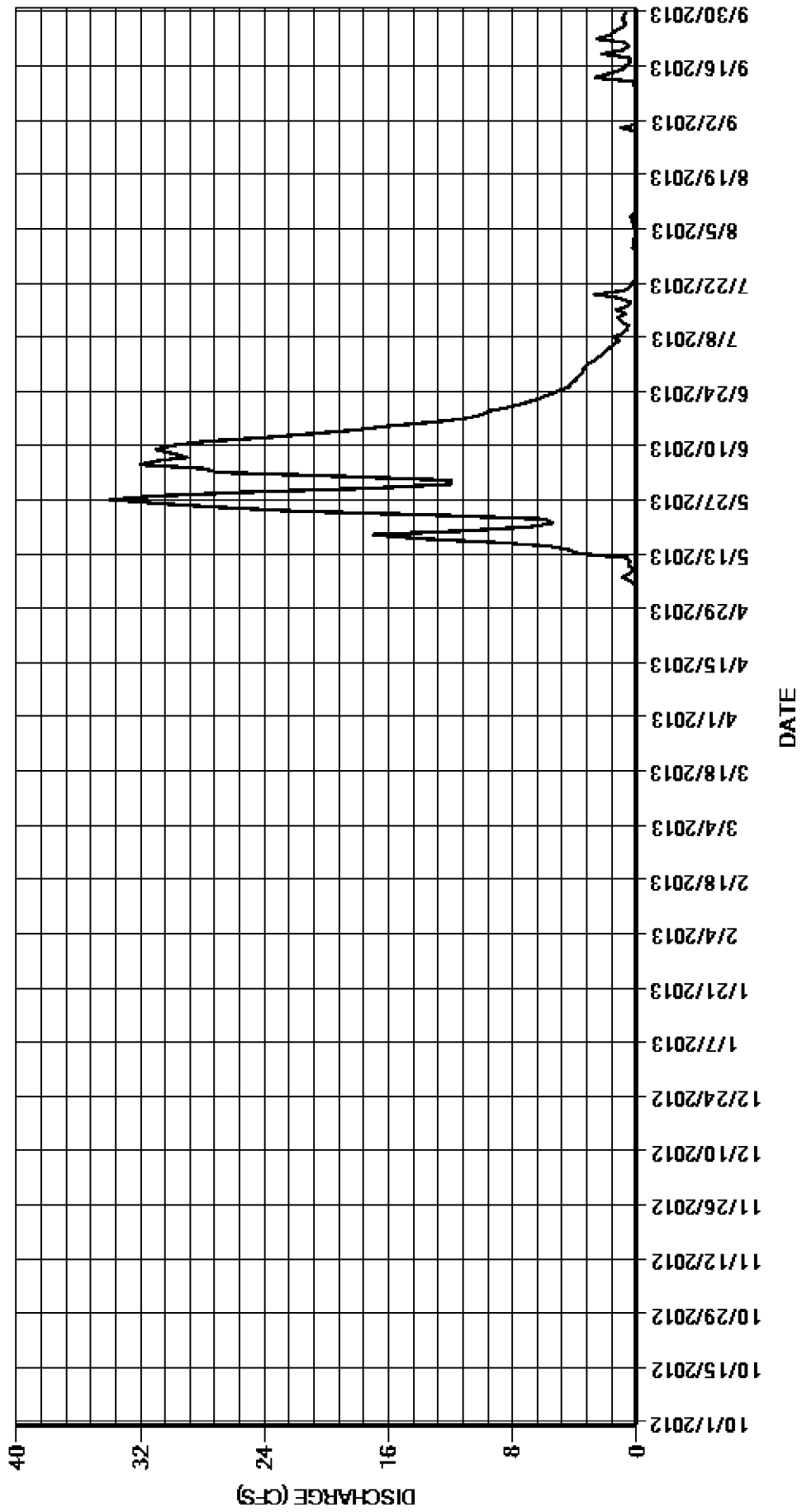
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	3.2	0.20	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	2.7	0.22	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27	2.4	0.05	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28	2.1	0.04	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.15	32	1.8	0.16	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.35	31	1.5	0.18	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.90	29	1.1	0.31	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43	30	1.5	0.37	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	31	0.92	0.08	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	30	0.63	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.46	28	0.56	0.00	0.16
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	24	0.96	0.00	0.18
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.7	21	1.2	0.00	2.7
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.4	18	0.70	0.00	1.8
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.7	16	1.3	0.00	0.97
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.2	13	0.60	0.00	0.73
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	11	0.39	0.00	0.43
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17	10	1.2	0.00	0.42
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	9.4	2.7	0.00	2.2
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.8	8.1	0.81	0.00	0.96
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.4	7.2	0.45	0.00	0.49
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.0	6.4	0.25	0.00	0.71
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	5.7	0.11	0.00	2.6
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22	5.1	0.09	0.00	1.7
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27	4.4	0.10	0.00	1.4
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31	4.2	0.00	0.00	0.88
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34	3.9	0.00	0.00	0.73
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31	3.7	0.00	0.00	0.91
29	0.00	0.00	0.00	0.00	---	0.00	0.00	25	3.5	0.00	0.00	0.82
30	0.00	0.00	0.00	0.00	---	0.00	0.00	17	3.4	0.03	0.00	0.66
31	0.00	---	0.00	0.00	---	0.00	---	12	---	0.26	1.0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	298.86	475.0	29.56	2.61	21.45
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	9.64	15.8	0.95	0.084	0.72
AC-FT	0	0	0	0	0	0	0	593	942	59	5.2	43
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34	32	3.2	1.0	2.7
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	0.00	0.00	0.00

CAL YR	2012	TOTAL	404.86	MEAN	1.11	MAX	10	MIN	0.00	AC-FT	803
WTR YR	2013	TOTAL	827.48	MEAN	2.27	MAX	34	MIN	0.00	AC-FT	1640

MAX DISCH: 48.3 CFS AT 21:00 ON JUN 05, 2013 GH 1.51 FT SHIFT 0.04 FT  
 MAX GH: 1.51 FT AT 21:00 ON JUN 05, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09062500 WURTZ DITCH NEAR TENNESSEE PASS  
 WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN

WURTZ EXTENSION

Water Year 2013

Location.-- Lat. 39°23'41", Long. 106°21'10", sec. 32, T.7 S., R.80 W., Eagle County.

Drainage Area and Period of Record.-- 5,840 acres.; N/A.

Equipment.-- Graphic water-stage recorder, A high data rate DCP satellite-monitored data collection platform and shaft encoder is installed in a 30-inch diameter metal pipe shelter and well. Stage discharge recorder and chart are set to outside staff gage. Control is a 6-foot, steel Parshall flume. No changes this water year.

Hydrologic Conditions.-- The Wurtz Extension Ditch, in combination with the Wurtz Ditch, are categorized as transmountain diversion structures which intercept runoff from a drainage basin of approximately 5,840 acres in the headwaters of the Eagle River basin and empties into West Tennessee Creek, a tributary of the Arkansas River. The conveyance of water across the Continental Divide is accomplished through saddles which traverse the divide. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except for the occasional low volume trail road. No hydrologic condition changes were apparent this water year.

Gage-Height Record.-- Primary record is 15-minute satellite data with chart record, DCP log and SDR as backup. The record is complete and reliable except May 17, 2013 when there was partial daily data during start up and May 18-19, 2013 when the gage height was affected by ice. Diversion occurred from May 17 through Sept 30, 2013.

Datum Corrections.-- No levels were run this year. Previous levels were run September 23, 2008. No datum corrections were necessary. Some unevenness along the flume floor and the position of the outside staff gage were noted

Rating.-- Control is a 6-foot, steel Parshall flume. A standard, 6-ft Parshall flume rating table (WUREXTCO01 dated June 22, 1971) was used this water year. One discharge measurement (No. 36) was made this year with a discharge of 5.44 cfs at a gage height of 0.39 ft. This measurement reflects the lower end of the rating which was experienced all of the water year. The peak flow of 7.20 cfs occurred at 2015 on May 27, 2013 at a gage height of 0.48 ft. and shift of -0.01 ft. It exceeded the stage of Measurement No. 36, made June 12, 2013, by 0.09 ft.

Discharge.-- Shifts were distributed using variable stage-shift relationship WUREXTCOVSC010 which was developed by analysis of current and historical measurements.

Special Computations.-- Ice effected days are estimated using straight line method, chart and surrounding good data.

Remarks.-- Overall the record is considered good. The peak is also considered good based upon the site visits and related measurement. Station maintained and record developed by Cheston Hart.

Recommendations.-- A flume inspection should be performed to confirm the staff gage location and floor elevations. Depending on the need for flume repairs or replacement, a new rating curve should be considered which incorporates values from the variable shift curve which is being used.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

WURTZ EXTENSION

RATING TABLE-- WUREXTCO01 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

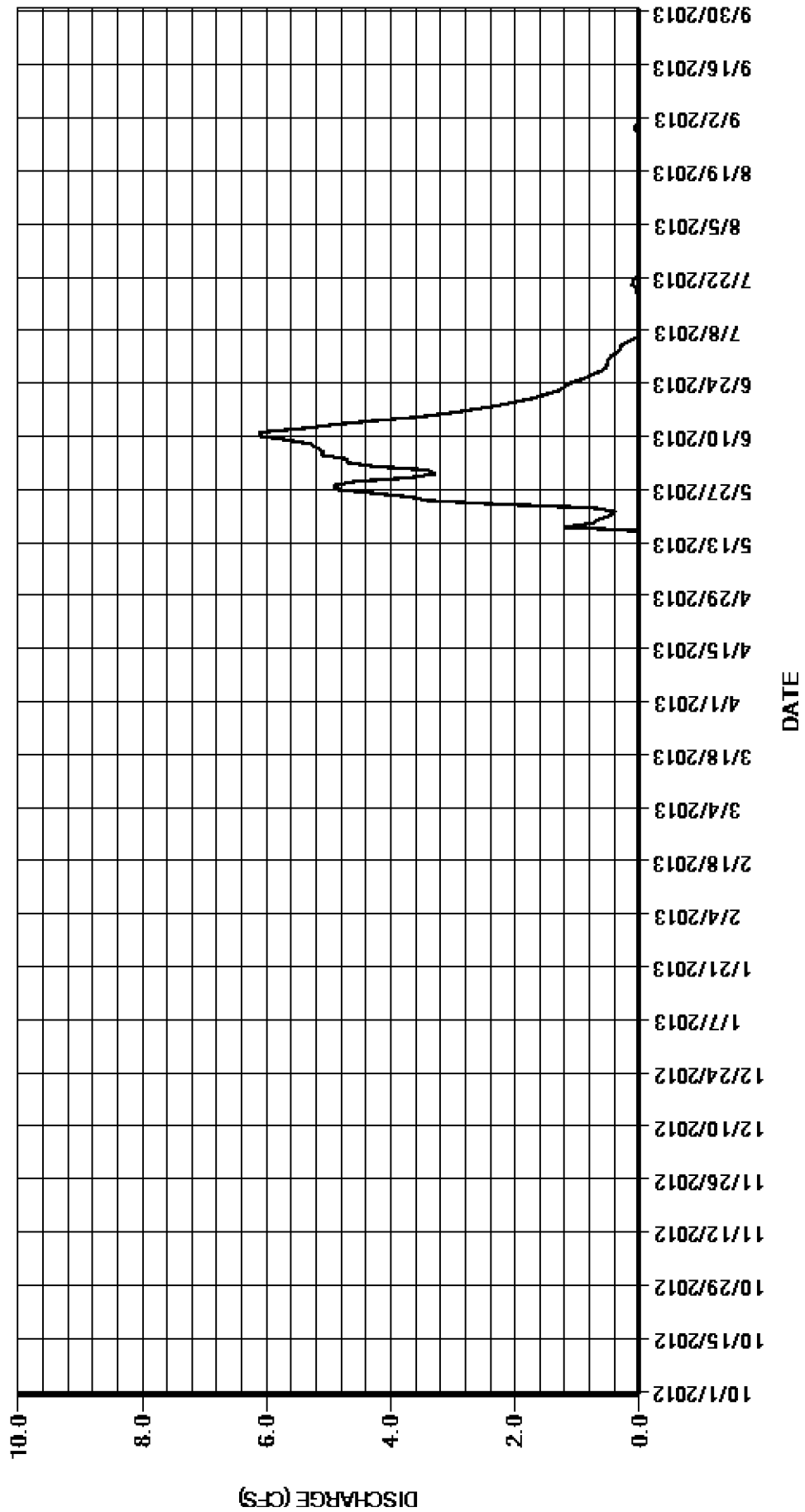
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	0.46	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.3	0.36	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	0.31	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	0.29	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.1	0.18	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.1	0.02	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.2	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.3	0.02	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.7	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.1	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.1	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.4	0.01	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.9	0.01	0.00	0.02
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.3	0.02	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	0.02	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e1.2	2.7	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.75	2.3	0.05	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.65	2.0	0.04	0.00	0.01
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.48	1.7	0.12	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	1.5	0.10	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73	1.3	0.05	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.3	1.2	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	1.1	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.7	0.92	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.3	0.79	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.9	0.65	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.9	0.54	0.03	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	4.6	0.52	0.02	0.01	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	3.7	0.51	0.00	0.07	0.00
31	0.00	---	0.00	0.00	---	0.00	---	3.3	---	0.00	0.06	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	39.31	94.73	2.11	0.14	0.03
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.27	3.16	0.068	0.005	0.001
AC-FT	0	0	0	0	0	0	0	78	188	4.2	0.3	.06
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.9	6.1	0.46	0.07	0.02
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51	0.00	0.00	0.00

CAL YR	2012	TOTAL	47.36	MEAN	0.13	MAX	1.5	MIN	0.00	AC-FT	94
WTR YR	2013	TOTAL	136.32	MEAN	0.37	MAX	6.1	MIN	0.00	AC-FT	270

MAX DISCH: 7.20 CFS AT 20:15 ON MAY 27, 2013 GH 0.48 FT SHIFT -0.01 FT  
 MAX GH: 0.48 FT AT 20:15 ON MAY 27, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WURTZ EXTENSION  
WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
09063700 HOMESTAKE TUNNEL  
Water Year 2013

Location.-- Lat. 39°16'52", Long. 106°25'56"; Homestake tunnel diverts water from Homestake Lake, in sec. 17, T. 8 S., R. 81 W., in Eagle River basin, to Lake Fork Creek in Arkansas River basin.

Drainage Area and Period of Record.-- Basin above Homestake Reservoir is approx 28,160 acres.; 1967-present.

Equipment.-- Graphic water-stage recorder, high-data rate satellite-monitored data collection platform (DCP) and stage discharge recorder (SDR) in a 4 ft x 4 ft wood shelter and concrete well. Stage discharge recorder is set to inside electric tape gage and outside staff gage. Control is a 12-foot concrete Parshall flume. No changes this water year.

Hydrologic Conditions.-- The Homestake Project is categorized as a transmountain diversion structure that collects water from the headwaters of the Eagle River, northwest of Leadville. Water is diverted from several tributaries of Homestake Creek and routed to Homestake Reservoir. Diversions then pass from the reservoir through the Homestake Tunnel to Lake Fork Creek, above Turquoise Reservoir. The collection basin consists primarily of high mountain terrain, some of which is above tree line with no urban development. No hydrologic condition changes were apparent this water year. Homestake Reservoir was drained to allow repairs on the dam during 2012-2013. Repairs will continue in 2014.

Gage-Height Record.-- The primary record is 15-minute satellite data with the DCP and stage discharge recorder logs used for backup purposes. The record is complete and reliable for the seasonally operated gage except for occasional missing data throughout the discharge period which was replaced with backup DCP data.

Datum Corrections.-- Levels were last run on Aug 22, 2013 with no corrections required.

Rating.-- A standard 12-ft. Parshall flume rating table (HOMTUNCO01 dated June 11, 1975) was used the entire water year. Five discharge measurements (No. 128-132) were made this year with measured discharges ranging from 125 cfs to 302 cfs which covered the range in stage except lower days of Oct 1-Dec 31, 2012; Jan 1-May 29; June 25-27; July 1-9, 12-31; Aug 1-Sept 30, 2013. Daily flows varied during the water year from zero to 279 cfs. The instantaneous peak discharge of 283 cfs occurred at 1015 on May 31, 2013 at a gage height of 2.97 ft and a shift of +0.11 ft. This peak exceeded the stage of the measurement No. 132 by 0.05 feet.

Discharge.-- Conventional measurements are made from a bridge near the intake/staff gage position. ADCP measurements were made upstream approx 15' from a temporary cable system. Shifts were applied as defined by measurements and were distributed by stage using variable stage-shift relationship HOMTUNCOVS12 which was utilized during the water year and developed using current and past measurement data. HOMTUNCOVS12 is used per an agreement between the water user and DWR. WY2012 measurements showed raw shifts ranging from +0.08 to +0.29 ft. Subsequent measurements will continue being made to reinforce the direction of the curve. Measurement No. 128, and 130-132 were discounted between -2.0% to 9% to fit the existing variable.

Special Computations.-- No special computations were used this water year.

Remarks.-- Record is considered fair, due to the fact most measurements are rated fair to poor given the surging effect of flows from the tunnel and through the flume. ADCP measurements were made as a test using a temporary cable system just above the flume. It was found using the ADCP and Section by Section method is a valid alternative to the historical conventional round rod method. Continued testing and usage of the ADCP will prove its validity. The peak gage height and flow are considered fair due to the surging effect. Station maintained and record developed by Cheston Hart.

Recommendations.-- Continued research should be attempted to reduce the surge effect. The water user has agreed to research anti surge devices and potentially rebuild the current control.



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09063700 HOMESTAKE TUNNEL

RATING TABLE-- HONTUNCO01 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

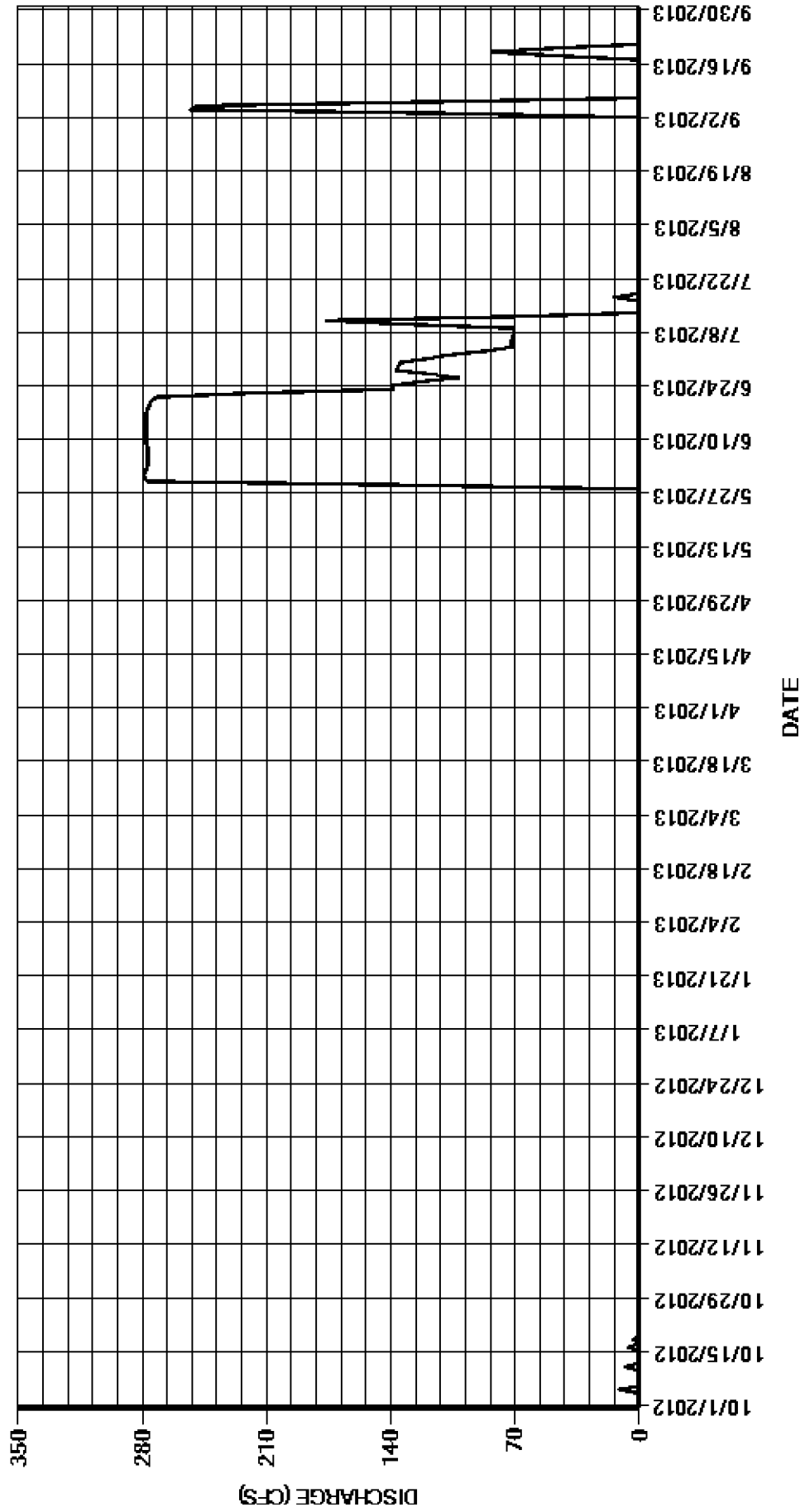
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.82	0.05	0.00	0.00	0.00	0.00	0.00	279	120	0.00	0.00
2	0.00	0.60	0.03	0.00	0.00	0.00	0.00	0.00	278	107	0.00	0.00
3	0.00	0.52	0.03	0.00	0.00	0.00	0.00	0.00	277	87	0.00	97
4	0.00	0.52	0.03	0.00	0.00	0.00	0.00	0.00	277	72	0.00	253
5	11	0.52	0.03	0.00	0.00	0.00	0.00	0.00	277	72	0.00	249
6	0.00	0.52	0.03	0.00	0.00	0.00	0.00	0.00	277	72	0.00	119
7	0.00	0.52	0.03	0.00	0.00	0.00	0.00	0.00	277	71	0.00	0.00
8	0.00	0.47	0.03	0.00	0.00	0.00	0.00	0.00	277	71	0.00	0.00
9	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	278	71	0.00	0.00
10	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	278	129	0.00	0.00
11	8.0	0.39	0.00	0.00	0.00	0.00	0.00	0.00	278	176	0.00	0.00
12	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	278	71	0.00	0.00
13	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	278	0.00	0.00	0.00
14	0.00	0.31	0.00	0.00	0.00	0.00	0.00	0.00	278	0.00	0.00	0.00
15	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.00	278	0.00	0.00	0.00
16	6.2	0.27	0.00	0.00	0.00	0.00	0.00	0.00	278	0.00	0.00	0.00
17	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.00	278	14	0.00	0.00
18	3.7	0.27	0.00	0.00	0.00	0.00	0.00	0.00	277	0.00	0.00	46
19	1.0	0.40	0.00	0.00	0.00	0.00	0.00	0.00	276	0.00	0.00	83
20	0.99	0.52	0.00	0.00	0.00	0.00	0.00	0.00	275	0.00	0.00	49
21	0.99	0.34	0.00	0.00	0.00	0.00	0.00	0.00	272	0.00	0.00	0.00
22	0.99	0.17	0.00	0.00	0.00	0.00	0.00	0.00	220	0.00	0.00	0.00
23	1.1	0.17	0.00	0.00	0.00	0.00	0.00	0.00	139	0.00	0.00	0.00
24	0.99	0.17	0.00	0.00	0.00	0.00	0.00	0.00	139	0.00	0.00	0.00
25	0.99	0.16	0.00	0.00	0.00	0.00	0.00	0.00	123	0.00	0.00	0.00
26	0.99	0.09	0.00	0.00	0.00	0.00	0.00	0.00	102	0.00	0.00	0.00
27	0.99	0.09	0.00	0.00	0.00	0.00	0.00	0.00	117	0.00	0.00	0.00
28	0.83	0.09	0.00	0.00	0.00	0.00	0.00	0.00	137	0.00	0.00	0.00
29	0.82	0.09	0.00	0.00	---	0.00	0.00	123	136	0.00	0.00	0.00
30	0.82	0.09	0.00	0.00	---	0.00	0.00	277	135	0.00	0.00	0.00
31	0.82	---	0.00	0.00	---	0.00	---	279	---	0.00	0.00	---
TOTAL	41.22	10.21	0.26	0.00	0.00	0.00	0.00	679.00	7069	1133.00	0.00	896.00
MEAN	1.33	0.34	0.008	0.000	0.000	0.000	0.000	21.9	236	36.5	0.000	29.9
AC-FT	82	20	0.5	0	0	0	0	1350	14020	2250	0	1780
MAX	11	0.82	0.05	0.00	0.00	0.00	0.00	279	279	176	0.00	253
MIN	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	102	0.00	0.00	0.00

CAL YR	2012	TOTAL	13444.20	MEAN	36.7	MAX	262	MIN	0.00	AC-FT	26670
WTR YR	2013	TOTAL	9828.69	MEAN	26.9	MAX	279	MIN	0.00	AC-FT	19500

MAX DISCH: 283 CFS AT 10:15 ON MAY 31, 2013 GH 2.97 FT SHIFT 0.11 FT  
 MAX GH: 2.97 FT AT 10:15 ON MAY 31, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09063700 HOMESTAKE TUNNEL  
 WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
09077160 CHARLES H. BOUSTEAD TUNNEL  
Water Year 2013

Location.-- Lat. 39°16'40", Long. 106°25'40"; Charles H. Boustead Tunnel diverts water from the main stem and tributaries of the Fryingpan River in the Colorado River basin, to Lake Fork Creek in sec. 10, T. 9 S., R. 81 W., in the Arkansas River basin.

Drainage Area and Period of Record.-- Potential drainage basin above tunnel inlet is 12,160 acres.; 1972-present

Equipment.-- Stage discharge recorder (SDR) and satellite-monitored data collection platform in a 5 ft x 5 ft concrete shelter and stilling well at a 15-foot concrete Parshall Flume. The SDR is set to inside electric tape gage. Outside staff gage used for supplemental reference gage. Bridge across concrete section at the entrance to the converging section of the flume is used for making high water cable and ADCP measurements. No changes this water year.

Hydrologic Conditions.-- The Charles H. Boustead Tunnel (a.k.a. Divide Tunnel) transports water from the Fryingpan River under the Continental Divide to the head of Turquoise Reservoir in the Arkansas River Basin. Diversions from the west slope are made from an elevation of 10,002 feet. The Boustead Tunnel is approximately 5.4 miles long, is horseshoe shaped with a diameter of 10.5 feet, has a maximum overburden of approximately 2000 feet, and a decreed capacity of 1000 cubic feet per second. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except for the low volume trail road. No hydrologic condition changes were apparent this water year.

Gage-Height Record.-- Primary record is 15-minute satellite data with the SDR/DCP data used for backup purposes. Record is complete and reliable.

Datum Corrections.-- Levels were last run on Aug 11, 2005. Elevation control was established using RM #1 (Elev 9.75) as base. No corrections were necessary.

Rating.-- Control is a 15-foot concrete Parshall Flume. A standard 15-ft. Parshall flume table (BOUTUNCO01 dated May 16, 1972) was used this water year. Four discharge measurements (No. 72-75) were made during this year. Measurements range in discharge from 116 cfs to 891 cfs. They covered the range in flows except for the lower daily flows of Oct 1- Dec 31, 2012; Jan 1 - May 15, 21, 22; June 29 - July 1, 3-31; Aug 1 - Sept 30, 2013; and the higher mean daily flows of June 10, 11, 2013. The peak flow of 950 cfs occurred at 2030 on June 9, 2013 at a gage height of 5.49 ft with a shift of +0.26 ft. It exceeded the stage of Meas. 74, made June 11, 2013, by 0.27 feet.

Discharge.-- Shifts were distributed by stage the entire year using shift curve BOUTUNCOVS09 which is based on a number of previous and current year measurements. BOUTUNCOVS09 is applied based on an agreement with USBR and CODWR. Measurement 72-75 were discounted between -1.69% - 10.6% to smooth distribution and fit the historically approved shift curve.

Special Computations.-- Missing data on Mar 10, 2013 is due to daylight savings time. No ice days were found due to temperature of water coming from tunnel.

Remarks.-- Record is considered good the entire year except through times with limited access, Dec 1, 2012 through May 16, 2013, when record should be considered poor. The peak event is rated good based on related measurements and site visits. The Boustead Tunnel flume is located approximately 90 feet downstream of the mouth of Boustead Tunnel. The approach channel from the mouth of the tunnel to the flume is a concrete rectangular section. The channel section diverges in width from the tunnel width at the mouth to a width of approximately 25 feet over a distance of about 70 feet. This is followed by approximately 20 feet of channel having a constant 25-ft width. This constant width section ends at the flume entrance. The floor of the approach channel is flat. There are no provisions over this 90-foot reach for a deeper channel section prior to the flume entrance, nor any other channel modifications, to help still and slow the flow to the recommended tranquil flow conditions. Observations of flow conditions at higher stages over the past several years have indicated the approach velocities to the flume are too high and poorly distributed by the time flow reaches the flume entrance. This results in increasing positive shifts to the rating as stage increases. Station operated and record developed by Cheston Hart.

Recommendations.-- Usage of new software and updates to the ADCP boat has improved the accuracy and ability to use this device at higher flows than in the past. Continued use of this device should be attempted to better test its accuracy at higher flows and under surging conditions.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09077160 CHARLES H. BOUSTEAD TUNNEL

RATING TABLE-- BOUTUNCO01 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

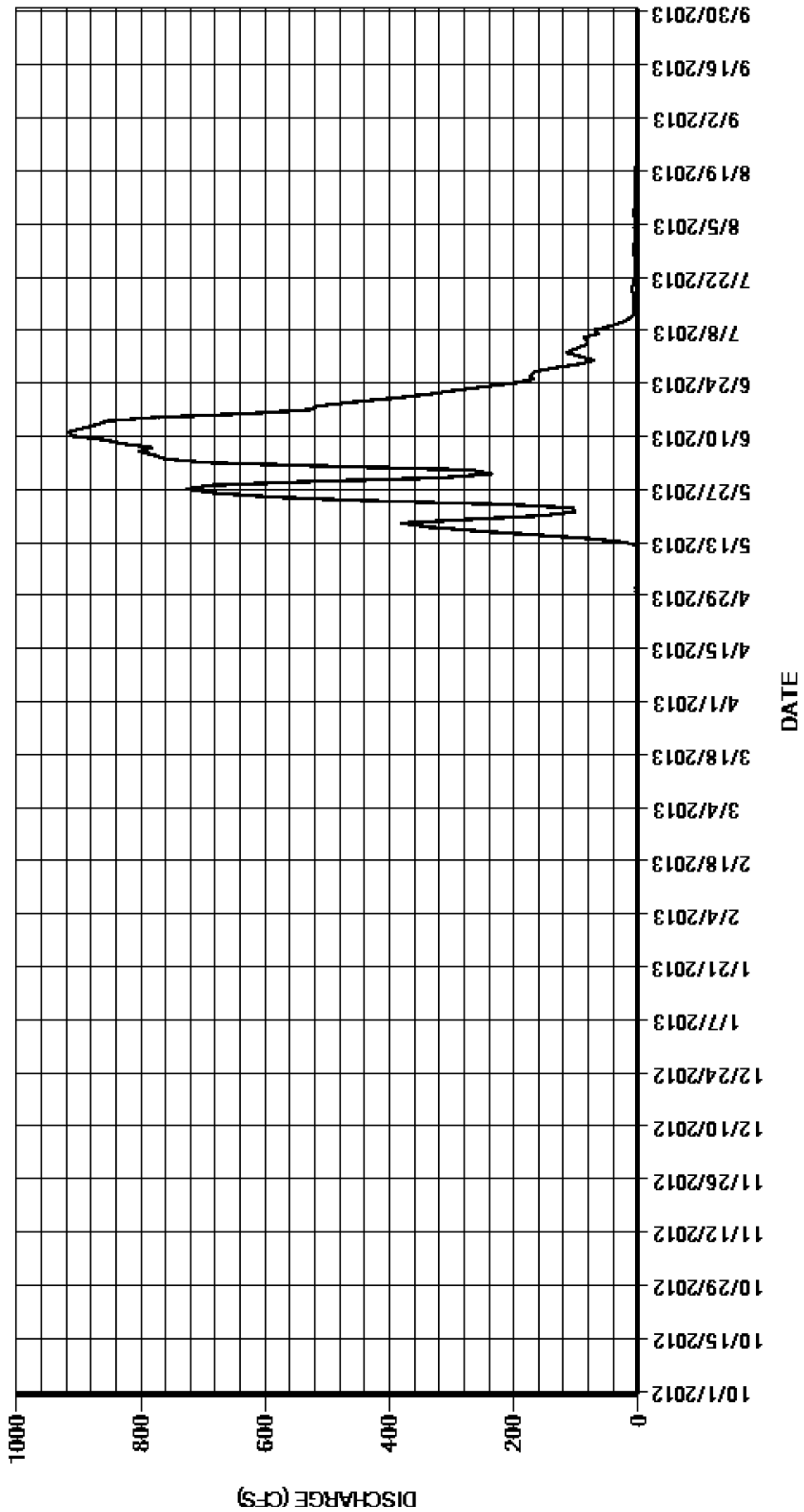
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.9	1.7	1.2	1.2	1.7	1.9	1.7	3.6	267	93	5.9	1.9
2	1.8	1.7	1.2	1.2	1.7	1.9	1.7	3.2	499	116	5.9	1.9
3	1.7	1.7	1.2	1.2	1.7	2.1	1.7	2.8	695	101	5.6	1.9
4	1.7	1.7	1.2	1.2	1.7	2.2	1.7	2.8	762	85	6.1	1.9
5	1.7	1.8	1.2	1.2	1.7	2.2	1.7	2.8	778	81	5.8	1.9
6	1.7	1.9	1.2	1.2	1.7	2.2	1.7	2.8	802	87	5.7	1.9
7	1.7	1.8	1.2	1.2	1.7	2.2	1.7	2.8	783	65	6.3	1.9
8	1.7	1.8	1.2	1.2	1.7	2.2	1.7	2.8	829	70	6.4	1.9
9	1.7	1.8	1.2	1.2	1.7	2.2	1.7	2.9	858	46	6.2	1.9
10	1.7	1.7	1.2	1.2	1.7	2.2	1.7	2.8	910	27	5.8	1.9
11	1.7	1.7	1.2	1.2	1.7	2.2	1.7	2.9	917	15	5.4	1.9
12	1.7	1.7	1.2	1.2	1.7	2.2	1.7	3.2	894	7.5	5.3	1.9
13	1.7	1.7	1.2	1.2	1.7	2.2	1.7	19	871	7.5	5.3	1.9
14	1.7	1.5	1.2	1.2	1.7	2.2	1.7	79	853	7.5	5.2	1.9
15	1.7	1.4	1.2	1.2	1.8	2.2	1.7	170	772	7.4	5.0	1.9
16	1.6	1.4	1.2	1.2	1.9	2.2	1.7	259	624	6.7	4.6	1.9
17	1.4	1.4	1.2	1.2	1.9	2.2	1.7	335	529	6.2	4.4	1.9
18	1.4	1.4	1.2	1.2	1.9	2.2	1.7	380	514	8.8	4.4	1.9
19	1.4	1.4	1.2	1.2	1.9	2.2	1.7	274	458	11	4.6	1.9
20	1.4	1.3	1.2	1.2	1.9	2.3	2.2	152	393	7.5	3.6	1.9
21	1.4	1.2	1.2	1.2	1.9	2.3	2.5	102	337	6.5	2.2	1.9
22	1.4	1.2	1.2	1.2	1.9	2.2	2.5	105	297	5.9	2.2	1.9
23	1.4	1.2	1.2	1.2	1.9	2.2	2.5	223	247	5.5	2.2	1.9
24	1.4	1.2	1.2	1.2	1.9	2.2	2.5	445	197	5.4	2.3	1.9
25	1.4	1.2	1.2	1.2	1.9	2.2	2.5	592	169	5.7	2.3	1.9
26	1.4	1.2	1.2	1.3	1.9	2.2	2.5	681	173	5.4	2.3	1.9
27	1.5	1.0	1.2	1.4	1.9	2.0	2.5	726	167	5.2	2.3	1.9
28	1.6	1.1	1.2	1.5	1.9	1.7	2.7	690	137	8.4	2.2	1.9
29	1.7	1.1	1.2	1.4	---	1.7	3.1	527	96	8.2	1.9	1.9
30	1.7	1.1	1.2	1.6	---	1.7	3.5	315	71	6.7	1.8	1.9
31	1.7	---	1.2	1.7	---	1.7	---	237	---	6.0	1.9	---
TOTAL	49.6	44.0	37.2	38.9	50.3	65.5	61.3	6346.4	15899	925.0	131.1	57.0
MEAN	1.60	1.47	1.20	1.25	1.80	2.11	2.04	205	530	29.8	4.23	1.90
AC-FT	98	87	74	77	100	130	122	12590	31540	1830	260	113
MAX	1.9	1.9	1.2	1.7	1.9	2.3	3.5	726	917	116	6.4	1.9
MIN	1.4	1.0	1.2	1.2	1.7	1.7	1.7	2.8	71	5.2	1.8	1.9

CAL YR	2012	TOTAL	6958.8	MEAN	19.0	MAX	284	MIN	1.0	AC-FT	13800
WTR YR	2013	TOTAL	23705.3	MEAN	64.9	MAX	917	MIN	1.0	AC-FT	47020

MAX DISCH: 950 CFS AT 20:30 ON JUN 09, 2013 GH 5.49 FT SHIFT 0.26 FT  
 MAX GH: 5.49 FT AT 20:30 ON JUN 09, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077160 CHARLES H. BOUSTEAD TUNNEL  
 WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
09077500 BUSK-IVANHOE TUNNEL  
Water Year 2013

Location.-- Lat. 39°14'55", Long. 106°28'14"; Water diverted from Ivanhoe Lake, tributary to Fryingpan River in sec. 13, T. 9 S., R. 82 W., in Roaring Fork River Basin, to Busk Creek (tributary to Lake Fork) in sec. 20, T. 9 S., R. 81 W., in Arkansas River Basin.

Drainage Area and Period of Record.-- Drainage area is determined by diversions into Ivanhoe lake and can vary.; 1948-present.

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform (High data rate DCP and logger) and Stage Discharge Recorder (SDR) in a 3 ft x 3 ft metal shelter and well. SDR and chart recorder are set to outside staff gage. Control is a 5-foot steel Parshall flume. No changes this water year.

Hydrologic Conditions.-- The Busk-Ivanhoe Tunnel (a.k.a. the Carlton Tunnel) was originally built as a railroad tunnel. The tunnel diverts water from the headwaters of Ivanhoe Creek, a tributary of the Fryingpan River. The Tunnel is 1.3 miles long and delivers the water to Busk Creek, which is tributary to the Turquoise Reservoir of the Arkansas River Basin. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except for the occasional low volume trail road. No hydraulic condition changes were apparent this water year.

Gage-Height Record.-- The primary record is 15-minute satellite data with chart record and SDR log as backup. Record is complete and reliable the entire water year.

Datum Corrections.-- Levels have not been run since new flume was installed.

Rating.-- A standard 5-ft. Parshall flume table (STD05FTP09) was used the entire water year. Two discharge measurements (Nos. 116-117), ranging in discharge from 36.1 to 41.7 cfs, were made during the year. They covered the range in flows except for the lower daily flows of Oct 1, 2012 - May 26, 28, 30, 31; Jun 1, 2, 5, 7, 9; Jul 1- Sept 30, 2013; and the higher mean daily flows of Jun 12-28, 2013. The peak discharge of 49.1 cfs occurred at 2300 on Jun 11, 2013 at a gage height of 1.72 ft with a shift of +0.04 ft. The peak exceeded the stage of high flow measurement 117, made Jun 27, 2013 by 0.14 feet.

Discharge.-- Shifts were distributed by stage using variable stage shift relation BUSTUNCOVS13 the entire water year. Measurements show raw shifts ranging from 0.01 to 0.04 ft. Measurement 117 was adjusted by -3% to fit the variable curve used. BUSTUNCOVS13 was created based on current and historical measurements.

Special Computations.-- No special computations were used this water year.

Remarks.-- Gage is operated during the winter months without a chart. The site is visited by Pueblo Board of Water Works and DWR hydro staff by snow machine during the months that the gage is not accessible by vehicle. The gage remains ice free by running a 1-inch water line from the tunnel directly into the well. The flume inlet is 2-in diameter, which allows a constant flow through the inlet and helps keep the well thawed and accurate. Overall the record is considered good, except for the winter operation months of October thru June 6th and those are considered poor. The peak gage height and discharge are also considered good since a site visit was made the same day of the peak event. Station maintained and record developed by Cheston Hart.

Recommendations.-- Approach conditions need to be improved so the Parshall flume can be operated in a more predicable manner. Currently datum corrections that appear during higher flows appear to be caused by waves found at staff gage. PBWW and DWR staff is looking at options to improve upstream conditions.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09077500 BUSK-IVANHOE TUNNEL

RATING TABLE-- STD05FTP09 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

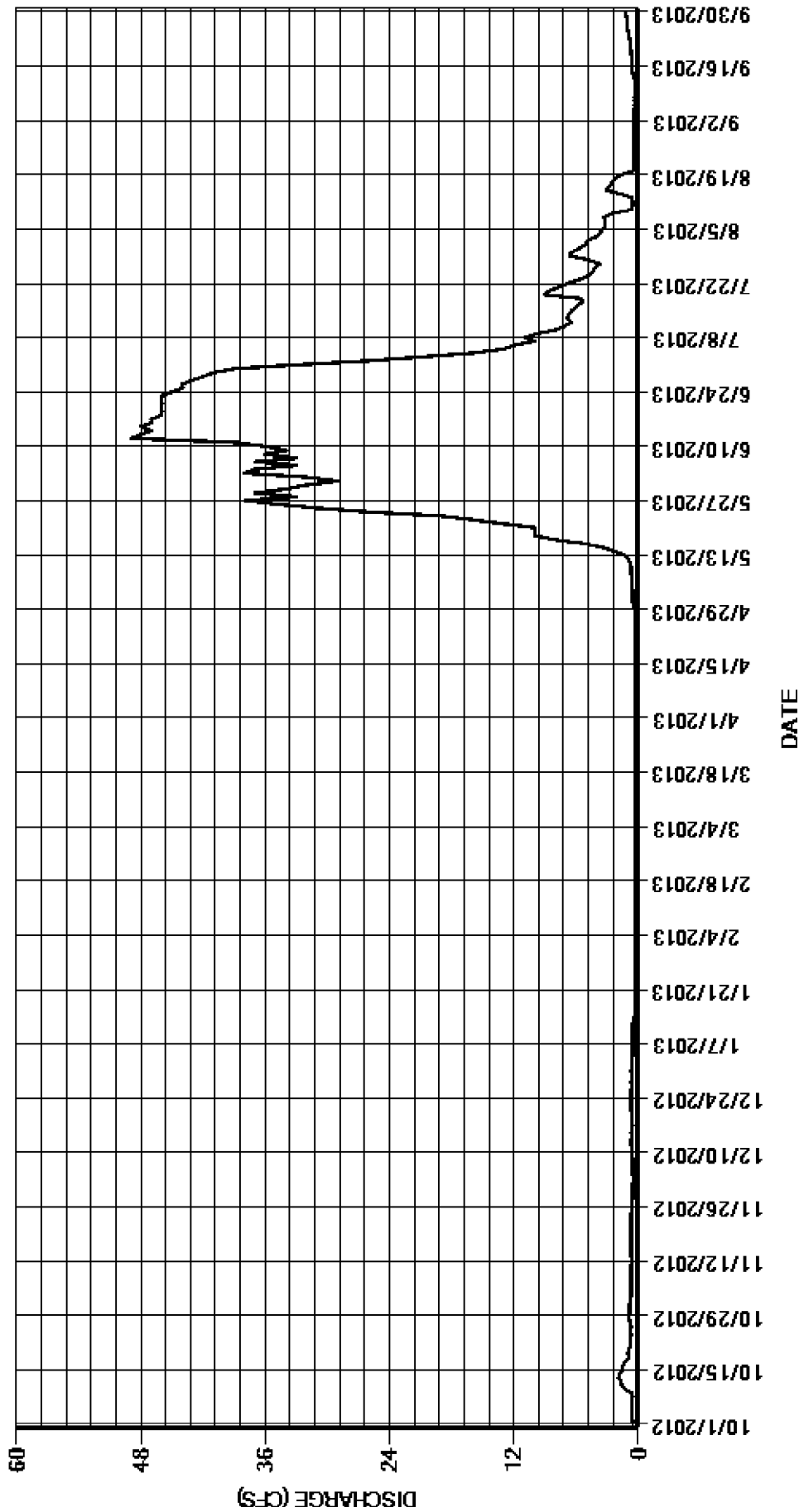
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.53	0.82	0.52	0.65	0.23	0.23	0.23	0.59	29	33	5.1	0.44
2	0.57	0.78	0.52	0.60	0.23	0.23	0.23	0.52	32	26	4.9	0.44
3	0.60	0.72	0.48	0.60	0.23	0.23	0.23	0.53	38	21	4.1	0.44
4	0.60	0.69	0.52	0.55	0.23	0.23	0.23	0.57	37	16	3.7	0.42
5	0.60	0.69	0.52	0.52	0.23	0.23	0.23	0.60	33	13	3.4	0.36
6	0.60	0.69	0.52	0.52	0.23	0.23	0.23	0.60	37	12	3.2	0.36
7	0.60	0.69	0.52	0.52	0.23	0.23	0.23	0.63	33	10	3.2	0.36
8	0.56	0.69	0.52	0.52	0.23	0.23	0.23	0.69	36	11	3.3	0.36
9	0.70	0.69	0.62	0.52	0.23	0.23	0.23	0.69	34	9.9	2.5	0.32
10	1.3	0.69	0.62	0.52	0.23	0.23	0.23	0.70	36	8.0	0.61	0.29
11	1.6	0.67	0.65	0.52	0.23	0.23	0.23	0.81	39	7.1	0.56	0.29
12	1.7	0.64	0.69	0.58	0.23	0.23	0.23	0.99	49	6.5	0.54	0.29
13	1.9	0.69	0.69	0.45	0.23	0.23	0.23	1.4	48	6.9	0.59	0.38
14	1.8	0.69	0.64	0.37	0.23	0.23	0.23	2.4	47	6.7	1.7	0.52
15	1.5	0.69	0.69	0.30	0.23	0.23	0.23	3.6	48	6.4	3.1	0.63
16	1.5	0.69	0.62	0.26	0.23	0.23	0.23	5.5	47	6.0	2.8	0.65
17	1.3	0.69	0.57	0.23	0.23	0.23	0.23	8.2	47	5.4	2.5	0.60
18	0.91	0.69	0.59	0.23	0.23	0.23	0.23	10	46	5.5	2.2	0.65
19	1.0	0.69	0.61	0.23	0.23	0.23	0.23	10	46	9.0	1.5	0.69
20	0.90	0.69	0.66	0.23	0.23	0.23	0.23	10	46	8.7	0.46	0.69
21	0.80	0.69	0.69	0.23	0.23	0.23	0.23	13	46	7.7	0.44	0.78
22	0.78	0.69	0.69	0.23	0.23	0.23	0.23	16	46	6.8	0.43	0.78
23	0.78	0.69	0.69	0.23	0.23	0.23	0.23	19	46	5.7	0.44	0.83
24	0.71	0.69	0.69	0.23	0.23	0.23	0.23	26	45	4.8	0.44	0.91
25	0.74	0.66	0.69	0.23	0.23	0.23	0.23	31	44	4.4	0.44	1.0
26	0.71	0.61	0.69	0.23	0.23	0.23	0.23	35	44	4.2	0.44	1.1
27	0.79	0.60	0.63	0.23	0.23	0.23	0.23	38	43	3.7	0.44	1.1
28	0.87	0.58	0.69	0.23	0.23	0.23	0.25	33	42	4.8	0.44	1.1
29	0.88	0.53	0.64	0.23	---	0.23	0.34	37	41	6.6	0.43	1.2
30	0.85	0.52	0.65	0.23	---	0.23	0.48	34	39	6.5	0.44	1.2
31	0.85	---	0.69	0.23	---	0.23	---	32	---	5.7	0.44	---
TOTAL	29.53	20.24	19.21	11.45	6.44	7.13	7.28	373.02	1244	289.0	54.78	19.18
MEAN	0.95	0.67	0.62	0.37	0.23	0.23	0.24	12.0	41.5	9.32	1.77	0.64
AC-FT	59	40	38	23	13	14	14	740	2470	573	109	38
MAX	1.9	0.82	0.69	0.65	0.23	0.23	0.48	38	49	33	5.1	1.2
MIN	0.53	0.52	0.48	0.23	0.23	0.23	0.23	0.52	29	3.7	0.43	0.29

CAL YR	2012	TOTAL	1502.65	MEAN	4.11	MAX	38	MIN	0.29	AC-FT	2980
WTR YR	2013	TOTAL	2081.26	MEAN	5.70	MAX	49	MIN	0.23	AC-FT	4130

MAX DISCH: 49.1 CFS AT 23:00 ON JUN 11, 2013 GH 1.72 FT SHIFT 0.04 FT  
 MAX GH: 1.72 FT AT 23:00 ON JUN 11, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077500 BUSK-IVANHOE TUNNEL  
WY2013 HYDROGRAPH





ARKANSAS RIVER BASIN  
09073000 TWIN LAKES TUNNEL  
Water Year 2013

Location.-- Lat. 39°04'56", Long. 106°32'24"; diverts water from tributaries of Roaring Fork River in Colorado River Basin to North Fork Lake Creek in sec. 22, T.11 S., R.82 W., in Arkansas River Basin.

Drainage Area and Period of Record.-- N/A; 1935-present.

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform (DCP) shaft encoder and Acoustic Doppler Velocimeter (ADV) in a 5 ft x 5 ft concrete shelter and well. Shaft encoder and chart are set to inside electric tape gage. ADV is installed in tunnel. An outside staff gage is used for supplemental reference. Control is a 12-foot concrete Parshall flume. No changes this water year.

Hydrologic Conditions.-- The collection system is located in the headwaters of the Roaring Fork River. Water is diverted into Grizzly reservoir, which is located in Lincoln Gulch. Grizzly has an active capacity of 570 acre-feet, but normally fluctuates less than 400 acre-feet. From Grizzly Reservoir, the water flows under the continental divide through the Twin Lakes (a.k.a. Independence pass) Tunnel into North Fork Lake Creek. The Twin Lakes Tunnel is circular, concrete lined and 8.5 feet in diameter. The tunnel is about 4 miles long and has a capacity of 625 cubic feet per second. The western portal of the Twin Lakes tunnel is an elevation of 10,520 feet, the eastern portal is at 10,460 feet, and the tunnel has a maximum overburden of 2,630 feet. During the winter the snow closes the road between the caretaker's house and the town of Aspen, the tunnel is then operated to allow the caretaker's family to travel thru the tunnel to Buena Vista each day. No hydrologic condition changes were apparent this water year.

Gage-Height Record.-- The primary record is 15-minute satellite data with chart record and DCP log as backup. Record is complete and reliable. Use of drain valve this year did not seem to affect gage height in the stilling well and the circulating water did help in decreasing ice effect within the well. Missing data on Mar 10 and May 20, 2013 were filled in using gage height trends from adjacent good record. Dates of Oct 11, 2012; Jan 13-15; April 22, 29; May 20, 23, 2013 were missing data that was filled in using DCP data without loss of accuracy.

Datum Corrections.-- Levels were last run on Oct. 22, 2007. No corrections were made.

Rating.-- Control is a 12-foot concrete Parshall flume. A standard 12-foot Parshall flume rating table (STD12FPF dated May 16, 1972) was used the entire water year. Two discharge measurements (Nos. 111-112) were made during the year. Measurements ranged in discharge from 199 to 309 cfs. They cover the range in stage experienced except for many lower flow days of October 1-Dec 31, 2012; Jan 1-May 15, 19-23, 31; June 23-Sept 30, 2013; and higher flow days of May 25-29; June 2-15, 17, 2013. The peak discharge of 600 cfs occurred at 0300 on June 11, 2013 at a gage height of 4.91 feet with a shift of 0.02 feet. Peak exceeded the stage of Measurement 111, made on May 17, 2013 by 1.93 feet.

Discharge.-- Wading measurements may be made in the flume at the staff gage (using extreme caution) up to a gage height of about 1.80 ft. High flow measurements are made with a bridge crane with the meter and weight assembly suspended at the outside staff gage position in the flume. A rigid 2-in pipe is installed at this location to act as a stay bar to reduce meter and weight movement downstream. Hose clamps on the pipe are used to control the position of the cable and reduce meter and weight lateral movement caused by the extreme turbulence in the measurement section. This measurement section is a standard 14.7 ft width. ADCP measurements were attempted this year using a temporary cable system upstream of the staff gage. Shifting control method was used for the entire water year. Shifts occur due to excessive approach velocities and the turbulence/waves in the flume caused by the approach section entering the flume at an angle. Shifts also occurred in relation to the assumed draw down effect of the well due to velocities found in the flume. These problems are exacerbated in the gage height range of 2.5 to 4.5 ft. Shifts were distributed by stage using the variable stage-shift relationship TWITUNCOSC11Z for the entire water year. The continued use of TWITUNCOSC11Z was based on historical measurements and an agreement between DWR and the Twin Tunnel Water Company. WY13 measurements were discounted between 9% and 15% to fit the approve shift curve.

Special Computations.-- Because it is difficult to read the outside staff gage at high flows due to surging and turbulence, the stilling well gage height value is used for weighted mean gage height and water depth in the flume. During times of high flows, it appears that a drawdown effect may be lowering the gage height in the stilling well due to high velocities passing the inlet pipe. Since this is an unconfirmed phenomenon, stilling well gage height values are not adjusted.

Remarks.-- Record is considered good, except for the winter months of November through March, which is fair. The peak discharge is rated good based on site visits and related measurements. An ADVM is installed in the Tunnel upstream of the mouth as an additional measurement device, but up to this point has not produced reliable data. Station maintained and record developed by Cheston Hart.

Recommendations.-- Additional measurements are needed to better define shifts to the rating throughout all stages. Measurements and stage recording at the flume would benefit considerably from flow straightening and energy dissipation baffles installed upstream of the flume entrance. Levels should be run in WY2014.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09073000 TWIN LAKES TUNNEL

RATING TABLE-- STD12FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

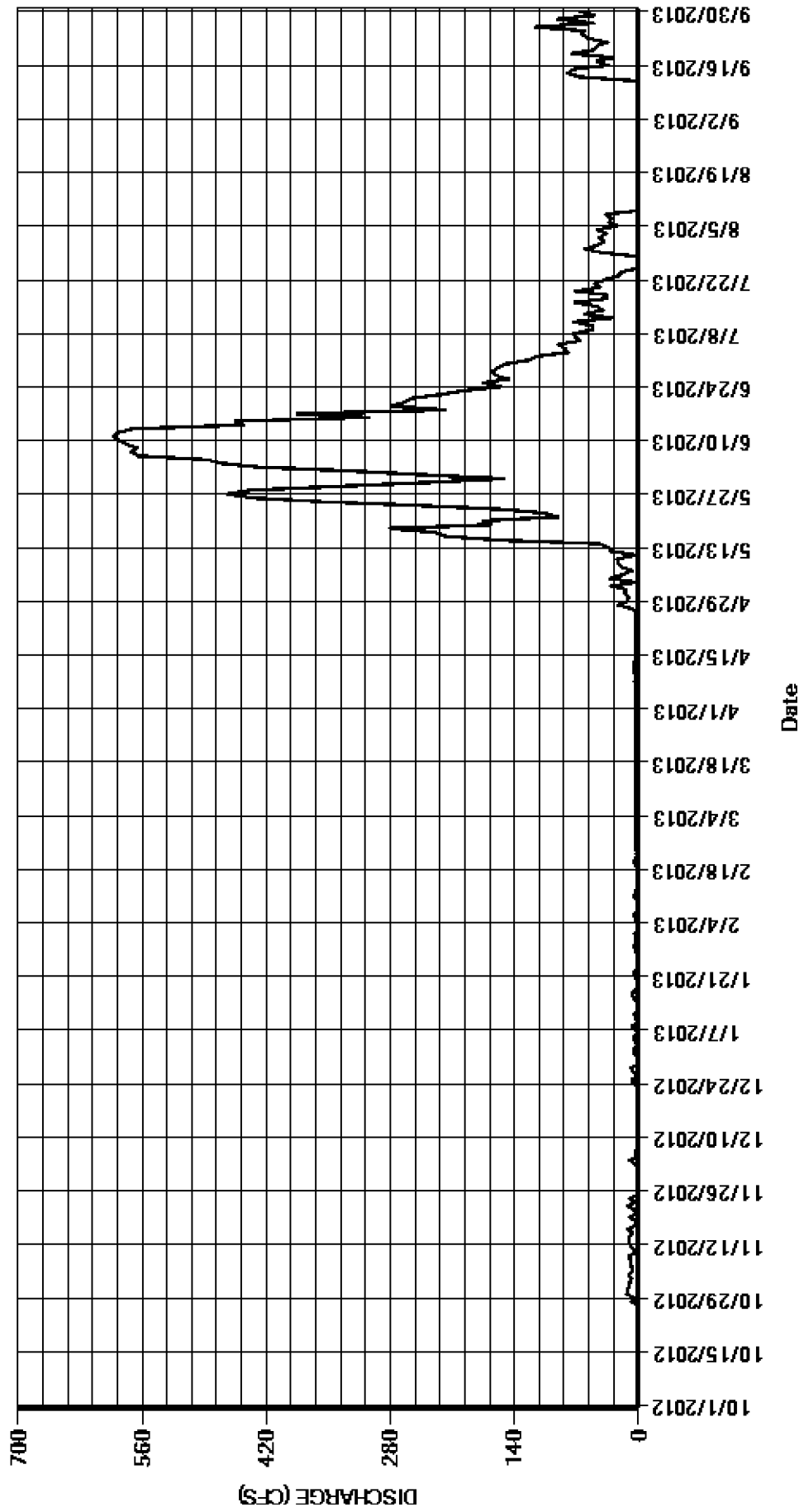
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.75	11	1.8	5.1	4.3	2.8	3.4	15	242	124	39	0.52
2	0.67	10	1.8	5.8	2.1	3.0	3.6	15	325	114	44	0.52
3	0.66	8.2	3.8	1.8	2.0	3.0	3.6	31	430	80	37	0.52
4	0.63	11	10	3.9	2.0	3.0	3.6	3.6	471	83	46	0.52
5	0.45	7.3	2.1	5.7	3.3	2.9	3.8	32	488	91	24	0.52
6	0.39	7.9	3.3	1.8	5.1	2.8	3.8	17	564	66	33	0.52
7	0.39	9.6	2.1	2.5	2.0	3.0	3.9	7.7	573	72	31	0.52
8	0.39	9.5	2.0	7.6	2.0	3.0	4.1	20	566	73	37	0.52
9	0.39	11	2.0	1.8	2.2	3.0	4.2	23	578	52	0.54	0.52
10	0.39	1.8	1.9	3.0	2.2	3.0	4.2	24	587	52	0.52	0.52
11	0.30	7.5	1.6	4.9	5.2	3.0	4.4	2.6	593	73	0.52	0.51
12	0.17	9.8	1.4	1.8	3.8	3.0	4.4	31	587	31	0.52	3.6
13	0.17	11	1.6	1.8	2.0	2.8	4.4	34	571	61	0.52	67
14	0.17	11	1.6	1.8	2.0	2.7	4.0	44	446	40	0.52	80
15	0.17	7.2	1.6	4.3	2.0	2.9	3.3	156	455	48	0.52	73
16	0.17	12	1.6	7.1	2.0	3.0	3.5	218	305	72	0.52	35
17	0.17	1.6	1.6	6.1	2.0	3.0	3.3	230	385	36	0.52	47
18	0.17	3.8	1.6	1.8	2.0	3.0	3.0	280	219	36	0.52	29
19	0.17	10	1.6	1.8	2.9	3.0	3.0	166	279	71	0.52	75
20	0.17	1.8	1.7	1.8	5.2	3.0	3.0	175	264	44	0.52	50
21	0.17	4.8	1.9	4.5	2.2	3.0	3.0	91	256	49	0.52	47
22	0.17	12	0.82	5.9	2.3	3.0	3.0	107	223	38	0.52	35
23	1.4	4.5	0.91	1.8	2.5	2.7	3.0	157	196	23	0.52	56
24	0.87	9.7	5.4	1.8	2.6	2.7	3.0	254	156	19	0.52	64
25	0.99	1.8	7.5	1.8	2.8	2.7	3.0	359	176	0.66	0.52	61
26	0.99	1.8	1.6	1.9	2.9	2.9	3.0	434	147	0.67	0.52	116
27	1.8	1.8	5.5	2.0	2.7	3.0	6.9	464	161	0.66	0.52	51
28	7.8	1.8	8.5	3.9	2.7	3.0	23	440	166	0.74	0.52	91
29	5.2	1.8	1.7	5.2	---	3.0	13	339	159	41	0.52	50
30	13	1.8	1.8	3.4	---	3.1	11	239	149	61	0.50	66
31	13	---	1.9	3.6	---	3.3	---	153	---	47	0.52	---
TOTAL	52.33	204.8	84.23	108.0	77.0	91.3	146.4	4561.9	10717	1599.73	302.96	1102.31
MEAN	1.69	6.83	2.72	3.48	2.75	2.95	4.88	147	357	51.6	9.77	36.7
AC-FT	104	406	167	214	153	181	290	9050	21260	3170	601	2190
MAX	13	12	10	7.6	5.2	3.3	23	464	593	124	46	116
MIN	0.17	1.6	0.82	1.8	2.0	2.7	3.0	2.6	147	0.66	0.50	0.51

CAL YR	2012	TOTAL	11067.20	MEAN	30.2	MAX	294	MIN	0.17	AC-FT	21950
WTR YR	2013	TOTAL	19047.96	MEAN	52.2	MAX	593	MIN	0.17	AC-FT	37780

MAX DISCH: 600 CFS AT 03:00 ON JUN 11, 2013 GH 4.91 FT SHIFT 0.02 FT  
 MAX GH: 4.91 FT AT 03:00 ON JUN 11, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09073000 TWIN LAKES TUNNEL  
 WY2013 HYDROGRAPH



ARKANSAS RIVER BASIN  
LARKSPUR DITCH AT MARSHALL PASS  
Water Year 2013

Location.-- Lat. 38°23'36.9", Long. 106°14'57.1", diverts water from tributaries of Tomichi Creek between headgates (in sec. 11, T.48 N., R.6 E., and sec. 1, T.47 N., R.6 E.), and Marshall Pass, in Gunnison River Basin, to Poncha Creek (tributary to South Arkansas River) in SE¼ sec. 24, T.48 N., R.6 E., in Arkansas River Basin.

Drainage Area and Period of Record.-- N/A; 1949-present.

Equipment.-- High data rate DCP, shaft encoder (SE) along with a stage discharge recorder (SDR) as backup in a 36-in x 36-in metal shelter and well. Shaft encoder and SDR are set to outside staff gage. Control is a 2-foot steel Parshall flume.

Hydrologic Conditions.-- The ditch was built in 1939, and diverts water from Hurry Creek, from north of the west side of Marshall Pass. The ditch crosses Marshall Pass at an elevation of 10,900 feet, and delivers water to Poncha Creek, a tributary of the South Arkansas River. The ditch runs approximately 1.5 miles. The basin consists primarily of high mountain terrain, most of which is above tree line with little to no development. No hydrologic condition changes were apparent this water year.

Gage-Height Record.-- The primary record is 15-minute satellite data with SDR data used for backup purposes. The record is complete and reliable except Oct 26, 2012 when gage was shut down. Diversions occurred from Oct 1- 22, 2012 and May 21, thru Sept 30, 2013.

Datum Corrections.-- Levels were last run July 25, 2006. No corrections were made at that time.

Rating.-- A standard, 2 ft. Parshall flume table (STD02FTPF) was used for the entire water year. Zero discharge measurements were made this water year. The peak discharge of 6.45 cfs occurred at 0030 Sept 23, 2013 at a gage height of 0.87 ft with a shift of 0.00 ft.

Discharge.-- Measurements are made from a walkway across the flume at a position where the meter axis is parallel with the staff gage and well intake. Unfortunately due to the lack of a sustained runoff no measurements were made this water year. Past historical measurements at this gage have shown this flume to be very stable and found to have a 0.00 shift at all flows. Discharge was computed by applying the rating directly to the gage height record with a shift of 0.00 ft for the entire year.

Special Computations.-- There was no ice affected or estimated days this water year.

Remarks.-- Given the high elevation conditions, low flows, and difficulty making accurate discharge measurements this year, the record is rated fair. The peak event is rated poor due to the fact it was a flashy rain event with minimal historical measurements at that gage height. Station maintained and record developed by Cheston Hart.

Recommendations.-- Better attempts to get measurements should be made. Levels and flume inspection should occur in the upcoming water year.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

LARKSPUR DITCH AT MARSHALL PASS

RATING TABLE-- STD02FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

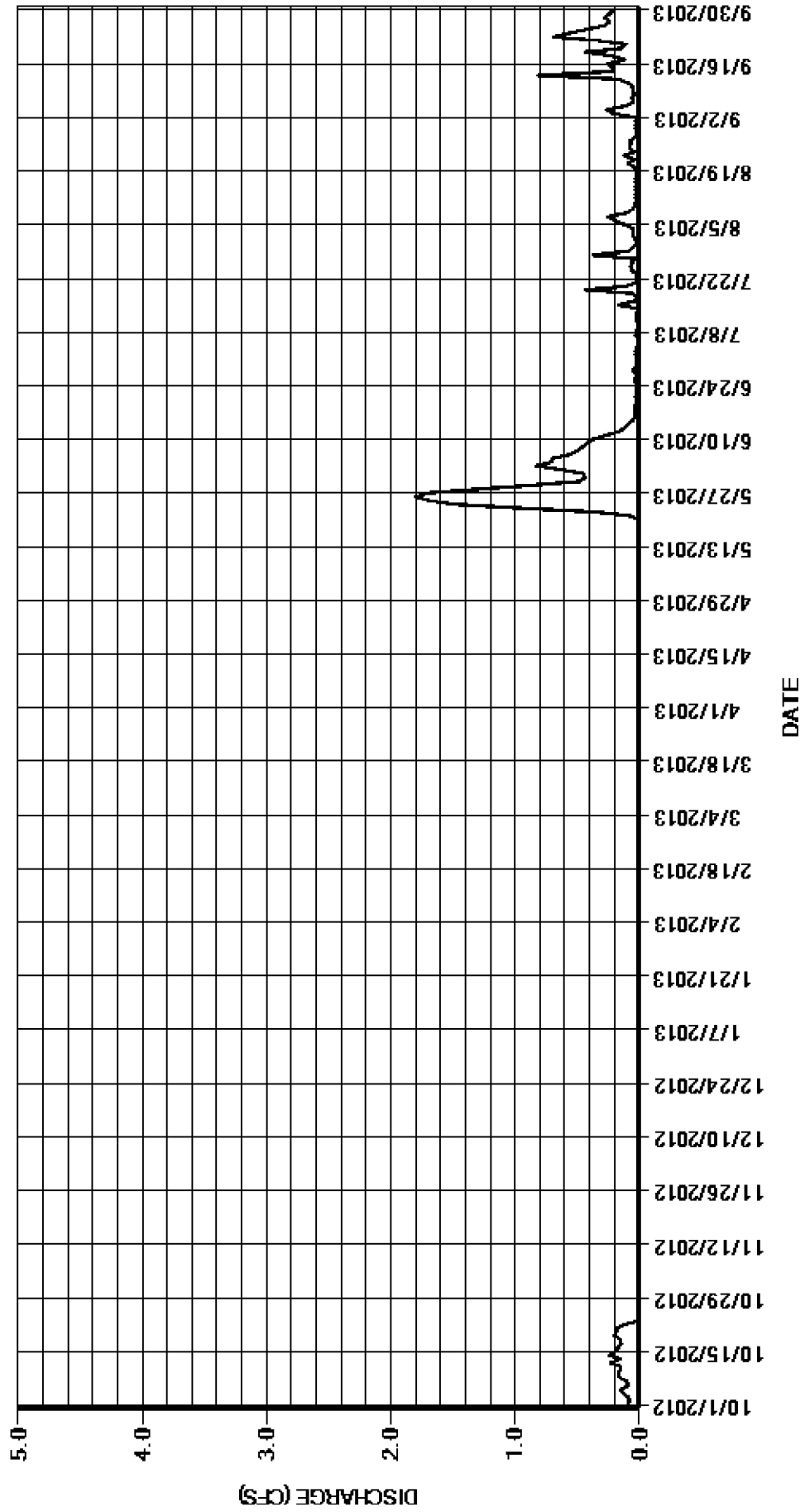
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.02	0.03	0.03
2	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.03	0.05	0.03
3	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.83	0.03	0.05	0.21
4	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	0.02	0.05	0.26
5	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.01	0.12	0.11
6	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.01	0.19	0.05
7	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.03	0.26	0.06
8	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.03	0.11	0.04
9	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.01	0.05	0.05
10	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.01	0.04	0.06
11	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.02	0.03	0.09
12	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.02	0.03	0.17
13	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.02	0.03	0.81
14	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.01	0.03	0.21
15	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.17	0.03	0.21
16	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.03	0.26
17	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.02	0.03	0.12
18	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.06	0.03	0.22
19	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.43	0.03	0.43
20	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.11	0.04	0.14
21	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.03	0.02	0.09	0.11
22	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.02	0.02	0.04	0.32
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.97	0.02	0.02	0.12	0.69
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.5	0.02	0.06	0.04	0.57
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.7	0.04	0.07	0.08	0.42
26	e0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.03	0.06	0.07	0.28
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.7	0.02	0.03	0.07	0.24
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	0.05	0.37	0.03	0.28
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.87	0.03	0.09	0.03	0.24
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.48	0.02	0.06	0.03	0.21
31	0.00	---	0.00	0.00	---	0.00	---	0.44	---	0.02	0.03	---
TOTAL	3.35	0.00	0.00	0.00	0.00	0.00	0.00	11.19	6.77	1.92	1.89	6.92
MEAN	0.11	0.000	0.000	0.000	0.000	0.000	0.000	0.36	0.23	0.062	0.061	0.23
AC-FT	6.6	0	0	0	0	0	0	22	13	3.8	3.7	14
MAX	0.24	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.83	0.43	0.26	0.81
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.03	0.03

CAL YR	2012	TOTAL	16.46	MEAN	0.045	MAX	0.42	MIN	0.00	AC-FT	33
WTR YR	2013	TOTAL	32.04	MEAN	0.088	MAX	1.8	MIN	0.00	AC-FT	64

MAX DISCH: 6.45 CFS AT 00:30 ON SEP 23, 2013 GH 0.87 FT SHIFT 0 FT  
 MAX GH: 0.87 FT AT 00:30 ON SEP 23, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LARKSPUR DITCH AT MARSHALL PASS  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08213500 RIO GRANDE RIVER AT THIRTY MILE BRIDGE NEAR CREEDE

Water Year 2013

Location.-- Lat 37°43'29", long 107°15'20" referenced to North American Datum of 1983 (Weminuche Pass, CO quad, scale 1:24,000), UTM Zone 13 301212 E and 4177665 N, in SW ¼ NE ¼ sec. 13, T.40 N., R.4 W., New Mexico Principal Meridian, Hinsdale County, CO, Hydrologic Unit 13010001, on right bank 70 ft downstream from bridge, 500 ft upstream from Squaw Creek, 0.7 mi downstream from Rio Grande Reservoir, and 20 mi southwest of Creede, CO.

Drainage Area and Period of Record.-- 163 mi<sup>2</sup>; Jun. 1909 to Sep. 1923, May 1925 to current year. No winter records 1910, 1926. Monthly data only for some periods.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Satlink2 with HDR GOES radio), and a float-operated Stage-Discharge Recorder in a 4 ft by 4 ft timber shelter and corrugated metal well. The primary reference gage is a drop tape from reference point on shelf. Outside gage installed on Jul 25, 2012. The cableway is located 21 feet upstream of gage.

Hydrologic Conditions.-- Flows regulated by Rio Grande Reservoir.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log, SDR log, and chart record as backup. Record is complete and reliable, except for Nov 2-4, and Mar 30- Apr 7 when the station was isolated, Apr 8-24 when the well was freezing, and Nov 5 to Mar 29 when the station was closed for the winter. Record was affected by weight catching on timbers inside well Mar 29 to Jul 16, record was compared with chart record and found to be within 0.02 ft so digital record was used.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on Sep 7, 2011 using B.M. no. 2 as the base. The RP elevation was found outside the allowable limits, so a correction of 0.02 ft was made on that date. Two-peg test was performed on the Lietz level (SN 130869) on Jul 28, 2011 and the instrument was within allowable limits and no correction was made.

Rating.-- Control is a boulder and cobble channel. Rating no. 12, in use since Oct 1, 1994, was used again this year. The rating is well defined from 8 to 2500 cfs. Fifteen measurements (nos. 871-885) were made this year ranging in discharge from 1.67 to 940 cfs. They cover the range of daily flows experienced, except for the higher daily flows on May 18, 23-26, 28, and 29. The peak flow of 1160 cfs occurred at 0845 on May 24, 2013 at a gage height of 3.57 feet with a shift of 0.04 ft. It exceeded high measurement no. 879 made May 22 (GH 3.32 ft) by 0.25 feet in stage.

Discharge.-- Shifting control method was used to compute the discharge record. Three shift curves (VS12a, VS13-A, VS13-B) and direct application of the rating were used to account for minor scour and fill. Open-water measurement shifts ranged from -0.06 to 0.07 ft; applied shift ranged from 0.00 to 0.04 ft. All measurements were given full weight except for nos. 871, 872, 875, 876, 878, 880, 882, and 885, which were adjusted by as much as 5.4 percent to smooth shift distribution.

Special Computations.-- Discharge for periods when station was isolated and closed for the winter was estimated using simple proration between measurements at closing and opening station. There was no change in reservoir release gates during the period, so change in flow is attributed to increased reservoir elevation.

Remarks.-- Record is good except for periods of no gage-height record, which are estimated and poor and the period of record between Mar 29 and Jul 16 when the equipment in the gage was catching on the timbers inside the well which is fair. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

08213500 RIO GRANDE RIVER AT THIRTY MILE BRIDGE NEAR CREEDE

RATING TABLE-- RIOMILCO12 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	40	37	e1.9	e2.2	e2.5	e2.8	e3.1	561	439	141	66	121
2	35	e1.7	e1.9	e2.2	e2.5	e2.8	e3.2	459	375	137	57	114
3	33	e1.7	e1.9	e2.3	e2.6	e2.8	e3.2	330	371	132	95	97
4	33	e1.7	e2.0	e2.3	e2.6	e2.8	e3.2	419	378	100	156	81
5	37	e1.7	e2.0	e2.3	e2.6	e2.9	e3.2	585	363	64	153	99
6	44	e1.7	e2.0	e2.3	e2.6	e2.9	e3.2	522	335	56	126	119
7	44	e1.7	e2.0	e2.3	e2.6	e2.9	e10	360	347	68	122	102
8	42	e1.7	e2.0	e2.3	e2.6	e2.9	e21	241	335	77	122	83
9	42	e1.7	e2.0	e2.3	e2.6	e2.9	e25	195	290	76	100	78
10	47	e1.7	e2.0	e2.3	e2.6	e2.9	e46	185	272	61	80	87
11	48	e1.7	e2.0	e2.3	e2.6	e2.9	e40	148	272	63	109	172
12	53	e1.7	e2.0	e2.3	e2.6	e2.9	e32	130	252	68	122	316
13	72	e1.7	e2.0	e2.4	e2.7	e2.9	e31	188	220	75	144	439
14	65	e1.8	e2.1	e2.4	e2.7	e2.9	e40	373	202	86	131	738
15	44	e1.8	e2.1	e2.4	e2.7	e3.0	e50	569	182	90	103	830
16	33	e1.8	e2.1	e2.4	e2.7	e3.0	e48	701	179	103	82	669
17	35	e1.8	e2.1	e2.4	e2.7	e3.0	e50	893	172	111	75	468
18	37	e1.8	e2.1	e2.4	e2.7	e3.0	e53	1000	150	119	80	327
19	31	e1.8	e2.1	e2.4	e2.7	e3.0	e46	827	134	115	83	367
20	29	e1.8	e2.1	e2.4	e2.7	e3.0	e40	613	115	151	97	480
21	25	e1.8	e2.1	e2.4	e2.7	e3.0	e40	553	112	146	98	423
22	23	e1.8	e2.1	e2.4	e2.7	e3.0	e55	792	115	101	100	367
23	23	e1.8	e2.1	e2.4	e2.8	e3.0	e89	1070	115	67	96	563
24	27	e1.9	e2.2	e2.5	e2.8	e3.0	e88	1130	115	58	84	554
25	34	e1.9	e2.2	e2.5	e2.8	e3.1	91	1060	106	51	95	482
26	33	e1.9	e2.2	e2.5	e2.8	e3.1	122	980	94	47	151	393
27	24	e1.9	e2.2	e2.5	e2.8	e3.1	150	890	92	64	177	339
28	28	e1.9	e2.2	e2.5	e2.8	e3.1	211	957	92	78	138	385
29	35	e1.9	e2.2	e2.5	---	e3.1	342	979	107	101	102	385
30	40	e1.9	e2.2	e2.5	---	e3.1	497	836	131	140	88	319
31	42	---	e2.2	e2.5	---	e3.1	---	696	---	116	100	---
TOTAL	1178	88.7	64.3	73.8	74.8	91.9	2236.1	19242	6462	2862	3332	9997
MEAN	38.0	2.96	2.07	2.38	2.67	2.96	74.5	621	215	92.3	107	333
AC-FT	2340	176	128	146	148	182	4440	38170	12820	5680	6610	19830
MAX	72	37	2.2	2.5	2.8	3.1	497	1130	439	151	177	830
MIN	23	1.7	1.9	2.2	2.5	2.8	3.1	130	92	47	57	78

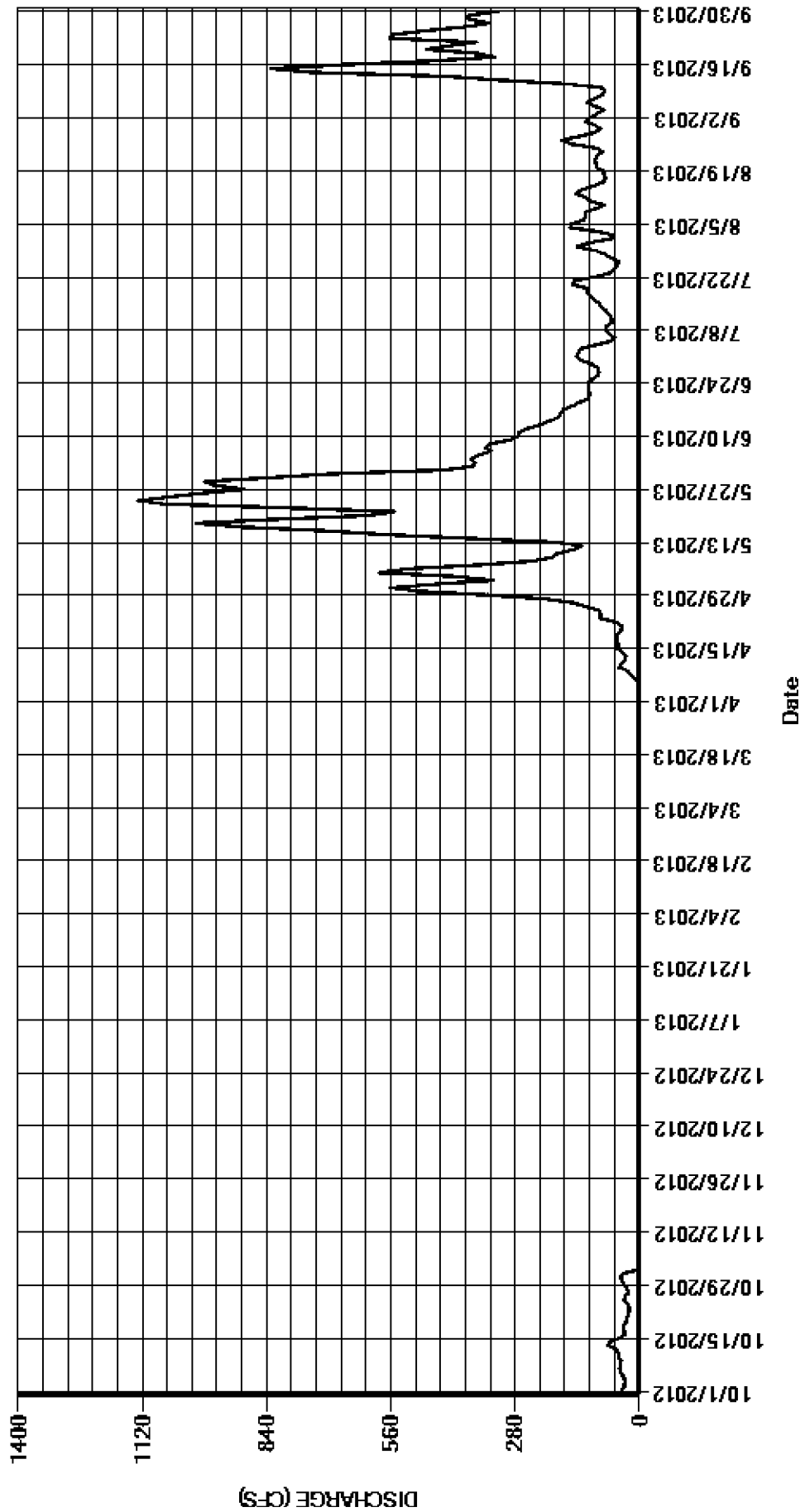
CAL YR	2012	TOTAL	47747.3	MEAN	130	MAX	993	MIN	1.7	AC-FT	94710
WTR YR	2013	TOTAL	45702.6	MEAN	125	MAX	1130	MIN	1.7	AC-FT	90650

MAX DISCH: 1160 CFS AT 08:45 ON MAY 24, 2013 GH 3.57 FT SHIFT 0.04 FT  
MAX GH: 3.57 FT AT 08:45 ON MAY 24, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



08213500 RIO GRANDE RIVER AT THIRTY MILE BRIDGE NEAR CREEDE  
 WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08214500 NORTH CLEAR CREEK BELOW CONTINENTAL RESERVOIR  
Water Year 2013

Location.-- Lat 37°53'18", long 107°12'13" referenced to North American Datum of 1983 (Slumgullion Pass, CO quad, scale 1:24,000), UTM Zone 13 306230 E and 4195705 N, in NE ¼ SW ¼ sec. 21, T.42 N., R.3 W., New Mexico Principal Meridian, Hinsdale County, CO, Hydrologic Unit 13010001, on left bank 100 ft downstream from bridge, 1,000 ft downstream from Continental Reservoir, and 15 mi west of Creede, CO.

Drainage Area and Period of Record.-- 51.7 mi<sup>2</sup>. from topographic map, San Cristobal Quad; 1929 to current year.

Equipment.-- Graphic water stage recorder, data collection platform (Satlink2 with SDR), and a float-operated shaft encoder in a 4-ft by 4-ft timber shelter and concrete well. Primary reference gage is a drop tape from reference point on shelf. The secondary reference gage is an outside reference mark on the bridge with a tape and weight.

Hydrologic Conditions.-- Gage is below Continental Reservoir and all flows are regulated.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted data with DCP log, SDR log, and graphic chart record as backup. Record is complete and reliable except for Nov 5 to Apr 24 when station was closed. There was one 0.02 ft shaft encoder correction on Jun 10, which was prorated back to the previous visit.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on May 27, 2011 using B.M. no. 4 as base. The RP was within allowable limits and no correction was made. Two-peg test was performed on the Lietz level (SN130869) on May 27, 2011 and the instrument was within allowable limits and no adjustment was made.

Rating.-- The control is a concrete ramp flume. There is a two foot wide notch in the middle of the ramp to provide more sensitivity at very low flows. Rating no. 24-1 in use since Oct 5, 2010 was used for the entire water year. Rating no. 24-1 is well defined from 0 cfs to 300 cfs. Thirteen measurements (nos 824 - 836) were made this year ranging in discharge from 0.39 to 98.9 cfs. Measurement 827 was split into three different measurements to calculate the discharge based on .6 depth and .2/.8 depths. The discharge measurements cover the range in discharge experienced except for lower daily flows on Oct 1- Apr 22. The peak flow of 105 cfs occurred at 09:30 on May 24, 2013 at a gage height of 2.33 ft with a shift of 0.02 ft. It exceeded high measurement no. 828 (GH = 2.26 ft), made May 22, by 0.07 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record. A +0.01 shift was applied from beginning of water year until station closed for winter. Shift curves (VS13-G, VS13-I, VS13-L) were developed and used along with the unshifted rating after opening station in the spring to distribute shifting by stage and time. Open-water measurement shifts ranged from -0.02 to +0.05 ft; applied shifts ranged from -0.01 to +0.02 ft. All open water measurements were given full weight except for nos. 825-831, 834 and 836, which were adjusted as much as 5.3 percent to smooth the shift trends. Discharge was estimated for the period of no gage-height record when station was closed.

Special Computations.-- Discharge for period of winter no gage-height record was estimated using two measurements and simple proration based on reservoir contents; there was no change of reservoir gates during the period.

Remarks.-- Record is good except for periods of estimation, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08214500 NORTH CLEAR CREEK BELOW CONTINENTAL RESERVOIR

RATING TABLE-- NCLCONCO24-1 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

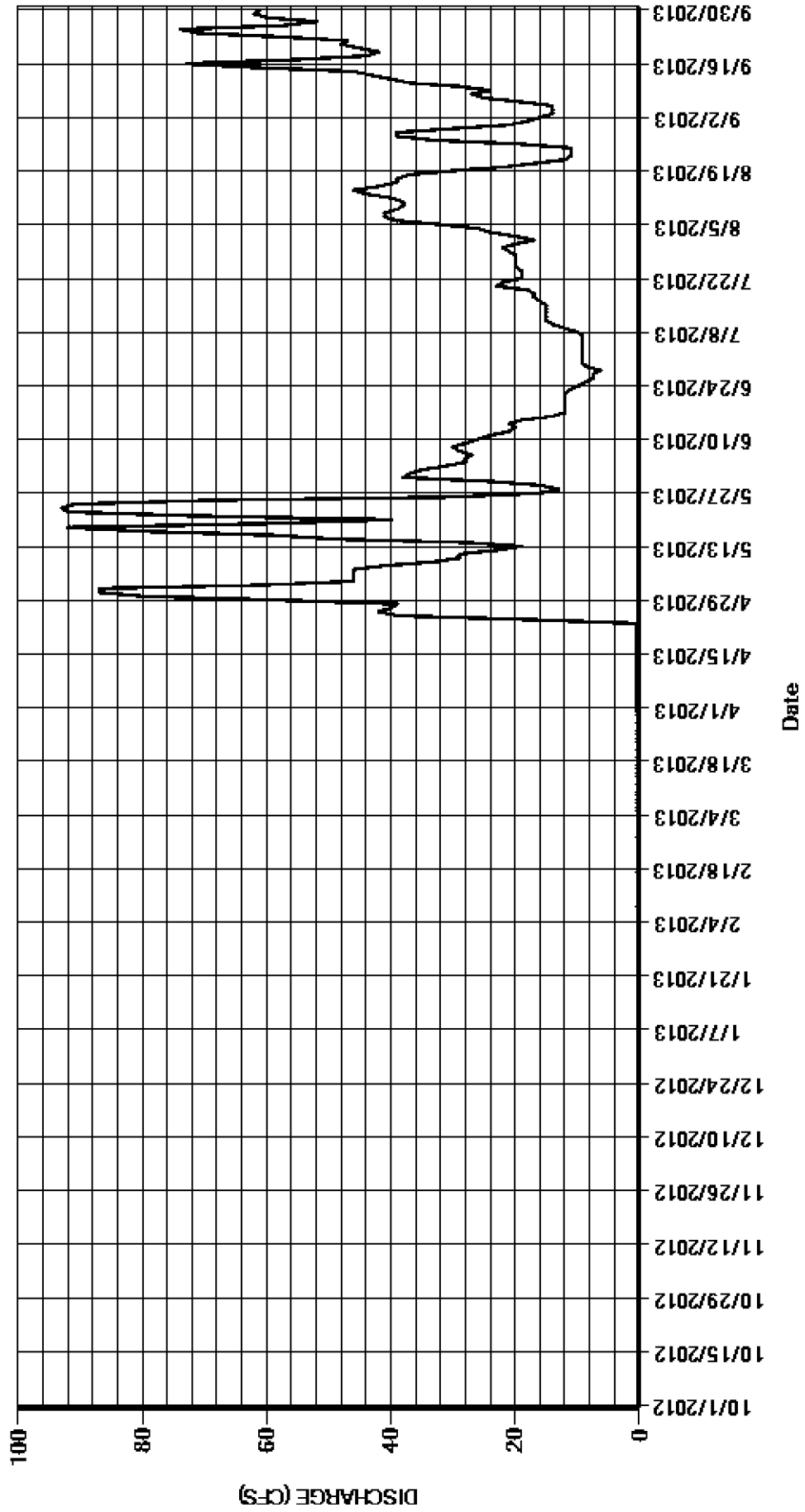
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.23	0.23	e0.26	e0.29	e0.31	e0.33	e0.36	87	37	9.2	17	18
2	0.23	0.23	e0.26	e0.29	e0.31	e0.33	e0.36	87	35	9.2	20	16
3	0.23	0.23	e0.26	e0.29	e0.31	e0.33	e0.36	60	31	9.2	24	14
4	0.23	0.23	e0.26	e0.29	e0.31	e0.34	e0.36	46	28	9.2	26	14
5	0.23	e0.24	e0.27	e0.29	e0.31	e0.34	e0.36	46	28	9.2	32	14
6	0.23	e0.24	e0.27	e0.29	e0.31	e0.34	e0.36	46	27	9.2	39	19
7	0.25	e0.24	e0.27	e0.29	e0.31	e0.34	e0.36	46	29	9.2	41	25
8	0.24	e0.24	e0.27	e0.29	e0.32	e0.34	e0.36	41	30	10	41	27
9	0.23	e0.24	e0.27	e0.29	e0.32	e0.34	e0.37	33	28	12	39	24
10	0.23	e0.24	e0.27	e0.29	e0.32	e0.34	e0.37	29	26	14	38	29
11	0.23	e0.25	e0.27	e0.29	e0.32	e0.34	e0.37	29	24	15	38	37
12	0.24	e0.25	e0.27	e0.29	e0.32	e0.34	e0.37	23	21	15	40	40
13	0.23	e0.25	e0.27	e0.30	e0.32	e0.34	e0.37	19	20	15	44	43
14	0.22	e0.25	e0.27	e0.30	e0.32	e0.34	e0.37	27	21	15	46	46
15	0.21	e0.25	e0.27	e0.30	e0.32	e0.34	e0.37	49	19	15	42	62
16	0.21	e0.25	e0.27	e0.30	e0.32	e0.34	e0.37	59	14	16	39	73
17	0.22	e0.25	e0.27	e0.30	e0.32	e0.34	e0.38	80	12	17	39	56
18	0.22	e0.25	e0.28	e0.30	e0.32	e0.35	e0.38	92	12	17	37	44
19	0.22	e0.25	e0.28	e0.30	e0.32	e0.35	e0.38	60	12	18	30	42
20	0.21	e0.25	e0.28	e0.30	e0.33	e0.35	e0.38	40	12	23	22	45
21	0.23	e0.25	e0.28	e0.30	e0.33	e0.35	e0.38	72	12	22	17	48
22	0.23	e0.26	e0.28	e0.30	e0.33	e0.35	e0.38	92	12	19	12	47
23	0.22	e0.26	e0.28	e0.30	e0.33	e0.35	e0.39	93	11	19	11	57
24	0.22	e0.26	e0.28	e0.30	e0.33	e0.35	e18	91	9.7	19	11	71
25	0.23	e0.26	e0.28	e0.30	e0.33	e0.35	39	71	8.4	20	11	74
26	0.23	e0.26	e0.28	e0.30	e0.33	e0.35	42	30	7.4	20	19	57
27	0.23	e0.26	e0.28	e0.31	e0.33	e0.35	40	16	7.4	20	33	52
28	0.23	e0.26	e0.28	e0.31	e0.33	e0.35	39	13	6.3	20	39	60
29	0.23	e0.26	e0.28	e0.31	---	e0.35	58	16	8.5	21	39	62
30	0.23	e0.26	e0.29	e0.31	---	e0.35	80	24	9.2	22	30	61
31	0.23	---	e0.29	e0.31	---	e0.36	---	38	---	20	21	---
TOTAL	7.05	7.45	8.49	9.23	8.98	10.66	324.51	1555	557.9	488.4	937	1277
MEAN	0.23	0.25	0.27	0.30	0.32	0.34	10.8	50.2	18.6	15.8	30.2	42.6
AC-FT	14	15	17	18	18	21	644	3080	1110	969	1860	2530
MAX	0.25	0.26	0.29	0.31	0.33	0.36	80	93	37	23	46	74
MIN	0.21	0.23	0.26	0.29	0.31	0.33	0.36	13	6.3	9.2	11	14

CAL YR	2012	TOTAL	5021.75	MEAN	13.7	MAX	172	MIN	0.20	AC-FT	9960
WTR YR	2013	TOTAL	5191.67	MEAN	14.2	MAX	93	MIN	0.21	AC-FT	10300

MAX DISCH: 105 CFS AT 09:30 ON MAY 24, 2013 GH 2.33 FT SHIFT 0.02 FT  
 MAX GH: 2.33 FT AT 09:30 ON MAY 24, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08214500 NORTH CLEAR CREEK BELOW CONTINENTAL RESERVOIR  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08217500 RIO GRANDE RIVER AT WAGON WHEEL GAP  
Water Year 2013

Location.-- Lat 37°46'1", long 106°49'53" referenced to North American Datum of 1983 (Wagon Wheel Gap, CO quad, scale 1:24,000), UTM Zone 13 338693 E and 4181532 N, in NW ¼ NE ¼ sec. 35, T.41 N., R.1 E., New Mexico Principal Meridian, Mineral County, CO, Hydrologic Unit 13010001, on left bank 40 ft downstream from private bridge, 0.3 mi upstream from Goose Creek, and 0.3 mi west of Wagonwheel Gap, CO.

Drainage Area and Period of Record.-- 780 mi<sup>2</sup>; 1951 to current year.

Equipment.-- A float-operated electronic stage discharge recorder and data collection platform (Sutron Satlink2), in a 4 ft by 4 ft timber shelter with a 4 ft diameter concrete well. The primary reference gage is a drop tape from reference point on shelf. Outside staff gage is located on bridge pier. A crest stage gage was installed on the left edge of water at the gage July 24, 2013. The cableway is located 350 feet above gaging station.

Hydrologic Conditions.-- Flow is somewhat regulated by Rio Grande Reservoir and other small reservoirs. There are several small diversions above gage for livestock and domestic use. The basin is mostly undeveloped with the exception of a few minor subdivisions and the town of Creede.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted data with DCP log and SDR log as backup. Secondary pressure transducer was setup to help with winter estimation. Pressure transducer data was used from Dec 10 - Mar 31. Record is complete and reliable. The stage-discharge relation was affected by ice Nov 11 - Mar 26. The pressure transducer data was corrected using comparison with the SDR before the well froze and after the well was opened. This comparison indicated a +0.04 ft correction before and a -0.03 ft correction after; this correction was prorated by time.

Datum Corrections.-- Levels were run July 24, 2013 using BM No. 4 as base. A new crest stage gage was installed and surveyed. The RP was within allowable limits therefore no correction was made. Two-peg test was performed on the Leitz level (SN130869) on July 29, 2013, the instrument was within allowable limits and no correction was made.

Rating.-- Low and medium water control is a wide cobble bar approximately 250 feet below the gage. High water control is the channel. Rating No. 6, in use since Mar 28, 2012 was used the entire water year. Eighteen measurements, nos. 200 to 217 were made this year, ranging in discharge from 76.8 to 2210 cfs. They cover the range experienced except for lower daily flows on Nov 11, 12, Jan 16-18 and higher daily flows on May 18, 24, 25. The peak flow of 2550 cfs occurred at 0400 on May 24, 2013 at a gage height of 3.90 ft with a shift of 0.01 ft. The peak flow exceeded high measurement No. 211 (GH = 3.69 ft), made May 24, 2013, by 0.21 ft in stage.

Discharge.-- Shifting control method was used to compute discharge record for all open-water periods. Direct application of the rating to the gage-height record was used before going into ice. Three variable shift curves were created and used to define minor shift trends during the remainder of the year. Shifting was caused by sediment depositing and scouring. Open-water measurement shifts ranged from -0.06 to +0.04 ft and applied shifts ranged from -0.04 to +0.02 ft. All measurements were given full weight except nos. 200, 201, 208-210, 216 and 217, which were adjusted as much as 2.6% to smooth the shift trends. Periods of ice affected stage record were estimated.

Special Computations.-- Winter estimates were determined based on streamflow measurements, hydrographic comparison with RIODELCO, RIOSFKCO, and weather records from RIOSFKCO.

Remarks.-- Record is good except for periods of estimation, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

08217500 RIO GRANDE RIVER AT WAGON WHEEL GAP

RATING TABLE-- RIOWAGCO06 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

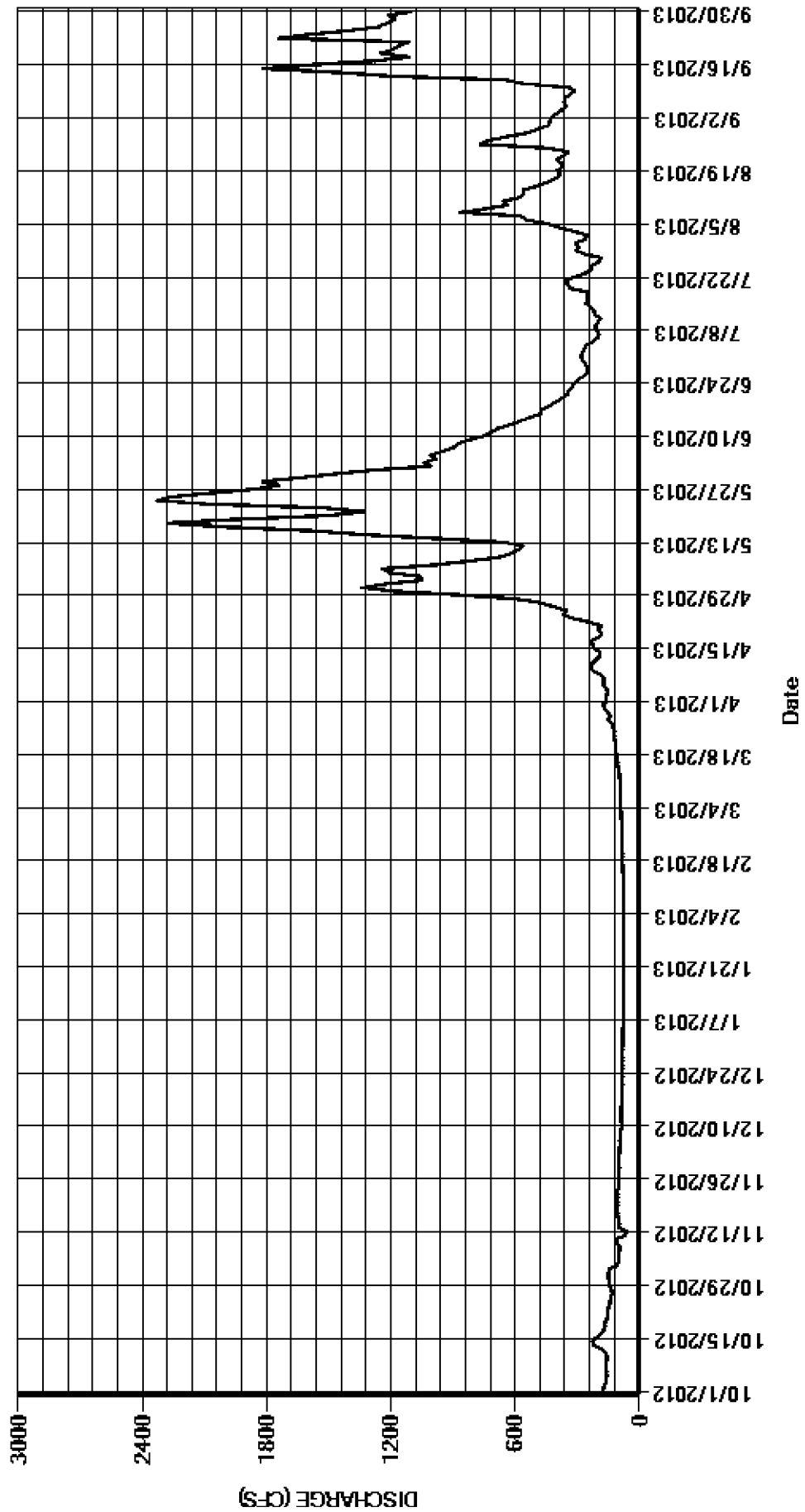
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	176	151	e98	e80	e78	e88	161	1340	1280	282	261	434
2	171	147	e98	e80	e78	e88	160	1230	1010	275	250	428
3	163	113	e96	e80	e78	e90	157	1050	1040	266	315	405
4	161	99	e96	e80	e78	e90	155	1060	986	256	388	378
5	158	101	e94	e80	e78	e92	173	1210	1010	222	439	352
6	159	101	e94	e78	e78	e92	174	1240	955	200	547	364
7	162	97	e94	e78	e78	e92	173	986	896	197	573	362
8	159	96	e92	e78	e78	e94	187	826	878	209	865	339
9	159	107	e90	e78	e78	e94	225	676	822	212	748	315
10	158	116	e82	e78	e78	e94	231	620	753	202	638	342
11	162	e70	e88	e78	e78	e94	229	584	718	188	656	561
12	180	e60	e88	e78	e78	e96	209	563	682	215	579	638
13	222	e96	e88	e78	e78	e98	193	655	622	219	559	1190
14	225	e98	e88	e78	e78	e100	191	968	574	238	560	1460
15	211	e100	e88	e78	e80	e105	218	1330	524	258	493	1820
16	189	e105	e86	e76	e80	e105	227	1570	476	252	443	1580
17	174	e105	e86	e76	e82	e110	231	1990	474	249	403	1280
18	167	e105	e86	e76	e82	e110	193	2280	436	246	383	1110
19	166	e105	e84	e78	e82	e115	183	1960	406	334	397	1250
20	158	e105	e84	e78	e82	e115	200	1500	374	347	369	1190
21	155	e105	e82	e78	e84	e115	182	1330	346	353	374	1160
22	152	e105	e82	e78	e84	e120	249	1520	342	315	402	1110
23	150	e105	e82	e78	e84	e120	324	2080	323	260	367	1740
24	144	e100	e82	e78	e84	e120	368	2330	312	232	343	1600
25	141	e100	e82	e78	e86	e125	353	2260	292	228	440	1410
26	137	e100	e82	e78	e86	e130	416	2070	268	197	769	1260
27	131	e100	e82	e78	e86	152	478	1860	249	185	728	1220
28	138	e98	e82	e78	e86	142	595	1740	253	267	637	1180
29	144	e98	e82	e78	---	151	860	1820	261	309	537	1210
30	147	e98	e82	e78	---	166	1180	1640	276	293	490	1100
31	150	---	e82	e78	---	178	---	1470	---	308	438	---
TOTAL	5069	3086	2702	2422	2260	3481	8875	43758	17838	7814	15391	28788
MEAN	164	103	87.2	78.1	80.7	112	296	1412	595	252	496	960
AC-FT	10050	6120	5360	4800	4480	6900	17600	86790	35380	15500	30530	57100
MAX	225	151	98	80	86	178	1180	2330	1280	353	865	1820
MIN	131	60	82	76	78	88	155	563	249	185	250	315

CAL YR	2012	TOTAL	140229	MEAN	383	MAX	2040	MIN	60	AC-FT	278100
WTR YR	2013	TOTAL	141484	MEAN	388	MAX	2330	MIN	60	AC-FT	280600

MAX DISCH: 2550 CFS AT 04:00 ON MAY 24, 2013 GH 3.90 FT SHIFT 0.01 FT  
MAX GH: 3.90 FT AT 04:00 ON MAY 24, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08217500 RIO GRANDE RIVER AT WAGON WHEEL GAP  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08218500 GOOSE CREEK AT WAGONWHEEL GAP  
Water Year 2013

Location.-- Lat 37°45'7", long 106°49'47" referenced to North American Datum of 1983 (Wagon Wheel Gap, CO quad, scale 1:24,000), UTM Zone 13 338810 E and 4179860 N, in SW ¼ SE ¼ sec. 35, T.41 N., R.1 E., New Mexico Principal Meridian, Mineral County, CO, Hydrologic Unit 13010001, on left bank 1/4 mi downstream from Pierce Creek, 1 mi upstream from mouth, 1 mi south of Wagon Wheel Gap, CO, and 8 3/4 mi southeast of Creede, CO.

Drainage Area and Period of Record.-- Approximately 90 mi<sup>2</sup>; June 1954 to current year.

Equipment.-- Data collection platform (Sutron Model Satlink Logger) and a float-operated Stage-Discharge-Recorder (SDR) in a 36-inch corrugated metal pipe shelter and concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage.

Hydrologic Conditions.-- Streamflow is partially regulated by upstream reservoir. Drainage area is predominantly undeveloped National Forest. The flow is affected by rapidly rising and falling stage due to issues related to the hydro-plant operation on Humphrey's reservoir.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP and SDR logs as backup. Record is complete and reliable except for Nov 11-19 and Mar 22-26 when ice in well was affecting floats; and Nov 20 - Mar 21 when the station was closed for winter. There were two instrument calibration corrections, a +0.01 and -0.01 ft, which were prorated by time from previous visits. A -0.02 flush correction was applied on Jun 7. A -0.05 ft correction was applied to one unit value on Jul 1 to fix an erroneous value that occurred during a visit. One erroneous unit value was corrected on Aug 8 when inlet valves were closed during a visit.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on Jul 10, 2012 using BM2 as base. The RP elevation was within allowable limits; therefore, no corrections were required or made. Two-peg test was performed on the Liets level (SN 130869) on Jun 11, 2012 and the instrument was within allowable limits and no correction was made.

Rating.-- Control is a series of rock and boulder riffles just downstream from the gage. Willows along banks influence high stages. Scour, fill, and vegetation cycles cause shift variations. Rating no. 11, in use since Oct 12, 2011, was used until Oct 4, 2012. Rating no. 12-1 was developed and used from Oct 4 through the end of the water year. Rating no. 12-1 is well defined from 20 to 400 cfs and considered fair above 400 cfs. Twenty two measurements (nos. 97-118) were made this year ranging in discharge from 14.4 to 185 cfs. They cover the flow range experienced except for lower daily flows on Jan 3, 11-15 and higher daily flows May 24-27, Sep 19, 22-25, 27. The peak flow of 457 cfs occurred at 23:30 on Sep 22, 2013 at a gage height of 3.95 feet with a shift of 0.00 feet. It exceeded high measurement no. 118 (GH=3.30 ft), made Sep 19 by 0.65 feet in stage.

Discharge.-- Shifting control method was used to compute the discharge record for all open-water periods. Shift curves VS13-G and VS13-I were developed and used to distribute shifts during periods when direct application of the rating was not used. Open-water measurement shifts ranged from -0.09 to +0.07 ft. All measurements were given full weight except nos. 104, 105, 107, 109, 112, and 114-116, which were adjusted as much as 4.3% to smooth shift trends. Periods of unreliable or no stage record were estimated.

Special Computations.-- Discharge for periods of unreliable and no gage-height record was estimated using discharge measurements, air temperature record from South Fork Rio Grande River at South Fork, and hydrographic comparison with Rio Grande River near Del Norte and Rio Grande River at Wagon Wheel Gap.

Remarks.-- Record is good except for periods of estimation, which are poor. Peak discharge is fair. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08218500 GOOSE CREEK AT WAGONWHEEL GAP

RATING TABLE-- GOOWAGCO11 USED FROM 01-OCT-2012 TO 04-OCT-2012  
 GOOWAGCO12-1 USED FROM 04-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	23	19	e25	e15	e16	e17	31	130	132	44	26	65
2	23	20	e24	e14	e16	e16	29	113	135	37	39	68
3	22	18	e24	e13	e17	e17	29	112	142	36	59	65
4	22	18	e22	e14	e16	e17	32	115	137	35	62	66
5	22	20	e23	e14	e16	e15	36	115	128	38	77	61
6	22	19	e23	e14	e16	e16	37	107	127	40	71	56
7	22	19	e22	e14	e16	e17	37	89	113	38	109	56
8	24	19	e22	e14	e16	e16	34	84	108	38	159	54
9	24	22	e20	e14	e16	e16	31	73	110	38	130	51
10	24	19	e18	e14	e15	e15	26	67	103	44	120	61
11	24	e15	e19	e13	e15	e16	26	64	101	39	119	76
12	32	e16	e19	e13	e14	e17	26	65	90	36	108	66
13	32	e18	e19	e13	e15	e17	28	75	82	40	98	126
14	27	e19	e20	e13	e15	e18	30	95	79	47	91	150
15	25	e20	e19	e13	e15	e19	26	104	74	48	84	153
16	25	e22	e19	e15	e15	e19	31	119	71	46	73	140
17	26	e23	e18	e16	e15	e19	32	164	69	46	67	119
18	24	e24	e19	e16	e15	e20	26	173	66	44	69	149
19	23	e24	e18	e16	e14	e20	27	152	62	67	67	197
20	22	e25	e18	e16	e15	e20	27	133	59	39	60	158
21	22	e25	e19	e16	e15	e22	28	124	56	31	57	142
22	21	e25	e20	e17	e14	e21	35	137	53	28	57	198
23	21	e24	e20	e16	e14	e20	47	181	52	26	52	284
24	20	e24	e21	e18	e15	e20	44	199	46	25	52	217
25	19	e24	e19	e18	e15	e21	48	204	45	23	86	192
26	17	e24	e19	e18	e14	e24	57	201	39	20	96	176
27	16	e23	e18	e19	e14	22	63	198	42	28	84	188
28	24	e22	e16	e18	e15	24	77	184	42	45	88	167
29	21	e24	e15	e16	---	25	113	170	42	38	76	153
30	20	e24	e16	e16	---	26	129	149	44	29	71	144
31	19	---	e17	e17	---	30	---	143	---	26	71	---
TOTAL	708	638	611	473	424	602	1242	4039	2449	1159	2478	3798
MEAN	22.8	21.3	19.7	15.3	15.1	19.4	41.4	130	81.6	37.4	79.9	127
AC-FT	1400	1270	1210	938	841	1190	2460	8010	4860	2300	4920	7530
MAX	32	25	25	19	17	30	129	204	142	67	159	284
MIN	16	15	15	13	14	15	26	64	39	20	26	51

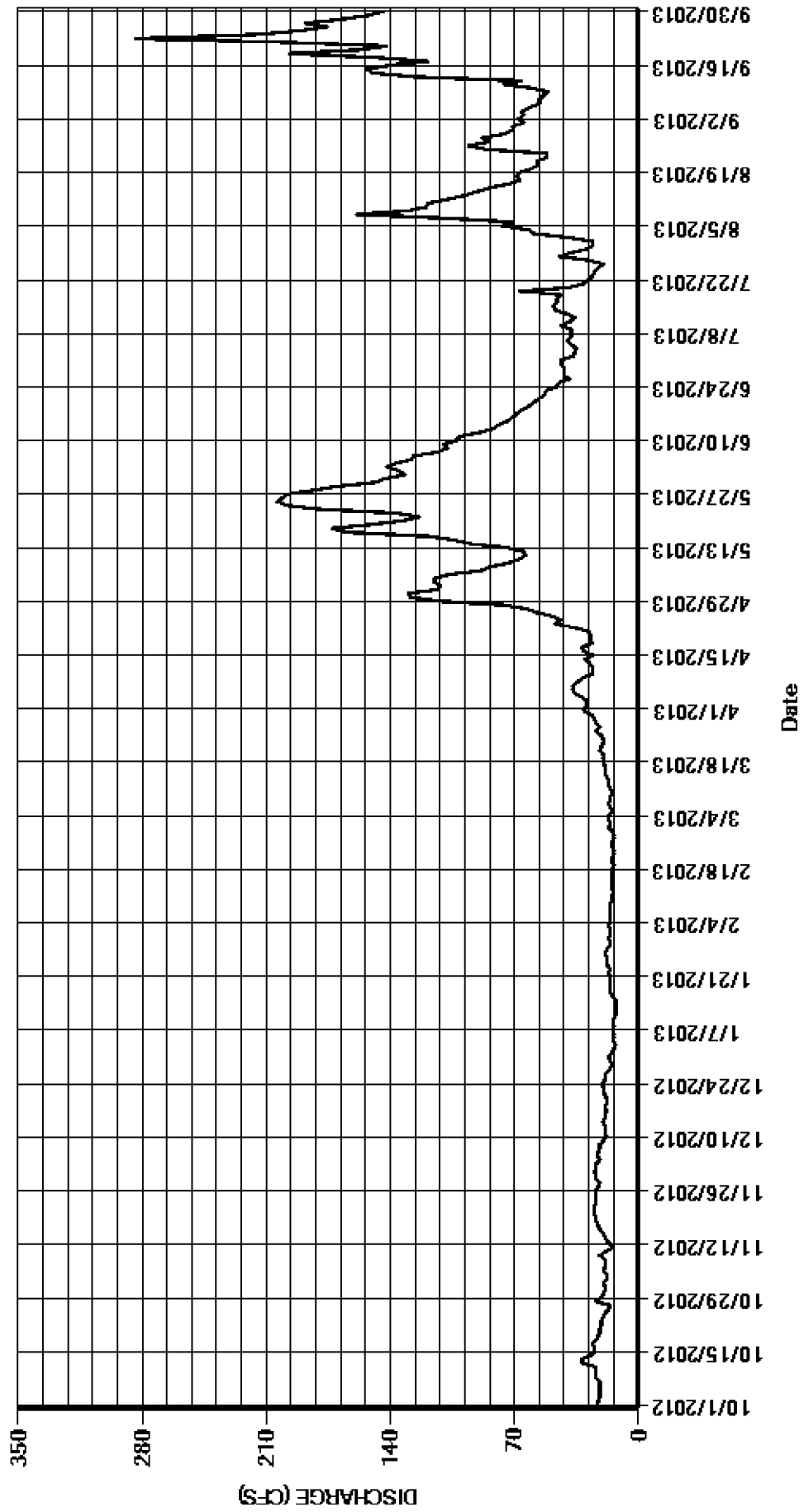
CAL YR	2012	TOTAL	18227	MEAN	49.8	MAX	236	MIN	14	AC-FT	36150
WTR YR	2013	TOTAL	18621	MEAN	51.0	MAX	284	MIN	13	AC-FT	36930

MAX DISCH: 457 CFS AT 23:30 ON SEP 22, 2013 GH 3.95 FT SHIFT 0 FT

MAX GH: 3.95 FT AT 23:30 ON SEP 22, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08218500 GOOSE CREEK AT WAGONWHEEL GAP  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08219500 SOUTH FORK RIO GRANDE RIVER AT SOUTH FORK  
Water Year 2013

Location.-- Lat 37°39'34", long 106°38'55" referenced to North American Datum of 1983 (South Fork West, CO quad, scale 1:24,000), UTM Zone 13 354589 E and 4169323 N, in NW ¼ NE ¼ sec. 3, T.39 N., R.3 E., New Mexico Principal Meridian, Rio Grande County, CO, Hydrologic Unit 13010001, on left bank near U.S. Highway 160, 0.1 mi downstream from Church Creek, 0.9 mi southwest of South Fork, CO, and 1.5 mi upstream from mouth.

Drainage Area and Period of Record.-- 216 mi<sup>2</sup> (from topographic maps); 1910-1922; 1936 to current year.

Equipment.-- Data collection platform (Satlink2), a float-operated Stage Discharge Recorder (SDR), air temperature sensor, and tipping-bucket rain gauge in a timber shelter and corrugated metal pipe well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Cableway is located 475 feet upstream. Crest stage gage installed July 24, 2013.

Hydrologic Conditions.-- Transmountain diversion from Colorado River Basin through Treasure Pass Ditch and into Rio Grande Basin above station. A few small diversions for irrigation, slight regulation by Beaver Creek Reservoir (capacity, 4,760 acre-ft.), and several smaller storage reservoirs.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted data with DCP log and SDR log as backup. Record is complete and reliable except for Nov 20 through Mar 21 when the station was closed and Mar 23-26 when the well froze. The stage-discharge relationship was affected by ice Nov 10-19 and Mar 22. There were no instrument calibration corrections needed or made. CSG installed July 24 had one recorded peak, 4.05 ft, 0.06 ft lower than the recorded peak during period 4.11 ft.

Datum Corrections.-- Levels were last run to the reference point (RP) inside gage on July 24, 2013 using BM7 as base. The crest stage gage was installed and surveyed. The RP elevation was found within allowable limits and no correction was made. Two-peg test was performed on the Lietz level (SN 130869) on June 25, 2013 the instrument was within allowable limits and no correction was made.

Rating.-- The control is a cobble bar at island approximately 250 ft downstream from the gage which splits the flow into two channels at medium and high flows. Shifting is caused by channel scour and fill and also vegetation and debris deposition associated with the cobble bar island. Rating no. 11 in use since Oct 1, 2007 was used until Mar 13. Rating no. 12 was used from Mar 13 to the end of the water year. Both ratings are fairly well defined from 34 to 2700 cfs. Seventeen measurements (nos. 297-313) were made this year ranging in discharge from 18.1 to 627 cfs. The measurements cover the discharge range experienced except for higher daily flows on May 17, 18, 24-26. The peak flow of 832 cfs occurred at 2215 on May 17, 2013 at a gage height of 4.13 feet with a shift of 0.00 ft. It exceeded high measurement no. 307 (GH=3.73 ft), made May 17, by 0.40 feet in stage.

Discharge.-- Shifting control method was used to compute the discharge record during all open water periods. Direct application of rating no. 11 was applied Oct 1 - Mar 13. Direct application of rating no. 12 was applied Mar 13 - Jul 28. Two shift curves were developed and used to define the stage-shift relationship through the rest of the water year. Open-water measurement shifts ranged from -0.07 feet to 0.02 feet; applied shifts ranged from -0.04 ft to 0.00 ft. All were given full weight except nos. 297, 304, 307-310, 312 and 313, which were adjusted as much as 10.2% to smooth shift distribution. Periods of ice affected and unreliable gage-height record were estimated.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using discharge measurements, comparison with flows at Rio Grande near Del Norte, Rio Grande near Wagon Wheel Gap, Goose Creek at Wagon Wheel Gap, and weather records.

Remarks.-- Record is good except for periods estimation, which are poor. Station maintained and records developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08219500 SOUTH FORK RIO GRANDE RIVER AT SOUTH FORK

RATING TABLE-- RIOSFKCO11 USED FROM 01-OCT-2012 TO 13-MAR-2013  
 RIOSFKCO12 USED FROM 13-MAR-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	42	27	e34	e26	e29	e36	84	501	402	87	63	94
2	44	28	e33	e26	e29	e36	90	462	390	72	56	98
3	50	26	e33	e26	e30	e37	89	424	394	71	69	99
4	51	26	e33	e26	e30	e37	91	446	391	66	64	91
5	56	28	e32	e26	e30	e37	107	415	371	69	75	87
6	54	27	e32	e26	e30	e37	114	404	334	74	77	84
7	52	27	e32	e26	e31	e37	122	354	300	68	140	81
8	52	27	e31	e26	e31	e37	120	340	281	68	165	80
9	52	33	e30	e26	e31	e37	114	305	274	68	128	74
10	52	e34	e30	e26	e31	e38	108	277	263	66	117	80
11	51	e24	e30	e25	e32	e38	95	274	245	66	149	116
12	52	e25	e30	e25	e32	e39	95	292	219	80	143	100
13	67	e26	e29	e25	e32	e39	98	343	196	67	166	175
14	57	e29	e29	e25	e32	e40	105	437	179	69	157	219
15	54	e30	e29	e25	e33	e42	106	488	163	68	129	226
16	52	e32	e29	e25	e33	e43	113	568	150	66	119	197
17	50	e33	e28	e25	e33	e44	122	694	138	63	113	174
18	48	e35	e28	e25	e33	e45	106	699	136	62	108	287
19	47	e36	e28	e26	e33	e46	97	594	132	77	106	409
20	47	e37	e27	e26	e34	e46	100	508	122	70	108	320
21	46	e37	e27	e26	e34	e48	99	450	114	56	99	272
22	47	e36	e27	e26	e34	e47	129	458	109	53	86	363
23	47	e36	e27	e27	e34	e46	169	561	104	51	84	567
24	46	e36	e27	e27	e34	e45	172	640	100	50	82	437
25	39	e35	e27	e27	e35	e45	194	679	96	51	136	359
26	23	e35	e27	e27	e35	e45	202	658	93	49	181	308
27	24	e34	e27	e28	e35	47	208	611	86	52	138	381
28	29	e34	e27	e28	e35	53	274	556	77	78	119	384
29	28	e34	e26	e28	---	59	360	509	72	74	108	349
30	28	e34	e26	e28	---	61	442	453	75	65	107	314
31	27	---	e26	e29	---	69	---	430	---	69	102	---
TOTAL	1414	941	901	813	905	1356	4325	14830	6006	2045	3494	6825
MEAN	45.6	31.4	29.1	26.2	32.3	43.7	144	478	200	66.0	113	228
AC-FT	2800	1870	1790	1610	1800	2690	8580	29420	11910	4060	6930	13540
MAX	67	37	34	29	35	69	442	699	402	87	181	567
MIN	23	24	26	25	29	36	84	274	72	49	56	74

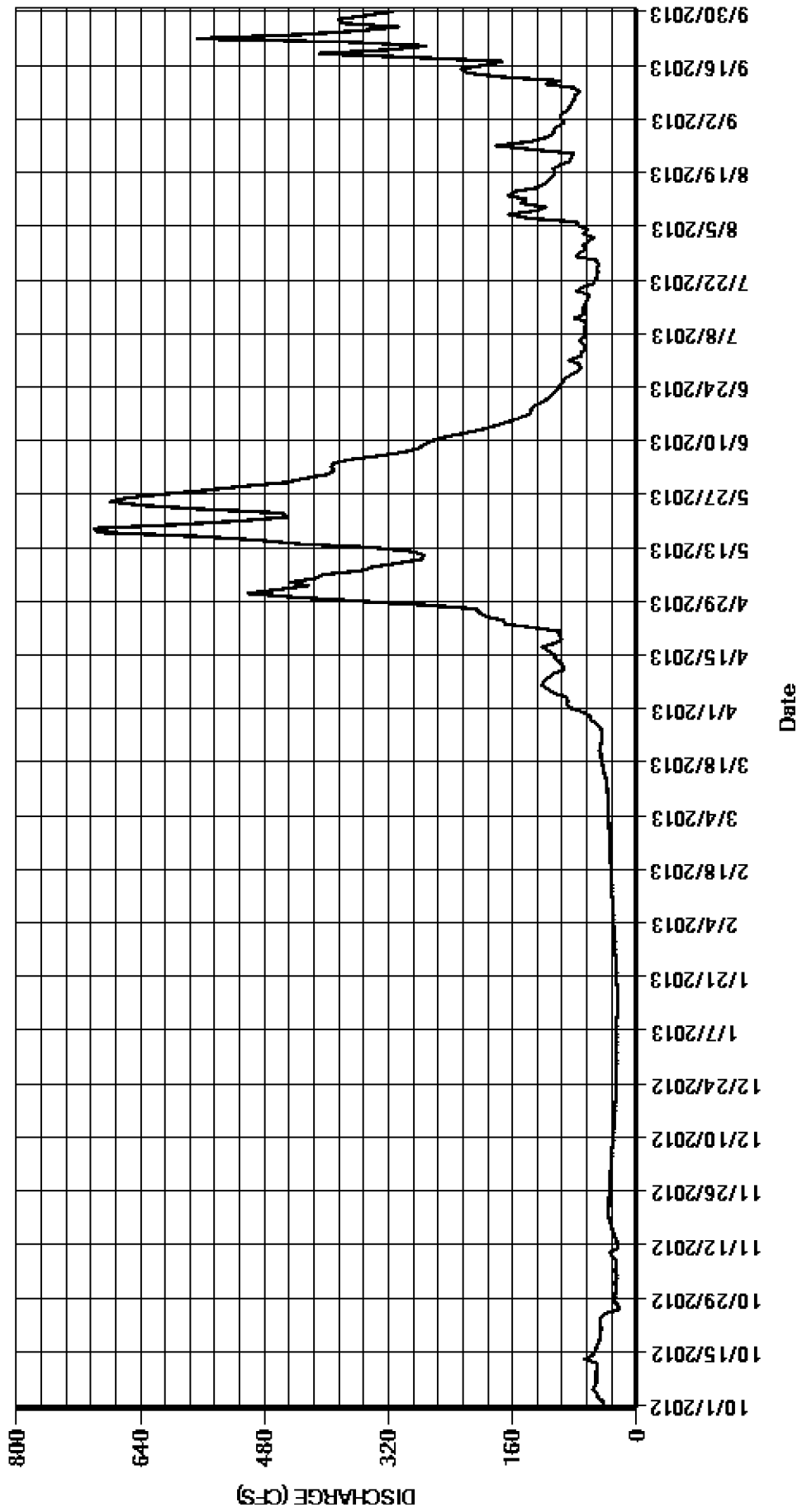
CAL YR	2012	TOTAL	46857	MEAN	128	MAX	717	MIN	23	AC-FT	92940
WTR YR	2013	TOTAL	43855	MEAN	120	MAX	699	MIN	23	AC-FT	86990

MAX DISCH: 832 CFS AT 22:15 ON MAY 17, 2013 GH 4.13 FT SHIFT 0 FT

MAX GH: 4.13 FT AT 22:15 ON MAY 17, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08219500 SOUTH FORK RIO GRANDE RIVER AT SOUTH FORK  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08220000 RIO GRANDE RIVER NEAR DEL NORTE, CO  
Water Year 2013

Location.-- Lat 37°41'19", long 106°27'35.5" referenced to North American Datum of 1983 (Indian Head, CO quad, scale 1:24,000), UTM Zone 13 371297 E and 4172269 N, in NE ¼ NE ¼ sec. 30, T.40 N., R.5 E., New Mexico Principal Meridian, Rio Grande County, CO, Hydrologic Unit 13010001, on right bank 40 ft downstream from county road 17 (Twin Mountain) bridge, 5 mi upstream from Pinos Creek, and 6 mi west of Del Norte, CO.

Drainage Area and Period of Record.-- 1,320 mi<sup>2</sup> (furnished by State Engineer of Colorado); June 1889 to current year. Monthly discharge only for some periods.

Equipment.-- Graphic water-stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio and phone modem), and a float-operated shaft encoder, air temperature sensor, water temperature sensor, and tipping bucket rain gauge in a 6 ft by 6 ft exposed aggregate building with a 4 ft diameter concrete well. The primary reference gage is a drop tape from reference point on shelf. Cableway located 1500 feet above gaging station. On Jul 15, 2011 the new outside chain gage was functional at the station.

Hydrologic Conditions.-- Natural flow of stream affected by storage reservoirs, transmountain diversions from Colorado River Basin, diversions for irrigation and municipal use, groundwater withdrawals, return flows from irrigated areas, and flows from sewage-treatment plants. Flow regulated by Beaver Creek Reservoir since 1910, Santa Maria Reservoir since 1912, Rio Grande Reservoir since 1912, and Continental Reservoir since 1925, combined capacity, 126,100 acre-ft, and by several smaller reservoirs.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable. The stage-discharge relation was affected by ice Dec 9 to Mar 18, Mar. 23-26. There were no instrument calibration corrections made to the shaft encoder.

Datum Corrections.-- Levels were last ran Sep 1, 2011 to the Reference Point (RP) inside the gage using BM #6 as base. The RP elevation was within allowable limits, so no correction was made. A 0.08 ft correction was made to the cantilever gage.

Rating.-- Low water control is a wide cobble bar 250 feet below the gage. High water control is the river channel. The channel splits at control section. At gage-heights below approximately 1.00 foot, all water flows in left channel. Rating no. 4, in use since March 15, 2007, was used again this year. It is well defined from 53 to 9000 cfs. This rating was extended to 12,500 cfs using data acquired from a USGS cooperative rating curve extension project completed in 2003. Thirty measurements (nos. 224-253) were made this year, ranging in discharge from 131 to 3140 cfs. They cover the discharge range experienced except for the lower daily flows on Nov 12, 13; Dec 10, 21, 28-30; Jan 1-26, 30, 31; and Feb 1-4, 9-14, 19, 22-28. The peak flow of 3360 cfs occurred at 0800 on May 18, 2013 at a gage height of 3.63 feet with a shift of -0.06 ft. It exceeded high measurement no. 244 (GH = 3.52 ft), made May 24, 2013 by 0.11 ft in stage.

Discharge.-- Shifting control method was used to compute discharge during all open-water periods. Periods when stage-discharge relation was affected by ice were estimated. Shift curves (VS12-3 and VS13-3) were developed and used to distribute shifting by stage and time. Open-water measurement shifts ranged from -0.16 to +0.07 ft; applied shifts ranged from -0.06 to 0 ft. Measurements were adjusted as much as 4.4% to smooth the shift trend except for measurement no. 240, which was rated poor and immediately followed by a check measurement, was adjusted 8.9% and measurement nos. 252 and 253 which were paired check measurements adjusted 5.9% and 7.9% respectively.

Special Computations.-- Discharge for periods of ice-affected record was estimated using discharge measurements, partial day records, weather records, and hydrographic comparison with nearby stations.

Remarks.-- Record is good except for the period of Nov 11 to Dec 8, due to possible slight ice effect, which is fair; and periods of ice affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08220000 RIO GRANDE RIVER NEAR DEL NORTE, CO

RATING TABLE-- RIODELCO04 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

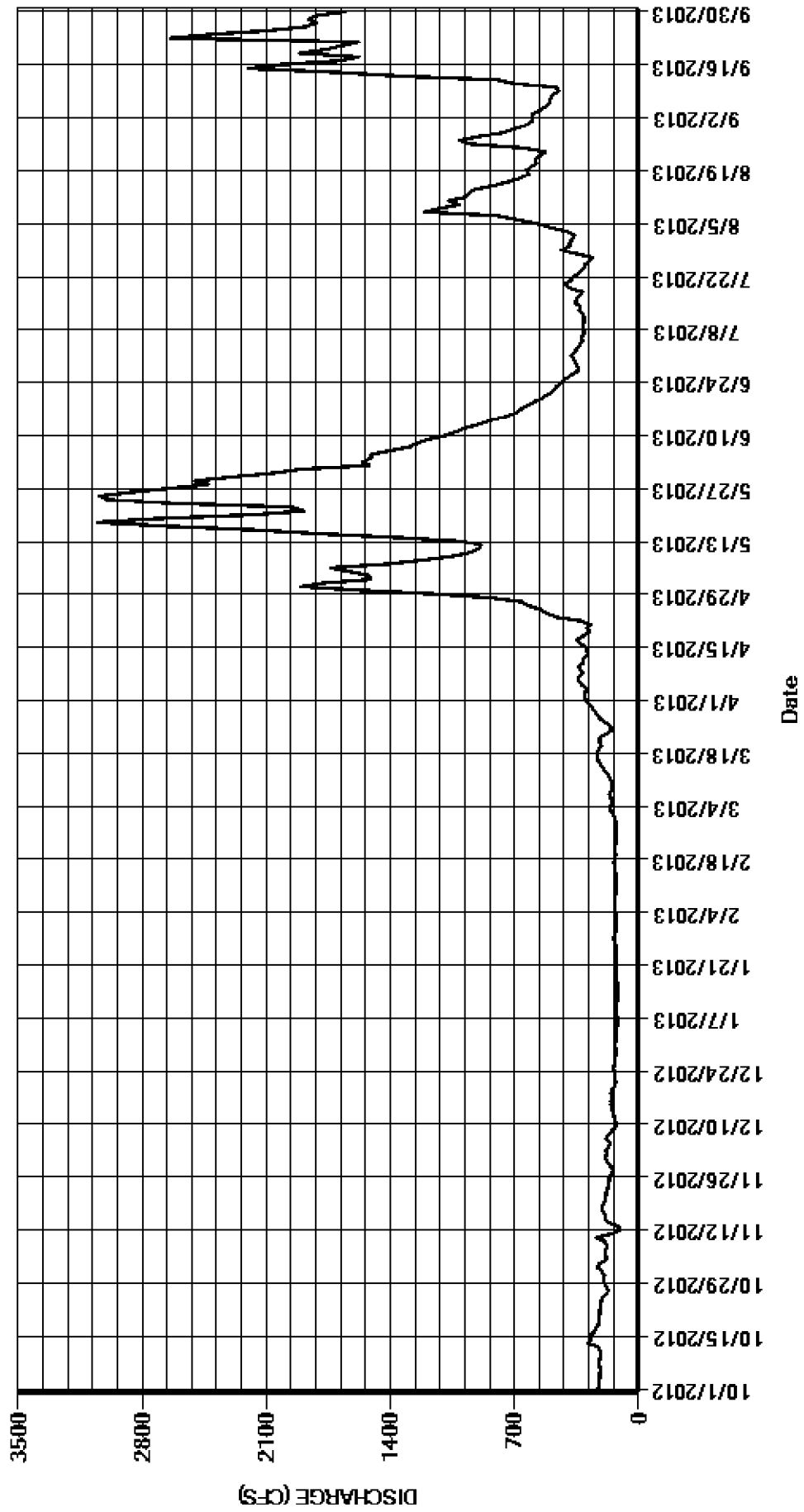
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	229	207	188	e130	e130	e135	297	1910	1910	379	373	602
2	223	233	181	e125	e130	e145	305	1780	1520	359	361	599
3	226	222	183	e125	e130	e160	301	1510	1560	349	415	601
4	219	186	171	e125	e130	e160	294	1520	1510	330	505	555
5	220	184	158	e120	e135	e145	321	1630	1510	318	576	519
6	216	189	184	e120	e135	e155	337	1740	1400	321	693	499
7	221	184	174	e120	e135	e165	343	1410	1290	306	796	498
8	222	180	152	e125	e135	e155	316	1220	1250	311	1210	483
9	219	191	e135	e125	e130	e145	330	1050	1180	313	1130	452
10	217	238	e125	e125	e130	e150	336	953	1090	308	1010	465
11	218	148	e135	e125	e125	e160	311	903	1030	308	1070	710
12	228	105	e140	e120	e125	e170	316	890	973	314	978	792
13	286	116	e145	e120	e125	e185	285	994	898	335	956	1340
14	271	174	e150	e120	e130	e200	294	1340	832	330	927	1710
15	275	189	e155	e120	e135	e215	299	1790	749	358	818	2200
16	253	190	e155	e120	e135	e230	330	2150	688	350	738	2020
17	240	202	e150	e125	e140	e235	349	2660	663	328	667	1690
18	229	207	e155	e125	e135	e235	312	3050	623	319	621	1580
19	224	199	e150	e125	e130	225	275	2720	583	392	633	1910
20	226	186	e135	e125	e135	211	293	2170	539	414	606	1760
21	219	185	e130	e125	e135	221	273	1890	502	383	578	1670
22	218	181	e135	e125	e130	220	325	1960	480	366	583	1580
23	214	173	e135	e125	e125	e188	467	2620	459	334	554	2640
24	212	171	e140	e125	e125	e150	518	3000	433	311	526	2420
25	207	167	e140	e130	e130	e160	556	3040	410	305	656	2090
26	183	166	e135	e130	e125	e184	622	2860	378	281	946	1880
27	170	151	e135	e135	e130	217	662	2650	346	263	1010	1820
28	182	142	e130	e140	e130	231	826	2430	341	355	896	1860
29	194	162	e125	e135	---	247	1140	2500	353	440	761	1810
30	195	178	e130	e130	---	259	1570	2290	364	392	697	1650
31	194	---	e135	e130	---	279	---	2060	---	388	638	---
TOTAL	6850	5406	4591	3895	3665	5937	13203	60690	25864	10560	22928	40405
MEAN	221	180	148	126	131	192	440	1958	862	341	740	1347
AC-FT	13590	10720	9110	7730	7270	11780	26190	120400	51300	20950	45480	80140
MAX	286	238	188	140	140	279	1570	3050	1910	440	1210	2640
MIN	170	105	125	120	125	135	273	890	341	263	361	452

CAL YR	2012	TOTAL	205167	MEAN	561	MAX	2930	MIN	105	AC-FT	406900
WTR YR	2013	TOTAL	203994	MEAN	559	MAX	3050	MIN	105	AC-FT	404600

MAX DISCH: 3360 CFS AT 08:00 ON MAY 18, 2013 GH 3.63 FT SHIFT -0.06 FT  
 MAX GH: 3.63 FT AT 08:00 ON MAY 18, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08220000 RIO GRANDE RIVER NEAR DEL NORTE, CO  
WY2013 HYDROGRAPH





RIO GRANDE RIVER BASIN  
08220500 PINOS CREEK NEAR DEL NORTE

Water Year 2013

Location.-- Lat 37°35'30", long 106°27'0" referenced to North American Datum of 1983 (Horseshoe Mountain, CO quad, scale 1:24,000), UTM Zone 13 371984 E and 4161500 N, in SW ¼ SE ¼ sec. 29, T.39 N., R.5 E., New Mexico Principal Meridian, Rio Grande County, CO, Hydrologic Unit 13010002, on left bank 200 ft downstream from Bennett Creek and 8 mi southwest of Del Norte, CO.

Drainage Area and Period of Record.-- 53 mi<sup>2</sup>; 1919 to 1924, May 1, 1936 to current year.

Equipment.-- Data collection platform (Sutron Satlink2), and a float-operated stage discharge recorder (Sutron SDR) in a 3 ft by 3 ft timber shelter and concrete well at a 12-foot rectangular concrete box control with a steel triangular ramp on each side of the concrete box at the discharge end. The primary reference gage is a drop tape from reference point on shelf. A supplemental outside staff gage is located in the concrete box.

Hydrologic Conditions.-- Drainage is composed of light development, alpine and sub-alpine conditions. Flows are affected by Fuchs Reservoir and five small diversions upstream.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log and SDR log as backup. Record is complete and reliable except for Nov 13-19 and Mar 24-26 when float was frozen in the well and Nov 20 to Mar 21 when the station was closed for the winter. Stage-discharge relation was affected by ice Oct 26 to Nov 12, and Mar 22, 23, 27-31. No instrument calibration corrections were required.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on Jul 12, 2012 using B.M. No. 3 as base. The RP elevation was within allowable limits, so no correction was made. Two-peg test was performed on the Lietz level (SN 130869) on Jun 11, 2012 and the instrument was within allowable limits and no adjustment was made.

Rating.-- The control is a 12 ft wide, 12 ft long, 5 ft high concrete box flume with a steel triangular ramp on each side of the concrete box at the discharge end. Minor shifting mainly occurs because of changes in approach conditions, spalling of the concrete, and movement of streambed materials through the box. Rocks, trees, and approach angle in the streambed above the gage also cause some shifting. Rating no. 15, first used Oct 4, 2007, was used again this water year. Seventeen measurements (nos. 188-204) were made this year ranging in discharge from 2.51 to 35.7 cfs. The measurements cover the discharge range experienced except for the lower daily flows on Jan 13-15 and higher daily flows on May 16-18. The peak flow of 184 cfs occurred at 1450 on Jul 27, 2013 at a gage height of 2.32 ft with a shift of 0.00 ft (from 5-minute SDR log forced into 1445 for peaks computation). It exceeded high measurement no. 198 (GH=1.23 ft), made May 16 by 1.09 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record during all periods of reliable stage record. Four shift curves were developed and used to distribute shifts based on stage and time. Open-water measurement shifts ranged from 0.00 to +0.04 ft. Applied shifts ranged from 0.00 to +0.03 ft. All measurements were given full weight except no. 189, 196, 199, and 203, which were adjusted by as much as 4.1 percent to smooth shift trends. Discharge for periods of ice affected, unreliable, and no gage-height record was estimated.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using discharge measurements and air temperature records from RIOSFKCO.

Remarks.-- Record is good except for periods of estimation, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Try to obtain more measurements above 1.50 ft gage height.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08220500 PINOS CREEK NEAR DEL NORTE

RATING TABLE-- PINDELCO15 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

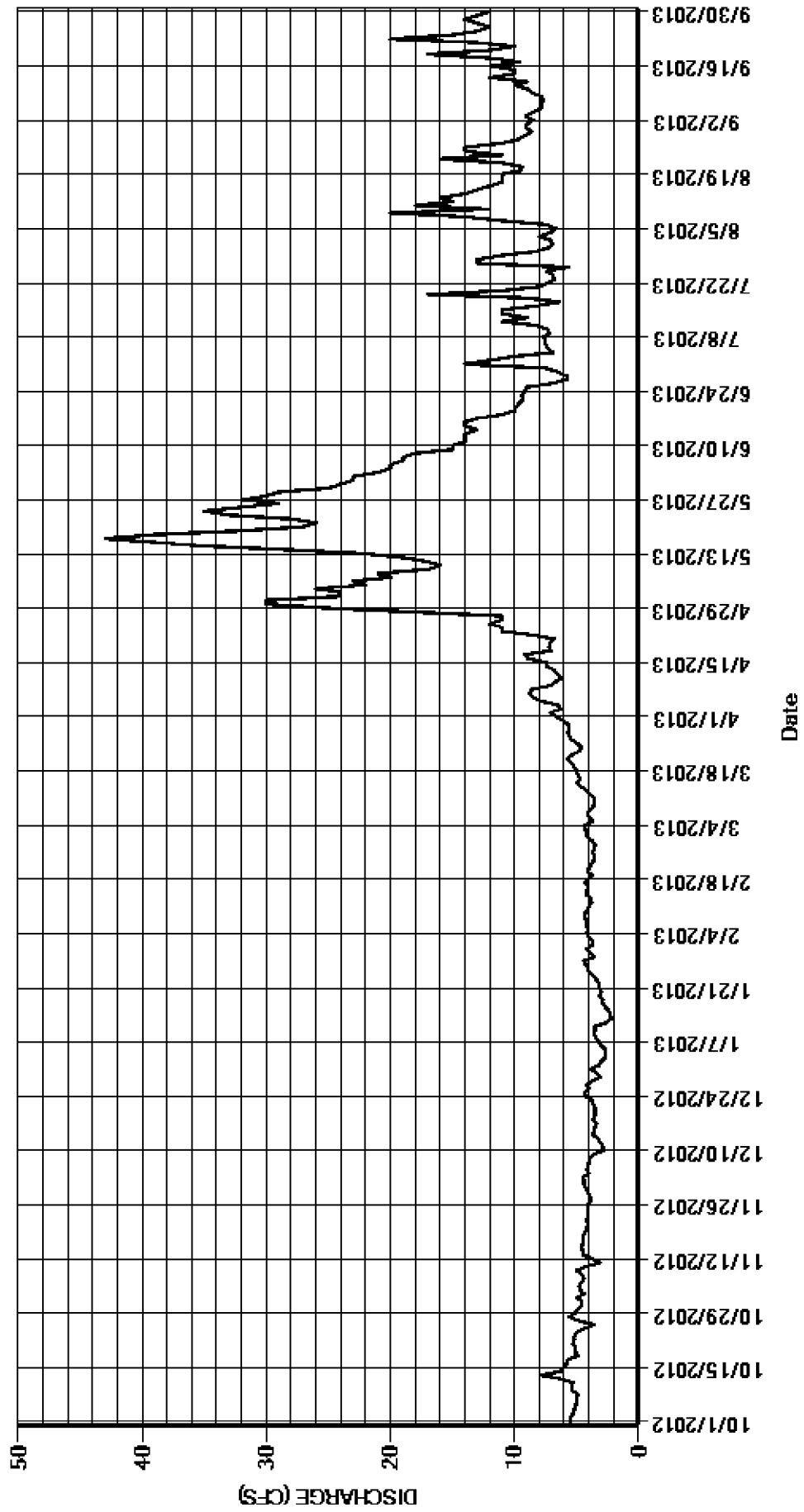
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.5	e4.6	e4.4	e3.2	e3.7	e4.2	6.7	30	23	14	6.9	9.0
2	5.5	e5.0	e4.4	e3.0	e3.7	e4.2	7.1	24	23	12	7.1	8.5
3	5.3	e4.4	e4.5	e2.7	e4.0	e4.3	6.3	24	21	10	8.0	9.1
4	5.2	e4.7	e4.0	e2.7	e4.2	e4.3	6.5	26	20	6.9	7.1	8.6
5	5.1	e4.8	e4.2	e2.7	e4.1	e3.7	7.8	22	20	7.3	6.7	7.9
6	5.0	e4.6	e4.1	e3.0	e4.2	e4.0	8.5	23	19	7.5	7.4	7.8
7	5.0	e4.4	e4.0	e3.2	e4.2	e4.1	8.8	20	19	7.5	11	7.7
8	4.9	e4.6	e4.0	e3.4	e4.3	e3.9	8.6	21	18	7.7	14	7.8
9	5.4	e5.0	e3.6	e3.6	e4.4	e3.6	7.1	17	15	7.2	20	8.6
10	5.4	e4.2	e2.8	e3.5	e4.1	e3.6	6.7	16	15	7.3	12	9.0
11	5.3	e3.1	e2.9	e3.5	e4.0	e3.6	6.2	17	14	8.2	18	10
12	6.3	e3.8	e3.1	e2.6	e3.8	e3.9	6.6	19	14	11	15	9.0
13	7.8	e4.5	e3.3	e2.2	e3.8	e4.2	6.8	22	14	9.0	16	12
14	6.3	e4.5	e3.7	e2.3	e4.2	e4.7	7.4	28	13	11	14	10
15	6.0	e4.6	e3.6	e2.4	e4.2	e5.0	7.4	35	14	11	13	10
16	5.8	e4.5	e3.5	e2.7	e4.1	e4.7	8.9	39	14	8.2	12	12
17	5.7	e4.5	e3.4	e2.9	e4.3	e4.9	9.2	43	13	6.4	11	9.6
18	4.9	e4.5	e3.7	e2.9	e4.1	e5.0	7.1	39	11	9.0	11	12
19	5.1	e4.3	e3.5	e3.2	e3.7	e5.2	7.2	32	10	17	11	17
20	5.1	e4.2	e3.5	e3.0	e4.1	e5.4	7.2	27	9.9	11	9.5	12
21	5.3	e4.1	e3.5	e3.2	e4.0	e5.8	6.8	26	9.6	8.1	9.4	10
22	5.2	e4.2	e3.7	e3.2	e3.8	e5.4	8.5	28	9.3	7.3	11	13
23	5.2	e4.1	e3.8	e3.4	e3.6	e4.8	11	33	9.4	6.8	16	20
24	5.0	e4.1	e4.3	e3.6	e3.6	e4.6	11	35	9.2	6.9	11	15
25	4.4	e4.1	e4.3	e4.0	e3.7	e4.9	12	32	9.0	7.4	14	13
26	e3.6	e4.1	e4.0	e4.1	e3.6	e5.4	11	29	6.9	5.7	14	12
27	e4.8	e3.9	e4.2	e4.3	e3.5	e5.6	11	32	5.8	13	11	13
28	e5.6	e3.9	e3.7	e4.4	e3.8	e5.7	18	30	5.8	13	9.7	14
29	e5.1	e4.1	e3.1	e3.6	---	e5.6	25	29	6.5	11	9.1	13
30	e4.9	e4.2	e3.4	e3.9	---	e5.7	30	25	7.5	8.4	8.6	12
31	e4.6	---	e3.9	e4.2	---	e6.1	---	24	---	7.3	9.1	---
TOTAL	164.3	129.6	116.1	100.6	110.8	146.1	292.4	847	398.9	284.1	353.6	332.6
MEAN	5.30	4.32	3.75	3.25	3.96	4.71	9.75	27.3	13.3	9.16	11.4	11.1
AC-FT	326	257	230	200	220	290	580	1680	791	564	701	660
MAX	7.8	5.0	4.5	4.4	4.4	6.1	30	43	23	17	20	20
MIN	3.6	3.1	2.8	2.2	3.5	3.6	6.2	16	5.8	5.7	6.7	7.7

CAL YR	2012	TOTAL	4663.5	MEAN	12.7	MAX	61	MIN	2.8	AC-FT	9250
WTR YR	2013	TOTAL	3276.1	MEAN	8.98	MAX	43	MIN	2.2	AC-FT	6500

MAX DISCH: 184 CFS AT 14:45 ON JUL 27, 2013 GH 2.32 FT SHIFT 0 FT  
 MAX GH: 2.32 FT AT 14:45 ON JUL 27, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08220500 PINOS CREEK NEAR DEL NORTE  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08221500 RIO GRANDE RIVER AT MONTE VISTA

Water Year 2013

Location.-- Lat 37°36'34", long 106°8'56" referenced to North American Datum of 1983 (Monte Vista, CO quad, scale 1:24,000), UTM Zone 13 398597 E and 4163100 N, in NW ¼ SW ¼ sec. 19, T.39 N., R.8 E., New Mexico Principal Meridian, Rio Grande County, CO, Hydrologic Unit 13010002, on left bank 40 ft downstream from bridge on U.S. Highway 285, 2.0 mi north of Monte Vista, CO, and 12 mi downstream from San Francisco Creek.

Drainage Area and Period of Record.-- 1,590 mi<sup>2</sup>; May 1, 1926 to present.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Satlink2), a float-operated Sutron Stage Discharge Recorder (SDR), and a tipping-bucket rain gauge in a 72-inch corrugated metal shelter and well. The primary reference gage is a drop tape from reference point on shelf. Auxiliary outside cantilever gage installed on Mar. 18, 2011.

Hydrologic Conditions.-- Watershed is comprised of valley floor and steep mountain headwaters. Headwaters areas are generally undeveloped with only sparse minimally populated areas. Valley floor is highly agriculturally based and flows from watershed are diverted for irrigation, livestock watering, domestic, commercial, recharge, and groundwater withdrawals. Flow at gage also includes return flows from all uses.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted data with DCP log, SDR log, and graphic chart record as backup. Record is complete and reliable except for Nov 28 through Mar 18 and Mar 23 through 26 when float was frozen. The stage-discharge relationship was affected by ice Mar 19 through 22. Unit values were hand entered from chart on Apr 7-9 when SDR float sank. There were four instrument calibration corrections ranging from -0.01 to +0.01 ft, which were prorated from previous visit. There were four flush corrections ranging from +0.02 to +0.03 ft, which were prorated from previous inflection point.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on Jul 28, 2011 using BM3 as base. The RP elevation was found within allowable limits and no correction was made. The outside staff gage was outside allowable limits and adjusted -0.06 ft. A two-peg test was performed on the Lietz level (SN 130869) on Jul 28, 2011 and no adjustment was required.

Rating.-- Control at most stages is small cobble riffle approximately 500 ft below gage. Low water control is a gravel and small cobble riffle 25 ft below the gage. There are two channels at gage during lower stages due to sedimentation behind bridge pier above gage. Rating no. 21-1, in use since Oct 1, 2008, was used for the entire water year. It is well defined from 16 to 5500 cfs. Eighteen measurements (nos. 297-314) were made this year, ranging in discharge from 84.1 to 1800 cfs. The measurements cover the discharge range experienced except for the lower daily flows on Oct 2, 4-7, 9-11, 19-21, 26-28, 31; Nov 1, 4, 5, 12-14; and Apr 11-15, 19, 22. The peak flow of 1980 cfs occurred at 1015 on Sep 23 at a gage height of 5.59 ft with a shift of -0.11 ft. It exceeded high measurement no. 313 (GH = 5.43 ft), made Sep 23 by 0.16 ft in stage.

Discharge.-- Shifting-control method was used to compute discharge during all periods of reliable stage record. Periods of ice affected and unreliable stage record were estimated. Shift curve VS12-4 was carried from last year to Oct 25. Three other shift curves (VS13-B, VS13-C, and VS13-D) were developed and used to distribute shifts according to stage during the remainder of the year. Shift curve VS13-B was used Nov 14-20 when fallen tree below gage was affecting gage-height. Open-water measurement shifts ranged from -0.11 to +0.07 ft and applied shifts ranged from -0.11 to +0.05 ft. All open water measurements were given full weight except for nos. 297-299, 302, 304-308, and 310-312, which were adjusted as much as 3.1 percent to smooth shift trends.

Special Computations.-- Discharge for periods of unreliable gage-height record was based on comparison with nearby gages using a river accounting sheet.

Remarks.-- Record is good except for estimated periods, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08221500 RIO GRANDE RIVER AT MONTE VISTA

RATING TABLE-- RIOMONCO21-1 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

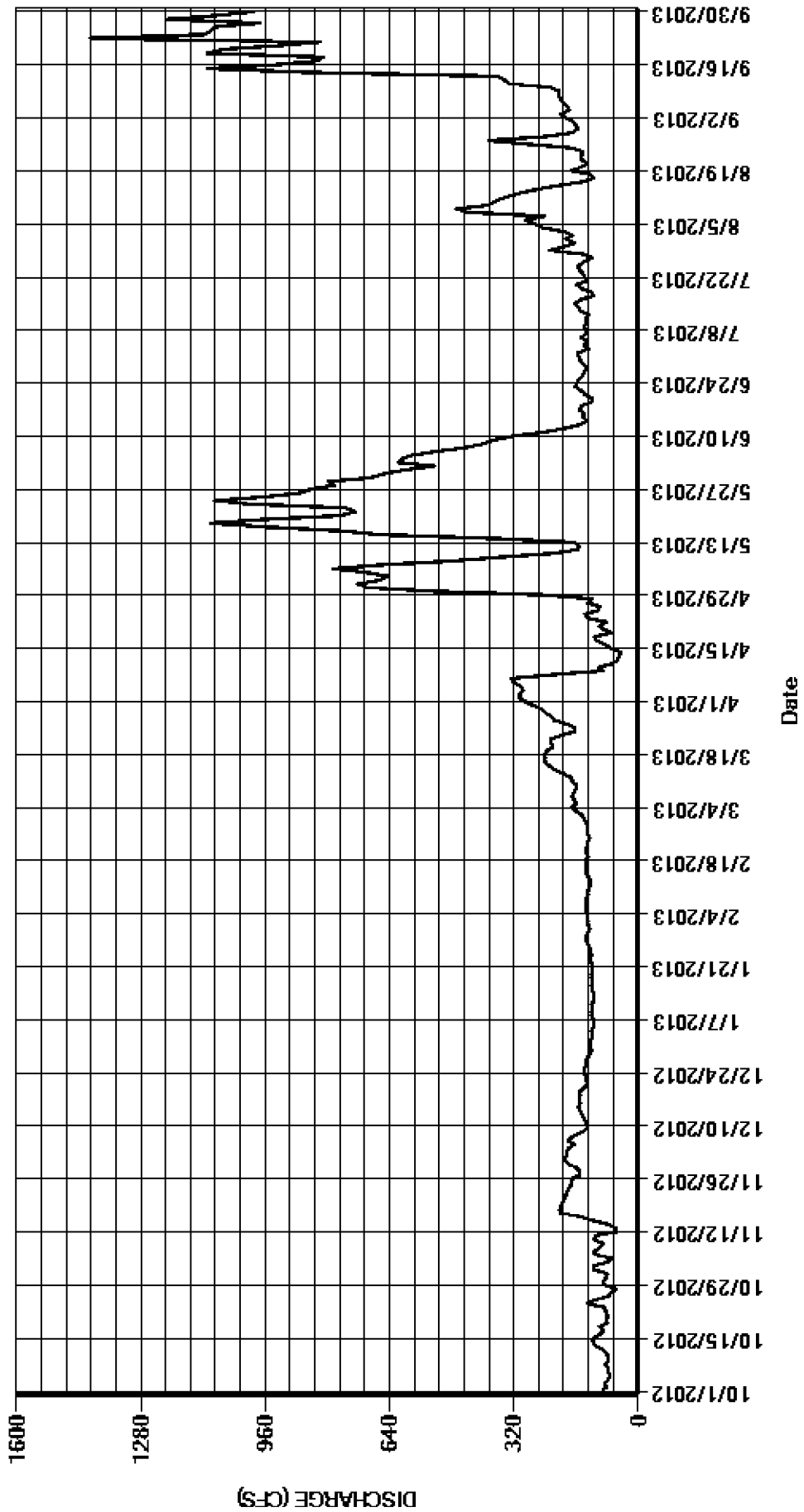
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	92	80	e190	e125	e130	e140	292	697	603	154	186	168
2	83	115	e185	e120	e130	e145	306	722	526	154	169	186
3	86	114	e185	e120	e130	e160	305	666	618	128	194	199
4	78	79	e180	e120	e130	e170	297	644	609	139	248	178
5	74	67	e165	e115	e135	e160	304	697	583	130	266	183
6	77	112	e180	e115	e135	e165	320	784	518	148	291	193
7	78	112	e170	e115	e135	e170	329	662	444	134	241	200
8	84	98	e150	e120	e135	e165	219	483	397	136	441	205
9	77	91	e135	e120	e130	e160	91	357	369	139	469	204
10	78	114	e130	e120	e130	e160	103	218	320	135	386	227
11	82	111	e135	e120	e125	e170	66	156	244	135	368	332
12	92	57	e140	e115	e125	e175	54	153	189	126	343	344
13	111	58	e145	e115	e125	e195	49	166	149	150	309	364
14	117	81	e150	e115	e130	e215	46	363	131	154	267	850
15	116	118	e155	e120	e135	e230	71	663	141	164	214	1110
16	99	149	e150	e120	e135	e240	85	765	141	146	147	932
17	89	201	e150	e120	e135	e240	107	954	151	116	115	825
18	100	202	e150	e120	e135	e240	113	1100	147	120	124	811
19	81	199	e150	e120	e130	e235	70	963	120	147	173	1110
20	81	193	e140	e120	e135	e220	90	766	118	158	148	1070
21	79	188	e130	e120	e135	e225	100	729	137	133	131	925
22	84	186	e135	e120	e130	e225	83	752	147	139	147	818
23	85	181	e135	e125	e130	e200	129	1000	163	144	146	1410
24	131	175	e140	e120	e125	e165	137	1090	157	153	144	1120
25	111	172	e140	e125	e130	e165	104	963	153	153	167	1100
26	77	169	e135	e125	e130	e185	99	870	143	139	282	1090
27	70	150	e135	e130	e130	217	130	844	140	119	386	976
28	57	e150	e130	e135	e135	225	120	782	134	145	238	1210
29	86	e160	e125	e135	---	238	235	797	142	231	171	1080
30	91	e180	e120	e130	---	249	523	689	149	192	155	990
31	82	---	e125	e125	---	272	---	656	---	163	161	---
TOTAL	2728	4062	4585	3765	3675	6121	4977	21151	7983	4524	7227	20410
MEAN	88.0	135	148	121	131	197	166	682	266	146	233	680
AC-FT	5410	8060	9090	7470	7290	12140	9870	41950	15830	8970	14330	40480
MAX	131	202	190	135	135	272	523	1100	618	231	469	1410
MIN	57	57	120	115	125	140	46	153	118	116	115	168

CAL YR	2012	TOTAL	89768	MEAN	245	MAX	1130	MIN	50	AC-FT	178100
WTR YR	2013	TOTAL	91208	MEAN	250	MAX	1410	MIN	46	AC-FT	180900

MAX DISCH: 1980 CFS AT 10:15 ON SEP 23, 2013 GH 5.59 FT SHIFT -0.11 FT  
 MAX GH: 5.59 FT AT 10:15 ON SEP 23, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08221500 RIO GRANDE RIVER AT MONTE VISTA  
 WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
RIO GRANDE RIVER AT RIO GRANDE-ALAMOSA COUNTY LINE  
Water Year 2013

Location.-- Lat 37°34'23", long 106°3'27" referenced to North American Datum of 1983 (Homelake, CO quad, scale 1:24,000), UTM Zone 13 406619 E and 4158984 N, in NW ¼ NW ¼ sec. 1, T.38 N., R.8 E., New Mexico Principal Meridian, Rio Grande County, CO, Hydrologic Unit 13010002, on left bank 1 mi above bridge on county line road.

Drainage Area and Period of Record.-- 1,640 mi<sup>2</sup>; April 1993 to present.

Equipment.-- Data collection platform (Sutron Satlink2) and a float-operated digital Stage-Discharge Recorder in a 42-inch diameter corrugated metal well and shelter. The primary reference gage is a drop tape from reference point on shelf. Auxiliary outside staff gage installed Apr 26, 2011.

Hydrologic Conditions.-- Watershed is comprised of valley floor and steep mountain headwaters. Headwaters areas are generally undeveloped with only sparse minimally populated areas. Valley floor is highly agriculturally based and flows from watershed are diverted for irrigation, livestock watering, domestic, commercial, recharge, and groundwater withdrawals. Flow at gage also includes return flows from all uses.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted data with DCP log and SDR log as backup. Record is complete and reliable except for Dec 20 through Mar 12 and Mar 25, 26 when float was frozen. There were three instrument calibration corrections ranging from -0.01 to +0.01 ft, which were prorated from previous visit. The stage-discharge relation was affected by ice Nov 28-Dec19 and Mar 13-19.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on Jul 28, 2011 using B.M. No. 4 as base. The RP elevation was found within allowable limits and no correction was made. The outside staff gage was adjusted -0.07 ft. A two-peg test was performed on the Lietz level (SN 130869) on Jul 28, 2011 and the instrument was within allowable limits and no adjustment was made.

Rating.-- The control is a compound control consisting of a gravel bar approximately 300 ft below the gage and a J-hook structure directly below the gage. Shifts have been trending more positive as the gravel bar is migrating downstream. Rating no. 10, in use since Mar 12, 2012 was used until the first measurement on Oct 25. Rating no. 11 was developed and used from Oct 25 to the end of the water year. Rating no. 11 is well defined from 50 to 700 cfs and poorly defined below 30 and above 1000 cfs. Eighteen measurements (nos. 385-402) were made this year ranging in discharge from 3.01 to 654 cfs. These measurements cover the discharge range experienced except for higher daily flows on Sep 20, 23, 26-30. The peak flow of 1020 cfs occurred at 0815 on Sep 28, 2013 at a gage height of 5.34 ft with a shift of 0.00 ft. It exceeded high measurement no. 402 (GH = 4.55 ft), made Sep 30, by 0.79 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record during all open water periods. Discharge was estimated for periods of unreliable gage-height and ice affected record. Shift curve VS12-B was carried over from last year to Oct 25. Two other shift curves (VS13-G and VS13-H) were developed and used during the remainder of the year to distribute shifts by stage and time. Open-water measurement shifts ranged from -0.06 to +0.07 ft and applied shifts ranged from -0.04 to +0.01 ft. All open water measurements were given full weight except for nos. 385, 388-391, 393-395, and 400-402, which were adjusted by as much as 7% to smooth shift trends.

Special Computations.-- Discharge for periods of unreliable gage-height and ice affected record was estimated by comparison with nearby stations using a river accounting sheet.

Remarks.-- Record is good except for estimated periods, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

RIO GRANDE RIVER AT RIO GRANDE-ALAMOSA COUNTY LINE

RATING TABLE-- RIOLINCO10 USED FROM 01-OCT-2012 TO 25-OCT-2012  
 RIOLINCO11 USED FROM 25-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	60	78	e180	e120	e125	e145	282	155	187	75	120	103
2	49	80	e180	e115	e130	e150	296	188	121	84	109	122
3	50	38	e175	e115	e130	e170	297	189	177	53	130	131
4	47	19	e175	e115	e130	e175	289	147	195	65	168	111
5	42	3.3	e155	e115	e135	e170	292	249	133	58	194	109
6	43	34	e165	e115	e135	e175	311	312	106	74	224	115
7	44	41	e165	e115	e135	e180	319	255	74	71	200	127
8	50	37	e140	e115	e135	e175	243	152	58	67	264	123
9	48	24	e130	e115	e130	e170	88	154	82	72	299	122
10	44	42	e100	e115	e130	e170	96	124	101	62	259	147
11	51	57	e125	e115	e125	e180	55	81	104	57	228	240
12	56	21	e140	e115	e125	e185	39	73	101	51	250	318
13	73	14	e145	e115	e125	e205	40	75	71	71	281	272
14	84	27	e150	e115	e130	e230	25	121	48	86	261	528
15	79	59	e150	e115	e130	e245	38	192	51	97	204	488
16	69	110	e150	e115	e135	e250	45	253	58	92	132	417
17	60	199	e145	e120	e135	e245	65	249	68	57	89	368
18	72	209	e150	e120	e135	e245	75	247	72	51	78	428
19	58	208	e145	e115	e130	e245	49	201	43	74	125	622
20	59	201	e135	e115	e135	242	67	201	31	92	105	669
21	59	194	e130	e120	e135	234	79	254	48	62	89	521
22	56	193	e130	e120	e125	231	62	261	52	66	98	512
23	52	189	e135	e120	e130	222	83	346	74	66	102	773
24	92	182	e135	e120	e125	172	95	319	74	85	97	552
25	96	180	e140	e115	e125	e175	63	142	72	99	109	611
26	69	176	e135	e120	e130	e190	46	140	65	85	223	663
27	61	170	e135	e125	e130	211	78	174	65	64	197	668
28	43	e145	e130	e130	e135	221	64	235	62	79	99	891
29	63	e155	e120	e130	---	236	47	280	60	165	125	747
30	76	e170	e115	e125	---	245	100	210	67	140	103	672
31	69	---	e120	e120	---	263	---	178	---	108	102	---
TOTAL	1874	3255.3	4425	3660	3655	6352	3728	6157	2520	2428	5064	12170
MEAN	60.5	109	143	118	131	205	124	199	84.0	78.3	163	406
AC-FT	3720	6460	8780	7260	7250	12600	7390	12210	5000	4820	10040	24140
MAX	96	209	180	130	135	263	319	346	195	165	299	891
MIN	42	3.3	100	115	125	145	25	73	31	51	78	103

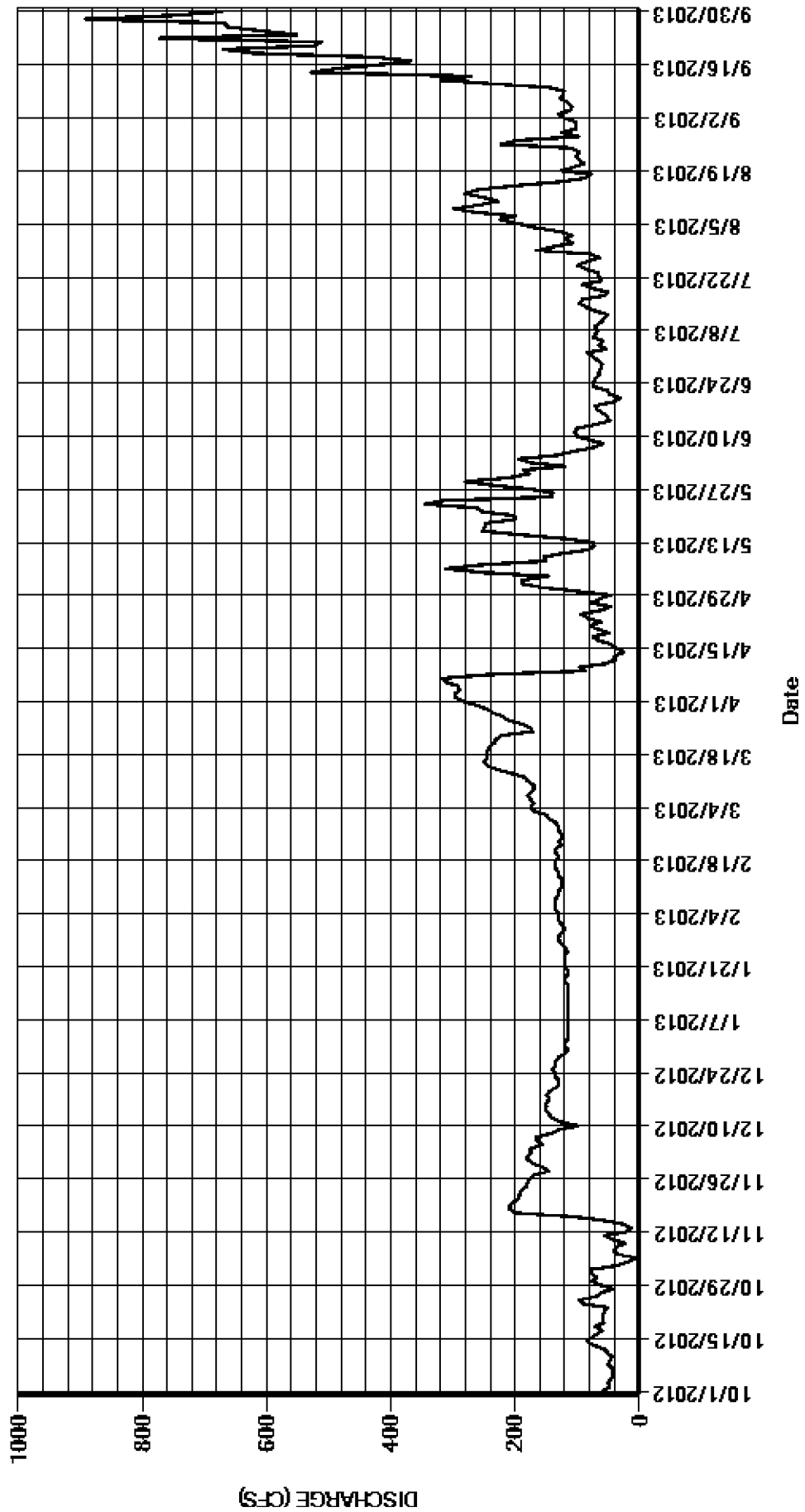
CAL YR	2012	TOTAL	52500.3	MEAN	143	MAX	768	MIN	3.3	AC-FT	104100
WTR YR	2013	TOTAL	55288.3	MEAN	151	MAX	891	MIN	3.3	AC-FT	109700

MAX DISCH: 1020 CFS AT 08:15 ON SEP 28, 2013 GH 5.34 FT SHIFT 0 FT  
 MAX GH: 5.34 FT AT 08:15 ON SEP 28, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



RIO GRANDE RIVER AT RIO GRANDE-ALAMOSA COUNTY LINE  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08223000 RIO GRANDE RIVER AT ALAMOSA

Water Year 2013

Location.-- Lat 37°28'51", long 105°52'41" referenced to North American Datum of 1983 (Alamosa West, CO quad, scale 1:24,000), UTM Zone 13 422367 E and 4148575 N, in SE ¼ NE ¼ sec. 4, T.37 N., R.10 E., New Mexico Principal Meridian, Alamosa County, CO, Hydrologic Unit 13010002, on left bank 0.3 mi northwest of Adams State College and 9 mi upstream from Alamosa Creek.

Drainage Area and Period of Record.-- 1,710 mi<sup>2</sup>; Apr. 7, 1915 to current year.

Equipment.-- Graphic water-stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), air temperature sensor, and a float-operated shaft encoder in a 4 ft by 6 ft exposed aggregate building with a 4 ft diameter concrete well. Primary reference gage is a drop tape from reference point on shelf. Auxilliary outside staff gage installed May 25, 2011.

Hydrologic Conditions.-- Watershed is comprised of valley floor and steep mountain headwaters. Headwaters areas are generally undeveloped with only sparse minimally populated areas. Valley floor is highly agriculturally based, flows from watershed are diverted for irrigation, livestock watering, domestic, commercial, recharge, and groundwater withdrawals. Flow at gage also includes return flows from all uses. Riparian areas in the vicinity of the gage have been modified by flood protection levees through the city of Alamosa thus water stage is affected by levees and vegetative growth within levees.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Dec 22 through Mar 6 when float was frozen. One erroneous unit value was filled on Jul 29 from measurement note without loss of accuracy. There was one -0.02 ft instrument calibration correction made on Aug 19, which was prorated by time from the previous visit. There was one -0.03 ft flush correction on Nov 7, which was prorated by time from previous inflection point. The stage-discharge relation was affected by ice Nov 12-14, 28-30; Dec 8-21; and Mar 7 -17.

Datum Corrections.-- Levels were last run to the Reference point (RP) inside the gage on Jun 11, 2012 using BM7 as base. The RP elevation was within allowable limits and no correction was made. Two-peg test was performed on the Lietz level (SN 130869) on Jun 11, 2012 and the instrument was within allowable limits and no correction was made.

Rating.-- The control is a sand streambed and channel. The sand movement, change in vegetation, and changes to downstream diversion structure (Westside Diversion) cause numerous shift changes. Rating no. 22D in use since Oct 1, 2005 was used for the entire water year. The upper end of curve (above 1500 cfs) was created by the USGS using step-backwater analysis method as part of a cooperative rating curve extension project. Seventeen measurements (nos. 363-379) were made this year ranging in discharge from 34.0 to 677 cfs. They cover the discharge range experienced except for lower daily flows on May 1, Jul 5, 6, 13, 14, 19, 20; and higher daily flow on Sep 29. The peak flow of 768 cfs occurred at 0645 on Sep 29, 2013 at a gage height of 5.54 ft with a shift of -0.85 ft. It exceeded high measurement no. 379 (GH=5.26 ft), made Sep 30, by 0.28 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record for all open water periods. Periods of unreliable gage-height and ice-affected record were estimated. Shift curve (VS12-E) from last year was carried to Oct 16. Eight additional shift curves (VS13-A, 13-B, 13-I, 13-M, 13-N, 13-O, 13-P and 14-A) were developed and used to distribute shifts by stage and time. Open-water measurement shifts ranged from -0.85 to -0.33 ft and applied shifts ranged from -0.85 to -0.34 ft. All measurements were given full weight except nos. 364, 366, 369, 370, 374, 375, 377, and 378, which were adjusted by as much as 2.4% to smooth shift trends.

Special Computations.-- Discharge for periods of unreliable gage-height and ice-affected record was estimated by comparison with nearby stations using a river accounting sheet.

Remarks.-- Record is good, except for estimated periods, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08223000 RIO GRANDE RIVER AT ALAMOSA

RATING TABLE-- RIOALACO22D USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

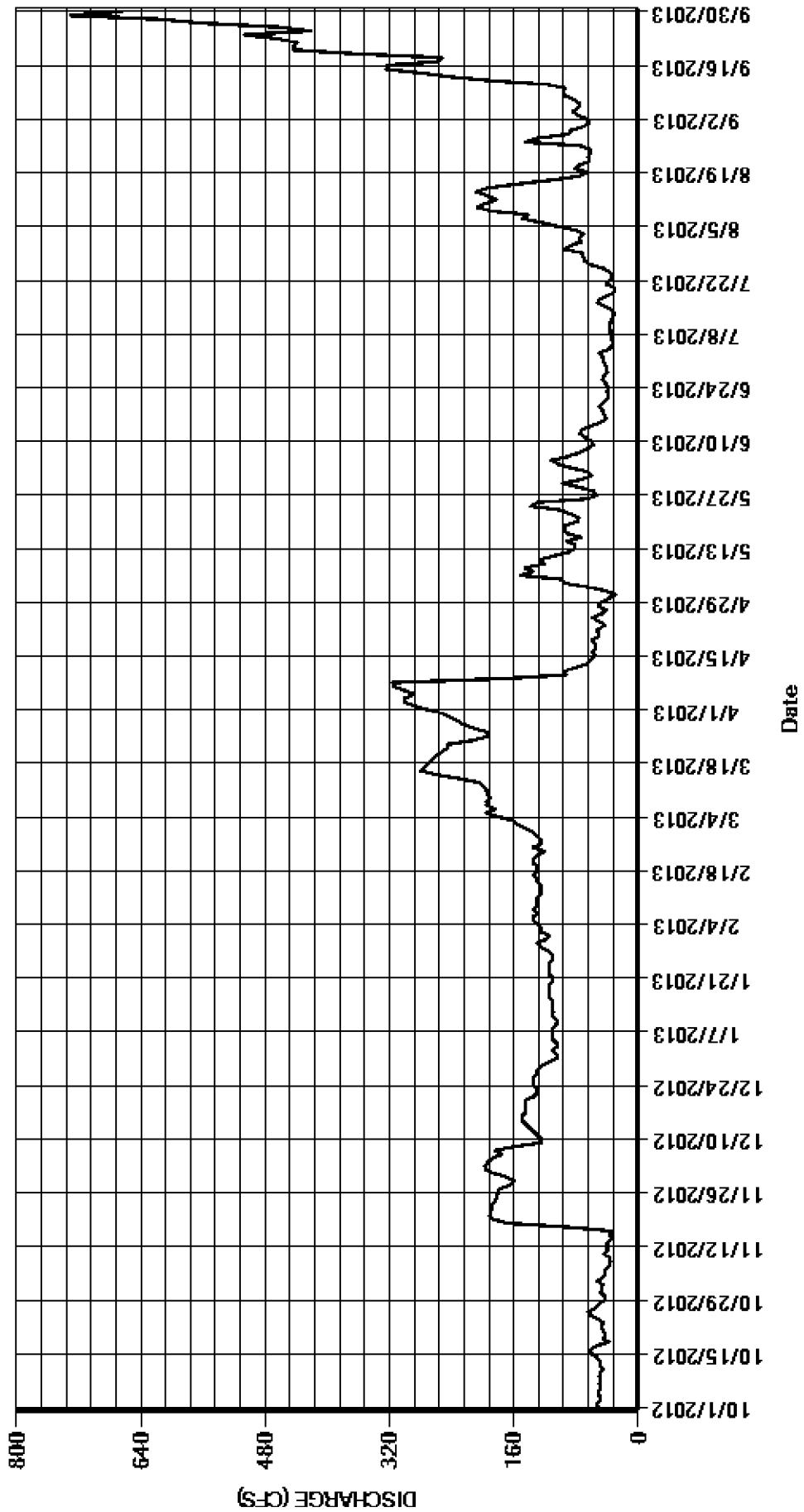
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	51	47	185	e105	e115	e145	272	30	60	45	74	64
2	54	46	197	e110	e125	e155	288	43	66	46	76	65
3	49	53	197	e105	e125	e160	301	66	87	50	71	78
4	50	45	194	e105	e130	e180	300	95	104	38	80	84
5	51	43	187	e110	e135	e195	288	98	112	33	105	77
6	49	42	176	e110	e135	e185	301	151	92	33	125	76
7	50	37	184	e110	e130	e195	315	136	76	35	149	82
8	49	36	e160	e110	e135	e195	316	146	66	36	142	94
9	50	37	e125	e105	e130	e190	175	121	58	36	189	96
10	49	44	e125	e105	e130	e195	93	127	60	37	207	95
11	46	40	e130	e110	e130	e195	95	110	69	36	197	116
12	49	e40	e135	e110	e125	e200	80	90	75	34	183	186
13	49	e40	e140	e110	e125	e205	66	82	72	31	194	240
14	53	e35	e145	e110	e125	e230	61	82	59	33	208	279
15	61	36	e150	e110	e130	e260	56	92	47	42	195	324
16	61	35	e150	e115	e130	e280	59	74	41	52	156	323
17	54	91	e145	e115	e135	e275	55	92	44	50	114	257
18	38	168	e145	e115	e130	270	55	95	46	38	77	253
19	45	187	e145	e115	e130	265	60	95	50	31	65	365
20	43	191	e145	e110	e135	259	51	78	45	30	81	444
21	45	190	e135	e110	e135	253	52	77	40	41	76	443
22	48	189	e130	e115	e130	246	52	88	39	36	63	439
23	45	188	e130	e115	e120	244	43	101	40	34	64	465
24	51	184	e135	e115	e135	212	50	138	38	36	63	507
25	61	182	e135	e115	e125	194	59	130	42	44	61	422
26	64	181	e135	e110	e125	192	47	65	46	62	74	465
27	55	178	e130	e110	e130	210	42	53	44	69	146	560
28	50	e165	e130	e115	e135	224	51	58	40	71	129	615
29	43	e160	e125	e125	---	233	47	76	41	71	90	731
30	43	e170	e115	e130	---	242	38	97	43	95	87	665
31	48	---	e105	e120	---	252	---	73	---	88	71	---
TOTAL	1554	3080	4565	3475	3620	6736	3768	2859	1742	1413	3612	8910
MEAN	50.1	103	147	112	129	217	126	92.2	58.1	45.6	117	297
AC-FT	3080	6110	9050	6890	7180	13360	7470	5670	3460	2800	7160	17670
MAX	64	191	197	130	135	280	316	151	112	95	208	731
MIN	38	35	105	105	115	145	38	30	38	30	61	64

CAL YR	2012	TOTAL	43838	MEAN	120	MAX	717	MIN	28	AC-FT	86950
WTR YR	2013	TOTAL	45334	MEAN	124	MAX	731	MIN	30	AC-FT	89920

MAX DISCH: 768 CFS AT 06:45 ON SEP 29, 2013 GH 5.54 FT SHIFT -0.85 FT  
 MAX GH: 5.54 FT AT 06:45 ON SEP 29, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08223000 RIO GRANDE RIVER AT ALAMOSA  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
372833105455800 CLOSED BASIN PROJECT CANAL NEAR ALAMOSA  
Water Year 2013

Location.-- Lat 37°28'33", long 105°46'2" referenced to North American Datum of 1983 (Alamosa East, CO quad, scale 1:24,000), UTM Zone 13 432167 E and 4147927 N, in SW ¼ SW ¼ sec. 3, T.37 N., R.11 E., New Mexico Principal Meridian, Alamosa County, CO, Hydrologic Unit 13010002, on right bank 400 ft north of State Highway 160, 5.5 mi east of Alamosa, CO.

Drainage Area and Period of Record.-- Not applicable; Sept. 23, 1987 to current year.

Equipment.-- Graphic water-stage recorder, data collection platform (Sutron Satlink) and two float-operated shaft encoders on wells Ha and Hb in 8 ft x 10 ft steel plated building with concrete stilling wells at a 12 ft concrete Parshall flume. The Bureau of Reclamation owns and operates an independent electronic data acquisition system using pressure transducers, a water quality monitor, and temperature sensor. The primary reference gage is a drop tape from reference point on shelf. There is a supplemental outside staff gage in the flume.

Hydrologic Conditions.-- Flow regulated by wells supplying water to canal and by the operation of San Luis Lake. Diversions above the gage to San Luis Lake and to the Blanca Wildlife Habitat Area.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Oct 20-23 and Aug 7-21 when gage was isolated, Dec 22-27 and Jan 3-28 when ice in well was affecting floats and ice in flume was affecting gage-heights. One instrument correction of +0.01 ft was made Aug 21 for one unit value while lower inlet was drilled, and a +0.01 ft correction was made Oct 1, 2013 and prorated by time from previous visit. 1 or 2 unit values were adjusted due to personnel in flume on the following days: Oct 1, Nov 15, Dec 3, Jan 31, Feb 15, Mar 15, May 1, May 15, Jul 1, and Aug 1. Prior to Aug 21 the stilling well isolated from the flume at 0.19 ft, new inlets were drilled Aug 21 so the stilling well no longer isolates from the flume. The gage-height was affected by backwater from ice Feb 25, 27, and 28.

Datum Corrections.-- Levels were last run Sep. 1, 2011 to the Ha well and Hb well Reference Points (RP) inside the gage using BM1 as base. Elevations of both RPs were within allowable limits, so no correction was made. Two-peg tests were performed on the instrument on May 27, Jul. 28, and Sep. 26, 2011. The instrument was adjusted slightly on Sep. 26, 2011.

Rating.-- The control structure is a 12 ft concrete Parshall flume. A standard rating for a 12 ft Parshall flume has been in use since Sep. 23, 1987. Twenty-two measurements (Nos. 666-687) were made this year, ranging in discharge from 0 to 23.1 cfs. They cover the discharge range experienced except for higher daily flows on Mar 16, 28, 30; Apr 3, 11, 12, and 18. The peak flow of 30.1 cfs occurred at 1415 on Mar 30, 2013 at a gage height of 0.75 feet with a shift of 0.01 feet. It exceeded high measurement No. 666 (GH=0.63 ft), made Oct 1, 2012, by 0.12 feet in stage. The peak stage of 0.93 ft occurred at 0700 on Feb 25, 2013 due to backwater from ice.

Discharge.-- Shifting control method was used to compute the discharge record during all periods of reliable stage record. Periods of unreliable stage and ice-affected record were estimated. Due to the stability of the control, high frequency of measurements, and numerous cleaning corrections, shifts were applied as defined by measurements and cleaning corrections and distributed by time from Oct 1 to Jun 17. From Jun 17 through end of the water year, shifts were distributed by stage using shift curve (CBPALA13-B) due to canal going in and out of no flow and a slight deviation from the bottom end of the standard rating resulting from a slight unevenness in the concrete flume floor apparent at very low flows. Measurement shifts ranged from -0.03 to +0.02 feet. All measurements were given full weight except numbers 670, 673, 674, 680, 684, and 685, which were adjusted as much as 4.1 percent to smooth shift distribution. There was no flow Aug 24, Aug 29 - Sep 9.

Special Computations.-- All periods of potential backwater were checked. The only period that data indicated submergence was Jan 14-18 and 21, when stage data was unreliable due to ice in stilling well and ice hanging in flume. This period was estimated by averaging available daily pumping records obtained from the Bureau of Reclamation during this period. While the stilling well was isolated from Aug 7-21 records were estimated based on once daily staff gage readings on Aug 7-9, 14-16, and 21 and prorated on days where staff gage readings were not available.

Remarks.-- Record is good except for periods of estimation, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

372833105455800 CLOSED BASIN PROJECT CANAL NEAR ALAMOSA

RATING TABLE-- CBPALACO01 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

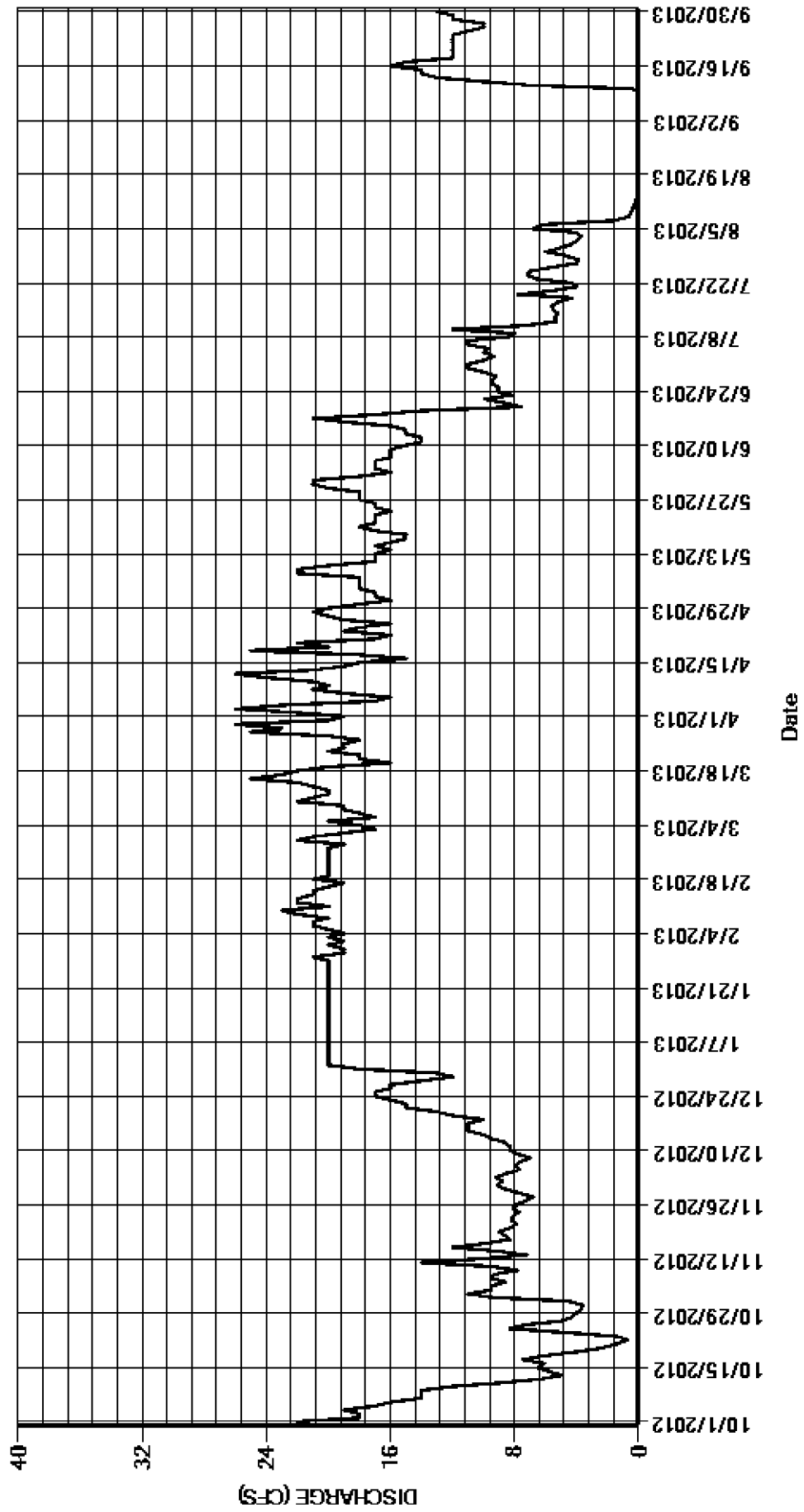
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	4.5	9.1	20	20	21	19	16	21	11	4.3	0.00
2	18	9.5	8.8	20	19	19	22	17	18	10	4.0	0.00
3	18	11	9.2	e20	20	17	26	17	16	9.3	3.7	0.00
4	19	9.5	8.5	e20	19	18	23	18	17	10	4.1	0.00
5	17	9.5	7.7	e20	20	20	17	18	17	9.7	6.8	0.00
6	16	8.6	7.9	e20	21	17	16	18	17	11	6.2	0.00
7	14	9.5	7.7	e20	21	18	19	18	16	11	e1.6	0.00
8	14	9.3	7.0	e20	20	19	21	22	16	8.4	e0.66	0.00
9	14	7.8	7.7	e20	22	19	20	22	16	8.0	e0.52	0.00
10	12	9.5	8.3	e20	23	22	21	20	15	12	e0.40	0.38
11	8.6	14	8.3	e20	20	21	24	17	14	7.3	e0.30	7.0
12	6.2	10	8.6	e20	22	20	26	17	14	5.3	e0.20	10
13	5.0	7.2	9.5	e20	22	20	21	17	15	5.4	e0.10	13
14	5.8	9.0	10	e20	21	21	19	16	15	5.2	e0.09	14
15	6.5	12	11	e20	21	22	18	17	16	5.5	e0.09	14
16	6.1	9.9	11	e20	20	25	15	16	19	5.6	e0.03	16
17	7.5	8.3	11	e20	19	23	18	15	21	5.2	e0.03	15
18	6.0	8.6	10	e20	21	22	25	15	17	4.3	e0.03	12
19	3.9	9.0	12	e20	20	20	20	17	14	7.8	e0.03	12
20	e2.3	8.3	13	e20	20	16	22	18	7.6	5.6	e0.03	12
21	e1.4	7.9	15	e20	20	18	17	17	8.7	4.0	e0.03	12
22	e0.70	8.2	e15	e20	20	18	16	17	9.9	4.3	0.02	12
23	e1.4	8.1	e16	e20	20	20	19	17	8.2	6.6	0.01	12
24	4.6	7.7	e17	e20	20	19	18	16	9.1	7.2	0.00	12
25	8.3	8.1	e17	e20	e20	19	16	17	9.0	7.0	0.01	11
26	7.3	7.9	e16	e20	20	18	19	17	9.5	5.6	0.04	10
27	4.9	7.3	e16	e20	e19	20	20	18	9.4	4.0	0.03	10
28	4.3	6.8	14	e20	e22	25	21	18	9.2	3.9	0.02	12
29	4.0	7.7	12	21	---	23	20	18	10	4.8	0.00	12
30	3.7	8.6	13	19	---	26	18	20	11	6.0	0.00	13
31	3.6	---	18	19	---	20	---	21	---	5.1	0.00	---
TOTAL	266.10	263.3	355.3	619	572	626	596	547	415.6	216.1	33.37	241.38
MEAN	8.58	8.78	11.5	20.0	20.4	20.2	19.9	17.6	13.9	6.97	1.08	8.05
AC-FT	528	522	705	1230	1130	1240	1180	1080	824	429	66	479
MAX	22	14	18	21	23	26	26	22	21	12	6.8	16
MIN	0.70	4.5	7.0	19	19	16	15	15	7.6	3.9	0.00	0.00

CAL YR	2012	TOTAL	6084.80	MEAN	16.6	MAX	26	MIN	0.70	AC-FT	12070
WTR YR	2013	TOTAL	4751.15	MEAN	13.0	MAX	26	MIN	0.00	AC-FT	9420

MAX DISCH: 30.1 CFS AT 14:15 ON MAR 30, 2013 GH 0.75 FT SHIFT 0.01 FT  
 MAX GH: 0.93 FT AT 07:00 ON FEB 25, 2013 (Backwater from ice)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

372833105455800 CLOSED BASIN PROJECT CANAL NEAR ALAMOSA  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08224500 KERBER CREEK NEAR VILLA GROVE  
Water Year 2013

Location.-- Lat 38°13'13", long 106°5'23" referenced to North American Datum of 1983 (Graveyard Gulch, CO quad, scale 1:24,000), UTM Zone 13 404622 E and 4230810 N, in SW ¼ SE ¼ sec. 21, T.46 N., R.8 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010003, on left bank 7 mi west of Villa Grove, CO and 5 ½ mi downstream from Bonanza, CO.

Drainage Area and Period of Record.-- Approximately 45.4 mi<sup>2</sup> (revised); June 1, 1923- September 16, 1926, May 2, 1936-September 30, 1982, October 1, 1993 -current year.

Equipment.-- Data collection platform (Sutron Satlink2), float-operated electronic stage discharge recorder (SDR), and tipping bucket rain gage, in a 6 ft by 6 ft exposed aggregate shelter and 48-inch concrete well. The primary reference gage is a drop tape from reference point on shelf. Secondary outside chain gage located above inlets.

Hydrologic Conditions.-- Station is located in a narrow high mountain valley with slender meadows and numerous homes scattered along the hill sides. Two small diversions above station for irrigation.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log and SDR log as backup. Record is complete and reliable except for Dec 28-31 when ice in the well was affecting the float. The stage-discharge relation was affected by ice Oct 7-10, Oct 19 - Dec 27, Jan 1 - Apr 19, Apr 24, 25, and May 2-4. There were no instrument corrections made to the SDR.

Datum Corrections.-- Levels were last ran to the Reference Point (RP) inside the gage on Aug 30, 2011 using BM8 as base. The RP elevation was within the allowable limit and no correction was made. A -0.02 ft correction was made to the secondary cantilever gage.

Rating.-- Control is a concrete ramp flume approximately 10 feet downstream from gage. Shifting occurs because of streambed material movement in the gage pool and approach. At high stages the stilling well experiences drawdown as observed when the upper inlets are closed the gage height rises. Rating no. 20, in use since Oct 19, 2011, was used again this water year. Sixteen measurements (nos. 167-182) were made this year ranging in discharge from 0 to 25.0 cfs. The measurements cover the discharge range experienced except for higher daily flows May 17-20, and 23-29. The peak flow of 33.8 cfs occurred at 0030 on May 26 at a gage height of 1.00 ft with a shift of -0.03 ft. It exceeded high measurement no. 176 (GH = 0.91 ft) made May 20 by 0.09 feet in stage.

Discharge.-- Shifting control method was used to compute the discharge record for all open-water periods. Variable shift curves (KERVIL12-3 and KERVILVS1302) were used to apply minor shifting caused from gage pool scour and fill as well as some control concrete degradation. Open-water measurement shifts ranged from 0 to -0.04 ft. All measurements were given full weight except nos. 174 through 179, which were adjusted as much as 8.1% to smooth shift trend. Periods of ice affected and unreliable gage-height record were estimated.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using measurements, partial day records, and air temperature records from Saguache Creek near Saguache.

Remarks.-- The record is good except for periods of estimation, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08224500 KERBER CREEK NEAR VILLA GROVE

RATING TABLE-- KERVILCO20 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

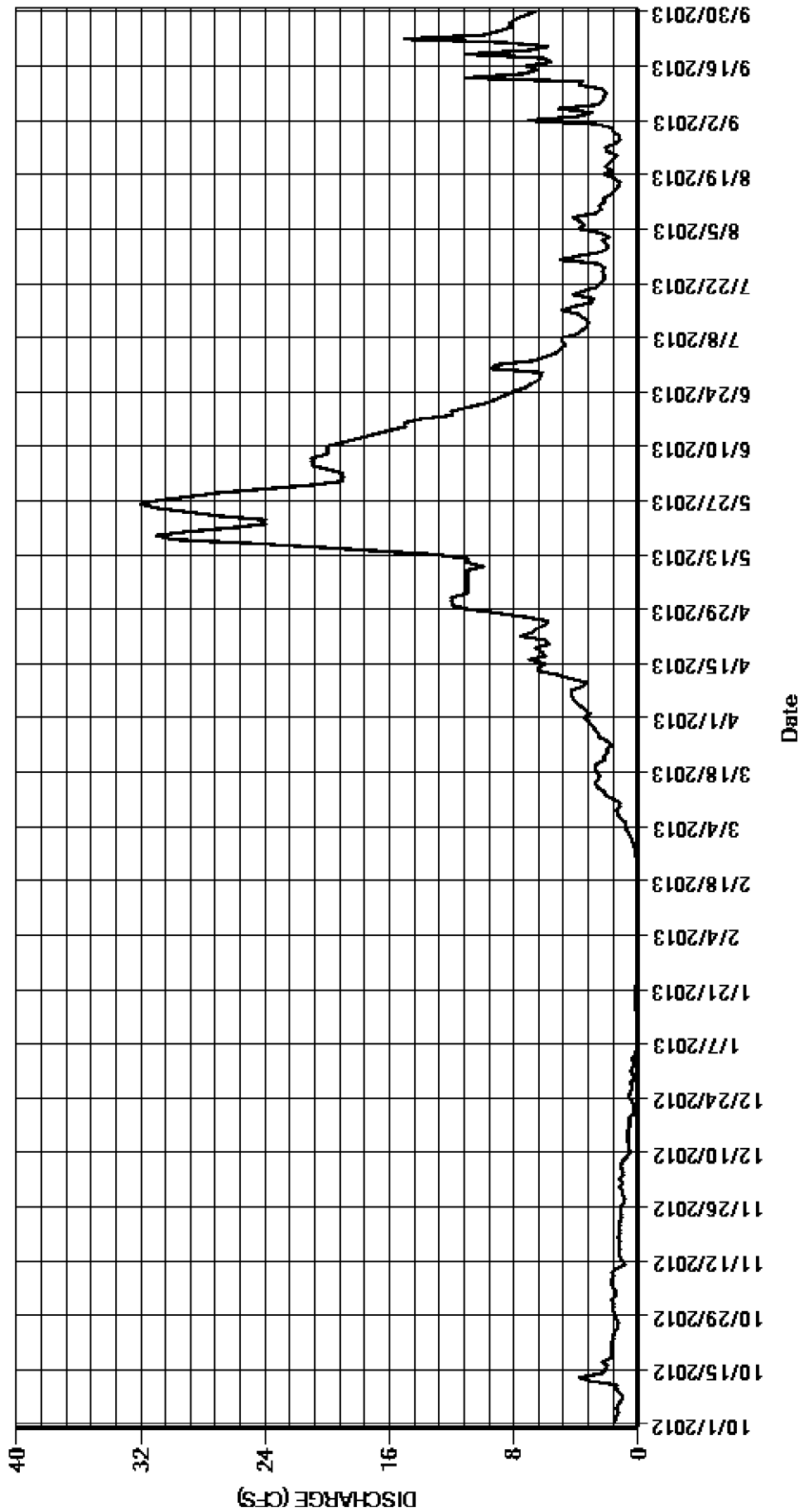
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.6	e1.6	e1.2	e0.36	e0.01	e0.46	e3.5	12	19	9.2	2.0	2.7
2	1.5	e1.7	e1.0	e0.24	e0.01	e0.60	e3.1	e12	19	6.8	2.3	7.1
3	1.4	e1.5	e1.2	e0.40	e0.01	e0.75	e3.4	e11	19	6.0	1.9	3.9
4	1.3	e1.4	e1.0	e0.16	e0.01	e0.80	e3.7	e11	20	5.3	2.5	3.0
5	1.4	e1.6	e1.0	e0.14	e0.01	e0.80	e4.0	11	21	5.0	3.8	5.1
6	1.3	e1.7	e1.1	e0.05	e0.01	e1.1	e4.2	11	21	4.7	3.5	2.6
7	e1.1	e1.7	e1.1	e0.06	e0.01	e1.3	e4.3	11	21	4.9	3.8	2.3
8	e1.0	e1.6	e0.95	e0.08	e0.01	e1.4	e4.3	11	20	4.9	4.2	2.2
9	e1.2	e1.7	e0.70	e0.08	e0.01	e1.2	e3.6	11	20	3.9	2.7	2.1
10	e1.4	e1.4	e0.55	e0.07	e0.05	e1.2	e3.3	10	20	3.6	2.4	2.3
11	1.4	e0.90	e0.60	e0.05	e0.03	e1.6	e4.3	11	19	3.3	2.5	3.8
12	3.1	e1.0	e0.60	e0.00	e0.03	e2.1	e5.2	11	18	3.2	2.2	3.6
13	3.8	e1.2	e0.70	e0.00	e0.05	e2.2	e6.4	13	17	3.5	2.2	11
14	2.4	e1.2	e0.65	e0.06	e0.05	e2.6	e6.4	17	16	3.8	1.7	7.4
15	2.1	e1.2	e0.70	e0.12	e0.08	e2.8	e6.0	21	15	4.9	1.5	6.5
16	2.0	e1.2	e0.65	e0.20	e0.06	e2.6	e7.0	25	15	4.1	1.3	7.2
17	2.3	e1.2	e0.55	e0.18	e0.06	e2.5	e6.0	30	14	3.0	1.2	5.6
18	1.7	e1.3	e0.55	e0.16	e0.06	e2.7	e6.2	31	12	2.9	1.5	6.1
19	e1.7	e1.2	e0.60	e0.16	e0.06	e2.8	e6.6	29	12	4.2	2.2	11
20	e1.7	e1.2	e0.22	e0.14	e0.07	e2.7	5.7	26	11	3.6	1.7	7.0
21	e1.7	e1.2	e0.28	e0.16	e0.07	e2.2	6.0	24	9.9	2.7	2.1	5.8
22	e1.7	e1.2	e0.32	e0.14	e0.10	e2.2	7.6	24	9.2	2.4	1.9	8.5
23	e1.6	e1.1	e0.40	e0.10	e0.09	e2.0	6.8	27	8.6	2.2	1.6	15
24	e1.6	e1.1	e0.60	e0.12	e0.14	e2.0	e6.5	29	8.1	2.2	1.4	10
25	e1.5	e1.1	e0.55	e0.10	e0.18	e1.7	e6.0	31	7.3	2.3	2.0	9.0
26	e1.3	e1.1	e0.44	e0.06	e0.20	e2.0	5.8	32	6.9	2.2	2.1	8.2
27	e1.3	e0.90	e0.40	e0.04	e0.28	e2.5	7.3	31	6.4	2.6	1.5	8.3
28	e1.4	e0.90	e0.48	e0.00	e0.42	e2.6	9.1	29	6.3	5.0	1.2	7.9
29	e1.5	e1.0	e0.24	e0.00	---	e2.8	11	27	6.2	3.8	1.2	7.3
30	e1.6	e1.0	e0.34	e0.00	---	e3.0	12	24	9.4	2.4	1.6	6.6
31	e1.6	---	e0.50	e0.00	---	e3.2	---	21	---	2.0	1.7	---
TOTAL	52.2	38.10	20.17	3.43	2.17	60.41	175.3	624	427.3	120.6	65.4	189.1
MEAN	1.68	1.27	0.65	0.11	0.078	1.95	5.84	20.1	14.2	3.89	2.11	6.30
AC-FT	104	76	40	6.8	4.3	120	348	1240	848	239	130	375
MAX	3.8	1.7	1.2	0.40	0.42	3.2	12	32	21	9.2	4.2	15
MIN	1.0	0.90	0.22	0.00	0.01	0.46	3.1	10	6.2	2.0	1.2	2.1

CAL YR	2012	TOTAL	1240.87	MEAN	3.39	MAX	14	MIN	0.22	AC-FT	2460
WTR YR	2013	TOTAL	1778.18	MEAN	4.87	MAX	32	MIN	0.00	AC-FT	3530

MAX DISCH: 33.8 CFS AT 00:30 ON MAY 26, 2013 GH 1.00 FT SHIFT -0.03 FT  
 MAX GH: 1.74 FT AT 09:30 ON JAN 03, 2013 (Backwater from ice)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08224500 KERBER CREEK NEAR VILLA GROVE  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
GARNER CREEK NEAR VILLA GROVE

Water Year 2013

Location.-- Lat 38°10'23", long 105°48'35" referenced to North American Datum of 1983 (Valley View Hot Springs, CO quad, scale 1:24,000), UTM Zone 13 429079 E and 4225326 N, in SE ¼ SE ¼ sec. 1, T.45 N., R.10 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010003, on right bank 12 mi southeast of Villa Grove, CO.

Drainage Area and Period of Record.-- 6.4 mi<sup>2</sup>; Station was established at existing Parshall flume January 1, 1999 to current year.

Equipment.-- Data collection platform (Sutron Satlink II) and a float-operated SDR shaft encoder in a 2-foot steel culvert pipe stilling well with a small steel box-type shelter atop well at a 2-foot Parshall Flume. Primary reference gage is drop tape from reference point on gage shelf. Secondary staff gage in flume.

Hydrologic Conditions.-- Undeveloped steep alpine and subalpine terrain. There are a few diversions above gage.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted stage data with DCP log and SDR log as backup. Record is complete and reliable except for Nov 13, when well was frozen, and Nov 14 - Apr 1, when station was closed. The stage-discharge relation was affected by ice Nov 12 and Apr 19. Two erroneous unit values were manually corrected on Jul 1 from log without loss of accuracy. No instrument calibration corrections were needed or made. The outside staff was mistakenly used for primary reference on Oct 17, 2013, the first visit of WY2014, since the next visit had exactly opposing corrections it was assumed the SDR did not need a correction prior to the visit.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on Jul 5, 2012 using B.M. no. 1 as base. The RP elevation was found to be within allowable limits, so no correction was made. Two-peg test was performed on the Lietz level (SN 130869) on Jun 11, 2012. The instrument was within allowable limits and no correction was made. A formal inspection of flume with levels was not performed.

Rating.-- The flume and well ice up during winter, and sediment movement in and above control causes minor shifting. Rating no. 1, a standard two foot Parshall flume rating, was used all year. The measurement shifts ranged from -0.14 to -0.11 ft, the applied shifts ranged from -0.13 to -0.11 ft. These shifts are due to the sloping flume floor and sediment movement in and above the control. Sixteen discharge measurements (nos. 204-219) were made this year, ranging in discharge from 0.83 to 1.91 cfs. Measurements cover the discharge range experienced except for lower daily flows on Oct 24; Jan 2-4, 12, and 15; and higher daily flows on Sep 13, 23, and 28-30. The instantaneous peak flow of 3.35 cfs occurred at 0715 on Sep 13, 2013 at a gage height of 0.69 ft with a shift of -0.12 ft. It exceeded high flow measurement 219 (GH= 0.52 ft), made Sep 24, by 0.17 ft in stage.

Discharge.-- Shifting control method was used to compute discharge during all open water periods. Shifts were applied as defined by discharge measurements and distributed by time. All measurements were given full weight except measurements 205, 210, 212, 214, and 218, which were adjusted by as much as 8.1 percent to smooth the shift distribution. Periods of ice affected and unreliable gage-height record were estimated.

Special Computations.-- Winter streamflow record was estimated using discharge measurements and air temperature record from SANDUNCO.

Remarks.-- Record is fair except for estimated daily discharge values, which are poor. Station maintained and record developed by Division 3 hydrographic staff.

Recommendations.-- Record quality may be improved by leveling flume and improving approach conditions.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

GARNER CREEK NEAR VILLA GROVE

RATING TABLE-- GARVILCO01 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

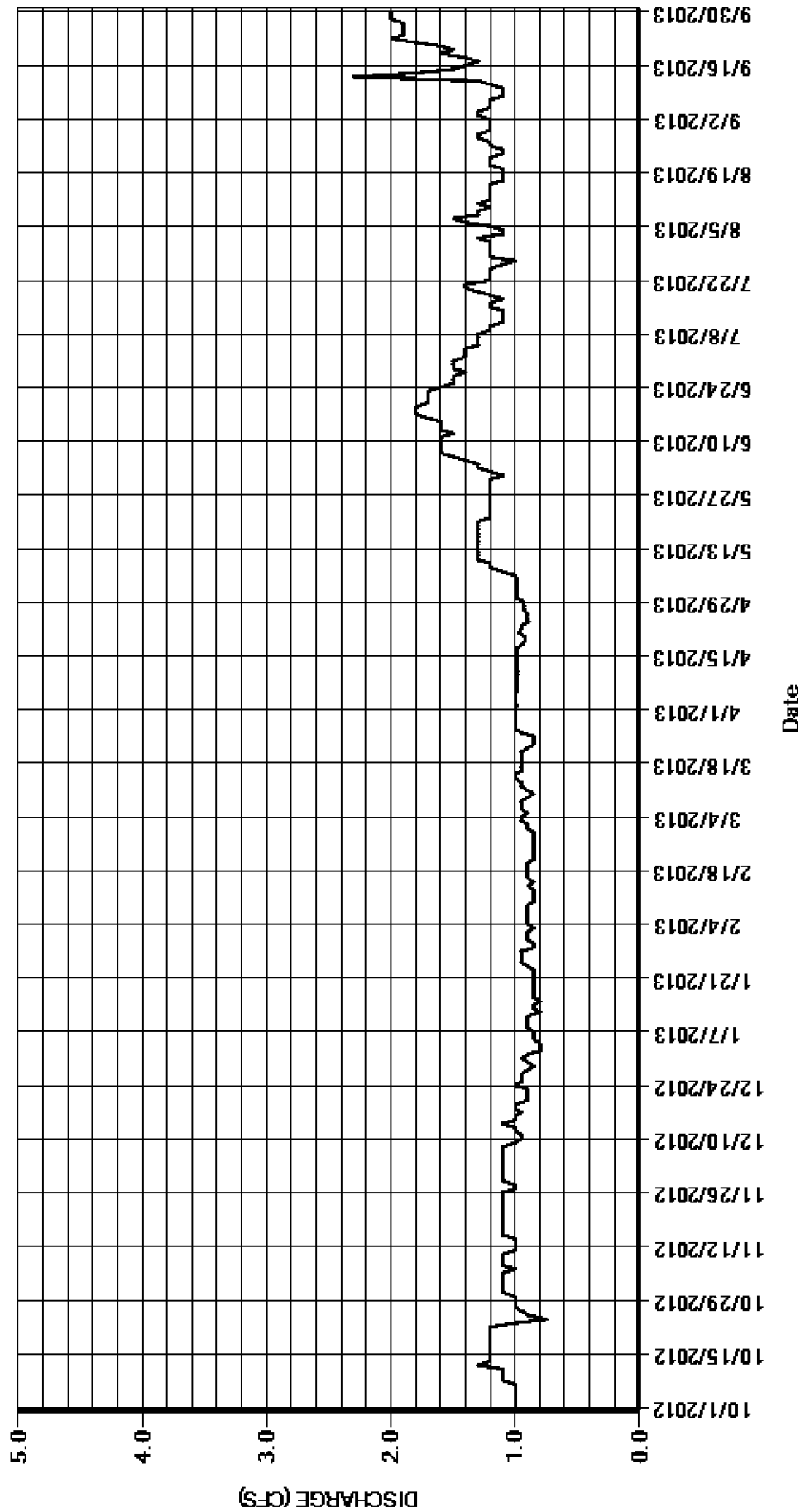
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.0	1.1	e1.1	e0.90	e0.90	e0.90	e1.0	0.99	1.1	1.5	1.2	1.2
2	1.0	1.1	e1.1	e0.80	e0.90	e0.90	0.99	0.99	1.2	1.4	1.3	1.2
3	1.0	1.1	e1.1	e0.80	e0.85	e0.95	1.0	0.99	1.3	1.4	1.1	1.3
4	1.0	1.1	e1.1	e0.80	e0.90	e0.95	1.0	0.99	1.3	1.4	1.1	1.3
5	1.0	1.1	e1.1	e0.85	e0.90	e0.90	1.0	0.99	1.4	1.3	1.2	1.2
6	1.0	1.0	e1.1	e0.85	e0.90	e0.95	0.99	1.0	1.5	1.3	1.4	1.2
7	1.0	1.1	e1.1	e0.85	e0.90	e0.95	0.99	1.1	1.6	1.3	1.5	1.2
8	1.1	1.1	e1.1	e0.90	e0.90	e0.95	0.99	1.2	1.6	1.3	1.3	1.1
9	1.1	1.1	e1.0	e0.90	e0.90	e0.90	0.99	1.2	1.6	1.2	1.3	1.1
10	1.1	1.1	e0.95	e0.90	e0.85	e0.85	0.98	1.3	1.6	1.2	1.2	1.1
11	1.1	1.0	e0.95	e0.90	e0.85	e0.90	0.98	1.3	1.6	1.1	1.3	1.2
12	1.3	e1.0	e1.0	e0.80	e0.85	e0.95	0.99	1.3	1.5	1.1	1.2	1.3
13	1.2	e1.0	e1.0	e0.85	e0.85	e0.95	0.99	1.3	1.6	1.1	1.2	2.3
14	1.2	e1.0	e1.1	e0.85	e0.90	e1.0	0.99	1.3	1.6	1.1	1.2	1.8
15	1.2	e1.1	e1.0	e0.80	e0.85	e1.0	0.99	1.3	1.6	1.2	1.2	1.5
16	1.2	e1.1	e1.0	e0.85	e0.90	e0.95	0.98	1.3	1.7	1.2	1.2	1.4
17	1.2	e1.1	e0.95	e0.85	e0.90	e0.95	0.99	1.3	1.8	1.1	1.1	1.3
18	1.2	e1.1	e1.0	e0.85	e0.90	e0.95	0.94	1.3	1.8	1.2	1.1	1.4
19	1.2	e1.1	e1.0	e0.85	e0.90	e0.95	e0.92	1.3	1.8	1.3	1.1	1.6
20	1.2	e1.1	e0.90	e0.85	e0.90	e0.95	0.92	1.3	1.7	1.4	1.1	1.5
21	1.2	e1.1	e0.90	e0.85	e0.85	e0.95	0.97	1.2	1.7	1.4	1.2	1.6
22	1.2	e1.1	e0.90	e0.85	e0.85	e0.90	0.95	1.2	1.7	1.2	1.2	1.8
23	1.0	e1.1	e0.90	e0.85	e0.85	e0.85	0.95	1.2	1.7	1.2	1.2	2.0
24	0.75	e1.1	e1.0	e0.90	e0.85	e0.85	0.89	1.2	1.6	1.2	1.1	1.9
25	0.89	e1.1	e0.95	e0.95	e0.85	e0.85	0.91	1.2	1.5	1.2	1.1	1.9
26	0.94	e1.1	e0.95	e0.95	e0.85	e0.95	0.90	1.2	1.5	1.1	1.2	1.9
27	1.0	e1.0	e0.95	e0.95	e0.85	e1.0	0.93	1.2	1.5	1.0	1.2	1.9
28	1.0	e1.0	e0.90	e0.95	e0.85	e1.0	0.93	1.2	1.4	1.2	1.3	2.0
29	1.0	e1.1	e0.85	e0.85	---	e1.0	0.93	1.2	1.5	1.2	1.3	2.0
30	1.0	e1.1	e0.90	e0.85	---	e1.0	0.98	1.2	1.5	1.2	1.2	2.0
31	1.1	---	e0.95	e0.90	---	e1.0	---	1.2	---	1.2	1.2	---
TOTAL	33.38	32.3	30.80	26.85	24.50	29.10	28.96	36.95	46.5	38.2	37.5	46.2
MEAN	1.08	1.08	0.99	0.87	0.88	0.94	0.97	1.19	1.55	1.23	1.21	1.54
AC-FT	66	64	61	53	49	58	57	73	92	76	74	92
MAX	1.3	1.1	1.1	0.95	0.90	1.0	1.0	1.3	1.8	1.5	1.5	2.3
MIN	0.75	1.0	0.85	0.80	0.85	0.85	0.89	0.99	1.1	1.0	1.1	1.1

CAL YR	2012	TOTAL	389.13	MEAN	1.06	MAX	1.6	MIN	0.64	AC-FT	772
WTR YR	2013	TOTAL	411.24	MEAN	1.13	MAX	2.3	MIN	0.75	AC-FT	816

MAX DISCH: 3.35 CFS AT 07:15 ON SEP 13, 2013 GH 0.69 FT SHIFT -0.12 FT  
 MAX GH: 0.69 FT AT 07:15 ON SEP 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

GARNER CREEK NEAR VILLA GROVE  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
MAJOR CREEK NEAR VILLA GROVE

Water Year 2013

Location.-- Lat 38°9'27", long 105°48'33" referenced to North American Datum of 1983 (Valley View Hot Springs, CO quad, scale 1:24,000), UTM Zone 13 429113 E and 4223602 N, in SE ¼ SE ¼ sec. 12, T.45 N., R.10 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010003, on right bank 11 mi southeast of Villa Grove, CO.

Drainage Area and Period of Record.-- 5.0 mi<sup>2</sup>.; January 1, 1999 to current year.

Equipment.-- Satellite monitored data collection platform (Sutron Satlink2) and Sutron SDR shaft encoder, in a 2-foot steel corrugated metal pipe stilling well with steel shelter atop well attached to the right edge of 2-foot Parshall flume via 1-inch intake pipe. Primary reference gage is staff gage located on left edge of flume; staff gage range is 0 to 2 ft. No change during year.

Hydrologic Conditions.-- Predominantly undeveloped steep alpine and sub-alpine terrain.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted stage data with electronic DCP and SDR logs as backup. Record is complete and reliable except for Nov 13, when station was frozen, and Nov 14 - Apr 1, when station was closed. Stage-discharge relation was affected by ice Oct 26-27, Nov 10-12, and Apr 19. There were three instrument calibration corrections ranging from -0.01 ft to +0.01 ft, which were prorated back to the previous visit.

Datum Corrections.-- A formal inspection with levels was not performed this year. The last formal inspection and levels were completed on Jul 24, 2008, with an assumed elevation of 0.000 at the flume staff gage (LEW) which is opposite the stilling well inlet (REW). Levels indicate that the flume floor slopes down from the LEW at the staff to the inlet by approximately 0.062 ft (Approx. 2%). The floor also slopes to the throat by 0.038 ft. Inspection included measurement of all pertinent Parshall Flume dimensions.

Rating.-- Rating MAJVILCO01, a standard two-foot Parshall flume rating, first used January 1, 1999, when the station was established, was used all year. Minor shifting results from sand and gravel movement and vegetation growth upstream and within the flume. Sixteen discharge measurements (nos. 204-219) were made ranging in discharge between 0.46 and 0.87 cfs. Discharge measurements cover the range in streamflow experienced except for the lower daily flow on Apr 18 and higher daily flows on Aug 6, Sep 13, Sep 19, and Sep 23. The peak discharge of 9.94 cfs occurred at 1545 on Aug 6, 2013 at a gage height of 1.11 ft with a shift of +0.04 ft. The peak flow exceeded high measurement no. 219 (GH = 0.22 ft) made Sep 24 by 0.89 ft in stage.

Discharge.-- Shifting-control method was used for all computed discharges. Shifts were applied as defined by discharge measurements and distributed by time. Applied shifts ranged from +0.01 ft to +0.05 ft. All measurements were given full weight except nos. 216-218, which were adjusted as much as 7.6% to smooth shift distribution. Periods of ice affected, unreliable, and no gage-height record were estimated.

Special Computations.-- Discharge for periods of ice affected, unreliable, and no gage-height record was estimated using discharge measurements and weather records.

Remarks.-- Record is fair except for estimated periods, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Establish inside reference point and drop tape.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

MAJOR CREEK NEAR VILLA GROVE

RATING TABLE-- MAJVILCO01 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

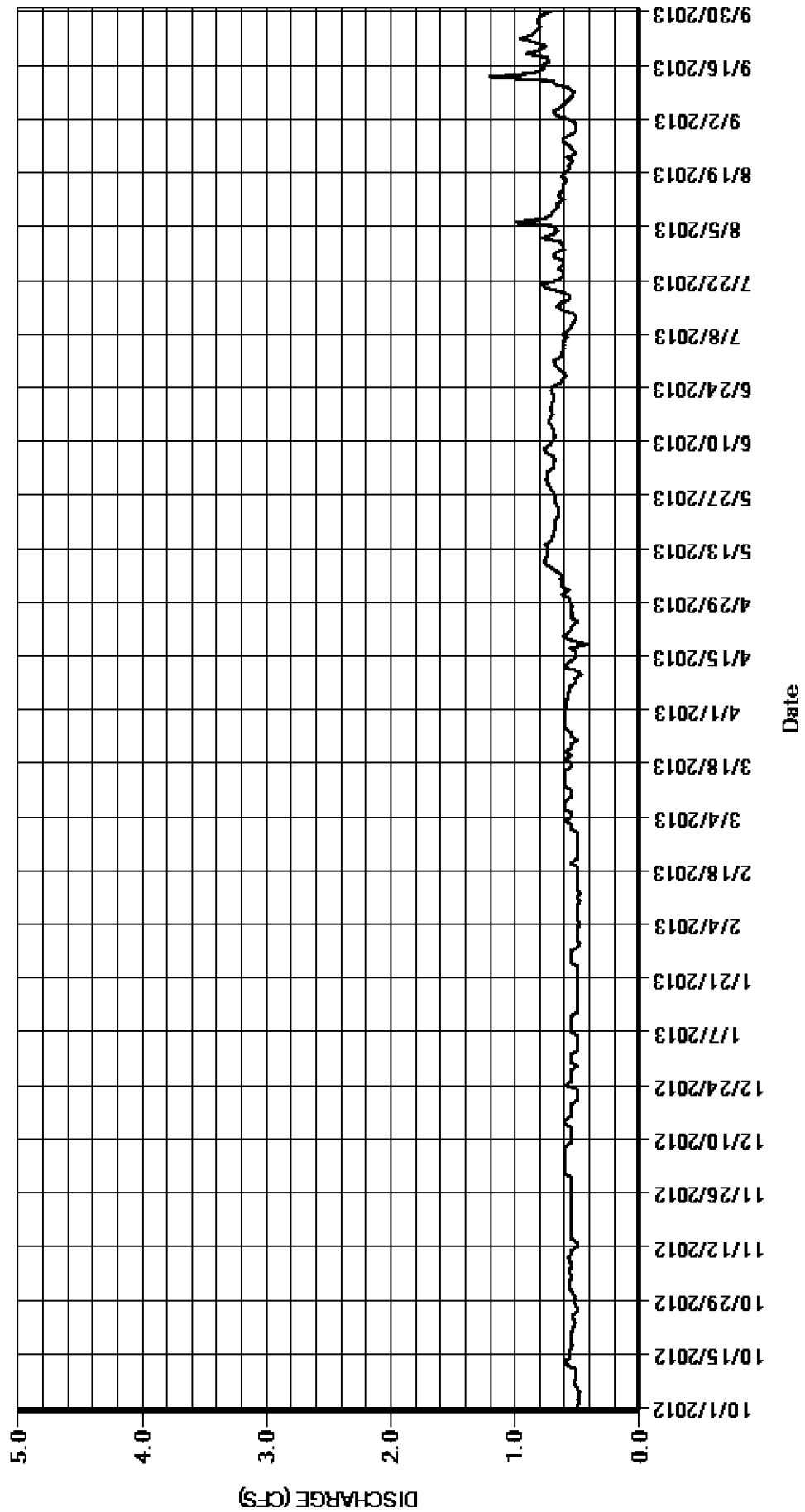
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.50	0.56	e0.60	e0.55	e0.50	e0.55	e0.60	0.62	0.74	0.69	0.64	0.52
2	0.49	0.56	e0.60	e0.50	e0.50	e0.55	0.59	0.57	0.74	0.63	0.78	0.57
3	0.49	0.56	e0.60	e0.50	e0.50	e0.60	0.59	0.62	0.69	0.63	0.69	0.67
4	0.49	0.55	e0.60	e0.50	e0.48	e0.55	0.58	0.62	0.69	0.61	0.66	0.69
5	0.48	0.56	e0.60	e0.50	e0.50	e0.55	0.58	0.63	0.68	0.61	0.70	0.64
6	0.50	0.56	e0.60	e0.50	e0.50	e0.60	0.56	0.62	0.69	0.61	0.99	0.60
7	0.52	0.55	e0.60	e0.55	e0.50	e0.60	0.56	0.66	0.75	0.58	0.76	0.57
8	0.52	0.56	e0.60	e0.55	e0.50	e0.60	0.51	0.71	0.77	0.62	0.71	0.54
9	0.51	0.57	e0.55	e0.55	e0.50	e0.55	0.52	0.76	0.72	0.57	0.69	0.53
10	0.51	e0.55	e0.55	e0.55	e0.48	e0.55	0.47	0.76	0.70	0.55	0.66	0.57
11	0.51	e0.55	e0.55	e0.55	e0.50	e0.55	0.49	0.74	0.68	0.53	0.66	0.67
12	0.58	e0.50	e0.55	e0.50	e0.48	e0.60	0.60	0.74	0.69	0.51	0.61	0.70
13	0.60	e0.50	e0.55	e0.50	e0.50	e0.60	0.58	0.74	0.69	0.52	0.65	1.2
14	0.56	e0.55	e0.60	e0.50	e0.50	e0.60	0.54	0.76	0.71	0.61	0.63	0.85
15	0.56	e0.55	e0.60	e0.50	e0.50	e0.60	0.51	0.71	0.73	0.66	0.61	0.77
16	0.56	e0.55	e0.55	e0.50	e0.50	e0.60	0.51	0.70	0.72	0.63	0.61	0.78
17	0.54	e0.55	e0.55	e0.50	e0.50	e0.55	0.56	0.69	0.70	0.56	0.59	0.73
18	0.55	e0.55	e0.55	e0.50	e0.50	e0.55	0.42	0.68	0.71	0.56	0.62	0.74
19	0.55	e0.55	e0.55	e0.50	e0.50	e0.60	e0.55	0.68	0.71	0.63	0.60	0.91
20	0.55	e0.55	e0.50	e0.50	e0.55	e0.55	0.61	0.68	0.70	0.76	0.56	0.80
21	0.54	e0.55	e0.50	e0.50	e0.50	e0.60	0.57	0.66	0.69	0.79	0.57	0.75
22	0.53	e0.55	e0.50	e0.50	e0.50	e0.55	0.55	0.65	0.69	0.65	0.54	0.84
23	0.52	e0.55	e0.50	e0.50	e0.50	e0.55	0.54	0.65	0.71	0.62	0.58	0.96
24	0.53	e0.55	e0.60	e0.50	e0.50	e0.50	0.50	0.66	0.70	0.61	0.51	0.86
25	0.54	e0.55	e0.55	e0.55	e0.50	e0.55	0.55	0.68	0.64	0.65	0.54	0.83
26	e0.50	e0.55	e0.55	e0.55	e0.50	e0.55	0.54	0.68	0.62	0.61	0.56	0.80
27	e0.50	e0.55	e0.55	e0.55	e0.50	e0.60	0.55	0.68	0.59	0.61	0.61	0.81
28	0.52	e0.55	e0.55	e0.55	e0.50	e0.60	0.54	0.70	0.61	0.69	0.61	0.82
29	0.52	e0.55	e0.50	e0.50	---	e0.60	0.56	0.72	0.65	0.68	0.54	0.79
30	0.52	e0.55	e0.55	e0.48	---	e0.60	0.56	0.74	0.68	0.61	0.51	0.72
31	0.54	---	e0.55	e0.50	---	e0.60	---	0.75	---	0.61	0.51	---
TOTAL	16.33	16.48	17.35	15.98	13.99	17.80	16.39	21.26	20.79	19.20	19.50	22.23
MEAN	0.53	0.55	0.56	0.52	0.50	0.57	0.55	0.69	0.69	0.62	0.63	0.74
AC-FT	32	33	34	32	28	35	33	42	41	38	39	44
MAX	0.60	0.57	0.60	0.55	0.55	0.60	0.61	0.76	0.77	0.79	0.99	1.2
MIN	0.48	0.50	0.50	0.48	0.48	0.50	0.42	0.57	0.59	0.51	0.51	0.52

CAL YR	2012	TOTAL	213.82	MEAN	0.58	MAX	0.85	MIN	0.40	AC-FT	424
WTR YR	2013	TOTAL	217.30	MEAN	0.60	MAX	1.2	MIN	0.42	AC-FT	431

MAX DISCH: 9.94 CFS AT 15:45 ON AUG 06, 2013 GH 1.11 FT SHIFT 0.04 FT  
 MAX GH: 1.11 FT AT 15:45 ON AUG 06, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**MAJOR CREEK NEAR VILLA GROVE  
WY2013 HYDROGRAPH**





RIO GRANDE RIVER BASIN  
08226700 COTTON CREEK NEAR MINERAL HOT SPRINGS  
Water Year 2013

Location.-- Lat 38°7'55", long 105°47'19" referenced to North American Datum of 1983 (Valley View Hot Springs, CO quad, scale 1:24,000), UTM Zone 13 430885 E and 4220748 N, in SW ¼ SW ¼ sec. 20, T.45 N., R.11 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010003, on left bank 300 ft north of road, 9 mi southeast of Mineral Hot Springs.

Drainage Area and Period of Record.-- 12.8 mi<sup>2</sup> (from topographical map); Jan 1967 - Sep 1970; Intermittent monthly record from May 1971 to Nov 1981 (Accuracy unknown); Jan 1999 to current year.

Equipment.-- Data collection platform (Sutron Satlink2), and SDR shaft encoder in metal pipe shelter and well. Primary reference gage is a drop tape from reference point on shelf. An outside staff gage was installed Mar. 30, 2012.

Hydrologic Conditions.-- Predominantly undeveloped steep alpine and sub-alpine terrain.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP and SDR log as backup. Many DCP transmissions were missing and missing data values were filled using the backup log during the period Oct 22 - May 2, without loss of accuracy. Record is complete and reliable except for Nov 12, 13 when ice in the well was affecting float, and Nov 14 through Apr 3 when station was closed for the winter. The stage-discharge relationship was affected by ice Nov 11 and Apr 19. Three shaft encoder corrections of + or - 0.01 ft were made and prorated back to previous visits. Fifteen minute values were corrected on Oct 23, Jul 24, and Aug 12 due to hydro affected gage-height during measurements. One fifteen minute value was changed on Sep 28 to maintain continuity of calculated flow during a period when rocks were being placed on the control.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on Sep 14, 2011 using B.M. no. 2 as base. The reference point was within allowable limits, so a correction was not made. Two-peg tests were performed on the Lietz level (SN 130869) on Jul 28, 2011, the instrument was within allowable limits and no adjustment was made.

Rating.-- The control at all stages is rock piled in stream channel 10 feet below gage. Some minor shifting will occur from movement of rocks. Rating no. 5-1 used from Oct 11, 2011 was used again this year until Oct 23. Rating COCRMICO06-1 was developed to account for year to year shift trends in upper measurements and used from Oct 23 through Sep 30. Rating 6-1 is considered fairly well defined from 4 cfs up to 99 cfs. The rating is poorly defined below 4 cfs. Records derived from this rating are good between approximately 4.5 cfs and 10 cfs and fair outside this range because of the known scatter. Eighteen discharge measurements (nos. 218-235) were made during the year ranging in discharge from 3.48 to 27.1 cfs. The measurements cover the range experienced except for the lower daily flows on Jan 13, 30; Feb 4, 5, 10-12, 27, 28; and Mar 25. The peak flow of 33.4 cfs occurred at 0845 on Sep 13, 2013 at a gage height of 3.36 ft with a shift of 0.00 ft. It exceeded high measurement no. 234 (GH=3.27 ft), made Sep 13 by 0.09 ft in stage.

Discharge.-- Shifting control method was used to the compute discharge record. Shifts were applied as defined by measurements and distributed by time and stage using seven variable shift curves (12-F, 12-RT, 13-RT, 13-F, 13-FTC, 13-H, and 13-K) Oct 1 through Sep 28. Sep 28 - 30 shifts were applied based on gage height changes caused by humans placing rocks on control. While rating COCRMICO05-1 was in use, one measurement, no. 218, was made resulting in a 0.00 ft shift. While rating COCRMICO06-1 was in use, open-water measurement shifts ranged from -0.04 ft to +0.03 ft, applied shifts ranged from -0.03 ft to +0.01 ft. All open water measurements were given full weight except for nos. 228, 229, 232, and 233, which were rated fair and adjusted as much as 6.6 percent to smooth the shift trend. Periods of ice affected and unreliable gage-height record were estimated.

Special Computations.-- Discharge for periods of ice affected, unreliable, and no gage-height record were estimated using discharge measurements, adjacent good record, and air temperature data from MEDSANCO.

Remarks.-- Record is good except for estimated daily discharges, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Obtain more PZF measurements.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08226700 COTTON CREEK NEAR MINERAL HOT SPRINGS

RATING TABLE-- COCRMICO05-1 USED FROM 01-OCT-2012 TO 23-OCT-2012  
 COCRMICO06-1 USED FROM 23-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

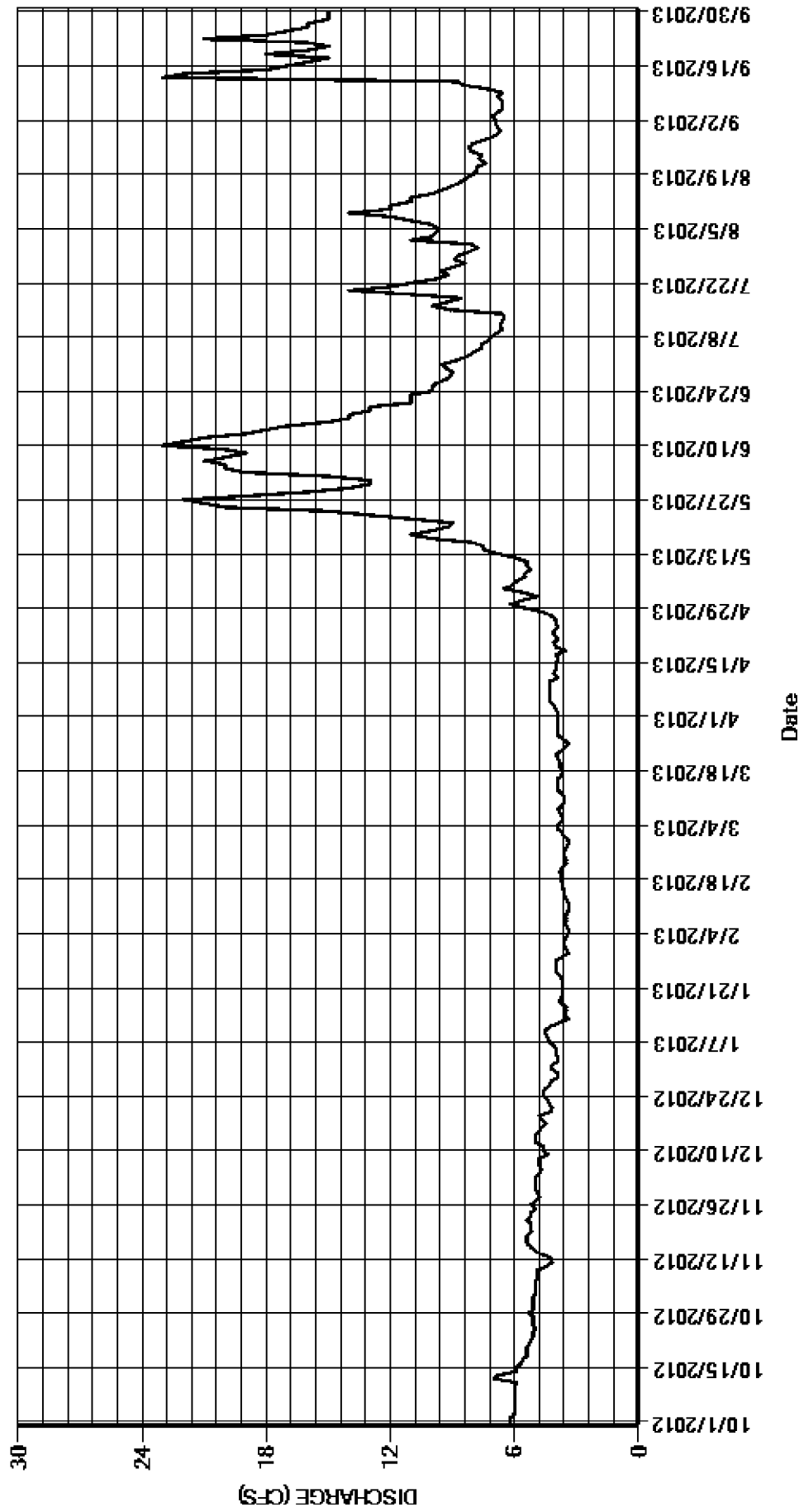
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.2	5.1	e5.0	e4.2	e3.6	e3.6	e3.9	5.6	13	9.5	8.1	6.9
2	6.2	5.1	e5.0	e3.9	e3.6	e3.7	e3.9	4.9	15	8.8	11	6.9
3	6.0	5.0	e5.0	e3.9	e3.5	e3.9	e4.0	5.6	19	8.3	10	7.1
4	6.0	5.0	e4.8	e4.0	e3.4	e3.9	4.1	6.5	20	8.0	9.8	6.8
5	6.0	5.0	e4.7	e4.0	e3.4	e3.7	4.3	6.1	20	7.6	9.7	6.6
6	6.0	5.0	e4.8	e4.1	e3.5	e3.7	4.3	5.9	21	7.6	10	6.6
7	6.0	4.9	e4.8	e4.3	e3.5	e3.8	4.3	5.5	20	7.3	11	6.6
8	6.0	4.9	e4.8	e4.4	e3.5	e3.9	4.3	5.5	19	7.1	12	6.8
9	6.0	4.9	e4.4	e4.5	e3.5	e3.7	4.3	5.2	20	6.9	14	6.6
10	6.0	4.5	e4.6	e4.5	e3.4	e3.6	4.3	5.4	23	6.6	12	7.3
11	5.9	e4.2	e4.6	e4.3	e3.4	e3.6	3.9	5.4	22	6.7	12	8.5
12	7.0	e4.2	e5.0	e3.8	e3.4	e3.7	4.1	6.0	21	6.6	11	8.7
13	6.8	e4.6	e5.0	e3.4	e3.5	e3.9	4.0	6.8	19	6.5	11	23
14	5.9	e5.0	e5.0	e3.6	e3.6	e3.9	4.0	7.5	18	6.6	10	22
15	5.9	e5.2	e4.8	e3.5	e3.6	e3.9	4.0	7.5	17	9.1	9.5	18
16	5.7	e5.4	e4.7	e3.5	e3.7	e3.9	3.9	8.1	15	10	9.0	17
17	5.6	e5.4	e4.5	e3.8	e3.7	e3.7	4.0	10	14	9.2	8.6	16
18	5.4	e5.4	e4.7	e3.8	e3.8	e3.7	3.5	11	14	8.6	8.3	15
19	5.4	e5.2	e4.8	e3.7	e3.7	e3.8	e4.0	10	13	11	8.0	18
20	5.4	e5.2	e4.2	e3.7	e3.8	e3.8	4.1	9.2	13	14	7.8	16
21	5.3	e5.2	e4.2	e3.7	e3.7	e3.9	3.9	9.0	11	12	7.8	15
22	5.2	e5.4	e4.3	e3.7	e3.5	e4.0	4.1	11	11	11	7.4	16
23	5.1	e5.2	e4.4	e3.7	e3.5	e3.8	4.1	13	11	9.8	7.7	21
24	5.1	e5.2	e4.6	e3.8	e3.6	e3.6	3.9	15	10	9.2	7.6	18
25	5.0	e5.0	e4.6	e4.0	e3.6	e3.4	4.0	20	10	9.6	8.1	17
26	5.1	e5.2	e4.5	e4.0	e3.5	e3.6	4.0	21	9.8	9.0	8.2	16
27	5.1	e5.0	e4.3	e4.0	e3.4	e3.9	4.2	22	9.3	8.4	8.0	16
28	5.1	e4.8	e4.2	e4.0	e3.4	e3.9	4.6	19	9.1	8.9	7.4	15
29	5.3	e4.9	e3.9	e3.7	---	e3.9	5.5	16	9.0	8.7	6.9	15
30	5.1	e5.0	e3.9	e3.4	---	e3.9	6.2	14	9.3	8.2	6.7	15
31	5.1	---	e4.2	e3.5	---	e3.9	---	13	---	7.8	6.8	---
TOTAL	175.9	150.1	142.3	120.4	99.3	117.2	125.7	310.7	455.5	268.6	285.4	394.4
MEAN	5.67	5.00	4.59	3.88	3.55	3.78	4.19	10.0	15.2	8.66	9.21	13.1
AC-FT	349	298	282	239	197	232	249	616	903	533	566	782
MAX	7.0	5.4	5.0	4.5	3.8	4.0	6.2	22	23	14	14	23
MIN	5.0	4.2	3.9	3.4	3.4	3.4	3.5	4.9	9.0	6.5	6.7	6.6

CAL YR	2012	TOTAL	2368.8	MEAN	6.47	MAX	20	MIN	3.6	AC-FT	4700
WTR YR	2013	TOTAL	2645.5	MEAN	7.25	MAX	23	MIN	3.4	AC-FT	5250

MAX DISCH: 33.4 CFS AT 08:45 ON SEP 13, 2013 GH 3.36 FT SHIFT 0 FT  
 MAX GH: 3.36 FT AT 08:45 ON SEP 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08226700 COTTON CREEK NEAR MINERAL HOT SPRINGS  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
WILD CHERRY CREEK NEAR CRESTONE

Water Year 2013

Location.-- Lat 38°6'1", long 105°46'6" referenced to North American Datum of 1983 (Mirage, CO quad, scale 1:24,000), UTM Zone 13 432636 E and 4217217 N, in SE ¼ SW ¼ sec. 33, T.45 N., R.11 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010003, on right bank 50 ft north of right branch of trail, 12 mi southeast of Mineral Hot Springs, 8 mi northwest of Crestone, CO.

Drainage Area and Period of Record.-- 4.5 mi<sup>2</sup> from topographical map.; March 1999 to current year.

Equipment.-- Sutron Satlink2 data collection platform and a float-operated SDR in a 4-foot diameter culvert pipe well and shelter. The primary reference gage is a drop tape from reference point on shelf. The secondary reference is a cantilever gage, installed May 10, 2012.

Hydrologic Conditions.-- Alpine and subalpine undeveloped National Forest.

Gage-Height Record.-- Primary record is fifteen-minute satellite transmitted data with SDR log and DCP log as backup. Secondary pressure transducer was installed Oct 1 to May 3. Pressure transducer data was used as the primary record from Oct 23 - May 3. Record is complete and reliable. The stage-discharge relationship was affected by ice Nov 10 - Mar 27. The pressure transducer data was corrected using comparison with SDR before the well froze and with comparison with outside staff gage readings. These comparisons indicated the following corrections: -0.03 ft correction on Oct 23, -0.06 ft correction on Apr 3, -0.02 ft correction on Apr 24, and -0.02 ft correction on May 3. The -0.06 ft correction on Apr 3 was not used based on shift trend, PZF measurement, and correction trend indicating the outside reference may have been affected by ice or other factors. The remaining corrections were prorated by time between observations. There were no shaft encoder corrections while SDR was primary record.

Datum Corrections.-- Levels were last ran to the Reference Point (RP) inside the gage on Jul 5, 2012 using B.M. 1 as base. The RP was outside allowable limits and was adjusted +0.02 ft. Two-peg test was performed on the Lietz level (SN 130869) on Jun 11, 2012, the instrument was within allowable limits and no adjustment was made.

Rating.-- Control at all stages is a log cross-vane about 10 feet below the gage. Rating no. 4 was used until Oct 23, Rating no. 5-1 was developed and used from Oct 23 to end of water year. Rating no. 5-1 was developed to better fit the low measurements that were made during the 2013 water year and make a slight adjustment to the upper end of the rating to better fit the highest measurement made with the log weir control. This rating is fairly well defined from 1 to 10 cfs but should be considered poor outside of that range. Shifting occurs due to poor measurement conditions and limited control sensitivity. Seventeen discharge measurements (nos. 216 - 232) were made this year ranging in discharge from 0.28 to 9.23 cfs. The measurements cover the discharge range experienced except for the lower daily flows on Jan 31; Feb 1-25, 27; Mar 3-6, 8-11, 20-29; and higher daily flows on May 25 -28. The peak flow of 19.6 cfs occurred at 2030 on May 24, 2013 at a gage height of 2.18 ft with a shift of 0 ft. It exceeded high measurement no. 226 (GH = 2.01 ft), made May 28 by 0.17 ft in stage. The peak gage-height of 2.40 ft occurred on Dec 10, 2012 at 0715 as a result of backwater from ice.

Discharge.-- Shifting control method was used to compute the discharge record. Shifts were applied as defined by measurements and distributed by time Oct 1-23 while rating CHECRECO04 was in use. Shifts were applied as defined by measurements and distributed by time and events the remainder of the water year while CHECRECO05-1 was in use. Open-water measurement shifts ranged from 0.00 to -0.03 and applied shifts ranged from 0.00 to -0.02. All open water measurements were given full weight except for nos. 224 and 232, which were adjusted as much as 8.1 percent to smooth the shift distribution. Periods of ice affected gage-height record were estimated.

Special Computations.-- Discharge for period of ice affected gage-height was estimated using discharge measurements, gage-height record from pressure transducer, and temperature data from Sand Creek at the Great Sand Dunes National Park. With the exception of measurement 217, all measurement shifts during period of ice affected gage-height indicate pipe flow at gage with positive shifts. These shifts were applied to transducer data and used as estimation except on days with apparent backwater conditions, which were estimated lower than computed discharge.

Remarks.-- Record is fair except for estimated periods and daily discharges less than 1 cfs, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Levels should be ran in 2014.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

WILD CHERRY CREEK NEAR CRESTONE

RATING TABLE-- CHECRECO04 USED FROM 01-OCT-2012 TO 23-OCT-2012  
 CHECRECO05-1 USED FROM 23-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.1	0.75	e0.56	e0.42	e0.26	e0.28	0.39	1.1	5.8	1.9	1.1	1.0
2	1.1	0.75	e0.53	e0.44	e0.26	e0.29	0.36	1.1	5.8	1.8	1.6	1.1
3	1.1	0.71	e0.53	e0.49	e0.26	e0.27	0.33	1.2	6.0	1.7	1.3	1.2
4	1.0	0.70	e0.51	e0.50	e0.26	e0.26	0.38	1.6	6.0	1.7	1.3	1.2
5	0.93	0.70	e0.51	e0.47	e0.26	e0.25	0.46	1.5	6.3	1.6	1.3	1.0
6	0.95	0.70	e0.52	e0.46	e0.26	e0.27	0.44	1.3	6.2	1.6	1.7	0.99
7	0.92	0.70	e0.51	e0.45	e0.26	e0.28	0.48	1.2	6.0	1.5	2.0	0.97
8	0.92	0.70	e0.50	e0.44	e0.26	e0.27	0.41	1.2	5.8	1.5	2.1	0.96
9	0.90	0.71	e0.50	e0.44	e0.26	e0.27	0.42	1.2	5.5	1.3	2.3	0.90
10	0.90	e0.60	e0.55	e0.44	e0.26	e0.25	0.36	1.3	5.5	1.2	2.2	1.1
11	0.90	e0.48	e0.45	e0.44	e0.26	e0.26	0.33	1.6	5.2	1.1	2.4	1.4
12	1.1	e0.45	e0.40	e0.44	e0.25	e0.28	0.33	1.9	5.0	1.1	2.4	1.4
13	1.1	e0.40	e0.39	e0.44	e0.24	e0.30	0.31	2.5	4.7	1.0	2.3	4.2
14	0.92	e0.40	e0.45	e0.45	e0.25	e0.34	0.33	3.3	4.5	1.1	2.3	3.8
15	0.91	e0.40	e0.47	e0.45	e0.24	e0.38	0.32	3.9	4.3	1.3	2.1	4.8
16	0.91	e0.40	e0.42	e0.46	e0.26	e0.37	0.33	4.5	4.0	1.2	2.0	5.4
17	0.90	e0.40	e0.39	e0.42	e0.27	e0.33	0.36	5.9	3.8	0.97	1.9	5.2
18	0.85	e0.45	e0.39	e0.39	e0.26	e0.30	0.30	5.9	3.7	0.97	1.8	5.0
19	0.84	e0.50	e0.42	e0.37	e0.25	e0.28	0.33	5.2	3.5	1.0	1.7	5.5
20	0.83	e0.55	e0.44	e0.36	e0.26	e0.27	0.32	4.8	3.3	1.1	1.6	4.9
21	0.82	e0.57	e0.44	e0.35	e0.24	e0.24	0.30	4.9	3.0	1.1	1.6	4.7
22	0.82	e0.56	e0.44	e0.35	e0.24	e0.23	0.35	6.0	2.8	0.97	1.5	4.9
23	0.83	e0.56	e0.44	e0.37	e0.25	e0.25	0.42	7.4	2.6	0.94	1.4	5.3
24	0.83	e0.56	e0.44	e0.33	e0.25	e0.25	0.36	9.1	2.5	0.94	1.3	5.4
25	0.81	e0.55	e0.41	e0.30	e0.24	e0.25	0.34	10	2.3	1.0	1.4	5.4
26	0.78	e0.52	e0.42	e0.31	e0.28	e0.26	0.34	11	2.1	1.1	1.4	5.2
27	0.76	e0.49	e0.44	e0.31	e0.27	e0.23	0.40	11	2.0	1.1	1.4	5.0
28	0.79	e0.53	e0.44	e0.30	e0.28	0.22	0.63	9.6	1.9	1.2	1.4	4.8
29	0.78	e0.58	e0.44	e0.30	---	0.27	0.98	8.1	2.0	1.2	1.2	4.5
30	0.78	e0.56	e0.44	e0.29	---	0.31	1.4	6.9	1.9	1.0	1.2	4.2
31	0.77	---	e0.44	e0.26	---	0.34	---	6.1	---	1.0	1.1	---
TOTAL	27.85	16.93	14.23	12.24	7.19	8.65	12.81	142.3	124.0	38.19	52.3	101.42
MEAN	0.90	0.56	0.46	0.39	0.26	0.28	0.43	4.59	4.13	1.23	1.69	3.38
AC-FT	55	34	28	24	14	17	25	282	246	76	104	201
MAX	1.1	0.75	0.56	0.50	0.28	0.38	1.4	11	6.3	1.9	2.4	5.5
MIN	0.76	0.40	0.39	0.26	0.24	0.22	0.30	1.1	1.9	0.94	1.1	0.90

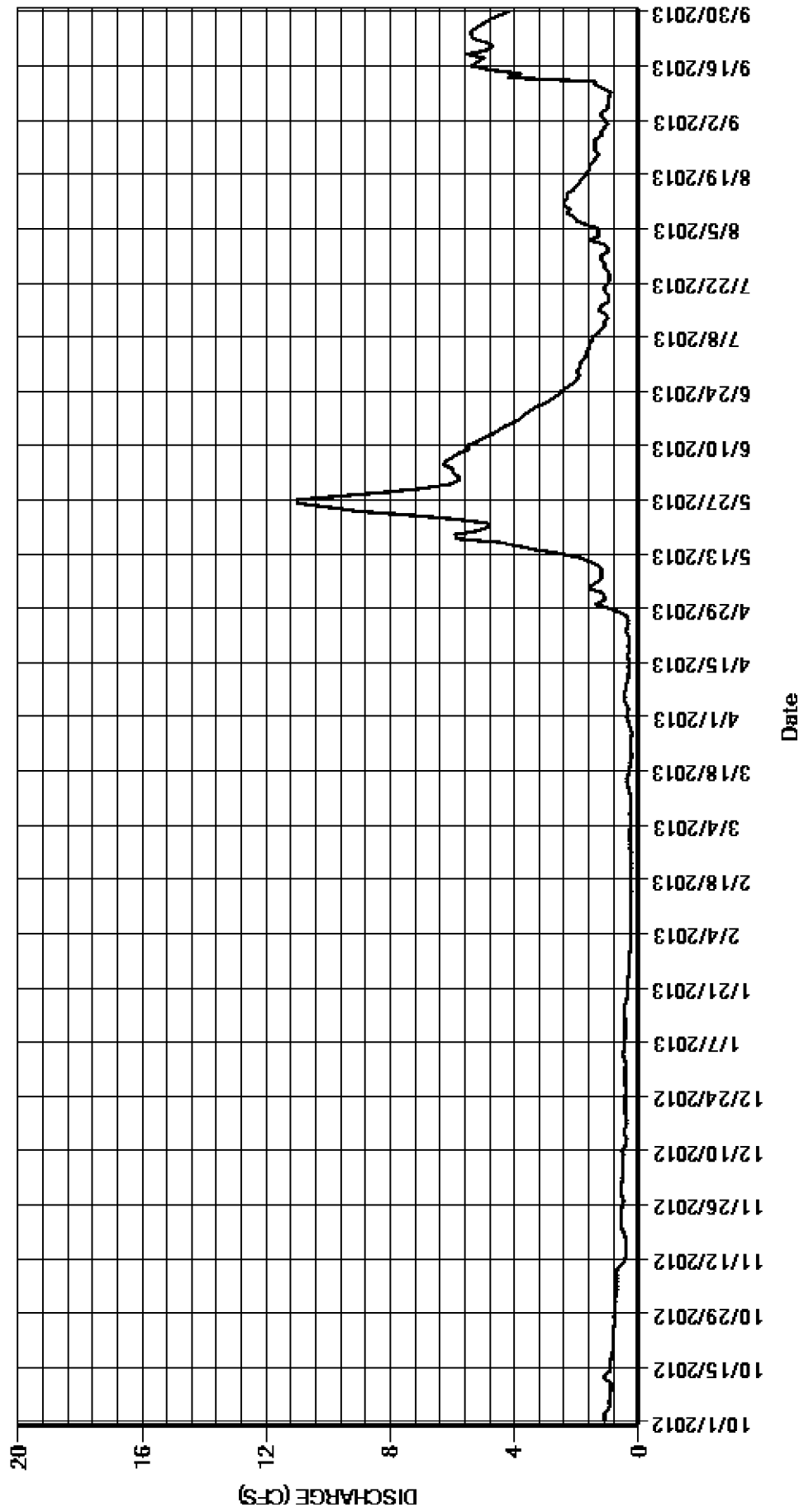
CAL YR	2012	TOTAL	357.45	MEAN	0.98	MAX	4.5	MIN	0.20	AC-FT	709
WTR YR	2013	TOTAL	558.11	MEAN	1.53	MAX	11	MIN	0.22	AC-FT	1110

MAX DISCH: 19.6 CFS AT 20:30 ON MAY 24, 2013 GH 2.18 FT SHIFT 0 FT

MAX GH: 2.40 FT AT 07:15 ON DEC 10, 2012 (Backwater from ice)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**WILD CHERRY CREEK NEAR CRESTONE  
WY2013 HYDROGRAPH**



RIO GRANDE RIVER BASIN  
RITO ALTO CREEK NEAR CRESTONE

Water Year 2013

Location.-- Lat 38°4'41", long 105°45'33" referenced to North American Datum of 1983 (Mirage, CO quad, scale 1:24,000), UTM Zone 13 433428 E and 4214738 N, in SE ¼ NE ¼ sec. 9, T.44 N., R.11 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010003, on right bank 300 ft east of parking area, 12 mi southeast of Mineral Hot Springs, 7 mi northwest of Crestone, CO.

Drainage Area and Period of Record.-- 10.3 mi<sup>2</sup> from topographical map; Jan 1999 to current year.

Equipment.-- Data collection platform (Satlink2), and a float-operated SDR in a 4-ft diameter culvert pipe shelter and well. The primary reference gage is a drop tape from reference point on shelf. A log cross-vane control structure was constructed on Apr 21, 2011. Outside cantilever gage installed Apr 22, 2011.

Hydrologic Conditions.-- Undeveloped steep alpine and subalpine terrain.

Gage-Height Record.-- Primary record is fifteen minute transmitted DCP data with DCP log and SDR log as backup. Record is complete and reliable, except for Nov 10-13 when well was frozen and Nov 14 to Apr 3 when station was closed. Four missing unit values were filled on May 9 by linear interpolation without loss of accuracy. There was one +0.02 ft instrument calibration correction on Jul 1, which was prorated by time from previous visit.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on Jul 13, 2011 using B.M. No. 1 as base. The RP elevation was within allowable limits, so no correction was made or required. The outside cantilever gage was adjusted +0.04 ft. Two-peg tests were performed on the Lietz level (SN 130869) on May 27, 2011 and July 28, 2011 and no adjustments were required or made.

Rating.-- Control is a log cross-vane structure. The log cross-vane structure shows minor shifting during low flows as a result of fill and scour in the gage pool. There may also be some influence due to scour, fill, and movement of rocks directly below control. Rating no. 5 in use since Apr 21, 2011 was used until Oct 23, 2012. Rating 06-1 was developed and used the remainder of the water year. Rating 06-1 is well defined from 2 to 70 cfs. Nineteen measurements (nos. 216-234) were made ranging in discharge from 2.07 cfs to 71.4 cfs. The measurements cover the discharge range experienced except for the lower daily flows on Jan 3-5, 12-16, 30; Feb 10-28; Mar 1-6, 9-13, 17-26. The peak flow of 107 cfs occurred at 0830 on Sep 13, 2013 at a gage height of 3.53 ft with a shift of 0.00 ft. The peak exceeded high Measurement No. 233 (GH= 3.34 ft) made Sep 13 by 0.19 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge for all periods of good stage record. Variable stage-shift relationships VS12-D and VS13-D were developed and used to distribute shifting by stage and time. VS12-D was used with rating no. 05 from Oct 1 to Oct 23. Direct application of rating no. 06-1 and shift curve VS13-D were used the remainder of the year. Open-water measurement shifts ranged from -0.02 to +0.06 ft and applied shifts ranged from 0.00 to 0.05 ft. All measurements were given full weight except for Nos. 216, 222, 226, 228-230 and 234 which were adjusted as much as 8.5% to smooth shift trends. Periods of unreliable and no gage-height record were estimated.

Special Computations.-- Discharge for periods of unreliable and no gage-height record were estimated using discharge measurements and temperature record from Medano Creek at Great Sand Dunes National Park (MEDSANCO).

Remarks.-- Record is fair, except for estimated daily values, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

RITO ALTO CREEK NEAR CRESTONE

RATING TABLE-- RITCRECO05 USED FROM 01-OCT-2012 TO 23-OCT-2012  
 RITCRECO06-1 USED FROM 23-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.1	4.1	e3.5	e2.4	e2.2	e1.8	e2.2	4.9	31	12	12	4.7
2	5.1	4.1	e3.6	e2.1	e2.2	e1.9	e2.2	4.7	35	9.8	20	4.7
3	5.1	4.0	e3.6	e2.0	e2.1	e2.0	e2.1	5.4	39	9.2	15	5.1
4	5.0	3.9	e3.5	e2.0	e2.1	e2.0	2.2	6.7	38	8.5	14	4.8
5	5.0	3.9	e3.4	e2.0	e2.1	e1.9	2.4	8.2	39	7.9	13	4.7
6	4.9	3.9	e3.4	e2.1	e2.2	e2.0	2.4	7.4	39	8.2	14	4.9
7	4.8	3.8	e3.5	e2.2	e2.2	e2.1	2.4	6.5	36	9.8	15	5.1
8	4.7	3.7	e3.4	e2.3	e2.2	e2.1	2.4	6.1	37	10	16	5.2
9	4.7	3.9	e3.1	e2.3	e2.2	e1.9	2.4	5.4	38	8.2	18	4.9
10	4.7	e3.3	e2.7	e2.3	e2.0	e1.8	2.3	5.2	39	7.6	14	5.5
11	4.5	e3.2	e2.7	e2.3	e1.9	e1.8	2.3	5.0	36	7.2	13	6.3
12	5.2	e3.0	e2.8	e2.0	e1.9	e1.9	2.3	5.9	33	7.1	11	7.5
13	5.4	e3.1	e3.0	e1.8	e1.8	e2.0	2.2	8.2	30	6.8	10	5.7
14	5.0	e3.2	e3.2	e1.9	e1.9	e2.1	2.3	11	28	6.9	9.7	4.2
15	5.2	e3.3	e3.2	e1.9	e1.9	e2.1	2.3	14	25	14	9.0	4.0
16	5.1	e3.4	e3.0	e1.9	e1.9	e2.1	2.2	17	23	12	8.3	4.3
17	4.9	e3.6	e2.9	e2.1	e2.0	e2.0	2.2	26	21	9.7	7.8	3.4
18	4.7	e3.6	e2.9	e2.1	e2.0	e2.0	2.1	26	20	8.7	7.4	3.0
19	4.7	e3.4	e2.9	e2.1	e1.9	e2.0	2.2	20	20	15	6.8	3.5
20	4.7	e3.4	e2.5	e2.1	e2.0	e2.0	2.2	17	18	17	6.5	2.7
21	4.7	e3.4	e2.3	e2.1	e1.9	e2.0	2.2	16	16	14	6.4	2.4
22	4.5	e3.5	e2.4	e2.2	e1.8	e2.0	2.3	21	15	13	6.0	2.8
23	4.5	e3.4	e2.5	e2.2	e1.8	e1.9	2.3	31	14	11	5.9	3.9
24	4.5	e3.3	e2.7	e2.3	e1.8	e1.7	2.2	42	13	11	5.6	3.6
25	4.2	e3.3	e2.7	e2.4	e1.8	e1.7	2.2	47	12	12	6.1	3.4
26	3.8	e3.3	e2.6	e2.4	e1.7	e1.9	2.3	52	11	11	6.2	3.0
27	3.9	e3.2	e2.6	e2.5	e1.7	e2.1	2.4	51	11	13	5.7	2.7
28	4.1	e3.2	e2.4	e2.5	e1.7	e2.2	2.8	44	11	15	5.3	2.4
29	4.3	e3.3	e2.3	e2.2	---	e2.2	4.2	36	11	14	5.1	2.1
30	4.2	e3.4	e2.3	e2.0	---	e2.2	5.5	31	11	12	4.9	1.9
31	4.2	---	e2.5	e2.1	---	e2.2	---	30	---	11	4.8	---
TOTAL	145.4	105.1	90.1	66.8	54.9	61.6	73.7	611.6	750	332.6	302.5	653.4
MEAN	4.69	3.50	2.91	2.15	1.96	1.99	2.46	19.7	25.0	10.7	9.76	21.8
AC-FT	288	208	179	132	109	122	146	1210	1490	660	600	1300
MAX	5.4	4.1	3.6	2.5	2.2	2.2	5.5	52	39	17	20	5.7
MIN	3.8	3.0	2.3	1.8	1.7	1.7	2.1	4.7	11	6.8	4.8	4.7

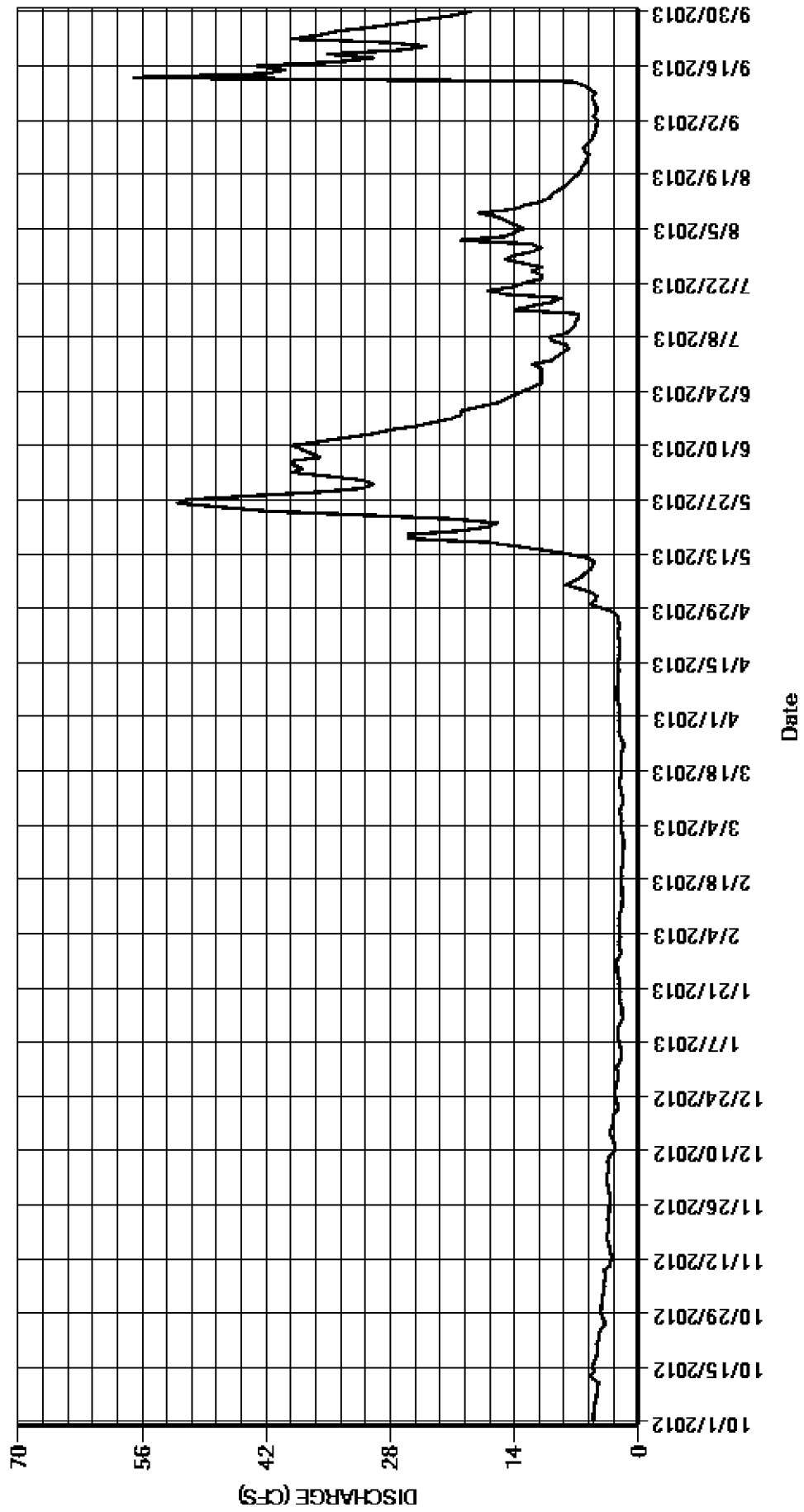
CAL YR	2012	TOTAL	2197.0	MEAN	6.00	MAX	28	MIN	1.5	AC-FT	4360
WTR YR	2013	TOTAL	3247.7	MEAN	8.90	MAX	57	MIN	1.7	AC-FT	6440

MAX DISCH: 107 CFS AT 08:30 ON SEP 13, 2013 GH 3.53 FT SHIFT 0 FT  
 MAX GH: 3.53 FT AT 08:30 ON SEP 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



RITO ALTO CREEK NEAR CRESTONE  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
SAN ISABEL CREEK NEAR CRESTONE

Water Year 2013

Location.-- Lat 38°2'4", long 105°43'5" referenced to North American Datum of 1983 (Rito Alto Peak, CO quad, scale 1:24,000), UTM Zone 13 436985 E and 4209879 N, in SW ¼ NW ¼ sec. 25, T.44 N., R.11 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010003, on left bank 200 feet northwest of trail, 3 mi northwest of Crestone, CO.

Drainage Area and Period of Record.-- 5.7 mi<sup>2</sup> (from topographical map); March 1999 to current year.

Equipment.-- Data collection platform (Sutron Satlink2 with HDR GOES radio) and a float-operated SDR in a 4-foot diameter culvert shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage.

Hydrologic Conditions.-- Undeveloped steep alpine and sub-alpine terrain.

Gage-Height Record.-- Primary record is 15 minute satellite transmitted data with SDR log and DCP log as backup. Record is complete and reliable except for Oct 23-25, while the control was being rebuilt; Nov 11-13, while ice in well was affecting float; Nov 14 - Apr 5, while station was closed; and Sep 24-25, while inlets were left closed. The stage-discharge relation was affected by ice Apr 18 and 19. There were two instrument calibration corrections, +0.01 and -0.01 ft, that were prorated by time from previous visit.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on July 13, 2011 using BM1 as base. The RP elevation was within allowable limits, so no correction was made or required. A two-peg test was performed on the Lietz level (SN 130869) on May 27, 2011 and no adjustment was required or made.

Rating.-- The cobble/boulder control was rebuilt as a log weir structure Oct 23-25, 2012. Stream bottom is mostly rounded rocks, cobbles, and gravel. The stage-discharge relation can be affected by persons moving rocks and piling logs on control and scour caused by high flows. Rating SANCRECO04 first used May 28, 2010 was used until the control was rebuilt Oct 23. Rating SANCRECO05 was developed from WY2013 measurements made after Oct 23 and was used for the remainder of the water year. SANCRECO04 is well defined from approximately 1.5 cfs to 10 cfs. SANCRECO05 is well defined from approximately 1.5 cfs to 35 cfs. Twenty-one discharge measurements (nos. 216-236) were made this year ranging in discharge from 0.95 to 29.3 cfs. They cover the discharge range experienced except for lower daily flows on Dec 21-23; Jan 3-8, 13-17. The peak flow of 40.0 cfs occurred at 0815 on Sep 13, 2013 at a gage height of 4.74 ft with a shift of 0.00 ft. It exceeded high measurement no. 234 (GH = 4.66 ft), made Sep 13, by 0.08 feet in stage.

Discharge.-- Discharge was computed by direct application of the rating to the gage-height record except for Oct 1 - Oct 23 and Aug 13 - Sep 13 when shifting control method was used. Three variable shift curves (SANCREVS12-B, SANCREVS13-A, and SANCREVS13-RT) were used to distributed shifts by stage and time during the period when the shifting control method was used. When rating SANCRECO04 was in use, the measured shift was +0.01 ft (M216) adjusted -7.3 percent to +0.02 ft to smooth shift distribution with WY2012 record. When SANCRECO05 was in use open water measurement shifts ranged from -0.03 ft to +0.02 ft and applied shifts ranged from -0.03 ft to 0 ft. All measurements while SANCRECO05 was in use were given full weight except for nos. 224, 226, 230-232, and 236 which were adjusted by as much as 8.0% to smooth shift distribution. Periods of ice affected, unreliable, and no gage-height record were estimated.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using discharge measurements and air temperature data from Sand Creek at Great Sand Dunes National Park (SANDUNCO). Discharge for periods when inlets were left closed was estimated from discharge measurements and adjacent good record.

Remarks.-- Record is fair except for estimated periods, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Levels in WY 2014

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

SAN ISABEL CREEK NEAR CRESTONE

RATING TABLE-- SANCRECO04 USED FROM 01-OCT-2012 TO 23-OCT-2012  
 SANCRECO05 USED FROM 23-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

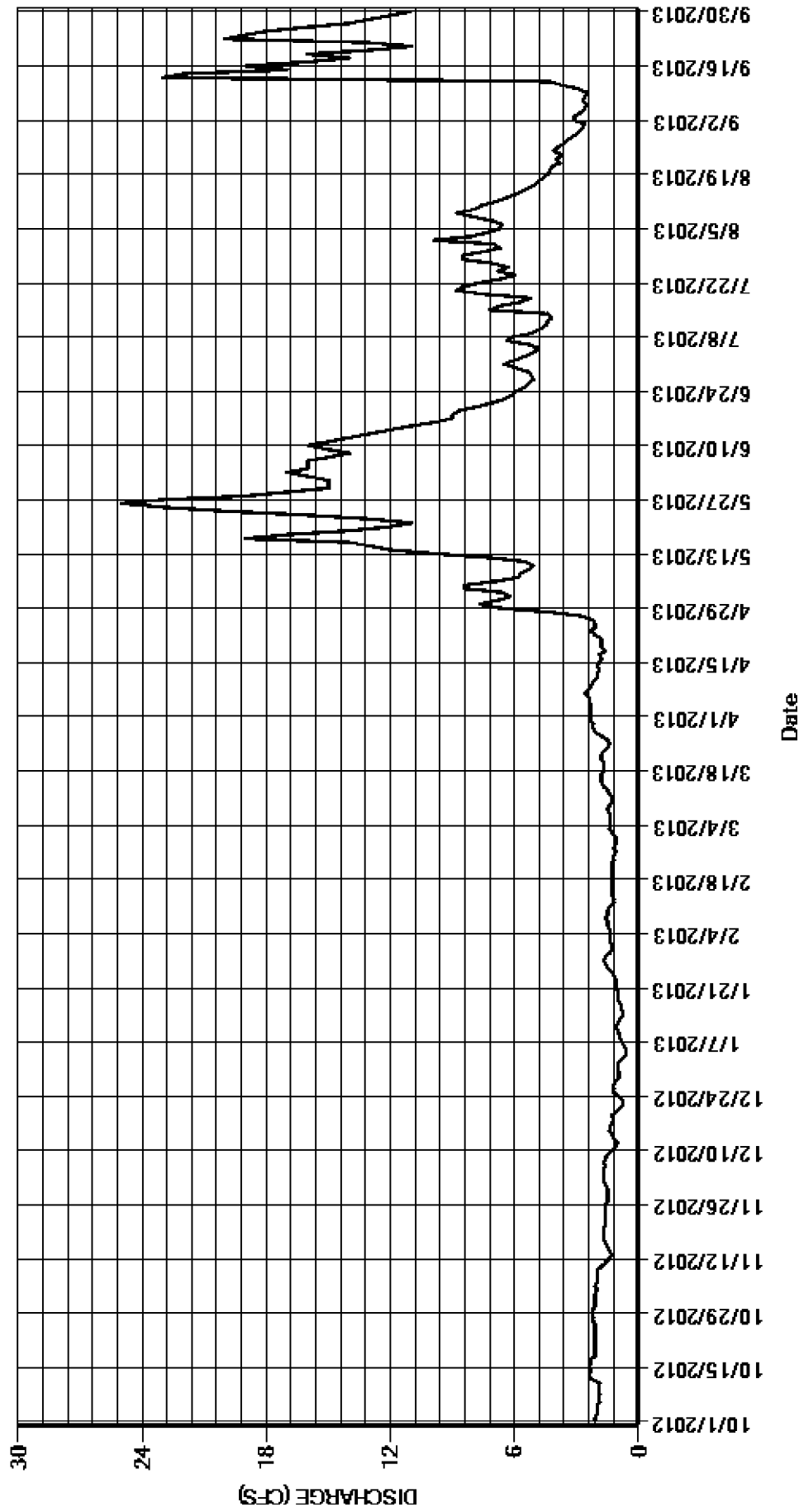
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.1	2.1	e1.6	e1.0	e1.3	e1.1	e2.3	6.8	15	6.5	7.0	2.6
2	2.1	2.1	e1.7	e0.95	e1.4	e1.3	e2.3	6.2	16	6.0	9.9	3.1
3	2.0	2.1	e1.7	e0.70	e1.4	e1.4	e2.3	6.6	17	5.5	8.1	3.1
4	2.0	2.0	e1.7	e0.60	e1.4	e1.4	e2.3	8.4	16	5.1	7.3	2.8
5	2.0	2.1	e1.7	e0.60	e1.4	e1.4	e2.4	8.4	16	4.8	6.7	2.6
6	1.9	2.0	e1.6	e0.70	e1.5	e1.4	2.4	6.9	16	5.3	6.6	2.5
7	1.9	2.0	e1.7	e0.80	e1.5	e1.4	2.6	5.8	15	6.4	7.1	2.7
8	1.9	2.0	e1.6	e0.90	e1.6	e1.5	2.4	5.7	14	6.1	8.0	2.6
9	1.9	2.0	e1.5	e0.95	e1.5	e1.4	2.3	5.3	15	5.2	8.8	2.5
10	1.9	1.8	e1.3	e1.0	e1.5	e1.3	2.2	5.1	16	4.8	7.9	2.9
11	1.9	e1.6	e1.1	e1.1	e1.4	e1.3	2.0	5.5	15	4.5	7.6	3.7
12	2.3	e1.4	e1.0	e1.0	e1.2	e1.4	2.0	7.2	14	4.4	6.9	4.3
13	2.4	e1.3	e1.2	e0.90	e1.2	e1.5	1.9	9.8	13	4.2	6.4	23
14	2.3	e1.4	e1.3	e0.75	e1.3	e1.7	2.0	12	12	4.4	5.9	22
15	2.4	e1.5	e1.4	e0.80	e1.3	e1.8	1.9	13	11	7.2	5.5	17
16	2.3	e1.6	e1.4	e0.85	e1.3	e1.8	1.8	14	9.8	6.7	5.1	19
17	2.3	e1.7	e1.3	e0.90	e1.3	e1.8	1.9	19	9.0	5.7	4.9	16
18	2.1	e1.7	e1.2	e1.0	e1.3	e1.7	e1.6	17	9.0	5.2	4.6	14
19	2.1	e1.7	e1.3	e1.0	e1.3	e1.7	e1.8	14	8.7	7.4	4.4	16
20	2.1	e1.7	e1.1	e1.0	e1.3	e1.7	1.8	12	7.8	8.8	4.3	13
21	2.1	e1.6	e0.90	e1.1	e1.3	e1.8	1.8	11	7.1	8.5	4.2	11
22	2.1	e1.6	e0.75	e1.1	e1.3	e1.8	2.1	13	6.5	7.7	3.8	13
23	e2.1	e1.6	e0.80	e1.1	e1.2	e1.7	2.3	16	6.1	6.7	4.0	20
24	e2.1	e1.6	e1.0	e1.2	e1.2	e1.5	2.1	20	5.9	6.0	3.7	e19
25	e2.1	e1.6	e1.2	e1.3	e1.1	e1.4	2.1	23	5.5	6.8	4.1	e18
26	2.1	e1.6	e1.2	e1.5	e1.2	e1.5	2.2	25	5.3	6.3	3.9	16
27	2.2	e1.5	e1.2	e1.6	e1.1	e1.8	2.8	23	5.1	7.1	3.6	14
28	2.2	e1.5	e1.1	e1.7	e1.1	e2.1	4.3	19	5.2	8.5	3.4	13
29	2.2	e1.5	e0.95	e1.6	---	e2.2	6.7	17	5.3	8.5	3.1	12
30	2.2	e1.5	e0.95	e1.4	---	e2.2	7.7	15	5.9	7.5	2.9	11
31	2.1	---	e1.0	e1.3	---	e2.3	---	15	---	6.7	2.7	---
TOTAL	65.4	51.4	39.45	32.40	36.9	50.3	76.3	385.7	323.2	194.5	172.4	322.4
MEAN	2.11	1.71	1.27	1.05	1.32	1.62	2.54	12.4	10.8	6.27	5.56	10.7
AC-FT	130	102	78	64	73	100	151	765	641	386	342	639
MAX	2.4	2.1	1.7	1.7	1.6	2.3	7.7	25	17	8.8	9.9	23
MIN	1.9	1.3	0.75	0.60	1.1	1.1	1.6	5.1	5.1	4.2	2.7	2.5

CAL YR	2012	TOTAL	1129.15	MEAN	3.09	MAX	12	MIN	0.75	AC-FT	2240
WTR YR	2013	TOTAL	1750.35	MEAN	4.80	MAX	25	MIN	0.60	AC-FT	3470

MAX DISCH: 40.0 CFS AT 08:15 ON SEP 13, 2013 GH 4.74 FT SHIFT 0 FT  
 MAX GH: 4.74 FT AT 08:15 ON SEP 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**SAN ISABEL CREEK NEAR CRESTONE  
WY2013 HYDROGRAPH**



RIO GRANDE RIVER BASIN  
08227000 SAGUACHE CREEK NEAR SAGUACHE

Water Year 2013

Location.-- Lat 38°9'48", long 106°17'26" referenced to North American Datum of 1983 (Lake Mountain NE, CO quad, scale 1:24,000), UTM Zone 13 386931 E and 4224736 N, in SE ¼ SE ¼ sec. 10, T.45 N., R.6 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010004, on left bank 0.2 mi downstream from Middle Creek and 10 mi northwest of Saguache, CO.

Drainage Area and Period of Record.-- 595 mi<sup>2</sup>; Aug 1910 - Sep 1912; Jun 1914 to current year. Monthly discharge only for some periods. Water-quality data available, Apr 1993 - Sep 1995.

Equipment.-- Data collection platform (Sutron Model Satlink2), a float-operated digital stage discharge recorder, a tipping-bucket rain gauge, and air temperature sensor in a CMP shelter and well. The primary reference gage is a drop tape from reference point on shelf. Outside gage installed Jul 20, 2012. Bank-operated cableway located 10 feet below gaging station. A water temperature sensor was installed by USGS on Apr 6, 2012.

Hydrologic Conditions.-- Gaging station is located in undeveloped irrigated ranch meadows near lower mountain ranges. Flows at gage affected by diversions for irrigation and return flows from irrigation.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log and SDR log as backup. Record is complete and reliable except for Dec 20 through 31 when the tape was off the pins of the shaft encoder. The stage-discharge relation was affected by ice Oct 26 through Dec 19 and Jan 1 through Mar 15, Mar 24, and 25. There was a +0.01 ft instrument calibration correction on Aug 12, which was prorated by time from previous visit.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on Aug 14, 2012 using BM2 as base. The RP was within allowable limits, so no corrections were required or made.

Rating.-- Channel and gravel bar downstream are the low water controls. A bend in the channel approximately 100 feet downstream is the high water control. Scour, fill, and moss growth cause shifting. Rating no. 16, in use since Oct. 1, 1999, was used again until Feb 26. Rating no. 17-1 was created and used from Feb 26 until the end of the water year. It is well defined from 10 to 500 cfs, but it is considered only fair outside that range. Seventeen measurements (Nos. 228-244) were made this year ranging in discharge from 12.8 to 125 cfs. They cover the range experienced except for the lower daily flows of Dec 10, 18, 20-23, 26-31; Jan 1-7, 12-15. The peak gage height of 3.05 ft was ice affected and occurred on Jan 27, 3013 at 14:45. The peak flow of 130 cfs occurred at 1715 on Sep 23, 2013 at a gage height of 2.15 ft with a shift of 0.00 ft. It exceeded high measurement 244 made Sep 23, (GH = 2.12 ft) by 0.03 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record for all open-water periods. Last year's shift curve (SAGSAGVS12-1) was carried into ice until Feb 26 when rating 17-1 began use. Direct application of the rating and one shift curve (VS13-A) was used to define shifting the remainder of the year. Measurement shifts ranged from +0.05 to +0.08 ft while using rating no. 16 and -0.03 to +0.02 ft while using rating no. 17-1. All open water measurements were given full weight except for nos. 235, 236, 239, 240, 242, and 243, which were adjusted as much as 3.4 percent to smooth the shift trend. Periods of unreliable and ice affected gage-height record were estimated.

Special Computations.-- Discharge for periods of unreliable and ice affected gage-height record was estimated using discharge measurements, weather records, partial record days, and comparison with nearby stations.

Remarks.-- Record is good except for periods of estimation, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08227000 SAGUACHE CREEK NEAR SAGUACHE

RATING TABLE-- SAGSAGCO16 USED FROM 01-OCT-2012 TO 26-FEB-2013  
 SAGSAGCO17-1 USED FROM 26-FEB-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

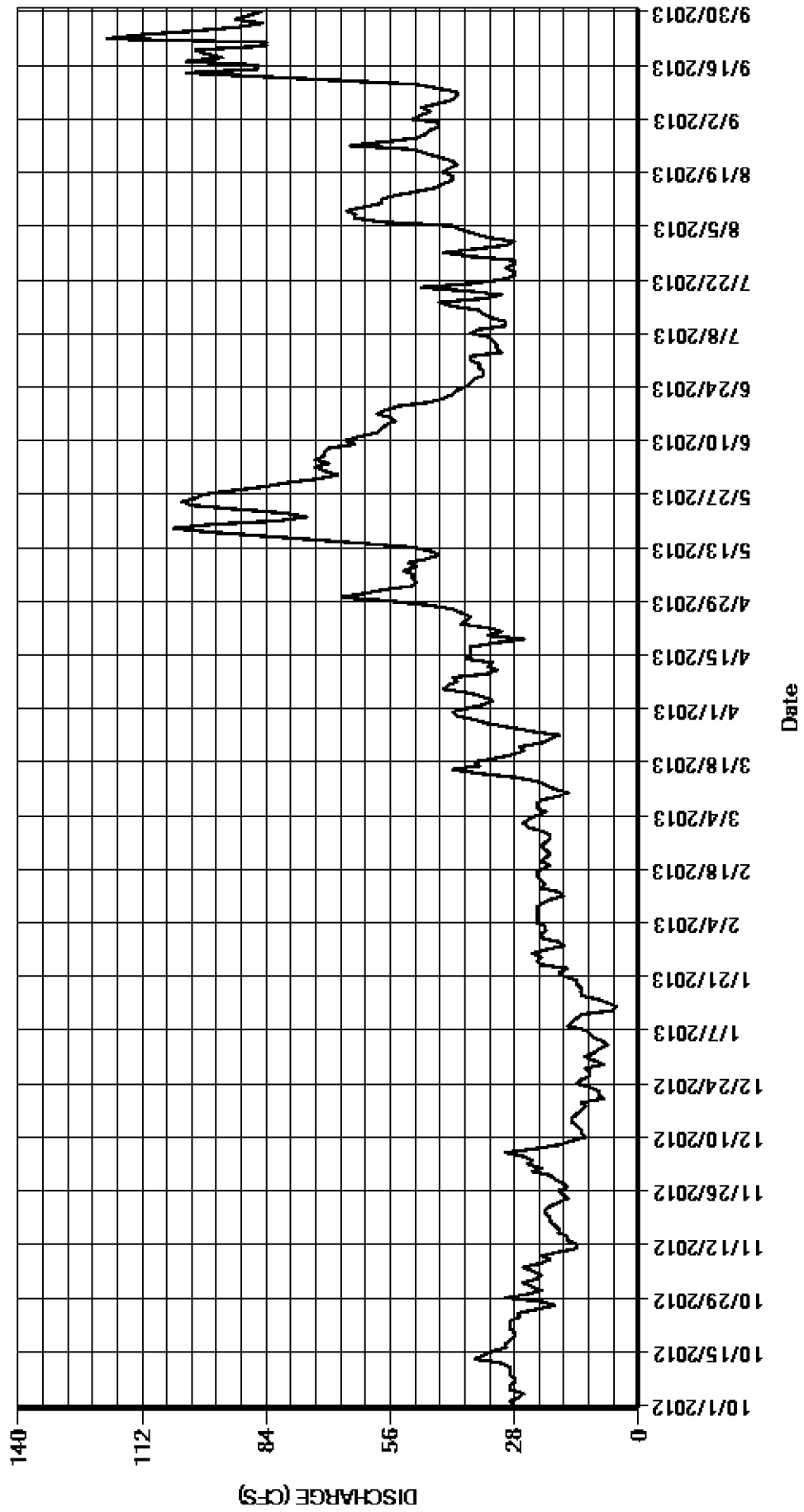
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	28	e24	e24	e10	e22	e25	39	62	68	38	28	45
2	29	e26	e22	e9.0	e21	e26	35	57	71	38	34	51
3	27	e23	e25	e7.0	e21	e25	33	51	73	31	37	49
4	26	e22	e24	e8.0	e23	e23	35	50	70	32	40	47
5	29	e24	e26	e10	e23	e21	38	51	73	32	42	49
6	29	e26	e30	e11	e23	e23	44	51	71	33	58	45
7	28	e22	e23	e12	e23	e23	43	53	71	34	64	42
8	28	e20	e18	e16	e23	e22	41	50	70	38	64	41
9	29	e22	e15	e15	e22	e18	42	52	64	36	66	41
10	29	e18	e12	e14	e20	e16	34	48	66	30	62	46
11	29	e14	e13	e13	e17	e19	32	45	63	30	58	50
12	31	e14	e13	e6.0	e18	e21	34	47	59	33	58	66
13	37	e16	e14	e5.0	e22	e23	33	51	58	35	55	84
14	35	e16	e15	e7.0	e21	e28	39	61	57	36	50	102
15	33	e18	e15	e9.0	e22	e36	38	72	55	42	46	86
16	30	e18	e14	e13	e23	42	38	84	56	45	44	86
17	30	e19	e13	e13	e23	36	38	96	59	35	42	102
18	29	e20	e12	e13	e22	37	33	105	57	31	42	94
19	28	e20	e13	e14	e20	32	26	97	54	38	44	98
20	28	e21	e8.0	e14	e22	28	34	81	47	49	43	100
21	29	e21	e9.0	e17	e21	26	31	75	44	38	41	84
22	29	e20	e9.0	e18	e20	27	34	80	42	31	42	84
23	29	e18	e11	e16	e21	22	40	91	41	28	45	120
24	27	e16	e14	e22	e22	e20	39	101	39	28	48	112
25	27	e17	e13	e23	e21	e18	38	103	38	30	51	100
26	e23	e18	e11	e22	e20	24	40	100	37	28	65	90
27	e19	e16	e11	e24	e20	29	42	98	35	28	57	85
28	e22	e17	e12	e21	e22	34	48	91	35	38	50	91
29	e30	e19	e8.0	e17	---	37	56	84	36	44	48	88
30	e25	e20	e10	e18	---	41	67	79	36	37	47	85
31	e22	---	e12	e22	---	42	---	72	---	30	45	---
TOTAL	874	585	469.0	439.0	598	844	1164	2238	1645	1076	1516	2263
MEAN	28.2	19.5	15.1	14.2	21.4	27.2	38.8	72.2	54.8	34.7	48.9	75.4
AC-FT	1730	1160	930	871	1190	1670	2310	4440	3260	2130	3010	4490
MAX	37	26	30	24	23	42	67	105	73	49	66	120
MIN	19	14	8.0	5.0	17	16	26	45	35	28	28	41

CAL YR	2012	TOTAL	11813.0	MEAN	32.3	MAX	80	MIN	8.0	AC-FT	23430
WTR YR	2013	TOTAL	13711.0	MEAN	37.6	MAX	120	MIN	5.0	AC-FT	27200

MAX DISCH: 130 CFS AT 17:15 ON SEP 23, 2013 GH 2.15 FT SHIFT 0 FT  
 MAX GH: 3.05 FT AT 14:45 ON JAN 27, 2013 (Ice affected)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08227000 SAGUACHE CREEK NEAR SAGUACHE  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08227500 CRESTONE CREEK, NORTH NEAR CRESTONE  
Water Year 2013

Location.-- Lat 38°0'49", long 105°41'34" referenced to North American Datum of 1983 (Rito Alto Peak, CO quad, scale 1:24,000), UTM Zone 13 439188 E and 4207550 N, in SE ¼ SE ¼ sec. 31, T.44 N., R.12 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010003, on right bank in canyon, 1.5 mi northeast of Crestone, CO, and 3.2 mi upstream from South Crestone Creek.

Drainage Area and Period of Record.-- 10.7 mi<sup>2</sup>; 1936 to current year (1936 to 1947 seasonal records only).

Equipment.-- Data collection platform (Sutron Satlink2) and a float-operated shaft encoder (SDR) in a 36-inch corrugated metal shelter and 36-inch concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Control is a concrete ramp flume approximately 4 feet below the gage.

Hydrologic Conditions.-- Undeveloped steep alpine and subalpine terrain.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted data with DCP log and SDR log as backup. Record is complete and reliable except for Nov 11-13 when float was frozen and Nov 14 to Mar 27 when station was closed.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on Jul 13, 2011 using B.M. No. 6 as base. The RP was within allowable limits and no correction was made. Two-peg test was performed on the Lietz level (SN 130869) on May 27, 2011, the instrument was within allowable limits and no adjustment was made.

Rating.-- Control is a concrete ramp flume approximately 4 feet below the gage. Shifting occurs mainly due to the movement of streambed materials in and above gage pool. Rating no. 11 was used until the first measurement of the water year on Oct 23. Rating 13-2 was developed from a survey of the site and recent measurements and used Oct 23, 2012 through the end of the water year. Rating 13-2 is well defined from 1.0 cfs to 77.7 cfs. Seventeen measurements (Nos. 246-262) were made this year ranging in discharge from 0.87 to 47.6 cfs. The measurements cover the range in discharge experienced except for higher daily flows on May 25-27 and lower daily flows on Dec 21; Jan 2-6, 13-17, 19, 20, 30, 31; Feb 4, 7, 10-16, 22-28. The peak flow of 75.8 cfs occurred at 20:00 on May 26, 2013 at a gage height of 1.71 ft with a shift of 0.00 ft; it exceeded high measurement no. 256 (GH = 1.53 ft), made May 28, by 0.18 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record during all periods of reliable stage record. Direct application of rating no. 11 was used from Oct. 1 to Oct. 23. Rating no. 13-2 along with two shift curves (VS13-C, VS13-E) were developed and used to distribute shifts by stage and time the rest of the water year. Measurement shifts ranged from 0 to -0.07 ft and adjusted shifts ranged from 0 to -0.05 ft. All measurements were given full weight except for Nos. 246, 252-255, and 257-260, which were adjusted as much as 7.5 percent to smooth shift trends. Discharge was estimated during periods of unreliable gage-height record.

Special Computations.-- Discharge for periods of unreliable gage-height record was estimated using discharge measurements and air temperature records from SANDUNCO.

Remarks.-- Record is good, except for periods of estimation, which are poor. Station maintained and records developed by Div 3 hydrographic staff.

Recommendations.-- Make more measurements at the upper end of the rating to help define the curve.



STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

08227500 CRESTONE CREEK, NORTH NEAR CRESTONE

RATING TABLE-- NOCRESKO11 USED FROM 01-OCT-2012 TO 23-OCT-2012  
NOCRESKO13-2 USED FROM 23-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.1	2.2	e2.2	e1.2	e0.95	e0.95	2.5	11	30	14	13	4.4
2	3.0	2.2	e2.2	e0.85	e0.90	e1.0	2.4	10	32	12	16	4.8
3	2.9	2.1	e2.2	e0.65	e0.90	e1.1	2.4	11	35	10	14	5.1
4	2.9	2.1	e2.2	e0.65	e0.85	e1.2	2.6	15	33	9.4	13	4.7
5	2.8	2.1	e2.1	e0.70	e0.90	e1.1	3.2	14	34	8.6	12	4.4
6	2.7	2.1	e2.1	e0.80	e0.90	e1.1	2.8	12	35	8.5	12	4.2
7	2.7	2.1	e2.1	e0.90	e0.85	e1.2	3.1	10	33	9.6	13	4.2
8	2.6	2.1	e2.0	e0.95	e0.90	e1.2	2.8	11	31	10	14	4.1
9	2.6	2.1	e1.8	e1.0	e0.90	e1.1	2.7	9.8	33	9.3	15	3.8
10	2.5	1.8	e1.4	e1.0	e0.85	e1.0	2.5	9.1	36	8.4	14	4.1
11	2.5	e1.7	e1.2	e1.1	e0.80	e1.0	2.4	9.6	35	7.6	14	5.1
12	3.4	e1.6	e1.4	e0.90	e0.75	e1.1	2.3	13	32	7.4	12	5.8
13	3.6	e1.9	e1.5	e0.70	e0.75	e1.2	2.2	20	29	7.0	11	30
14	3.1	e2.2	e1.7	e0.80	e0.85	e1.3	2.3	23	28	6.8	10	27
15	3.2	e2.2	e1.8	e0.75	e0.85	e1.4	2.2	25	25	11	9.6	23
16	3.1	e2.3	e1.6	e0.75	e0.85	e1.3	2.1	29	22	12	9.0	26
17	3.0	e2.5	e1.4	e0.85	e0.90	e1.3	2.2	37	20	10	8.4	24
18	2.7	e2.5	e1.5	e0.90	e0.90	e1.2	2.0	34	19	9.4	7.8	21
19	2.7	e2.4	e1.5	e0.85	e0.90	e1.3	2.2	27	18	11	7.3	23
20	2.6	e2.3	e1.2	e0.85	e0.90	e1.3	2.2	23	16	11	6.8	21
21	2.6	e2.3	e0.85	e0.90	e0.90	e1.3	2.1	22	14	11	6.6	19
22	2.6	e2.3	e0.90	e0.95	e0.85	e1.3	2.4	27	13	9.9	6.3	23
23	2.5	e2.2	e1.0	e0.90	e0.80	e1.1	2.8	33	12	9.1	6.4	38
24	2.4	e2.2	e1.3	e0.95	e0.85	e0.95	2.5	45	11	8.6	5.9	37
25	2.3	e2.2	e1.4	e1.1	e0.85	e0.95	2.5	52	10	9.5	6.4	38
26	2.2	e2.1	e1.3	e1.2	e0.85	e1.2	2.5	56	9.7	9.0	6.0	34
27	2.3	e2.0	e1.3	e1.2	e0.80	e1.4	3.2	53	9.5	9.8	5.6	28
28	2.3	e2.0	e1.2	e1.2	e0.80	1.7	5.6	45	9.6	13	5.2	27
29	2.3	e2.0	e1.0	e1.0	---	1.8	10	36	9.9	16	5.0	23
30	2.3	e2.1	e0.95	e0.85	---	2.0	13	31	11	15	5.0	22
31	2.2	---	e1.2	e0.85	---	2.1	---	29	---	13	4.7	---
TOTAL	83.7	63.9	47.50	28.25	24.05	39.15	95.7	782.5	685.7	316.9	295.0	538.7
MEAN	2.70	2.13	1.53	0.91	0.86	1.26	3.19	25.2	22.9	10.2	9.52	18.0
AC-FT	166	127	94	56	48	78	190	1550	1360	629	585	1070
MAX	3.6	2.5	2.2	1.2	0.95	2.1	13	56	36	16	16	38
MIN	2.2	1.6	0.85	0.65	0.75	0.95	2.0	9.1	9.5	6.8	4.7	3.8

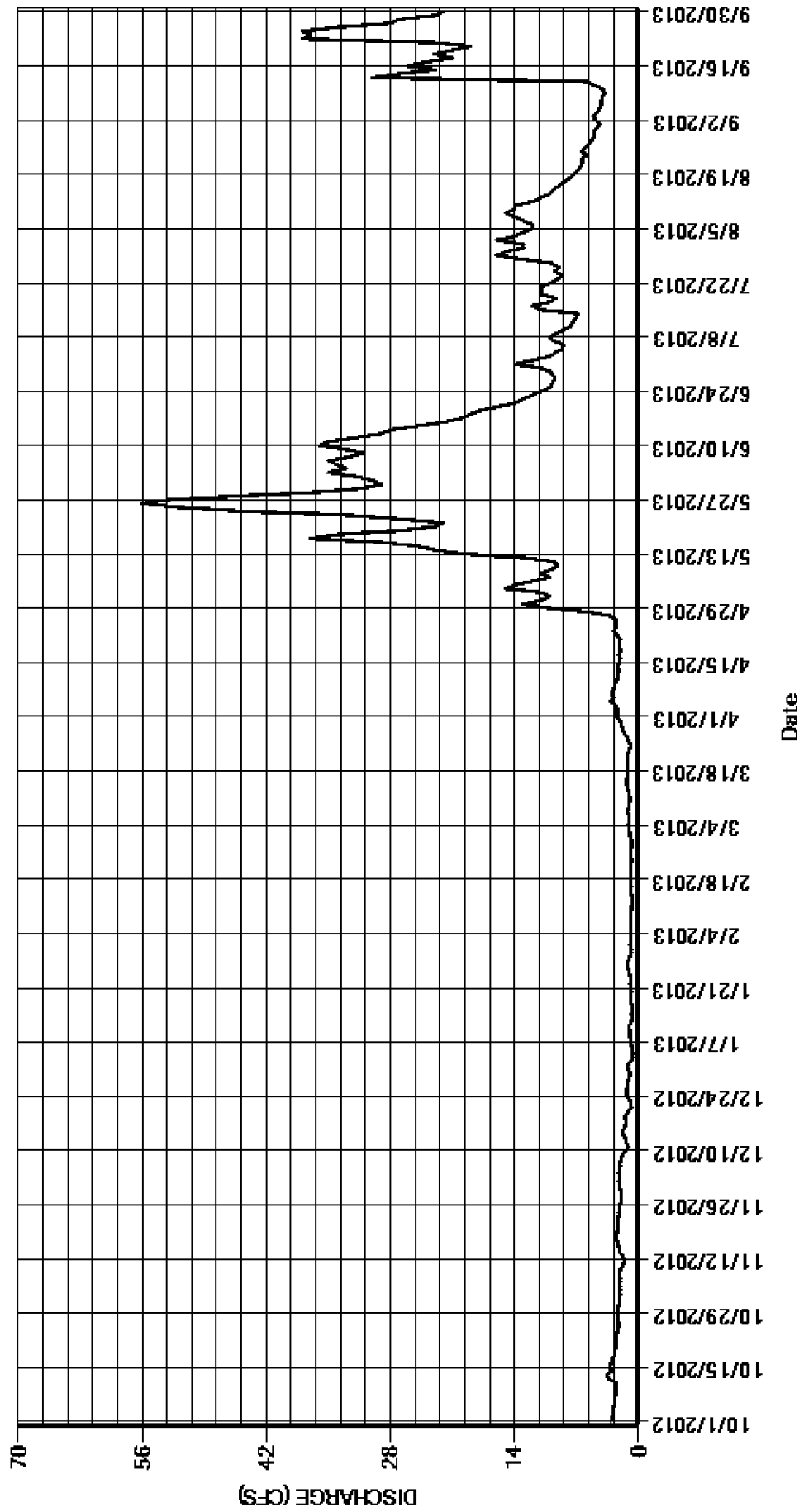
CAL YR	2012	TOTAL	2218.70	MEAN	6.06	MAX	29	MIN	0.85	AC-FT	4400
WTR YR	2013	TOTAL	3001.05	MEAN	8.22	MAX	56	MIN	0.65	AC-FT	5950

MAX DISCH: 75.8 CFS AT 20:00 ON MAY 26, 2013 GH 1.71 FT SHIFT 0 FT

MAX GH: 1.71 FT AT 20:00 ON MAY 26, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08227500 CRESTONE CREEK, NORTH NEAR CRESTONE  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
SOUTH CRESTONE CREEK NEAR CRESTONE

Water Year 2013

Location.-- Lat 37°58'60", long 105°42'8" referenced to North American Datum of 1983 (Crestone, CO quad, scale 1:24,000), UTM Zone 13 438341 E and 4204184 N, in SW ¼ SE ¼ sec. 31, T.2 N., R.1 E., Luis Maria Baca No. 4 Survey, Saguache County, CO, Hydrologic Unit 13010003, on right bank 1 mile southeast of Crestone, CO.

Drainage Area and Period of Record.-- 4.6 mi<sup>2</sup>; Jun 26, 1915 - Nov 10, 1915 (some days missing), May 1936 to Nov. 1936, Apr. 1999 to current year.

Equipment.-- Data collection platform (Sutron Satlink2) and a float-operated SDR in a 2-ft diameter corrugated culvert pipe stilling well with small steel shelter on top. A 2-inch intake pipe attaches well to a 2.5 foot Parshall flume at the REW. The primary reference gage is a staff gage also located at REW. No changes this water year.

Hydrologic Conditions.-- Predominantly undeveloped steep alpine and sub-alpine terrain with extensive losses as stream traverses sandy valley margins.

Gage-Height Record.-- Primary record is fifteen-minute satellite transmitted data with DCP log and SDR log as backup. Record is complete and reliable except for Oct 24 - Nov 12; Apr 6-29; Aug 30 - Sep 2 when gage was isolated for all or part of day; Nov 13 when well was froze; and Nov 14 - Apr 5 when station was closed for winter. When station was opened on Apr 5 the flume was dry so the SDR was set arbitrarily to -0.14 ft. On May 2, a +0.01 ft calibration correction was made which was carried back to Apr 5 when the station was opened. Two additional instrument calibration corrections, -0.02 ft and -0.01 ft made on Oct 23 and May 21 respectively, were prorated back to the previous visit.

Datum Corrections.-- The last complete Parshall flume inspection was completed on Aug. 5, 2008. Levels indicate that the lateral slope of the flume floor at the staff gage is approximately 0.4% from REW, but is slightly concave with the middle being about 0.04 feet lower than at staff. Laterally, at the throat section, the flume is level. Inspection included measurement of all pertinent Parshall Flume dimensions. A partial inspection was performed on Jul 30, 2010 after the intakes were replaced. This partial inspection showed the flume to be fairly level.

Rating.-- Control is a 2.5 foot Parshall flume in good condition. Rating no. 1, a standard 2.5 foot Parshall flume rating, was used for the entire water year. The flume and well ice up during winter, and sediment deposition in and above flume can cause minor shifting. Inlets isolate at approximately 0.05 ft. Seventeen measurements (nos. 216-232) were made this year ranging in discharge from 0 to 4.87 cfs. The measurements cover the range in discharge experienced except for higher daily flows on May 27 and Sep 13-16. The peak flow of 7.76 cfs occurred at 0300 on Sep 14, 2013 at a gage height of 0.85 feet with a shift of 0.00 feet; it exceeded high measurement no. 226 (GH = 0.63 ft) by 0.22 feet in stage.

Discharge.-- Shifting control method was used to compute discharge for all periods of good record. Shifts were applied by time from Oct 1 to Nov 14 when station was closed. Variable shift curve (SOUCRECO13-B) was used to apply shifts according to stage from Apr 5 to Sep 30 except for May 2-6 when (SOUCRECO13-C) was used to account for a small cleaning correction. Measurement shifts ranged from -0.02 to 0.01 ft and applied shifts ranged from -0.01 to 0.00 ft. All were given full weight except for measurement nos. 225, 227, 229, 231, and 232, which were adjusted as much as 10.1 percent to smooth the shift trend. Periods of unreliable and no gage-height record were estimated.

Special Computations.-- No flow was observed on four measurement visits while station was closed for the winter. Periods when gage was isolated, as determined by minimum gage height less than or equal to 0.05 ft, were estimated using record during day that was good and evaluating portion that was isolated.

Remarks.-- Record is good above 1.69 cfs, fair from 0.52 to 1.68 cfs, and poor below 0.52 cfs. Estimated record is also poor. Record accuracy statement is based on analysis of the standard 2.5 ft Parshall flume rating, where 0.52 cfs is the minimum free-flow capacity and 1.68 cfs is the point where 0.01 ft change in gage height is less than 5 percent change in streamflow. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

SOUTH CRESTONE CREEK NEAR CRESTONE

RATING TABLE-- SOUCRECO01 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

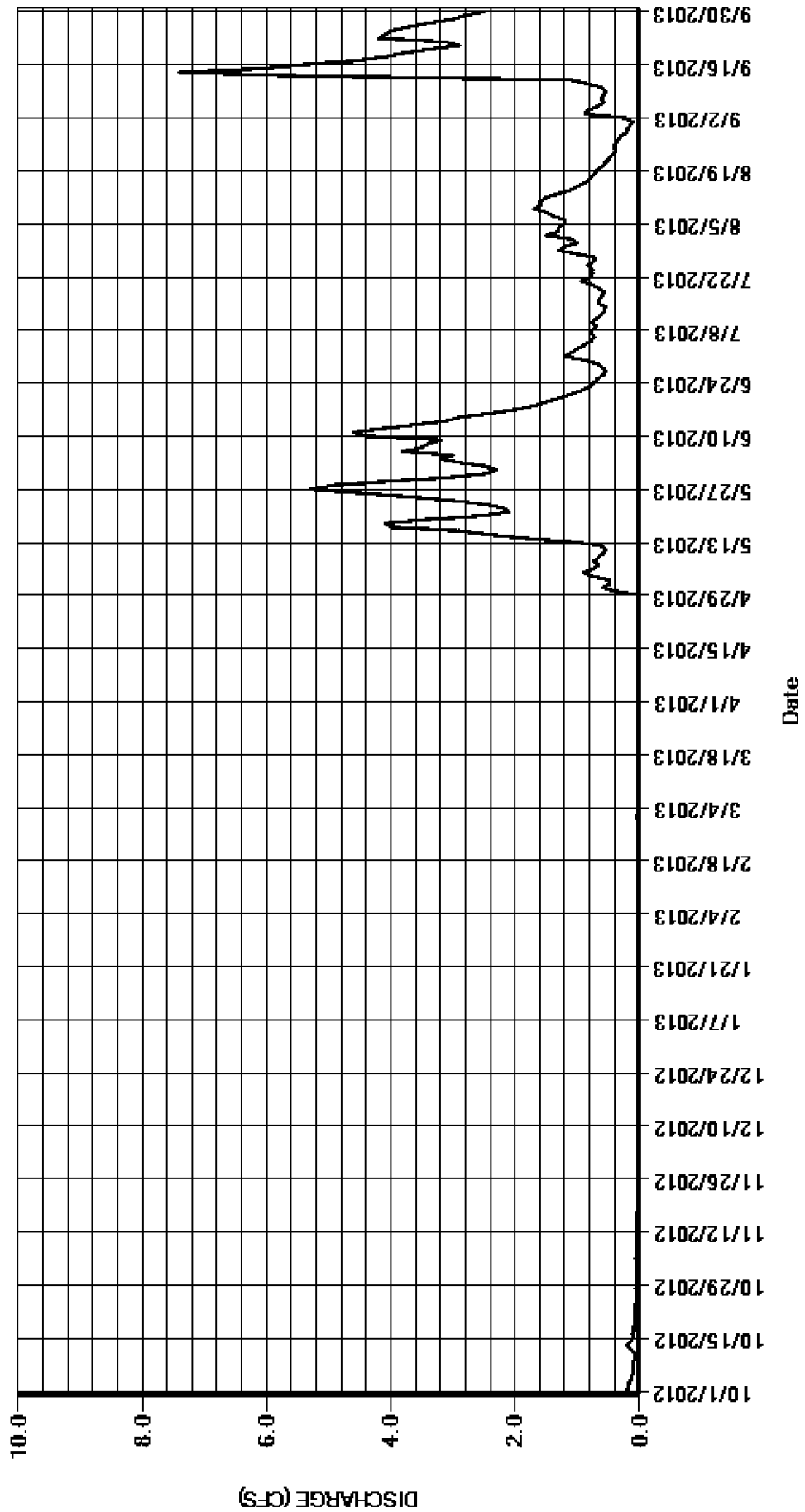
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.20	e0.04	e0.00	e0.00	e0.00	e0.04	e0.00	0.60	2.3	1.2	1.1	e0.11
2	0.18	e0.04	e0.00	e0.00	e0.00	e0.04	e0.00	0.49	2.5	1.1	1.5	e0.23
3	0.17	e0.05	e0.00	e0.00	e0.00	e0.00	e0.00	0.48	2.9	1.0	1.3	0.88
4	0.14	e0.05	e0.00	e0.00	e0.00	e0.00	e0.00	0.75	3.2	0.89	1.3	0.84
5	0.13	e0.06	e0.00	e0.00	e0.00	e0.00	e0.00	0.90	3.0	0.78	1.2	0.68
6	0.10	e0.04	e0.00	e0.00	e0.00	e0.00	e0.00	0.75	3.8	0.73	1.2	0.58
7	0.10	e0.04	e0.00	e0.00	e0.00	e0.00	e0.00	0.66	3.5	0.76	1.4	0.61
8	0.11	e0.04	e0.00	e0.00	e0.00	e0.00	e0.00	0.73	3.4	0.77	1.5	0.58
9	0.09	e0.04	e0.00	e0.00	e0.00	e0.00	e0.00	0.66	3.2	0.70	1.7	0.54
10	0.08	e0.04	e0.00	e0.00	e0.00	e0.00	e0.00	0.58	4.4	0.76	1.6	0.62
11	0.08	e0.04	e0.00	e0.00	e0.00	e0.00	e0.00	0.54	4.6	0.69	1.6	0.84
12	0.14	e0.04	e0.00	e0.00	e0.00	e0.00	e0.00	0.61	4.1	0.61	1.5	1.1
13	0.21	e0.04	e0.02	e0.00	e0.00	e0.00	e0.00	1.0	3.6	0.56	1.3	5.3
14	0.14	e0.04	e0.00	e0.00	e0.00	e0.00	e0.00	1.8	3.1	0.55	1.1	7.4
15	0.11	e0.04	e0.00	e0.00	e0.00	e0.00	e0.00	2.4	2.9	0.66	0.97	6.1
16	0.11	e0.04	e0.00	e0.00	e0.00	e0.00	e0.00	2.9	2.4	0.65	0.86	5.4
17	0.09	e0.04	e0.00	e0.00	e0.00	e0.00	e0.00	4.0	2.0	0.60	0.80	4.6
18	0.09	e0.02	e0.00	e0.00	e0.00	e0.00	e0.00	4.1	1.7	0.56	0.74	4.1
19	0.08	e0.02	e0.00	e0.00	e0.00	e0.00	e0.00	3.4	1.5	0.65	0.69	3.8
20	0.08	e0.02	e0.00	e0.00	e0.00	e0.00	e0.00	2.5	1.3	0.77	0.62	3.4
21	0.08	e0.02	e0.00	e0.00	e0.00	e0.00	e0.00	2.1	1.1	0.93	0.56	2.9
22	0.08	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	2.2	0.93	0.77	0.50	3.1
23	0.08	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	2.5	0.81	0.76	0.46	4.2
24	e0.06	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	3.0	0.74	0.76	0.38	4.1
25	e0.05	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	3.7	0.68	0.83	0.40	4.0
26	e0.03	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	4.5	0.59	0.74	0.39	3.7
27	e0.05	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	5.3	0.54	0.71	0.36	3.4
28	e0.06	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	4.9	0.58	0.99	0.31	3.0
29	e0.06	e0.00	e0.00	e0.00	---	e0.00	e0.00	4.1	0.66	1.3	0.21	2.8
30	e0.04	e0.00	e0.00	e0.00	---	e0.00	0.38	3.1	0.86	1.2	e0.19	2.5
31	e0.04	---	e0.00	e0.00	---	e0.00	---	2.5	---	1.0	e0.15	---
TOTAL	3.06	0.80	0.02	0.00	0.00	0.08	0.38	67.75	66.89	24.98	27.89	81.41
MEAN	0.099	0.027	0.0006	0.000	0.000	0.003	0.013	2.19	2.23	0.81	0.90	2.71
AC-FT	6.1	1.6	.04	0	0	0.2	0.8	134	133	50	55	161
MAX	0.21	0.06	0.02	0.00	0.00	0.04	0.38	5.3	4.6	1.3	1.7	7.4
MIN	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.54	0.55	0.15	0.11

CAL YR	2012	TOTAL	106.19	MEAN	0.29	MAX	2.1	MIN	0.00	AC-FT	211
WTR YR	2013	TOTAL	273.26	MEAN	0.75	MAX	7.4	MIN	0.00	AC-FT	542

MAX DISCH: 7.76 CFS AT 03:00 ON SEP 14, 2013 GH 0.85 FT SHIFT 0 FT  
 MAX GH: 0.85 FT AT 03:00 ON SEP 14, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH CRESTONE CREEK NEAR CRESTONE  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
WILLOW CREEK NEAR CRESTONE  
Water Year 2013

Location.-- Lat 37°58'3", long 105°40'35" referenced to North American Datum of 1983 (Crestone, CO quad, scale 1:24,000), UTM Zone 13 440582 E and 4202428 N, in SW ¼ SW ¼ sec. 4, T.1 N., R.1 E., Luis Maria Baca No. 4 Survey, Saguache County, CO, Hydrologic Unit 13010003, on right bank 2 mi southeast of Crestone, CO.

Drainage Area and Period of Record.-- 8.0 mi<sup>2</sup>; April 1, 1999 to current year.

Equipment.-- Data collection platform (Sutron SatLink2), and a float-operated SDR in a 3-foot concrete pipe well and steel box shelter. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No changes this year.

Hydrologic Conditions.-- Mostly undeveloped steep alpine and sub-alpine terrain, with minor subdivision for approximately 0.5 miles above gage.

Gage-Height Record.-- Primary record is 15-minute transmitted data with SDR and DCP logs as backup. Record is complete and reliable except for Nov 12-13 when station was frozen, Nov 14 through Apr 11 when station was closed, and Apr 19, May 19, 20, and Sep 22 when inlet was plugged. Stage-discharge relationship was affected by backwater from ice on Nov 10, 11. There were three instrument calibration corrections ranging from -0.01 to +0.01 ft, which were prorated back to the previous visit. One +0.02 ft flush correction was found Sep 24 and prorated back to the previous inflection point on Sep 22.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on Jul 12, 2011 using BM1 as base. The RP elevation was within allowable limits, so no correction was made or required. Two-peg test was performed on the Lietz level (SN 130869) on May 27, 2011 and no adjustments were required or made.

Rating.-- Control is a weir made of rocks and cobbles. Rating no. 4 in use since Nov 30, 2010 was used until Apr 11. Rating no. 6-1 was used from Apr 11 through the end of the water year. Rating no. 4 is well defined up to approximately 15 cfs. Rating 6-1 was developed to adjust the rating for gage pool fill and include definition for higher flows that were measured this year. Rating no. 6-1 is well defined from 0.4 cfs to approximately 75 cfs. Twenty measurements (nos. 225-244) were made this year ranging in discharge from 0.36 to 63.4 cfs. Measurements cover the discharge range experienced. The peak flow of 77.8 cfs occurred at 1615 on Sep 13, 2013 at a gage height of 3.73 ft with a shift of 0.00 ft. It exceeded high measurement no. 243 (GH = 3.64 ft) made Sep 13 by 0.09 ft in stage.

Discharge.-- Shifting control method was used to compute discharge during all periods of reliable stage record. Shifts were distributed by time until Oct 24, the rating was used directly Oct 24 to Jul 1, and shift curve (VS13-D) and the rating were used Jul 1 to the end of the water year to distribute shifting by stage and time. Measurement shifts ranged from -0.01 to +0.07 ft and applied shifts ranged from 0.00 to +0.05 ft on rating 6-1. One measurement, no. 225, was made while rating WILCRECO04 was in use resulting in a zero shift. All measurements were given full weight and applied except for measurement nos. 231, 233, and 235-238, which were adjusted as much as 8.6 percent to smooth the shift trend. Periods of ice affected and unreliable gage-height record were estimated.

Special Computations.-- Discharge for winter periods of no gage-height and ice affected record was estimated using discharge measurements and weather records from SANDUNCO.

Remarks.-- Record is fair except for periods of estimation, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Continue to monitor gage for inlets plugging to see if problem has been fixed or further work needs to be performed. Install new control.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

WILLOW CREEK NEAR CRESTONE

RATING TABLE-- WILCRECO04 USED FROM 01-OCT-2012 TO 11-APR-2013  
 WILCRECO06-1 USED FROM 11-APR-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.0	1.2	e1.5	e0.85	e0.44	e0.46	e0.65	2.1	6.7	9.5	5.6	1.9
2	2.0	1.2	e1.6	e0.75	e0.44	e0.50	e0.65	2.0	9.2	8.1	6.6	8.2
3	1.9	1.2	e1.6	e0.70	e0.42	e0.50	e0.65	2.0	11	7.6	6.4	31
4	1.9	1.1	e1.6	e0.60	e0.42	e0.55	e0.65	2.4	12	6.8	6.0	26
5	1.9	1.1	e1.6	e0.60	e0.42	e0.55	e0.65	2.9	12	6.2	5.5	20
6	1.7	1.1	e1.6	e0.60	e0.40	e0.55	e0.65	3.0	14	5.8	5.2	15
7	1.7	1.1	e1.6	e0.60	e0.40	e0.55	e0.65	2.9	15	5.8	6.0	11
8	1.6	1.1	e1.6	e0.60	e0.42	e0.55	e0.65	3.0	14	6.4	6.5	8.8
9	1.6	1.0	e1.5	e0.60	e0.42	e0.55	e0.65	3.0	13	6.0	6.8	5.5
10	1.5	e1.0	e1.4	e0.60	e0.40	e0.55	e0.60	2.7	16	5.3	6.4	4.4
11	1.6	e1.0	e1.3	e0.60	e0.40	e0.50	e0.60	2.8	17	4.9	6.4	7.6
12	1.9	e1.1	e1.3	e0.60	e0.38	e0.55	0.56	3.1	15	5.2	6.0	10
13	2.3	e1.1	e1.4	e0.55	e0.40	e0.55	0.52	3.3	13	4.9	5.7	47
14	2.1	e1.2	e1.5	e0.50	e0.40	e0.60	0.51	4.3	13	4.6	5.1	34
15	2.0	e1.3	e1.5	e0.50	e0.42	e0.60	0.47	5.0	13	7.0	4.4	20
16	1.9	e1.3	e1.4	e0.50	e0.42	e0.60	0.47	6.3	10	9.1	3.9	21
17	1.8	e1.4	e1.3	e0.50	e0.42	e0.60	0.50	8.8	9.2	7.2	3.5	18
18	1.7	e1.4	e1.3	e0.50	e0.44	e0.55	0.45	7.8	8.5	6.0	3.2	15
19	1.6	e1.4	e1.3	e0.50	e0.44	e0.55	e0.45	e7.4	7.9	5.6	2.9	13
20	1.6	e1.4	e1.2	e0.50	e0.44	e0.55	0.48	e5.9	7.1	5.5	2.7	11
21	1.6	e1.4	e1.1	e0.50	e0.44	e0.60	0.50	4.9	6.3	6.3	2.4	9.5
22	1.5	e1.4	e0.95	e0.50	e0.44	e0.60	0.49	4.9	5.9	6.2	2.2	e9.1
23	1.5	e1.4	e0.95	e0.50	e0.42	e0.55	0.49	7.1	5.6	5.8	2.1	14
24	1.5	e1.4	e1.0	e0.50	e0.44	e0.50	0.45	9.1	5.5	5.1	2.0	13
25	1.4	e1.4	e1.1	e0.50	e0.44	e0.50	0.46	11	4.9	5.4	1.9	13
26	1.3	e1.4	e1.1	e0.55	e0.44	e0.60	0.48	13	4.6	5.0	1.8	12
27	1.3	e1.4	e1.0	e0.55	e0.44	e0.65	0.51	15	5.0	5.0	1.9	11
28	1.3	e1.4	e0.95	e0.55	e0.44	e0.65	0.54	13	5.4	5.7	1.7	9.5
29	1.3	e1.4	e0.90	e0.50	---	e0.65	0.63	11	5.8	7.2	1.5	8.7
30	1.3	e1.5	e0.85	e0.46	---	e0.65	2.0	8.7	6.3	7.1	1.7	8.0
31	1.3	---	e0.85	e0.44	---	e0.65	---	7.3	---	6.2	1.8	---
TOTAL	51.6	37.8	39.85	17.30	11.84	17.56	18.01	185.7	291.9	192.5	125.8	436.2
MEAN	1.66	1.26	1.29	0.56	0.42	0.57	0.60	5.99	9.73	6.21	4.06	14.5
AC-FT	102	75	79	34	23	35	36	368	579	382	250	865
MAX	2.3	1.5	1.6	0.85	0.44	0.65	2.0	15	17	9.5	6.8	47
MIN	1.3	1.0	0.85	0.44	0.38	0.46	0.45	2.0	4.6	4.6	1.5	1.9

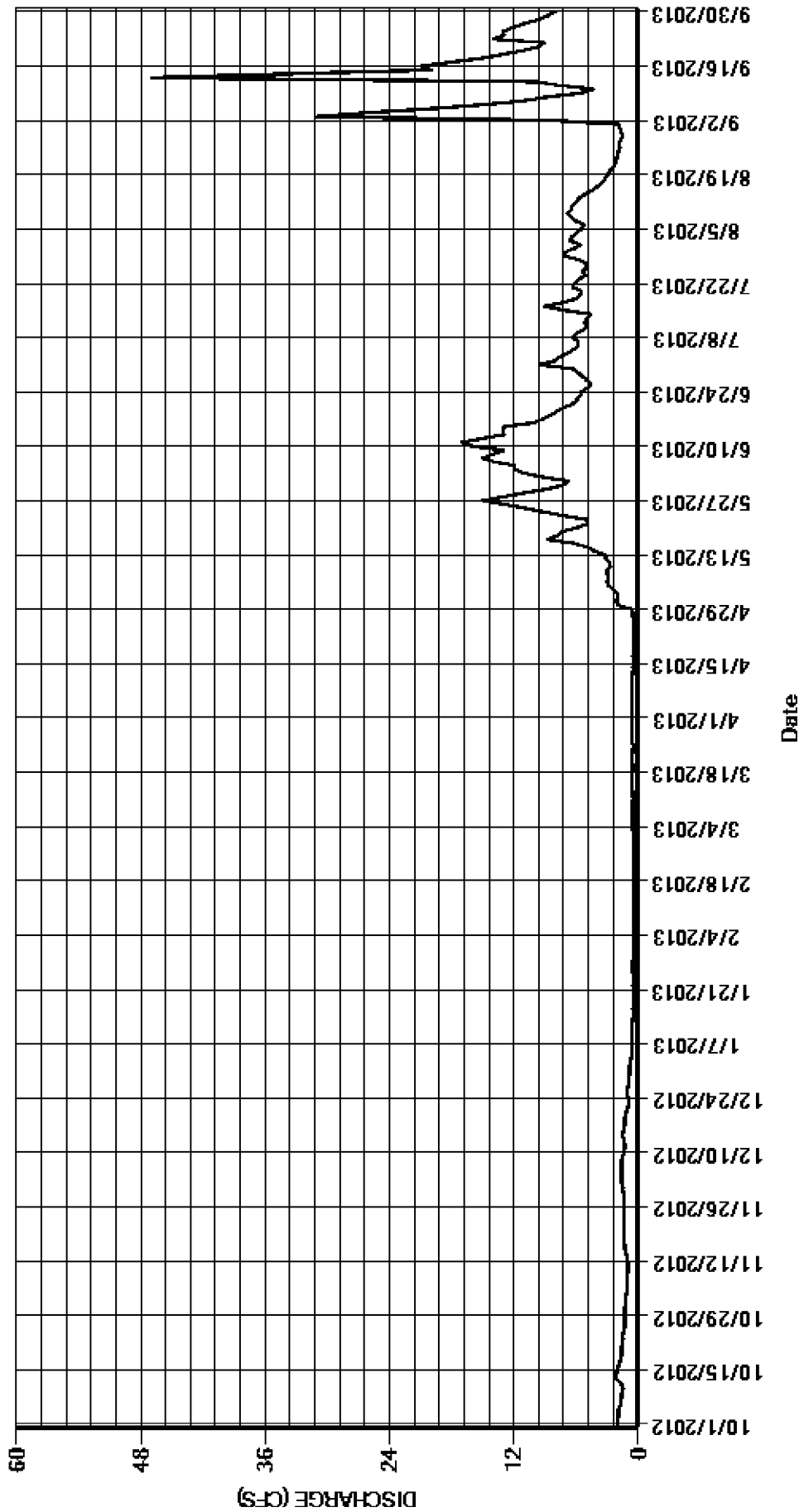
CAL YR	2012	TOTAL	850.34	MEAN	2.32	MAX	9.3	MIN	0.30	AC-FT	1690
WTR YR	2013	TOTAL	1426.06	MEAN	3.91	MAX	47	MIN	0.38	AC-FT	2830

MAX DISCH: 77.8 CFS AT 16:15 ON SEP 13, 2013 GH 3.73 FT SHIFT 0 FT

MAX GH: 3.73 FT AT 16:15 ON SEP 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WILLOW CREEK NEAR CRESTONE  
WY2013 HYDROGRAPH





RIO GRANDE RIVER BASIN  
SPANISH CREEK NEAR CRESTONE

Water Year 2013

Location.-- Lat 37°57'10", long 105°39'42" referenced to North American Datum of 1983 (Crestone, CO quad, scale 1:24,000), UTM Zone 13 441870 E and 4200782 N, in SE ¼ SE ¼ sec. 9, T.1 N., R.1 E., Luis Maria Baca No. 4 Survey, Saguache County, CO, Hydrologic Unit 13010003, on right bank 3.5 mi southeast of Crestone, CO.

Drainage Area and Period of Record.-- 2.4 mi<sup>2</sup>. ; 1999 to current year.

Equipment.-- Data collection platform (Sutron SatLink2), and a float-operated SDR in a 2-ft culvert pipe well and small steel box shelter. The primary reference gage is a drop tape from reference point on shelf. No outside gage. On Apr 25, 2013 the station was relocated downstream to an existing flume, which was modified to operate as a v-notch weir. The primary reference gage is the staff in the flume.

Hydrologic Conditions.-- Station is located in upper foot hills of a mountain creek above housing development green belt area.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted data with DCP log and SDR log as backup. Record is complete and reliable except for Nov 12 through Apr 1; Apr 9-11, 18, 19, when the float was affected by ice in well; and Apr 25 when the station was being moved. The stage-discharge relation was affected by ice Nov 10, 11; Apr 23 and 24. There were four instrument calibration corrections ranging from -0.03 to +0.03 ft, which were prorated by time from previous visits.

Datum Corrections.-- At the old site levels were last run to the Reference Point (RP) inside the gage on Jul 12, 2011 using BM1 as base. The RP was within allowable limits, so a correction was not made. Two-peg test was performed on the Lietz level (SN 130869) on May 27, 2011 and the instrument was within allowable limits and no adjustment was made. Levels were ran at the new site on Aug 22, 2013 to establish three new benchmarks and calculate the change in datum. Two-peg test was performed on the Lietz level (SN 130869) on Aug 20, 2013 and the instrument was within allowable limits and no adjustment was made.

Rating.-- At the old site the control is a rock weir approximately 3 feet below the gage. The new site is at an existing six foot Parshall Flume modified with a v-notch weir plate on the outlet. Due to large daily diurnals and flashy rain events, peak flow measurements are difficult to obtain. A higher flow measurement of 38.3 cfs was made on Sep 13 and was used to define the upper end of new rating SPACRECO08 and used at new site from Apr 25 through the end of water year. Rating SPACRECO08 is well defined from 2 to 10 cfs and should be considered fair outside that range. Twenty measurements (Nos. 214-233) were made this year ranging in discharge from 0.27 to 38.3 cfs. They cover the discharge range experienced except for the lower daily flows on Jan 3-7, 12-21; Feb 12-13, 22-28; Mar 1, 10, 11. The peak flow of 53.9 cfs occurred at 0815 on Sep 13, 2013 at a gage height of 2.91 ft with a shift of 0 ft. It exceeded high Measurement No. 232, made Sep 13 (GH=2.72 ft) by 0.19 ft in stage.

Discharge.-- Shifting control method was used compute discharge during all periods of reliable non-ice affected stage record. Two variable stage-shift relationships were used to apply shifts by stage, SPACREVS12-F used from Oct 1 until station was moved on Apr 25 with rating SPACRECO06. SPACREVS13-RT (direct application of rating) with rating SPACRECO08 was used the remainder of the water year. With the exception of two measurements, Nos. 227 and 229, open water measurement shifts ranged from -0.02 to +0.02 ft and applied shifts ranged from 0 to +0.01. Measurement Nos. 227 and 229, with shifts of +0.05 and -0.05, were not used for discharge computation due to possible erratic velocity distribution at measurement location. All others were given full weight except Nos. 222, 224-226, 228, 230, 231, and 233, which were adjusted as much as 6.7% to fit the rating. Periods of ice affected and unreliable gage-height record were estimated.

Special Computations.-- Discharge for periods of ice affected and unreliable gage-height record was estimated using discharge measurements and weather records from Sand Creek at Great Sand Dunes National Park (SANDUNCO).

Remarks.-- Record is fair except for estimated periods, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Obtain more measurements at higher flows.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

SPANISH CREEK NEAR CRESTONE

RATING TABLE-- SPACRECO06 USED FROM 01-OCT-2012 TO 25-APR-2013  
 SPACRECO08 USED FROM 25-APR-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.5	0.96	e1.1	e0.46	e0.32	e0.26	e0.50	2.5	6.0	5.6	3.3	1.1
2	1.4	0.92	e1.2	e0.32	e0.32	e0.28	0.44	2.1	7.7	4.2	4.4	6.2
3	1.4	0.90	e1.2	e0.22	e0.32	e0.30	0.44	2.3	8.3	3.7	4.0	14
4	1.3	0.89	e1.2	e0.20	e0.32	e0.30	0.44	3.8	7.8	3.1	3.7	12
5	1.3	0.88	e1.2	e0.22	e0.32	e0.28	0.48	3.5	8.9	2.6	3.2	7.7
6	1.2	0.86	e1.2	e0.24	e0.34	e0.28	0.48	2.5	9.7	2.4	2.9	5.4
7	1.2	0.84	e1.2	e0.26	e0.34	e0.32	0.48	2.0	8.8	2.5	3.2	4.5
8	1.2	0.83	e1.2	e0.28	e0.34	e0.32	0.49	2.0	8.4	3.6	3.4	3.9
9	1.2	0.83	e1.1	e0.28	e0.34	e0.30	e0.48	1.8	9.3	3.1	3.6	3.2
10	1.2	e0.70	e0.80	e0.28	e0.30	e0.26	e0.45	1.6	11	2.5	3.3	3.0
11	1.2	e0.65	e0.75	e0.32	e0.28	e0.26	e0.44	1.5	9.8	2.2	3.2	4.4
12	1.4	e0.70	e0.85	e0.24	e0.26	e0.30	0.45	1.7	8.3	2.1	2.7	5.0
13	1.4	e0.75	e0.95	e0.20	e0.26	e0.34	0.44	2.3	7.4	2.0	2.5	27
14	1.3	e0.80	e1.1	e0.22	e0.28	e0.36	0.45	3.7	7.2	2.0	2.2	15
15	1.5	e0.85	e1.1	e0.20	e0.28	e0.38	0.44	4.7	6.3	7.4	2.0	9.9
16	1.5	e0.90	e0.95	e0.22	e0.28	e0.38	0.44	6.3	4.9	6.1	1.8	15
17	1.5	e0.95	e0.85	e0.24	e0.30	e0.36	0.48	8.9	4.3	4.3	1.7	12
18	1.4	e1.0	e0.85	e0.26	e0.30	e0.36	e0.44	8.2	4.1	3.6	1.6	9.2
19	1.4	e0.95	e0.90	e0.26	e0.28	e0.36	e0.44	5.8	4.0	3.4	1.5	8.4
20	1.3	e0.95	e0.65	e0.26	e0.28	e0.36	0.45	4.6	3.8	3.8	1.4	7.2
21	1.3	e1.0	e0.44	e0.26	e0.28	e0.38	0.44	4.1	3.4	4.5	1.3	6.1
22	1.2	e1.0	e0.44	e0.28	e0.24	e0.38	0.44	5.3	3.1	4.0	1.3	6.7
23	1.2	e1.0	e0.50	e0.28	e0.24	e0.32	e0.43	7.5	2.7	3.3	1.2	9.2
24	1.1	e1.0	e0.65	e0.30	e0.24	e0.28	e0.40	9.3	2.6	2.6	1.2	8.8
25	1.1	e1.0	e0.70	e0.34	e0.26	e0.28	e0.43	11	2.3	3.5	1.2	9.1
26	0.99	e1.0	e0.60	e0.38	e0.24	e0.34	0.35	13	2.3	3.4	1.1	8.1
27	1.1	e0.95	e0.60	e0.40	e0.22	e0.42	0.38	12	2.4	3.8	1.2	7.1
28	1.1	e0.95	e0.50	e0.40	e0.22	e0.46	0.59	9.7	2.5	4.5	1.2	6.3
29	1.0	e1.0	e0.44	e0.34	---	e0.46	1.5	7.6	2.7	5.6	1.1	5.2
30	1.0	e1.1	e0.40	e0.28	---	e0.46	3.0	6.3	3.7	4.6	1.2	4.8
31	0.99	---	e0.48	e0.30	---	e0.48	---	5.8	---	3.9	1.1	---
TOTAL	38.88	27.11	26.10	8.74	8.00	10.62	17.11	163.4	173.7	113.9	68.7	245.5
MEAN	1.25	0.90	0.84	0.28	0.29	0.34	0.57	5.27	5.79	3.67	2.22	8.18
AC-FT	77	54	52	17	16	21	34	324	345	226	136	487
MAX	1.5	1.1	1.2	0.46	0.34	0.48	3.0	13	11	7.4	4.4	27
MIN	0.99	0.65	0.40	0.20	0.22	0.26	0.35	1.5	2.3	2.0	1.1	1.1

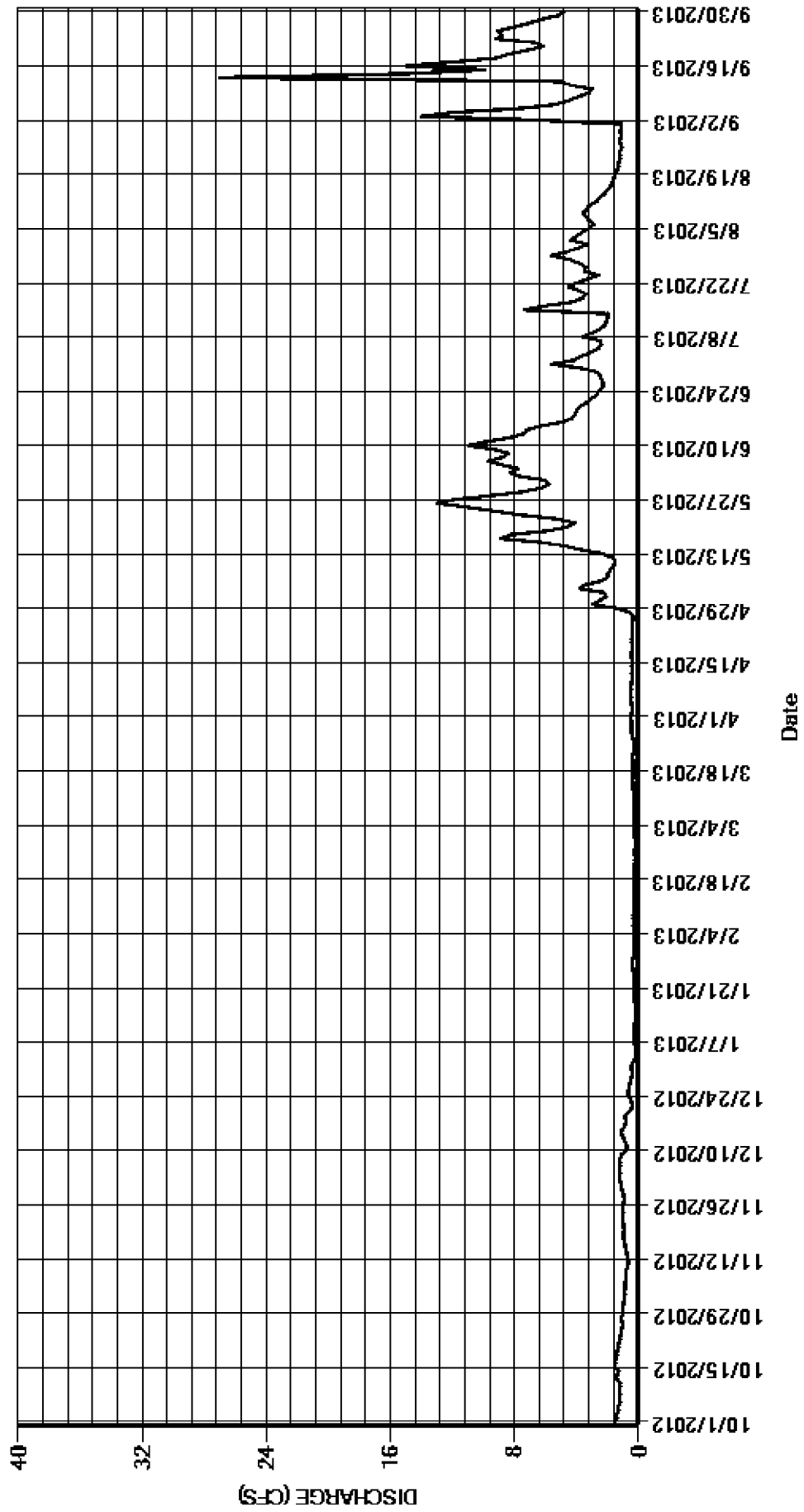
CAL YR	2012	TOTAL	568.04	MEAN	1.55	MAX	6.5	MIN	0.20	AC-FT	1130
WTR YR	2013	TOTAL	901.76	MEAN	2.47	MAX	27	MIN	0.20	AC-FT	1790

MAX DISCH: 53.9 CFS AT 08:15 ON SEP 13, 2013 GH 2.91 FT SHIFT 0 FT

MAX GH: 2.91 FT AT 08:15 ON SEP 13, 2013 (To match peak flow)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SPANISH CREEK NEAR CRESTONE  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08229500 COTTONWOOD CREEK NEAR CRESTONE  
Water Year 2013

Location.-- Lat 37°55'60", long 105°38'44" referenced to North American Datum of 1983 (Crestone, CO quad, scale 1:24,000), UTM Zone 13 443270 E and 4198611 N, in NE ¼ NE ¼ sec. 22, T.1 N., R.1 E., Luis Maria Baca No. 4 Survey, Saguache County, CO, Hydrologic Unit 13010003, on left bank 5 mi southeast of Crestone, CO.

Drainage Area and Period of Record.-- 7.0 sq mi (from topographical map); May 1936 - Nov. 30, 1936, 1967 - 1970, October 1998 to current year.

Equipment.-- Float-operated digital stage recorder (SDR) and data collection platform (Satlink 2) in a steel shelter atop a 2 ft CMP stilling well at a modified 6 ft Parshall flume. The primary reference gage is an outside staff gage on the left edge (gage side) of the flume.

Hydrologic Conditions.-- Steep undeveloped alpine and sub-alpine drainage. One minor diversion above gage for domestic use.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted data with DCP log and SDR log as backup. Gage-height record is complete and reliable except Nov 14 through Mar 28 when station was frozen. Two erroneous unit values were corrected on Aug 22 with no loss in accuracy. The stage-discharge relationship was affected by ice Nov 11-13. There were three instrument corrections made to the SDR. Two of them were prorated back to the previous measurement and the third was taken straight back to where the tape came off the pins on the shaft encoder when the lid was closed.

Datum Corrections.-- Levels were last run Aug 22, 2013 to the outside staff gage(OSG). The elevations of the new bench marks were established. Two-peg test was performed on Aug 20, 2013 the instrument was within allowable limits so no correction was made.

Rating.-- Rating 06 was used from the beginning of the WY until Oct 24. Rating 08 was developed and used from Oct 24 till the end of the water year. It is well defined from 2 to 20 cfs and fairly well defined outside that range. Twenty discharge measurements (Nos. 218-237) were made during the year ranging in discharge from 0.65 to 47.6 cfs. They cover the discharge range experienced except for lower daily flows on Dec 10, 20-22, 29; Jan 2-6, 12-15, 30; Feb 10-16, 19, 21-28; Mar 1, 5, 9-11, 17-20, 22-26. The peak flow of 78.5 cfs occurred at 1545 on Sep 13, 2013 at a gage height of 2.05 ft and shift of 0.00 ft. It exceeded high measurement No. 236 (GH 1.64 ft), made Sep 13, by 0.41 ft in stage.

Discharge.-- Shifting control method was used to compute discharge for all open-water periods. Variable stage-shift relationship COCRESCOV13-A was developed and used to distribute shifts based on stage from Oct 24 to Sep13. The rating was directly applied to the gage-height record to compute discharge for the remainder of the water year. Open water measurement shifts ranged from -0.03 to +0.02 ft; applied shifts ranged from -0.01 to 0.00 ft. All measurements were given full weight except Nos. 218-220, 225, 226, 229-231, 233 and 235-237, which were adjusted by as much as 8% to smooth shift distribution. Periods of ice affected and unreliable gage-height record were estimated.

Special Computations.-- Discharge for periods of ice affected and unreliable gage-height were estimated using discharge measurements and weather records from Medano Creek at Great Sand Dunes National Park (MEDSANCO).

Remarks.-- Record is good except for periods of estimation, which are poor; and daily flow values less than 2 cfs or greater than 20 cfs, which are fair. The peak should be considered poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08229500 COTTONWOOD CREEK NEAR CRESTONE

RATING TABLE-- COCRESCO06 USED FROM 01-OCT-2012 TO 24-OCT-2012  
 COCRESCO08 USED FROM 24-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.5	1.7	e1.6	e0.60	e0.85	e0.55	0.93	4.2	17	13	6.7	2.4
2	2.4	1.7	e1.6	e0.34	e0.80	e0.65	0.92	3.7	20	9.9	7.6	4.9
3	2.3	1.6	e1.7	e0.40	e0.75	e0.75	0.90	3.8	21	8.5	6.7	11
4	2.2	1.6	e1.4	e0.42	e0.75	e0.70	0.95	6.7	21	7.6	6.2	12
5	2.2	1.6	e1.4	e0.44	e0.80	e0.60	1.2	5.9	22	6.9	5.8	9.0
6	2.1	1.6	e1.5	e0.60	e0.90	e0.75	1.1	4.3	24	6.4	5.7	7.1
7	2.1	1.6	e1.5	e0.75	e0.80	e0.75	1.1	3.6	23	7.4	6.1	6.1
8	2.0	1.5	e1.4	e0.85	e0.90	e0.70	1.1	3.8	23	9.5	6.3	5.3
9	2.0	1.5	e0.80	e0.90	e0.75	e0.55	1.1	3.4	24	8.0	6.4	4.6
10	2.0	1.4	e0.60	e0.95	e0.60	e0.46	1.0	3.0	26	6.8	5.8	4.5
11	2.0	e1.2	e0.65	e0.90	e0.60	e0.50	0.95	3.0	24	6.2	5.7	5.4
12	2.4	e1.3	e0.90	e0.20	e0.44	e0.65	0.96	3.6	21	6.0	5.1	5.7
13	2.5	e1.6	e1.1	e0.40	e0.60	e0.70	0.94	5.8	18	5.5	4.7	45
14	2.3	e1.4	e1.3	e0.55	e0.55	e0.75	0.98	7.2	18	5.7	4.4	30
15	2.5	e1.6	e1.2	e0.34	e0.55	e0.70	0.95	8.5	16	15	4.0	19
16	2.5	e1.7	e1.0	e0.65	e0.60	e0.65	0.90	11	13	12	3.7	26
17	2.4	e1.8	e0.90	e0.75	e0.65	e0.60	0.94	18	12	8.8	3.6	19
18	2.2	e1.7	e1.2	e0.70	e0.65	e0.60	0.85	17	11	7.3	3.4	15
19	2.2	e1.5	e0.95	e0.75	e0.60	e0.60	0.89	12	11	6.9	3.3	15
20	2.2	e1.5	e0.28	e0.70	e0.70	e0.60	0.91	8.4	10	7.3	3.2	13
21	2.1	e1.7	e0.50	e0.80	e0.55	e0.65	0.88	7.7	9.5	8.6	3.1	11
22	2.1	e1.6	e0.60	e0.85	e0.46	e0.55	0.94	11	8.7	7.5	3.0	13
23	2.0	e1.5	e0.80	e0.80	e0.48	e0.38	1.0	17	8.1	6.4	2.9	21
24	2.0	e1.4	e1.1	e1.0	e0.55	e0.32	0.94	22	7.8	5.6	2.8	19
25	1.8	e1.4	e0.90	e1.1	e0.48	e0.34	0.98	28	7.2	6.6	2.8	18
26	1.8	e1.4	e0.90	e1.1	e0.46	e0.55	1.0	30	7.3	6.5	2.7	15
27	2.0	e1.2	e0.80	e1.2	e0.40	e0.65	1.1	28	7.5	7.7	2.7	14
28	1.9	e1.2	e0.70	e1.1	e0.44	e0.65	1.6	23	7.7	8.9	2.6	12
29	1.9	e1.4	e0.46	e0.70	---	0.66	3.0	20	8.3	11	2.6	11
30	1.9	e1.6	e0.80	e0.60	---	0.74	4.5	17	10	8.9	2.6	9.4
31	1.8	---	e0.90	e0.85	---	0.78	---	16	---	7.5	2.4	---
TOTAL	66.3	45.5	31.44	22.29	17.66	19.08	35.51	356.6	457.1	249.9	134.6	403.4
MEAN	2.14	1.52	1.01	0.72	0.63	0.62	1.18	11.5	15.2	8.06	4.34	13.4
AC-FT	132	90	62	44	35	38	70	707	907	496	267	800
MAX	2.5	1.8	1.7	1.2	0.90	0.78	4.5	30	26	15	7.6	45
MIN	1.8	1.2	0.28	0.20	0.40	0.32	0.85	3.0	7.2	5.5	2.4	2.4

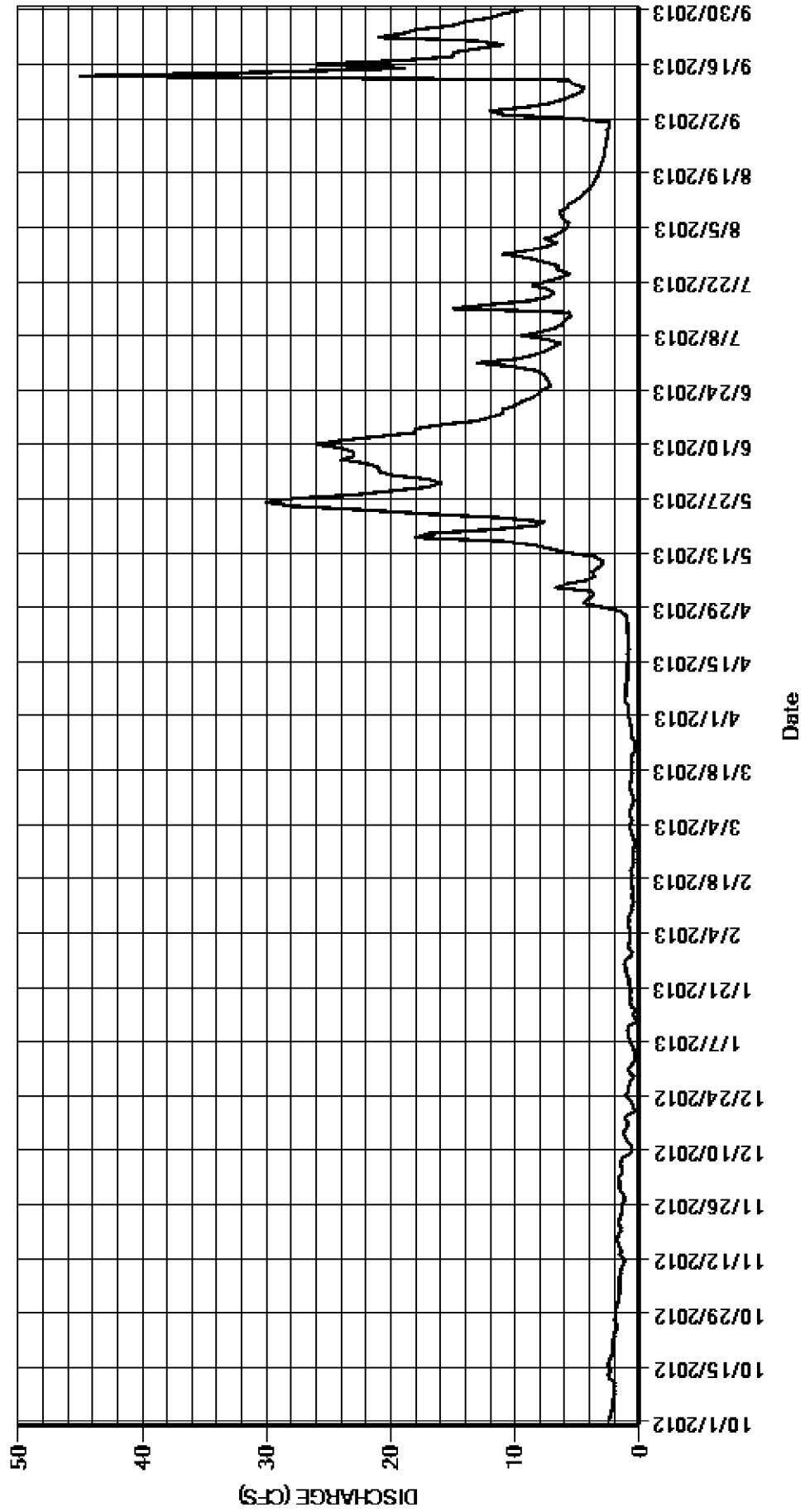
CAL YR	2012	TOTAL	1199.44	MEAN	3.28	MAX	15	MIN	0.28	AC-FT	2380
WTR YR	2013	TOTAL	1839.38	MEAN	5.04	MAX	45	MIN	0.20	AC-FT	3650

MAX DISCH: 78.5 CFS AT 15:45 ON SEP 13, 2013 GH 2.05 FT SHIFT 0 FT

MAX GH: 2.05 FT AT 15:45 ON SEP 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08229500 COTTONWOOD CREEK NEAR CRESTONE  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
DEADMAN CREEK AT MOUTH OF CANYON NEAR CRESTONE, CO  
Water Year 2013

Location.-- Lat 37°53'41", long 105°37'25" referenced to North American Datum of 1983 (Crestone Peak, CO quad, scale 1:24,000), UTM Zone 13 445160 E and 4194332 N, in SW ¼ SW ¼ sec. 36, T.1 N., R.1 E., Baca Survey, Saguache County, CO, Hydrologic Unit 13010003, on right bank 8.2 mi southeast of Crestone, CO and 21.4 mi northeast of Mosca, CO.

Drainage Area and Period of Record.-- 9.6 mi<sup>2</sup>, from 10m DEM in Colorado StreamStats; May 1936 - November 1936, April 2011 to current year.

Equipment.-- Sutron Constant Flow Bubbler with Sutron Satlink2 DCP in NEMA enclosure at log cross-vane control structure. The primary reference gage is an outside cantilever gage.

Hydrologic Conditions.-- Undeveloped steep alpine and subalpine terrain.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log as backup. Record is complete and reliable except for Jan 24-29 when ice was affecting the CFB operation; and May 18, 25, 26, 29-31; Jun 1-3, and Sep 23 when silt and leaves on orifice caused erroneously elevated gage-heights. Two instrument calibration corrections, a -0.02 and +0.02 ft, were made to the CFB and applied by prorating between visits based on site observations. The stage-discharge relation was affected by ice Nov 12 to Jan 23 and Jan 30 to Mar 26. The stage record accuracy is considered to be +/- 0.02 ft under most circumstances due to index resolution and cantilever sight distance.

Datum Corrections.-- Levels were last run to the cantilever chain gage on Aug 22, 2013 using B.M. No. 1 as base. The cantilever chain gage was within allowable limits and no correction was made. Two-peg test was performed on the Lietz level (SN 130869) on Aug 20, 2013 and the instrument was within allowable limits and no adjustment was made. Site conditions make it impractical to run levels to any better accuracy than 0.01 ft and the chain gage only allows corrections to be within 0.01 ft.

Rating.-- The control is a log cross-vane structure that was installed the week of Apr 11, 2011. This structure is expected to be stable with shifting resulting from fill and scour of the material in the gage pool. The log cross-vane structure is insensitive at low flows, but was constructed this way to help reduce the potential for control failure. Rating DEDMOUCO03 was used until Oct 24. Rating DEDMOUCO04 was developed primarily from streamflow measurement nos 4, 34-47. A survey of the control cross-section from July 11, 2011 was evaluated to identify breakpoints in the rating. DEDMOUCO04 is well defined from 1 cfs to 40 cfs and poorly defined outside this range. Eighteen measurements (nos 27-44) were made this year, ranging in discharge from 1.08 to 33.4 cfs. The measurements cover the discharge range experienced except for lower daily flows on Jan 11, 12, 28-31; Feb 1-7; and higher daily flows on May 17, 18, 24-27, 29. The peak flow of 105 cfs occurred at 2200 on May 24, 2013 at a gage height of 2.50 ft with a 0 ft shift. It exceeded high measurement no. 36 made May 17 (GH = 1.93 ft) by 0.57 ft in stage.

Discharge.-- Shifting control method was used to compute discharge for all open water periods. Shift curves (VS13-A, VS13-B, and VS13-C) were developed and used to distribute shifts by stage and time. Open-water measurement shifts ranged from -0.04 to +0.04 ft and applied shifts ranged from -0.01 to +0.03 ft. All were given full weight except nos. 36, 37, 39, and 44, which were adjusted as much as 9.8% to smooth shift trends. Discharge for periods of ice affected and unreliable gage-height record was estimated.

Special Computations.-- Discharges during ice affected periods and periods of equipment malfunction were estimated based on streamflow measurements, stage record, and adjacent good record. Since the primary reference gage is a cantilever wire weight gage, the constant flow bubbler can only be set accurately to plus or minus 0.02 ft at lower stages and more error at higher stages depending on gage pool conditions.

Remarks.-- Record is poor due to control insensitivity and primary reference accuracy. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Install outside staff gage in stream.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

DEADMAN CREEK AT MOUTH OF CANYON NEAR CRESTONE, CO

RATING TABLE-- DEDMOUCO03 USED FROM 01-OCT-2012 TO 24-OCT-2012  
 DEDMOUCO04 USED FROM 24-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.2	2.0	e1.4	e1.1	e0.90	e1.2	1.7	7.1	e31	14	8.3	2.3
2	3.0	1.9	e1.3	e1.2	e0.90	e1.1	1.8	6.4	e32	9.8	7.9	3.3
3	2.9	1.8	e1.3	e1.2	e0.80	e1.1	1.8	7.5	e28	8.5	7.3	7.4
4	2.8	1.8	e1.3	e1.3	e0.80	e1.1	1.7	12	25	7.5	6.9	7.8
5	2.7	1.8	e1.3	e1.4	e0.80	e1.3	2.1	11	26	6.8	6.4	9.2
6	2.6	1.8	e1.3	e1.4	e0.80	e1.1	2.0	8.7	26	6.3	6.1	7.5
7	2.6	1.8	e1.2	e1.3	e1.0	e1.2	2.1	8.2	25	6.9	6.1	6.6
8	2.6	1.8	e1.2	e1.2	e1.1	e1.2	2.0	8.6	24	6.9	6.2	5.9
9	2.5	1.8	e1.2	e1.1	e1.1	e1.1	2.0	8.1	23	6.2	6.3	5.2
10	2.4	1.8	e1.2	e1.1	e1.1	e1.1	1.9	7.4	25	5.6	5.7	5.2
11	2.4	1.9	e1.2	e1.0	e1.1	e1.4	1.6	7.5	24	5.4	5.5	6.7
12	2.7	e2.0	e1.2	e1.0	e1.3	e1.3	1.5	8.7	21	5.6	5.0	9.3
13	3.0	e1.8	e1.2	e1.2	e1.6	e1.3	1.5	13	19	5.1	4.7	43
14	2.8	e1.7	e1.2	e1.1	e1.5	e1.3	1.5	15	17	5.2	4.4	51
15	2.8	e1.6	e1.2	e1.1	e1.4	e1.4	1.5	17	16	13	4.1	29
16	2.7	e1.6	e1.2	e1.1	e1.4	e1.4	1.4	22	14	12	3.7	30
17	2.6	e1.6	e1.2	e1.1	e1.3	e1.4	1.5	34	12	9.7	3.5	21
18	2.4	e1.5	e1.2	e1.1	e1.2	e1.3	1.4	e34	12	8.3	3.3	17
19	2.4	e1.5	e1.3	e1.1	e1.3	e1.3	2.1	23	12	8.6	3.3	17
20	2.3	e1.5	e1.3	e1.1	e1.3	e1.3	1.5	18	10	9.7	3.1	15
21	2.3	e1.5	e1.3	e1.1	e1.2	e1.1	1.5	17	9.4	9.8	3.0	14
22	2.3	e1.5	e1.2	e1.1	e1.1	e1.1	1.5	23	8.6	8.9	2.8	18
23	2.3	e1.5	e1.2	e1.1	e1.2	e1.2	1.7	30	7.9	7.9	2.7	e28
24	2.2	e1.4	e1.2	e1.1	e1.1	e1.2	1.6	39	7.5	7.0	2.6	22
25	2.0	e1.4	e1.2	e1.3	e1.2	e1.2	1.6	e52	6.9	7.9	2.6	21
26	2.0	e1.4	e1.2	e1.3	e1.2	e1.2	1.7	e46	6.7	7.7	2.6	19
27	2.0	e1.4	e1.2	e1.3	e1.2	1.2	1.8	42	6.5	8.2	2.5	17
28	2.0	e1.4	e1.2	e0.90	e1.2	1.2	2.8	33	6.7	10	2.4	15
29	2.0	e1.4	e1.2	e0.90	---	1.3	6.8	e35	7.5	13	2.4	13
30	2.0	e1.4	e1.3	e0.90	---	1.4	9.0	e27	9.6	10	2.4	12
31	2.0	---	e1.2	e1.0	---	1.6	---	e28	---	8.9	2.4	---
TOTAL	76.5	49.3	38.3	35.20	32.10	38.6	64.6	649.2	499.3	260.4	136.2	478.4
MEAN	2.47	1.64	1.24	1.14	1.15	1.25	2.15	20.9	16.6	8.40	4.39	15.9
AC-FT	152	98	76	70	64	77	128	1290	990	517	270	949
MAX	3.2	2.0	1.4	1.4	1.6	1.6	9.0	52	32	14	8.3	51
MIN	2.0	1.4	1.2	0.90	0.80	1.1	1.4	6.4	6.5	5.1	2.4	2.3

CAL YR	2012	TOTAL	1461.49	MEAN	3.99	MAX	16	MIN	0.86	AC-FT	2900
WTR YR	2013	TOTAL	2358.10	MEAN	6.46	MAX	52	MIN	0.80	AC-FT	4680

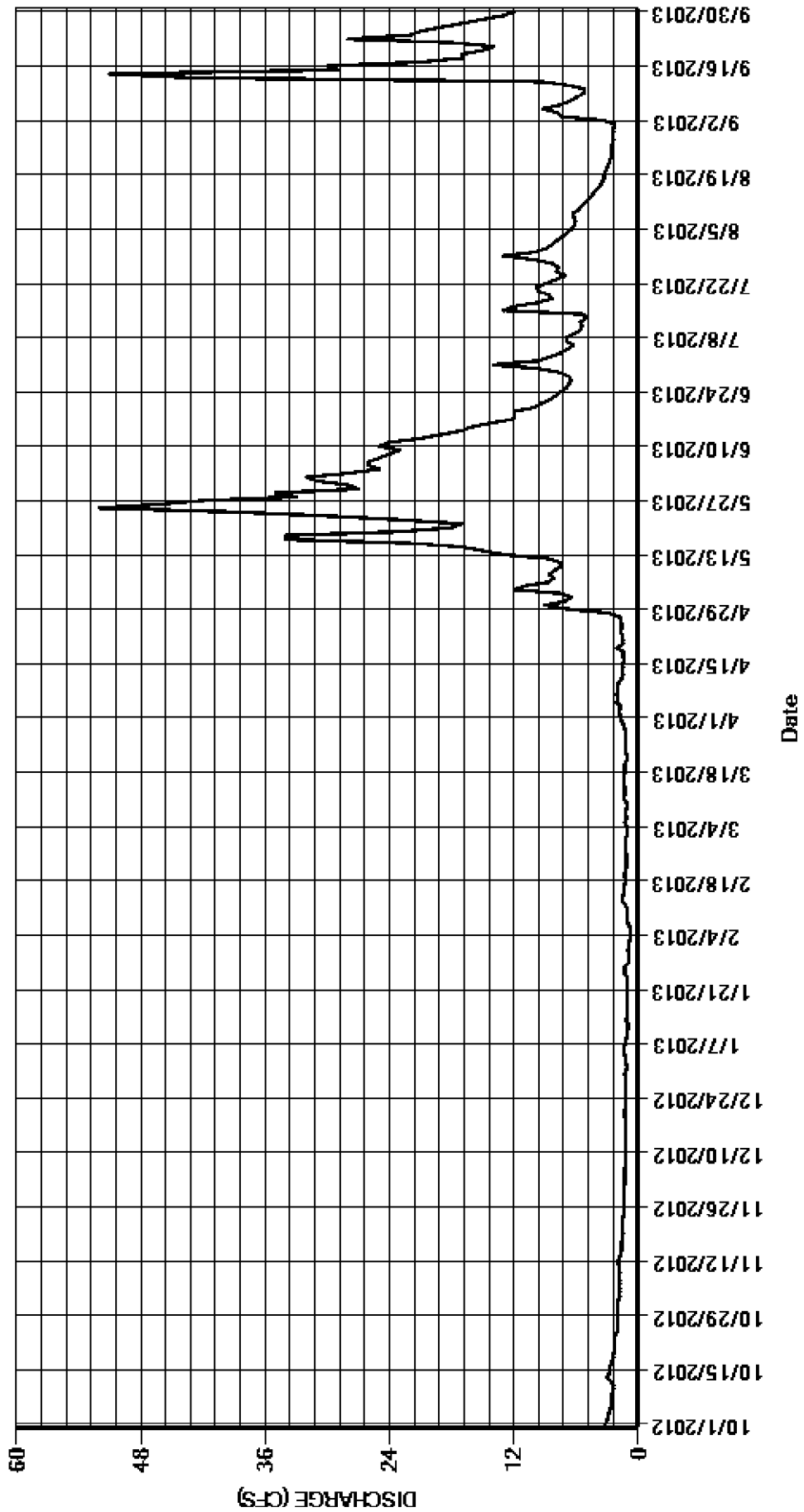
MAX DISCH: 105 CFS AT 22:00 ON MAY 24, 2013 GH 2.50 FT SHIFT 0 FT

MAX GH: 2.50 FT AT 22:00 ON MAY 24, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



DEADMAN CREEK AT MOUTH OF CANYON NEAR CRESTONE, CO  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
DEADMAN CREEK NEAR CRESTONE  
Water Year 2013

Location.-- Lat 37°53'5", long 105°38'47" referenced to North American Datum of 1983 (Crestone, CO quad, scale 1:24,000), UTM Zone 13 443160 E and 4193222 N, in NE ¼ SE ¼ sec. 3, T.1 S., R.1 E., Baca Survey, Saguache County, CO, Hydrologic Unit 13010003, on left bank 8 mi southeast of Crestone, CO and 20.5 mi northeast of Mosca, CO.

Drainage Area and Period of Record.-- 8.4 mi<sup>2</sup>; May 1936 - November 1936, and October 1998 to current year. 1936 record not equivalent.

Equipment.-- Data collection platform (Sutron Satlink2) and a float-operated SDR in a 2-foot steel culvert pipe stilling well with a small steel box-type shelter atop of well until April 18, 2011, when DCP was removed leaving the SDR to log the water-stage. The well is connected to a non-standard 6-foot Parshall Flume in fair condition. Gage-height set from outside staff gage in the non-standard 6-foot Parshall Flume.

Hydrologic Conditions.-- Predominantly undeveloped steep alpine and sub-alpine terrain with extensive losses as stream traverses sandy valley margins.

Gage-Height Record.-- Primary record is 15-minute SDR log with DCP log as backup. Record is complete and reliable except for Nov 14 - May 6, when station was closed; and Oct 6, 8-12, 18-31; Nov 1-13; Aug 23-31; Sep 1-2, when gage was isolated from flume for all or part of each day. One unit value was estimated from field note on Sep 6 while data was downloaded. No instrument calibration corrections were needed or applied. Gage isolates at approximately 0.07 ft. The stage-discharge relation was affected by trees lodged in flume on May 26-28.

Datum Corrections.-- A formal inspection with levels was not performed this year. The Parshall flume was last inspected and levels were shot on Aug. 5, 2008.

Rating.-- Rating No. 1, a standard six foot Parshall flume rating, was used all year. Minor shifting occurs due to non-standard flume dimensions, approach velocity, and approach angle. Twelve discharge measurements, nine measurements greater than 0 cfs, (nos. 81-92) were made during the water year because of limited access to the station. The measured discharges ranged from 0 to 25.8 cfs. The measurements cover the discharge range experienced except for higher daily flows on May 17, 18, 23-28, and Sep 14. The peak flow of 43 cfs occurred at 2300 on May 24, 2013 at a gage height of 1.42 feet with a shift of 0.02 feet. It exceeded high measurement no. 87 (GH = 1.02 ft), made May 28, by 0.40 feet in stage. The peak stage occurred at 2015 on May 26, 2013 at a gage height of 1.64 feet was caused by backwater from a tree in the flume.

Discharge.-- Shifting-control method was used to compute discharge for all periods of reliable gage-height record. Shift curve DEDCRES13-A was developed and used to distribute shifts according to stage. Measurement shifts ranged from -0.03 to +0.03 feet. All were given full weight and applied except for no. 91, which was adjusted 6.9% to smooth shift trend and no. 81 which was not used to develop shifts since well was isolated. Discharge was estimated for periods of unreliable and no gage-height record and May 26-28 when trees were caught in flume.

Special Computations.-- Discharge for periods of no gage-height was estimated using site observations and hydrographic comparison with Deadman Creek at Mouth of Canyon.

Remarks.-- Record is fair except for periods of estimation and flows below 2.6 cfs, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Inlets should be reworked to lower the point of isolation and inside reference point and drop tape should be established.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

DEADMAN CREEK NEAR CRESTONE

RATING TABLE-- DEDCRECO01 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

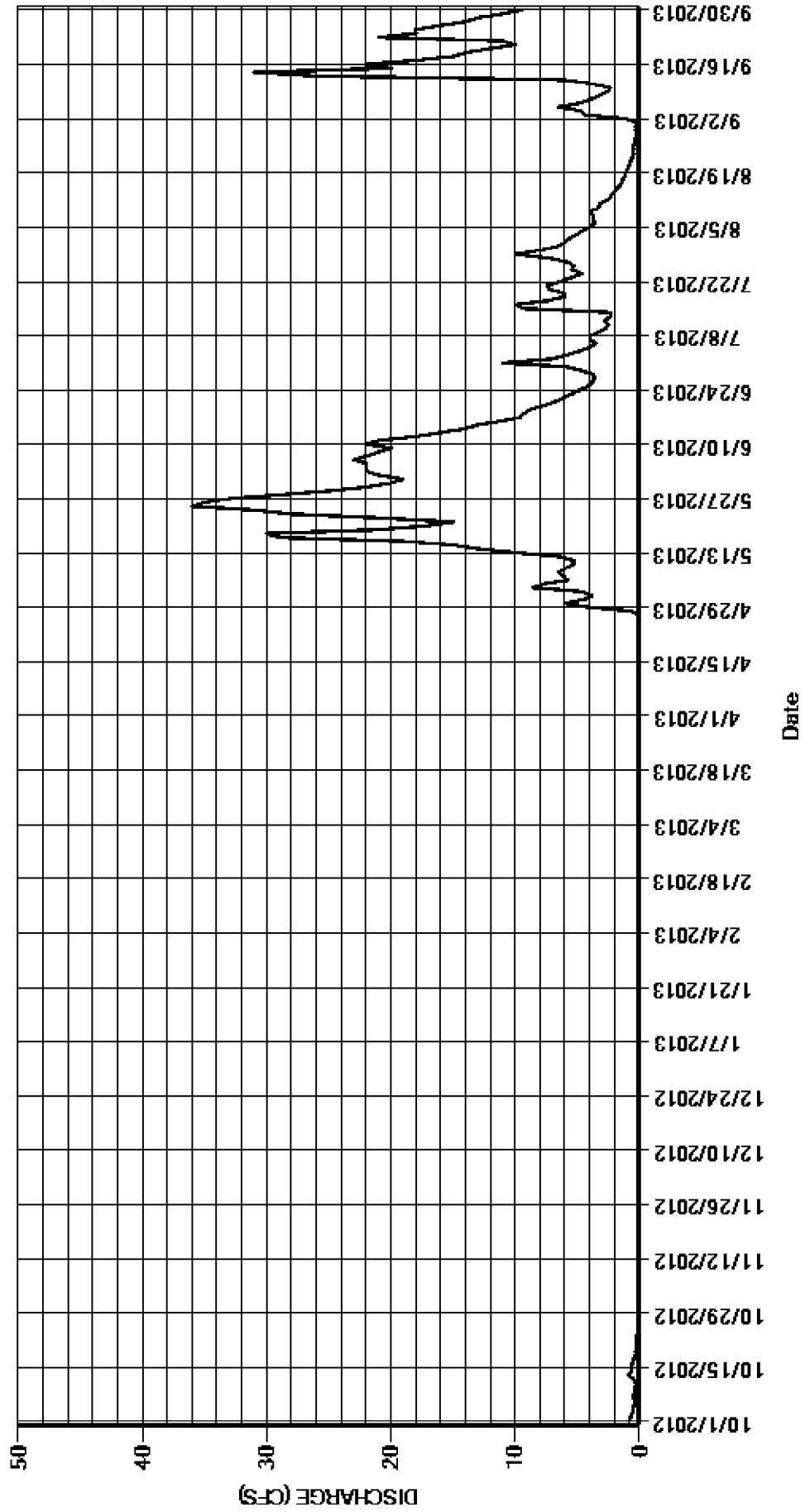
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.84	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e4.4	19	11	6.0	e0.21
2	0.73	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e3.8	21	7.1	5.7	e1.1
3	0.61	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e4.7	22	5.9	5.1	4.4
4	0.51	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e8.6	22	4.8	4.6	4.7
5	0.46	e0.00	e0.00	e0.00	e0.00	e0.00	e0.05	e7.8	22	4.0	4.0	6.5
6	e0.40	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e5.8	23	3.5	3.6	4.8
7	0.46	e0.00	e0.00	e0.00	e0.00	e0.01	e0.05	6.1	22	4.0	3.7	3.9
8	e0.44	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	6.5	21	4.0	3.7	3.2
9	e0.38	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	6.0	20	3.3	4.0	2.5
10	e0.30	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	5.3	22	2.7	3.3	2.4
11	e0.30	e0.05	e0.00	e0.00	e0.00	e0.00	e0.00	5.3	21	2.5	3.2	3.9
12	e0.50	e0.05	e0.00	e0.00	e0.00	e0.00	e0.00	6.4	18	2.8	2.6	6.2
13	0.85	e0.05	e0.00	e0.00	e0.00	e0.00	e0.00	10	16	2.3	2.3	26
14	0.64	e0.05	e0.00	e0.00	e0.00	e0.00	e0.00	13	14	2.3	2.1	31
15	0.63	e0.05	e0.00	e0.00	e0.00	e0.00	e0.00	15	13	9.4	1.8	20
16	0.56	e0.05	e0.00	e0.00	e0.00	e0.00	e0.00	19	11	10	1.5	22
17	0.48	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	29	9.6	7.4	1.4	18
18	e0.30	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	30	9.3	6.0	1.2	15
19	e0.30	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	21	8.8	6.1	1.1	14
20	e0.20	e0.00	e0.00	e0.00	e0.00	e0.00	e0.05	17	7.7	7.3	0.94	12
21	e0.20	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	15	6.8	7.4	0.82	10
22	e0.20	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	21	6.1	6.4	0.72	11
23	e0.20	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	28	5.4	5.5	e0.56	21
24	e0.12	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	31	4.8	4.6	e0.47	18
25	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	36	4.1	5.4	e0.47	18
26	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e35	3.8	5.3	e0.47	16
27	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e33	3.6	5.8	e0.38	14
28	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e0.65	e29	3.7	7.3	e0.30	13
29	e0.00	e0.00	e0.00	e0.00	---	e0.00	e4.1	25	4.6	10	e0.30	11
30	e0.00	e0.00	e0.00	e0.00	---	e0.00	e6.0	22	5.8	8.1	e0.30	9.5
31	e0.00	---	e0.00	e0.00	---	e0.00	---	20	---	6.6	e0.30	---
TOTAL	10.61	0.30	0.00	0.00	0.00	0.01	10.90	519.7	391.1	178.8	66.93	343.31
MEAN	0.34	0.010	0.000	0.000	0.000	0.0003	0.36	16.8	13.0	5.77	2.16	11.4
AC-FT	21	0.6	0	0	0	.02	22	1030	776	355	133	681
MAX	0.85	0.05	0.00	0.00	0.00	0.01	6.0	36	23	11	6.0	31
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	3.6	2.3	0.30	0.21

CAL YR	2012	TOTAL	666.06	MEAN	1.82	MAX	13	MIN	0.00	AC-FT	1320
WTR YR	2013	TOTAL	1521.66	MEAN	4.17	MAX	36	MIN	0.00	AC-FT	3020

MAX DISCH: 43.0 CFS AT 23:00 ON MAY 24, 2013 GH 1.42 FT SHIFT 0.02 FT  
 MAX GH: 1.64 FT AT 20:15 ON MAY 26, 2013 (Backwater from tree in flume.)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DEADMAN CREEK NEAR CRESTONE  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
LITTLE SPRING CREEK AT MEDANO RANCH NEAR MOSCA, CO

Water Year 2013

Location.-- Lat 37°42'46", long 105°39'1" referenced to North American Datum of 1983 (Medano Ranch, CO quad, scale 1:24,000), UTM Zone 13 442697 E and 4174153 N, in NE ¼ SW ¼ sec. 15, T.40 N., R.12 E., New Mexico Principal Meridian, Alamosa County, CO, Hydrologic Unit 13010003, on left bank 5 mi northeast of San Luis Lakes and 13 mi northeast of Mosca, CO.

Drainage Area and Period of Record.-- 0.2 mi<sup>2</sup>. ; WY 2000 to current year.

Equipment.-- Float-operated Sutron SDR with SDI-12 radio bridge in a 30 inch diameter pipe stilling well and CMP extension for gage shelter at a two foot Parshall flume. The gage-height data is transmitted via radio bridge to data collection platform (Sutron Satlink2) at Big Spring Creek at Medano Ranch near Mosca. The primary reference gage was a staff gage in the 2 foot Parshall flume until June 20, 2013 when a RP was established inside the shelter. Water-stage set by tape and weight from reference point on shelf in shelter after June 20, 2013.

Hydrologic Conditions.-- Flow primarily due to groundwater accretions.

Gage-Height Record.-- Primary record is 15-minute transmitted data with SDR and DCP log as backup. Record is complete and reliable except for Nov 26-29 when the well was frozen and Nov 30 - Apr 3 when station was closed for the winter. One erroneous unit value was corrected on May 3 and May 31. Six missing unit values were estimated on Aug 13 by linear interpolation with no loss in accuracy. The stage-discharge relation was affected by ice Nov 12. There were three corrections made to the shaft encoder of -0.04 ft, -0.01 and +0.01 ft on May 3, May 31, and Aug 30, respectively, which were prorated by time from the previous visits.

Datum Corrections.-- A formal inspection with levels was performed on Jun 20, 2013, with an assumed elevation of 0.000 at the flume floor adjacent to the staff gage (REW). Levels indicate that the flume floor slopes approximately 2% with the floor at the staff gage (REW) found to be 0.074 ft lower than the well inlet (LEW). The flume also slopes slightly downward toward diverging section. Inspection included measurement of all pertinent Parshall Flume dimensions. BM #1, a piece of rebar stuck in ground near the gate (elevation = 2.010'), BM #2, top of well casing of northern observation well (elevation = 3.132'), BM #3, top of well casing of southern observation well, (elevation = 3.103') were established along with an inside adjustable RP on shelf, (elevation = 4.297') and drop tape (length = 4.297'). Two-peg test was performed on the Lietz level (S/N 130869) Jun 19, 2013 the instrument was within allowable limits and no correction was made.

Rating.-- A standard two-foot Parshall flume rating was used all year. Sand and moss build-up in approach and inside the flume requires occasional cleaning. Fifteen measurements (Nos. 157-171) were made this year ranging in discharge from 1.20 to 1.80 cfs. They cover the discharge range experienced except for the higher daily flows on Mar 13-15 (estimated) and Apr 8-15, 17-22, 24, 26, and the lower daily flows Jun 24 -28, Jul 31, Aug 16-21, 23-25, 27-31, and Sep 1, 5-10 . The peak flow of 4.40 cfs occurred at 2015 on Jul 12 at a gage height of 0.65 ft with a shift of +0.03 ft. It exceeded open water high flow measurement No. 163 (gh = 0.38 ft) by 0.27 ft in stage. The peak occurred as a result of a rainfall event.

Discharge.-- Shifting control method was used to compute discharge during all periods of gage-height record. Shifts were applied as defined by measurements and distributed by time. Measurement shifts ranged from -0.01 ft to +0.05 ft; applied shifts ranged from -0.01 ft to 0.03 ft. All were given full weight except for Nos. 164, 166-169, which were adjusted by as much as 8.5% to smooth shift distribution. Discharge for periods of ice affected, unreliable, and no gage-height record was estimated.

Special Computations.-- Discharge for periods of ice affected, unreliable, and no gage-height record was estimated using discharge measurements, hydrographic comparison with nearby station Big Spring Creek at Medano Ranch, and weather records.

Remarks.-- Record is good, except for estimated periods, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

LITTLE SPRING CREEK AT MEDANO RANCH NEAR MOSCA, CO

RATING TABLE-- STD02FTPF USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

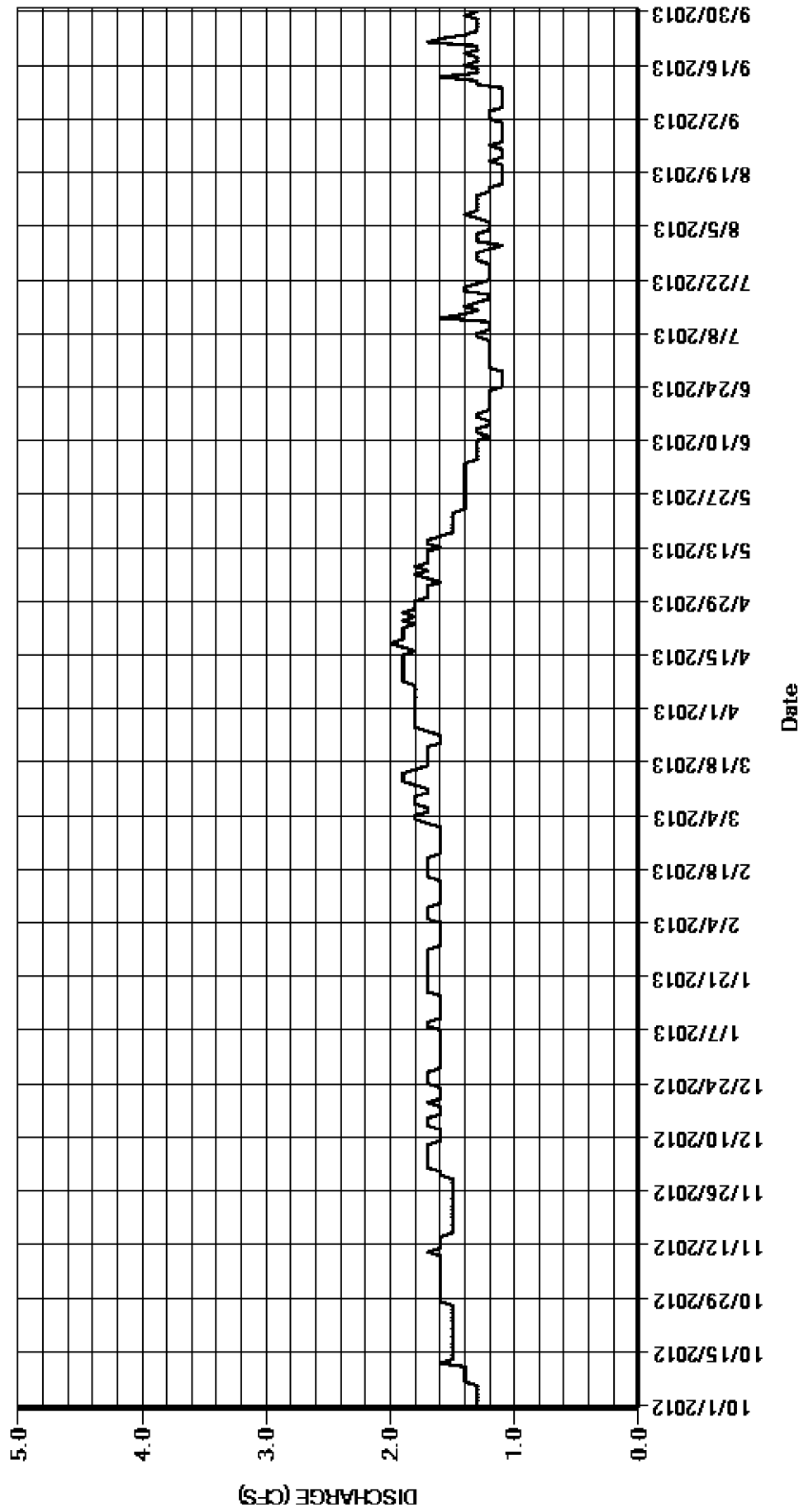
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.3	1.6	e1.6	e1.6	e1.6	e1.6	e1.8	1.7	1.4	1.2	1.3	1.1
2	1.3	1.6	e1.7	e1.6	e1.6	e1.7	e1.8	1.7	1.4	1.2	1.3	1.2
3	1.3	1.6	e1.7	e1.6	e1.6	e1.8	e1.8	1.7	1.4	1.2	1.3	1.2
4	1.3	1.6	e1.7	e1.6	e1.6	e1.8	1.8	1.6	1.4	1.2	1.2	1.2
5	1.3	1.6	e1.7	e1.6	e1.7	e1.7	1.8	1.7	1.3	1.2	1.2	1.1
6	1.3	1.6	e1.7	e1.6	e1.7	e1.7	1.8	1.8	1.3	1.2	1.2	1.1
7	1.4	1.6	e1.7	e1.6	e1.7	e1.8	1.8	1.7	1.3	1.3	1.3	1.1
8	1.4	1.6	e1.7	e1.7	e1.7	e1.8	1.9	1.8	1.3	1.3	1.4	1.1
9	1.4	1.6	e1.6	e1.7	e1.6	e1.8	1.9	1.7	1.3	1.2	1.3	1.1
10	1.4	1.7	e1.6	e1.6	e1.6	e1.7	1.9	1.7	1.3	1.2	1.3	1.1
11	1.4	1.6	e1.6	e1.6	e1.6	e1.7	1.9	1.7	1.2	1.2	1.3	1.3
12	1.6	e1.6	e1.6	e1.6	e1.6	e1.8	1.9	1.7	1.3	1.6	1.3	1.3
13	1.5	1.6	e1.7	e1.6	e1.6	e1.9	1.9	1.6	1.3	1.4	1.3	1.6
14	1.5	1.6	e1.7	e1.6	e1.6	e1.9	1.9	1.7	1.2	1.3	1.2	1.3
15	1.5	1.5	e1.7	e1.6	e1.6	e1.9	1.9	1.7	1.2	1.4	1.2	1.3
16	1.5	1.5	e1.6	e1.6	e1.7	e1.8	1.8	1.6	1.3	1.3	1.1	1.4
17	1.5	1.5	e1.6	e1.7	e1.7	e1.7	1.9	1.5	1.3	1.2	1.1	1.3
18	1.5	1.5	e1.6	e1.7	e1.7	e1.7	2.0	1.5	1.2	1.2	1.1	1.3
19	1.5	1.5	e1.7	e1.7	e1.7	e1.7	1.9	1.5	1.2	1.4	1.1	1.4
20	1.5	1.5	e1.6	e1.7	e1.7	e1.7	1.9	1.5	1.2	1.4	1.1	1.3
21	1.5	1.5	e1.6	e1.7	e1.7	e1.7	1.9	1.5	1.2	1.3	1.1	1.3
22	1.5	1.5	e1.6	e1.7	e1.6	e1.7	1.9	1.5	1.2	1.2	1.2	1.7
23	1.5	1.5	e1.6	e1.7	e1.6	e1.6	1.8	1.4	1.2	1.2	1.1	1.6
24	1.5	1.5	e1.7	e1.7	e1.6	e1.6	1.9	1.4	1.1	1.2	1.1	1.4
25	1.5	1.5	e1.7	e1.7	e1.6	e1.6	1.8	1.4	1.1	1.2	1.1	1.3
26	1.5	e1.5	e1.7	e1.7	e1.6	e1.7	1.9	1.4	1.1	1.2	1.2	1.3
27	1.5	e1.5	e1.7	e1.7	e1.6	e1.8	1.8	1.4	1.1	1.3	1.1	1.3
28	1.6	e1.5	e1.6	e1.7	e1.6	e1.8	1.8	1.4	1.1	1.3	1.1	1.3
29	1.6	e1.5	e1.6	e1.6	---	e1.8	1.8	1.4	1.2	1.3	1.1	1.4
30	1.6	e1.6	e1.6	e1.6	---	e1.8	1.7	1.4	1.2	1.2	1.1	1.3
31	1.6	---	e1.6	e1.6	---	e1.8	---	1.4	---	1.1	1.1	---
TOTAL	45.3	46.6	51.1	51.0	45.8	54.1	55.6	48.7	37.3	39.1	36.9	38.7
MEAN	1.46	1.55	1.65	1.65	1.64	1.75	1.85	1.57	1.24	1.26	1.19	1.29
AC-FT	90	92	101	101	91	107	110	97	74	78	73	77
MAX	1.6	1.7	1.7	1.7	1.7	1.9	2.0	1.8	1.4	1.6	1.4	1.7
MIN	1.3	1.5	1.6	1.6	1.6	1.6	1.7	1.4	1.1	1.1	1.1	1.1

CAL YR	2012	TOTAL	551.8	MEAN	1.51	MAX	2.0	MIN	1.0	AC-FT	1090
WTR YR	2013	TOTAL	550.2	MEAN	1.51	MAX	2.0	MIN	1.1	AC-FT	1090

MAX DISCH: 4.40 CFS AT 20:15 ON JUL 12, 2013 GH 0.65 FT SHIFT 0.03 FT  
 MAX GH: 0.65 FT AT 20:15 ON JUL 12, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LITTLE SPRING CREEK AT MEDANO RANCH NEAR MOSCA, CO  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
BIG SPRING CREEK AT MEDANO RANCH NEAR MOSCA

Water Year 2013

Location.-- Lat 37° 44' 4", long 105° 39' 49" referenced to North American Datum of 1983 (Medano Ranch, CO quad, scale 1:24,000), UTM Zone 13 441521 E and 4176551 N, in NW ¼ NE ¼ sec. 9, T.40 N., R.12 E., New Mexico Principal Meridian, Alamosa County, CO, Hydrologic Unit 13010003, on left bank ¼ mi above Los Ojos Diversion.

Drainage Area and Period of Record.-- 0.3 mi<sup>2</sup>; 2000 to current year.

Equipment.-- Data collection platform (Sutron SatLink2) and dual orifice constant flow bubbler in a 30-inch diameter pipe well and shelter at 4-ft Parshall flume that was converted to a vertical, suppressed, rectangular, submerged orifice in February 2012. The dimensions of the submerged orifice are 3.68 ft W by 0.55 ft H and the top crest of the orifice plate is 2.31 ft. One bubbler orifice is used to collect upstream head (Ha) data and the other is used to collect downstream head (Hb) data. The gage-height record is the computed difference (Ha - Hb) as calculated by the Satlink logger. Stage set by staff gage on LEW above the submerged orifice for the Ha gage-height and by staff gage on LEW below the submerged orifice for the Hb gage-height. No auxiliary gages.

Hydrologic Conditions.-- Flow primarily due to groundwater accretions.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log as backup. Record is complete and reliable except for Dec 9, 10, 12, 13, 17-23, 26-30; Jan 2-24, 27, 28, 30, when ice was affecting constant flow bubbler readings. Stage-discharge relation was affected by ice Nov 12; Dec 11; Feb 12, 13, 16, 19, 23, 25, 27, 28; and Mar 9, 10, 24, 25. Stage-discharge relation was affected by material caught upstream of submerged orifice Aug 9, 11, 12, 23-30. Corrections to the dual orifice pressure transducer data were applied by time and amount as calculated from changes in logged data during site visits and applied as needed. Mean gage height record is the result of subtracting recorded gage height (Hb) from the upstream recorded gage height (Ha). Hb unit values were evaluated against the physical dimensions of the submerged orifice plate and it was determined there were no periods when the orifice was not fully submerged. The top crest of the orifice plate was not overtopped (Ha > 2.31 ft) during any period of reliable gage height record.

Datum Corrections.-- Levels were run at this gage on June 20, 2013 to establish BMs 1, 2, and 3. Two-peg test was performed on the Lietz level (SN 130869) on June 19, 2013, the instrument was within allowable limits and no correction was made.

Rating.-- Rating BIGSPGCO05-1, developed from measurements 141-150, was first used Feb 24, 2012 and used again this year. Rating 5-1 was developed to relate the head difference above and below the orifice to the flow through the orifice. Since site conditions preclude meeting the requirements for a standard submerged orifice coefficient, the coefficients calculated from 10 measurements (141-150) were analyzed to determine the best-fit relationship between head difference and the orifice coefficient. The coefficient varies with the head difference and the best fit equation developed was  $C[h]=9.3891 \times h^{\wedge}(-0.228)$ . This coefficient is then used in the simplified submerged orifice equation  $Q = C[h] \times h^{\wedge}(1/2)$ . This rating is only valid when the orifice is submerged and for the portion of the flow going through the orifice when the plate is overtopped. The orifice is not submerged when downstream head measurement Hb is at or below 0.55 ft (the top of the orifice). When flow overtops the orifice plate additional flow is added to the computed flow as calculated from the Francis equation for the standard suppressed rectangular weir  $Q = 3.33 \times L \times (Ha - 2.31)^{\wedge}(3/2)$  (USBR water measurement manual equation 7-5) where L = 3.68 ft and the top of the orifice plate sits at 2.31 ft. Fourteen discharge measurements (nos. 153 -166) were made this year ranging in discharge from 5.68 to 7.30 cfs. The measurements cover the discharge range experienced except for lower daily flows on Dec 9-13, 17, 20-23, 25-30; Jan 2-7, 13; Jul 31; Aug 13-21, 23-26, 29-31; and Sep 1, 5-10, 26, 27. The peak flow of 8.17 cfs occurred at 22:45 on Sep 22 at a gage height (Ha - Hb = 0.69 ft) with a shift of -0.09 ft. The peak upstream gage height (Ha) occurred sometime during the winter estimated period but the sensor was also affected by ice at this time so the peak could not be determined.

Discharge.-- Shifting control method was used to compute discharge for all periods of reliable gage-height record. Shifting is caused by continuously changing sand deposition in, above, and below the control structure. Shifts were applied as defined by measurements and distributed by time. Open-water measurement shifts ranged from 0.00 ft to -0.16 ft; applied shifts ranged from 0.01 ft to -0.11 ft. All open water measurements were given full weight except for nos. 153, 156-158, 163, and 165 which were adjusted as much as 6.5 percent to smooth the shift trend. Periods of ice affected and unreliable gage-height record were estimated.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using measurements, weather records, and interpolation between periods of good record.

Remarks.-- Record is good except for estimated periods, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

BIG SPRING CREEK AT MEDANO RANCH NEAR MOSCA

RATING TABLE-- BIGSPGCO05-1 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

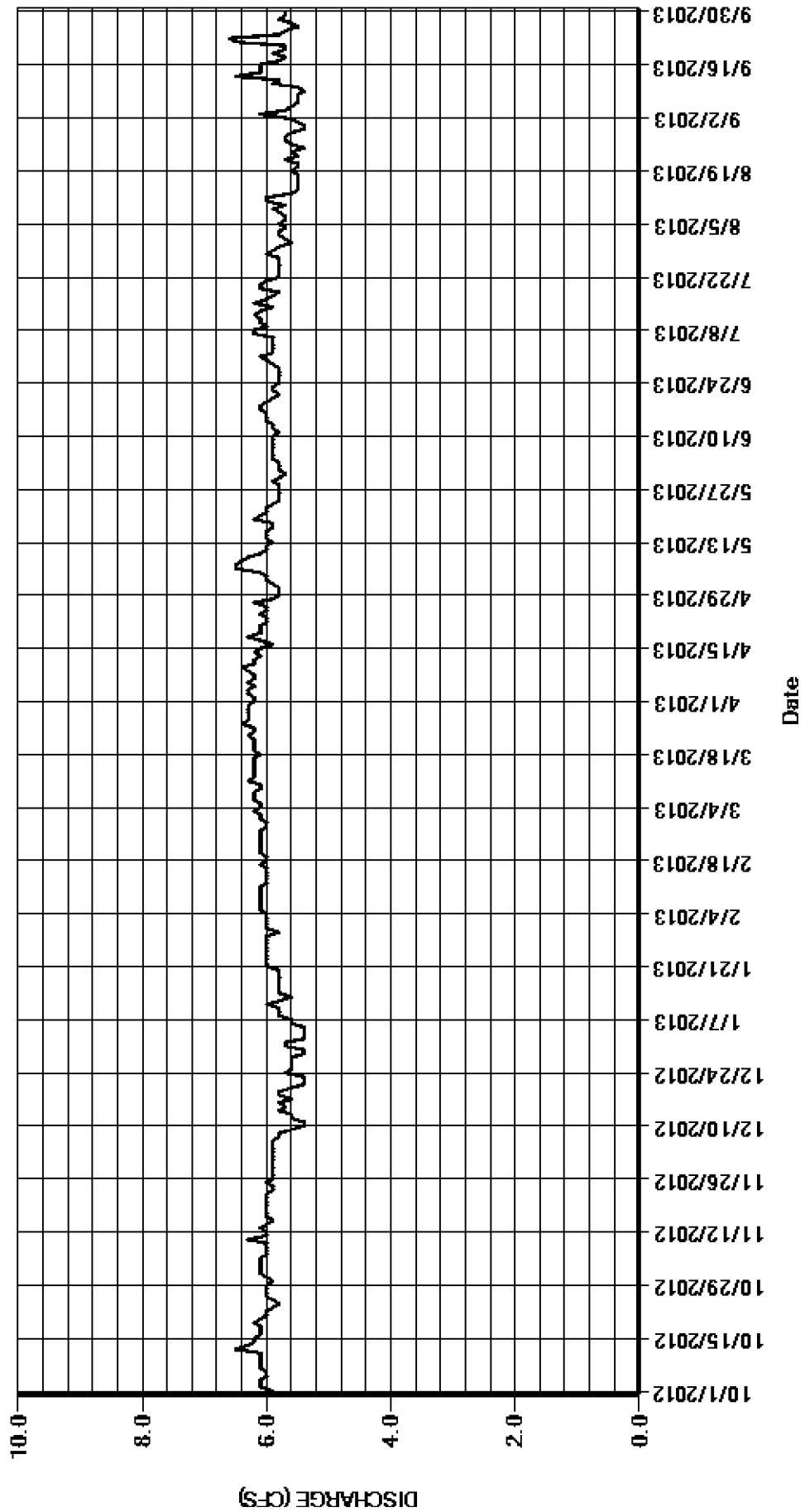
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.9	6.1	5.9	5.7	6.0	6.1	6.2	5.8	5.8	6.1	5.7	5.5
2	6.1	6.1	5.9	e5.4	6.0	6.1	6.2	5.9	5.8	5.9	5.8	5.7
3	6.1	6.1	5.9	e5.4	6.0	6.2	6.3	6.0	5.8	5.9	5.8	6.1
4	6.1	6.1	5.9	e5.4	6.0	6.1	6.3	6.0	5.9	5.9	5.7	5.7
5	6.0	6.1	5.9	e5.4	6.1	6.1	6.2	6.1	5.9	5.9	5.8	5.6
6	6.0	6.0	5.9	e5.6	6.1	6.2	6.3	6.5	5.9	5.9	5.7	5.5
7	6.1	6.0	5.8	e5.6	6.1	6.2	6.2	6.5	5.9	6.2	5.7	5.5
8	6.1	6.0	5.8	e5.8	6.1	6.2	6.2	6.4	5.9	6.2	5.8	5.5
9	6.1	6.0	e5.6	e5.8	6.1	e6.1	6.3	6.3	5.9	6.0	e5.9	5.4
10	6.1	6.3	e5.4	e5.8	6.1	e6.1	6.4	6.1	5.9	6.1	5.7	5.5
11	6.1	6.0	e5.4	e6.0	6.1	6.3	6.2	6.0	5.8	6.1	e6.0	5.9
12	6.5	e6.0	e5.6	e5.8	e6.0	6.2	6.2	6.0	5.9	6.2	e6.0	5.8
13	6.3	6.1	e5.6	e5.6	e6.0	6.2	6.1	5.9	5.9	6.1	5.6	6.5
14	6.2	6.0	5.8	e5.8	6.0	6.2	6.2	6.0	6.0	5.9	5.5	6.1
15	6.2	5.9	5.7	e5.8	6.0	6.2	6.1	6.0	6.0	6.2	5.5	6.1
16	6.1	6.0	5.8	e5.8	e6.0	6.2	5.9	6.0	6.0	6.0	5.5	6.1
17	6.1	6.0	e5.6	e5.8	6.1	6.2	6.1	5.9	6.1	5.9	5.5	5.8
18	6.1	6.0	e5.8	e5.8	6.0	6.1	6.3	5.9	6.1	5.8	5.5	5.7
19	6.2	6.0	e5.8	e5.8	e6.0	6.2	6.1	6.2	6.0	6.1	5.6	5.9
20	6.1	6.0	e5.6	e5.8	6.1	6.2	6.1	6.1	5.9	6.1	5.5	5.7
21	6.0	6.0	e5.4	e6.0	6.1	6.2	6.1	6.0	5.8	6.0	5.5	5.7
22	6.0	6.0	e5.4	e6.0	6.1	6.2	6.0	6.0	5.9	5.8	5.7	6.5
23	5.9	5.9	e5.4	e6.0	e6.1	6.3	6.0	5.9	5.9	5.8	e5.5	6.6
24	5.8	5.9	5.7	e6.0	6.1	e6.2	6.1	5.8	5.8	5.8	e5.6	5.8
25	5.9	6.0	5.6	6.0	e6.1	e6.2	6.0	5.8	5.8	5.8	e5.4	5.7
26	6.0	5.9	e5.6	6.0	6.1	6.4	6.0	5.8	5.8	5.8	e5.6	5.5
27	6.0	5.9	e5.6	e6.0	e6.0	6.3	6.2	5.8	5.8	5.8	e5.7	5.6
28	6.0	5.9	e5.6	e6.0	e6.0	6.3	5.9	5.8	5.8	6.0	e5.7	5.8
29	6.0	5.9	e5.4	6.0	---	6.3	5.8	5.9	5.9	5.9	e5.6	5.7
30	5.9	5.9	e5.4	e5.8	---	6.3	5.8	5.8	6.0	5.8	e5.4	5.7
31	6.0	---	5.7	6.0	---	6.3	---	5.7	---	5.6	5.4	---
TOTAL	188.0	180.1	175.5	179.7	169.5	192.4	183.8	185.9	176.9	184.6	174.9	174.2
MEAN	6.06	6.00	5.66	5.80	6.05	6.21	6.13	6.00	5.90	5.95	5.64	5.81
AC-FT	373	357	348	356	336	382	365	369	351	366	347	346
MAX	6.5	6.3	5.9	6.0	6.1	6.4	6.4	6.5	6.1	6.2	6.0	6.6
MIN	5.8	5.9	5.4	5.4	6.0	6.1	5.8	5.7	5.8	5.6	5.4	5.4

CAL YR	2012	TOTAL	2242.7	MEAN	6.13	MAX	7.1	MIN	5.4	AC-FT	4450
WTR YR	2013	TOTAL	2165.5	MEAN	5.93	MAX	6.6	MIN	5.4	AC-FT	4300

MAX DISCH: 8.17 CFS AT 22:45 ON SEP 22, 2013 GH 0.69 FT SHIFT -0.09 FT (stage is head difference.)  
 MAX GH: (not determined)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**BIG SPRING CREEK AT MEDANO RANCH NEAR MOSCA  
WY2013 HYDROGRAPH**



RIO GRANDE RIVER BASIN  
08230500 CARNERO CREEK NEAR LA GARITA  
Water Year 2013

Location.-- Lat 37° 51' 35", long 106° 19' 10" referenced to North American Datum of 1983 (Twin Mountains SE, CO quad, scale 1:24,000), UTM Zone 13 383929 E and 4191069 N, in SW ¼ NE ¼ sec. 28, T.42 N., R.6 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010004, on left bank 5.5 mi downstream from the North Fork and 4 mi northwest of La Garita, CO.

Drainage Area and Period of Record.-- 117 mi<sup>2</sup> (from topographic maps); 1919 to 1936 mostly partial years, 1936 to current year.

Equipment.-- A data collection platform (Sutron Satlink2), and a float-operated digital stage discharge recorder in a 42-inch diameter metal shelter and concrete well. The primary reference gage is a drop tape from reference point on shelf; a cantilever gage is the secondary reference.

Hydrologic Conditions.-- Gage is located in lower mountain valley meadows with small homes established in the area. There are some diversions above gage for irrigation of meadows used for grazing stock.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log and SDR log as backup. Record is complete and reliable except for Dec 10-30; Mar 24-26, when ice in well was affecting floats and Dec 31 to Mar 19 when station was closed for the winter. The stage-discharge relation was affected by ice Oct 26-29; Nov 1, 3, 8, 10-30; Dec 1-9, Mar 20-23, 27-31; Apr 1-4, 9-13, 18, 19, 24, 25. There were three instrumentation calibration corrections ranging from -0.01 to +0.01 ft, which were prorated from previous visit.

Datum Corrections.-- Levels were run to the reference point (RP) inside the gage and to the outside cantilever gage on Aug 14, 2012 using B.M. 1 as base. The RP was within allowable limits, so no correction was made. A two-peg test was ran on Aug 6, 2012, the instrument was within allowable limits and no adjustment was made.

Rating.-- Control is a concrete, broad-crested weir about 25 feet downstream from the gage. Stream banks affect flow at higher stages. Minor shifting occurs as a result of scour and fill in gage pool. Rating 16, in use since Oct 1, 2009, was used again until Oct 12, 2012. Rating 17-1 was developed and used for the remainder of the water year. Rating 17-1 is well defined from 1.5 to 30 cfs, fairly well defined from 31 to 161 cfs; and poorly defined outside those ranges. Eighteen discharge measurements (Nos. 202-219) were made during the water year ranging in discharge from 0 to 22.4 cfs. They covered the discharge range experienced this year. The peak flow of 21.8 cfs occurred at 1145 on Sep 23, 2013 at a gage height of 2.42 ft with a shift of 0.00 ft. High measurement No. 219 was made at this time.

Discharge.-- Shifting-control method was used to compute discharge record during open-water periods. Shift curve (VS1201) was carried from previous water year with rating 16 to Oct 10. New rating 17-1 was then applied directly until Apr 9. Two shift curves (VS13-A and VS13-B) were developed and used to define minor shifting during remainder of water year. Open-water measurement shifts ranged from -0.04 to +0.01 ft and applied shifts ranged from -0.03 to 0 ft. All measurements were given full weight and applied except for nos. 209, 212-214, and 216-219, which were adjusted as much as 8.4% to smooth shift trends. Periods of unreliable stage record and ice-affected stage-discharge relation were estimated.

Special Computations.-- Discharge was estimated for periods of unreliable gage-height and ice affected record using discharge measurements, hydrographic comparison with La Garita Creek near La Garita, and weather records.

Remarks.-- Record is good except for periods of estimation, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08230500 CARNERO CREEK NEAR LA GARITA

RATING TABLE-- CARLAGCO16 USED FROM 01-OCT-2012 TO 10-OCT-2012  
 CARLAGCO17-1 USED FROM 10-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

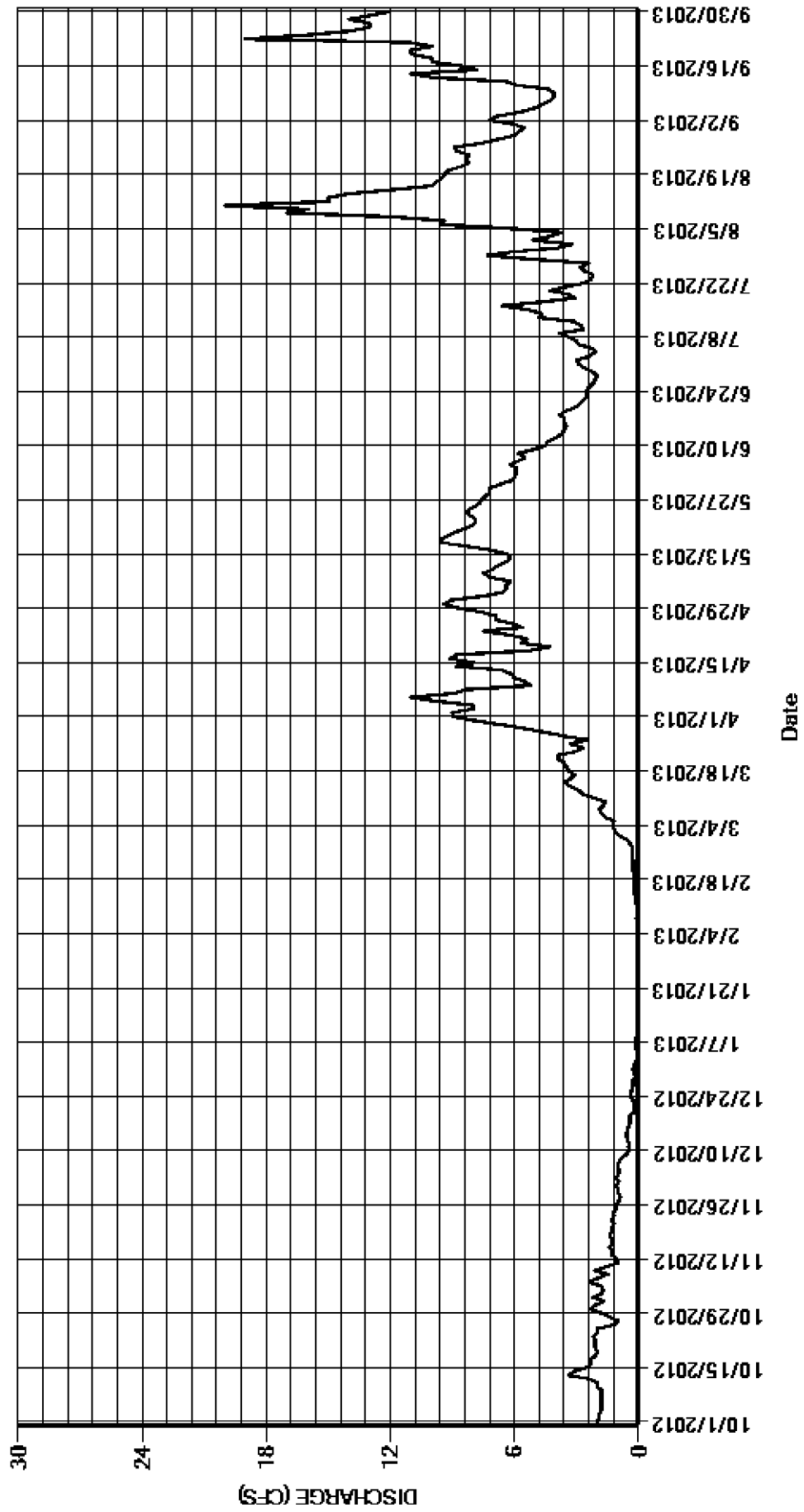
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.0	e1.7	e1.1	e0.20	e0.00	e0.85	e9.0	9.1	6.1	2.9	3.2	6.1
2	1.9	2.2	e0.95	e0.12	e0.00	e1.1	e9.0	7.6	6.0	3.0	5.1	7.2
3	1.9	e1.8	e1.1	e0.08	e0.02	e1.2	e8.0	6.6	5.9	2.4	4.3	6.9
4	1.8	1.7	e0.95	e0.08	e0.04	e1.2	e8.0	6.4	5.9	2.1	3.7	5.8
5	1.8	1.8	e0.95	e0.10	e0.05	e1.2	9.8	6.4	6.2	2.2	6.2	5.1
6	1.8	2.4	e1.0	e0.12	e0.07	e1.6	11	6.2	5.8	2.9	9.5	4.7
7	1.8	2.0	e0.95	e0.12	e0.08	e1.8	8.9	7.2	5.5	3.0	9.4	4.3
8	1.8	e1.5	e0.85	e0.12	e0.10	e1.9	8.3	7.5	5.8	3.4	12	4.1
9	1.8	2.1	e0.60	e0.09	e0.10	e1.7	e5.2	7.1	5.1	3.8	17	4.1
10	2.0	e1.5	e0.48	e0.05	e0.10	e1.6	e5.5	6.8	4.5	2.7	16	4.4
11	2.0	e1.0	e0.48	e0.02	e0.10	e2.2	e6.0	6.4	4.4	2.8	20	5.9
12	2.4	e1.1	e0.48	e0.00	e0.12	e2.7	e6.2	6.2	4.0	3.1	15	6.4
13	3.4	e1.3	e0.55	e0.00	e0.16	e2.9	e6.6	6.4	3.7	4.8	15	9.9
14	3.1	e1.3	e0.60	e0.00	e0.18	e3.3	8.8	7.2	3.6	4.7	14	11
15	2.5	e1.4	e0.55	e0.00	e0.20	e3.6	8.0	8.4	3.5	5.3	12	7.8
16	2.3	e1.3	e0.50	e0.00	e0.24	e3.3	9.1	9.6	3.6	6.6	10	8.6
17	2.3	e1.3	e0.42	e0.00	e0.24	e3.1	8.8	9.5	3.6	4.7	9.8	10
18	2.1	e1.4	e0.42	e0.00	e0.24	e3.4	e5.3	9.1	3.8	3.1	9.5	10
19	2.0	e1.3	e0.44	e0.00	e0.22	e3.5	e4.3	8.7	3.5	3.4	9.4	11
20	2.1	e1.3	e0.16	e0.00	e0.26	e3.6	5.7	8.2	3.0	4.3	9.2	11
21	2.1	e1.2	e0.20	e0.00	e0.26	e3.9	5.4	7.9	2.8	3.5	8.6	10
22	2.1	e1.3	e0.22	e0.00	e0.26	e3.9	6.2	7.9	2.6	2.6	8.2	11
23	2.2	e1.2	e0.28	e0.00	e0.28	e3.0	7.5	8.2	2.5	2.3	8.3	19
24	2.0	e1.2	e0.40	e0.00	e0.32	e2.7	e5.6	8.3	2.5	2.2	8.2	16
25	2.0	e1.1	e0.36	e0.00	e0.30	e3.3	e6.1	8.0	2.4	2.6	8.8	14
26	e1.2	e1.1	e0.30	e0.00	e0.30	e2.5	6.9	7.7	2.2	2.8	8.9	13
27	e1.0	e0.95	e0.26	e0.00	e0.40	e3.6	6.9	7.6	2.1	2.4	7.6	13
28	e1.4	e0.90	e0.30	e0.00	e0.55	e4.6	7.6	7.4	2.0	5.0	6.8	14
29	e1.8	e1.0	e0.16	e0.00	---	e5.6	8.7	7.2	2.2	7.3	6.0	13
30	2.3	e1.0	e0.22	e0.00	---	e6.8	9.4	7.2	2.6	6.1	5.8	12
31	2.1	---	e0.30	e0.00	---	e8.0	---	6.7	---	3.9	5.5	---
TOTAL	63.0	42.35	16.53	1.10	5.19	93.65	221.8	234.7	117.4	111.9	293.0	279.3
MEAN	2.03	1.41	0.53	0.035	0.19	3.02	7.39	7.57	3.91	3.61	9.45	9.31
AC-FT	125	84	33	2.2	10	186	440	466	233	222	581	554
MAX	3.4	2.4	1.1	0.20	0.55	8.0	11	9.6	6.2	7.3	20	19
MIN	1.0	0.90	0.16	0.00	0.00	0.85	4.3	6.2	2.0	2.1	3.2	4.1

CAL YR	2012	TOTAL	1003.72	MEAN	2.74	MAX	17	MIN	0.16	AC-FT	1990
WTR YR	2013	TOTAL	1479.92	MEAN	4.05	MAX	20	MIN	0.00	AC-FT	2940

MAX DISCH: 21.8 CFS AT 11:45 ON SEP 23, 2013 GH 2.42 FT SHIFT 0 FT  
 MAX GH: 2.43 FT AT 09:00 ON APR 02, 2013 (Backwater from ice)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08230500 CARNERO CREEK NEAR LA GARITA  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08231000 LA GARITA CREEK NEAR LA GARITA  
Water Year 2013

Location.-- Lat 37°48'48", long 106°19'8" referenced to North American Datum of 1983 (Twin Mountains SE, CO quad, scale 1:24,000), UTM Zone 13 383918 E and 4185927 N, in NW ¼ SE ¼ sec. 9, T.41 N., R.6 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010004, on left bank 4.5 mi downstream from Little La Garita Creek and 4.5 mi southwest of La Garita, CO.

Drainage Area and Period of Record.-- 61 mi<sup>2</sup>; Apr. 1, 1919 to Sept. 30, 1947 (seasonal records only most years), Oct. 1, 1947 to current year.

Equipment.-- A float-operated stage discharge recorder (SDR), data collection platform (Sutron Satlink2), and a tipping bucket rain gage in a 3-ft corrugated metal pipe shelter and concrete well. The primary reference gage is a drop tape from reference point on shelf. The secondary reference is a cantilever chain gage installed Sep 9, 2011.

Hydrologic Conditions.-- Drainage basin is primarily Rio Grande National Forest and is generally sub-alpine terrain. The mean basin elevation is 10,300 ft (from Stream Stats, 2009).

Gage-Height Record.-- Primary record is 15-minute satellite transmitted data with DCP log and SDR log as backup. Record is complete and reliable except for Jan 10-25 when there was an ice plug in the oil cylinder. One erroneous unit value was corrected from field note observation on Nov 6. There were two instrument calibration corrections, both +0.01 ft, and were prorated by time from previous visit. There was one flush correction prorated from previous inflection point. The stage-discharge relation was affected by ice Nov 12 - Jan 9 and Jan 26 to Mar 26.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on Aug 14, 2012 using BM1 as base. The RP elevation was found within allowable limits and no correction was made. Levels were last run to the secondary outside cantilever chain gage on Aug 14, 2012 using BM1 as base. The outside cantilever chain gage was found to read 0.08 ft above gage datum, and the gage was not corrected.

Rating.-- The control is a rock weir structure approximately 30 feet downstream of the gage. Minor shifting occurs mainly due to the movement of streambed materials, especially at high stages. Rating no. 13 in use since Oct 1, 2009 was used until Jan 24. Rating no. 13-1 (identical to no. 13 except extended by straight line up to 3.30 ft to compute this year's peak) was used from Jan 25 through the water year. Twenty measurements (nos 278-297) were made this year ranging in discharge from 1.29 to 63.2 cfs. The measurements cover the discharge range experienced except for lower daily flows on Nov 12, 13, Dec 30, Jan 2-5, 12-15. The peak flow of 112 cfs occurred at 1715 on Aug 7 at a gage-height of 3.19 ft with a shift of +0.07 ft. It exceeded high measurement no. 297 (GH= 2.82 ft), made Sep 23, by 0.37 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record for all open-water periods. A variable shift curve, LAGLAGVS12-01, was used to distributed shifts by stage Oct 1 to Oct 13. Shifts were prorated by time for the remainder of the water year because the control changed with the fall rains making it impossible to accurately define the upper and lower ends of shift curves. Open-water measurement shifts ranged from -0.04 to +0.11 ft and applied shifts ranged from -0.02 to +0.10 ft. All open water measurements were given full weight except for nos. 278, 279, 286, 287, 291-293, and 295, which were adjusted as much as 6.8% to smooth shift distribution. Periods of ice affected and unreliable gage-height record were estimated.

Special Computations.-- The shift curve (VS12-01) was left open on top and limited to a -0.05 shift due to the new control with no higher flow measurements. Discharge for periods of ice-affected record was estimated using discharge measurements, weather records and comparison with nearby stations.

Remarks.-- Record is good, except for periods of estimation, which are poor and the period of Jul 29 to Sep 30 after control change is fair. The peak flow should also be considered fair. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Develop new rating after low flow measurements are made.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08231000 LA GARITA CREEK NEAR LA GARITA

RATING TABLE-- LAGLAGCO13 USED FROM 01-OCT-2012 TO 24-JAN-2013  
 LAGLAGCO13-1 USED FROM 25-JAN-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

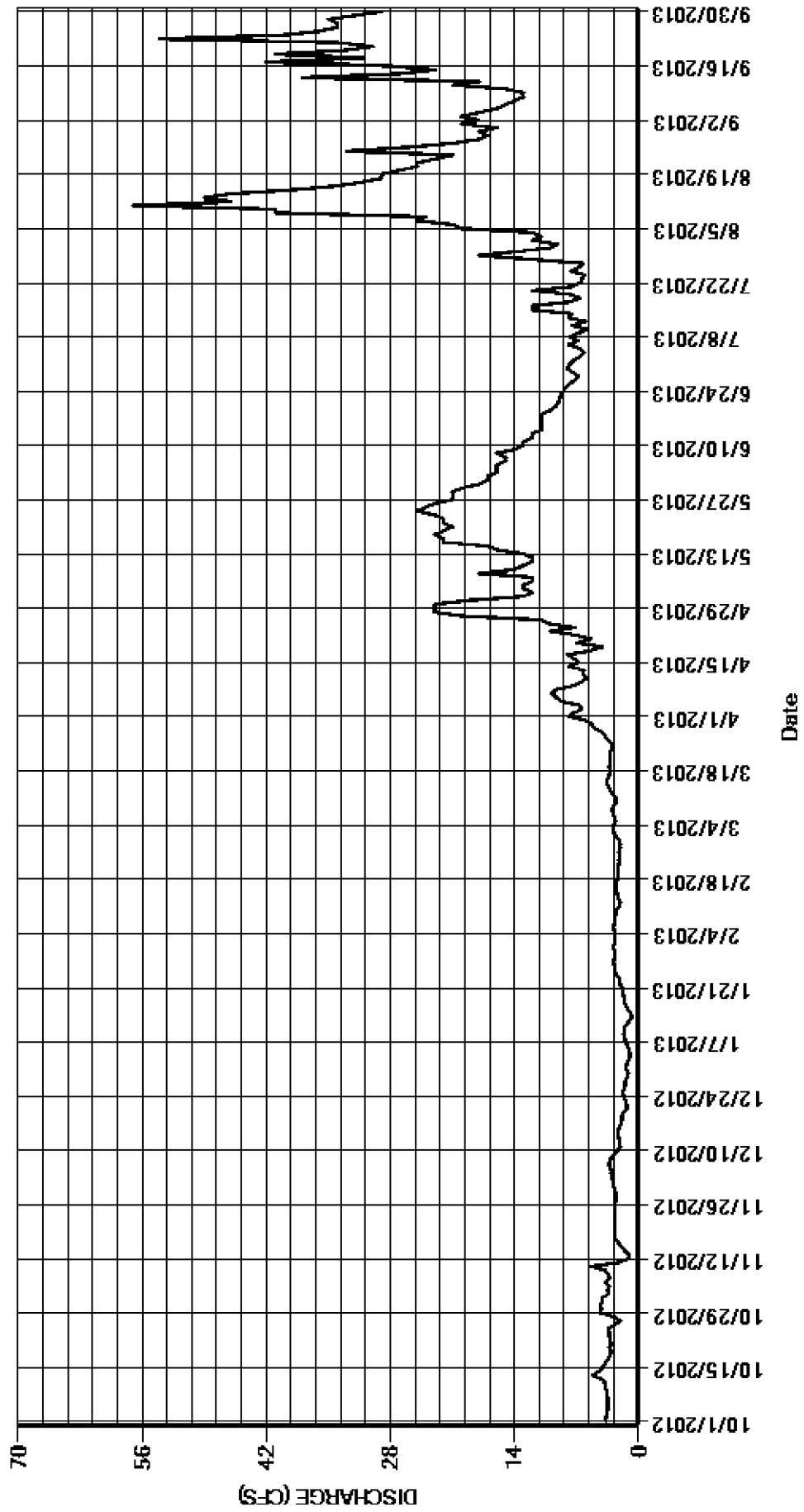
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.7	4.1	e2.9	e1.4	e2.8	e2.5	7.8	19	17	7.8	9.2	20
2	3.7	4.1	e2.9	e1.2	e2.7	e2.8	7.3	13	17	7.3	12	18
3	3.6	3.4	e3.0	e1.0	e2.7	e2.9	6.4	12	16	6.6	11	20
4	3.5	3.5	e3.1	e1.0	e2.7	e2.8	6.7	13	16	6.2	12	18
5	3.5	3.3	e3.1	e1.1	e2.8	e2.6	8.8	13	16	6.6	20	16
6	3.5	3.8	e3.3	e1.3	e2.8	e2.7	9.3	12	15	7.9	21	15
7	3.5	3.3	e3.3	e1.4	e2.7	e2.9	9.8	12	15	6.9	25	14
8	3.6	3.4	e3.1	e1.6	e2.7	e3.0	9.3	18	16	7.7	24	13
9	3.6	3.8	e2.7	e1.7	e2.6	e2.8	7.3	14	14	6.9	41	13
10	3.8	5.3	e2.3	e1.6	e2.5	e2.5	6.4	13	13	5.7	41	15
11	3.8	2.3	e2.1	e1.6	e2.2	e2.6	5.8	12	13	7.5	57	21
12	4.2	e1.2	e2.1	e1.2	e2.1	e3.0	6.3	12	12	6.0	46	18
13	5.2	e1.1	e2.2	e0.80	e2.3	e3.2	6.2	13	12	7.9	49	38
14	4.4	e1.5	e2.3	e0.85	e2.4	e3.4	7.9	16	11	7.5	46	27
15	4.1	e1.9	e2.3	e1.1	e2.5	e3.6	6.8	17	11	12	39	23
16	3.8	e2.2	e2.2	e1.4	e2.5	e3.5	7.3	22	11	12	34	28
17	3.5	e2.6	e2.0	e1.6	e2.5	e3.3	8.0	22	11	7.9	31	42
18	3.2	e2.7	e1.9	e1.6	e2.4	e3.2	5.4	23	11	6.6	29	31
19	3.1	e2.7	e1.9	e1.7	e2.3	e3.3	4.1	22	10	7.8	29	41
20	3.3	e2.7	e1.6	e1.8	e2.3	e3.2	6.9	21	9.4	12	27	33
21	3.1	e2.7	e1.3	e1.9	e2.3	e3.2	5.4	22	9.1	7.7	25	30
22	3.2	e2.7	e1.4	e2.1	e2.2	e3.2	7.1	22	8.9	6.6	25	34
23	3.3	e2.7	e1.5	e2.1	e2.2	e3.2	10	23	8.8	6.4	23	54
24	3.3	e2.7	e1.7	e2.4	e2.2	e3.0	7.2	25	8.5	6.1	21	40
25	3.4	e2.7	e1.8	e2.7	e2.2	e3.0	10	24	8.2	7.6	33	36
26	2.7	e2.7	e1.6	e2.7	e2.1	e3.5	11	23	7.7	6.7	26	34
27	2.1	e2.6	e1.5	e2.8	e2.1	3.8	20	21	7.1	6.3	21	34
28	2.7	e2.5	e1.5	e2.8	e2.2	4.1	23	21	6.8	12	18	35
29	4.3	e2.6	e1.3	e2.7	---	5.0	23	21	7.5	18	17	32
30	4.2	e2.7	e1.2	e2.7	---	5.3	23	20	8.1	14	18	29
31	4.3	---	e1.4	e2.8	---	6.0	---	18	---	10	16	---
TOTAL	111.2	85.5	66.5	54.65	68.0	103.1	283.5	559	347.1	258.2	846.2	822
MEAN	3.59	2.85	2.15	1.76	2.43	3.33	9.45	18.0	11.6	8.33	27.3	27.4
AC-FT	221	170	132	108	135	204	562	1110	688	512	1680	1630
MAX	5.2	5.3	3.3	2.8	2.8	6.0	23	25	17	18	57	54
MIN	2.1	1.1	1.2	0.80	2.1	2.5	4.1	12	6.8	5.7	9.2	13

CAL YR	2012	TOTAL	1903.80	MEAN	5.20	MAX	25	MIN	1.1	AC-FT	3780
WTR YR	2013	TOTAL	3604.95	MEAN	9.88	MAX	57	MIN	0.80	AC-FT	7150

MAX DISCH: 112 CFS AT 17:15 ON AUG 07, 2013 GH 3.19 FT SHIFT 0.07 FT  
 MAX GH: 3.19 FT AT 17:15 ON AUG 07, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08231000 LA GARITA CREEK NEAR LA GARITA  
WY2013 HYDROGRAPH





RIO GRANDE RIVER BASIN  
08235250 ALAMOSA RIVER ABOVE WIGHTMAN FORK NEAR JASPER  
Water Year 2013

Location.-- Lat 37°24'09", long 106°31'17", in SE¼SW¼ sec.35, T.37 N., R.4 E., Rio Grande Co. Hydrologic Unit 13010002, Rio Grande National Forest, on left bank 650 ft. upstream from Wightman Fork, 1.8 mi downstream from Bitter Creek, 4.1 mi west of Jasper, and 4.2 mi southeast of Summitville.

Drainage Area and Period of Record.-- 37.8 mi<sup>2</sup> ; Jul 1995 to current year, no winter record, missing some years.

Equipment.-- Shelter is 4 ft x 4 ft x 8 ft steel building. Gage-height is measured by a Sutron Accubar pressure transducer. A Hydrolab instrument measures water temperature, conductance, and pH data. A Sutron Satlink2 is used to transmit and store data. The Accubar gage-height is set using outside staff gage. Bank-operated cableway installed at site to obtain high flow measurements.

Hydrologic Conditions.-- Undeveloped subalpine and alpine forest.

Gage-Height Record.-- Primary record is 15-minute transmitted data with Satlink2 log as backup. Period of operation: Oct 1 to Nov 3 and May 5 to Sep 30. Record is complete, except for Jul 19-27 and Aug 2-4 when the pressure transducer orifice was buried isolating the gage. There were six instrument calibration corrections ranging from -0.10 to +0.04 ft, which were prorated back to the previous visit. On Jun 8 the instrument was over adjusted by -0.01 ft so a +0.01 ft correction was carried forward to the end of the measurement where the instrument was reset. The stage-discharge relationship was affected by ice on the control Oct 25 - Nov 1, and Nov 3. Pressure transducer orifice was covered or isolated causing unreliable gage-height readings part or all of Jul 12-14, 19-27, and Aug 2-4, 7-9.

Datum Corrections.-- Levels are not run at this station.

Rating.-- Control is cobble channel and banks. Rating ALAWIGCO08a first used May 2, 2011 was used this year. Nine discharge measurements (nos. 80-88) were made during the water year. The measurements ranged in discharge from 7.84 to 215 cfs. Measurements covered the discharge range experienced except for the lower daily flows on Oct 3-11, 18-31; Nov 1-3, and the higher daily flows on May 17, 23-26. The peak flow of 401 cfs occurred at 1945 on May 24, 2013 at a gage height of 5.44 ft with a shift of +0.03 ft. It exceeded high measurement no. 82 (GH = 4.97 ft) made May 18 by 0.47 ft in stage.

Discharge.-- Shifting control method was used to compute discharge during the entire period of record. Shift curves (VS12-I and 13-A) were developed and used Oct 1 - Nov 3 and May 5 to Sep 30 respectively to distribute shifting by stage. Open-water measurement shifts ranged from 0.00 to +0.08 ft; applied shift ranged from +0.01 to +0.08 ft. All open-water measurements were given full weight except for no. 80, 81, 83-85 and 87 which were adjusted as much as 5.4 percent to smooth the shift trend. Periods of ice affected and unreliable gage-height record were estimated.

Special Computations.-- Discharge for periods of estimation was based on weather records, partial stage records, and comparison with nearby stations Wightman Fork at Mouth near Jasper and Alamosa River above Terrace Reservoir.

Remarks.-- Record is fair except for estimated daily discharges, which are poor. Station maintained and record developed by private consultant; record reviewed by Colorado Division of Water Resources, Division 3 personnel.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08235250 ALAMOSA RIVER ABOVE WIGHTMAN FORK NEAR JASPER

RATING TABLE-- ALAWIGCO08a USED FROM 17-DEC-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

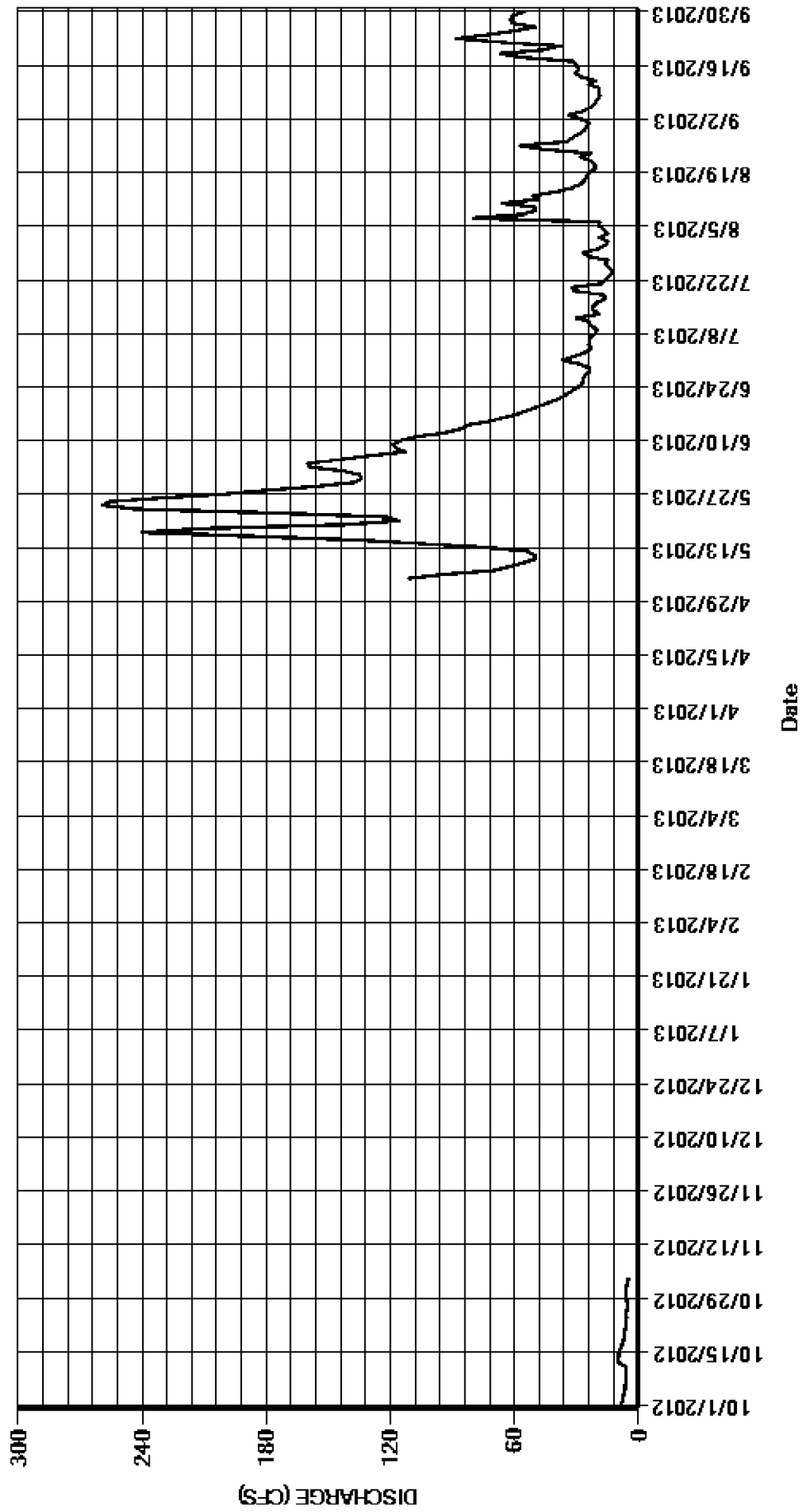
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.5	e6.0	---	---	---	---	---	---	135	37	15	24
2	7.9	5.3	---	---	---	---	---	---	143	31	e19	28
3	7.6	e5.0	---	---	---	---	---	---	159	26	e15	34
4	7.2	---	---	---	---	---	---	---	160	23	e17	27
5	6.7	---	---	---	---	---	---	111	144	24	19	23
6	6.5	---	---	---	---	---	---	95	131	24	19	21
7	6.1	---	---	---	---	---	---	70	113	23	e80	20
8	6.3	---	---	---	---	---	---	63	117	21	e56	19
9	6.0	---	---	---	---	---	---	56	119	20	e50	19
10	6.1	---	---	---	---	---	---	50	115	23	50	19
11	6.1	---	---	---	---	---	---	50	107	24	66	24
12	9.6	---	---	---	---	---	---	54	93	e30	49	21
13	9.9	---	---	---	---	---	---	74	86	e19	51	28
14	9.4	---	---	---	---	---	---	104	82	e22	39	31
15	9.6	---	---	---	---	---	---	134	72	22	32	29
16	8.6	---	---	---	---	---	---	186	65	20	28	30
17	7.9	---	---	---	---	---	---	240	58	16	26	32
18	7.3	---	---	---	---	---	---	209	53	17	25	56
19	7.0	---	---	---	---	---	---	142	48	e31	24	67
20	6.9	---	---	---	---	---	---	116	43	e32	21	46
21	6.4	---	---	---	---	---	---	122	38	e18	21	38
22	6.2	---	---	---	---	---	---	175	35	e16	23	66
23	6.0	---	---	---	---	---	---	243	32	e14	28	88
24	5.9	---	---	---	---	---	---	259	29	e12	23	73
25	e6.0	---	---	---	---	---	---	256	27	e14	46	60
26	e5.6	---	---	---	---	---	---	231	27	e16	57	50
27	e5.2	---	---	---	---	---	---	201	26	e15	35	61
28	e5.8	---	---	---	---	---	---	180	24	24	32	62
29	e6.0	---	---	---	---	---	---	156	24	27	29	61
30	e6.0	---	---	---	---	---	---	138	29	20	26	55
31	e6.0	---	---	---	---	---	---	134	---	16	25	---
TOTAL	216.3	16.3	---	---	---	---	---	3849	2334	677	1046	1212
MEAN	6.98	5.43	---	---	---	---	---	143	77.8	21.8	33.7	40.4
AC-FT	429	32	---	---	---	---	---	7630	4630	1340	2070	2400
MAX	9.9	6.0	---	---	---	---	---	259	160	37	80	88
MIN	5.2	5.0	---	---	---	---	---	50	24	12	15	19

CAL YR	2012	TOTAL	10383.2	MEAN	51.4	MAX	230	MIN	4.4	AC-FT	20600 (PARTIAL YEAR RECORD)	
WTR YR	2013	TOTAL	9350.6	MEAN	51.1	MAX	259	MIN	5.0	AC-FT	18550 (PARTIAL YEAR RECORD)	

MAX DISCH: 401 CFS AT 19:45 ON MAY 24, 2013 GH 5.44 FT SHIFT 0.03 FT  
 MAX GH: 5.44 FT AT 19:45 ON MAY 24, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08235250 ALAMOSA RIVER ABOVE WIGHTMAN FORK NEAR JASPER  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08235270 WIGHTMAN FORK BELOW CROPSY CREEK AT SUMMITVILLE  
Water Year 2013

Location.-- Lat 37°25'45", long 106°35'4" referenced to North American Datum of 1983 (Summitville, CO quad, scale 1:24,000), UTM Zone 13 359822 E and 4143669 N, in NW ¼ NW ¼ sec. 29, T.37 N., R.4 E., New Mexico Principal Meridian, Rio Grande County, CO, Hydrologic Unit 13010002, on left bank 200 ft downstream from Cropsy Creek, and 0.25 mi east of Summitville, CO.

Drainage Area and Period of Record.-- 4.44 mi<sup>2</sup>; July 1995 to current year (seasonal records only).

Equipment.-- Sutron Accubar non-submersible pressure transducer with Sutron Satlink2 data collection platform in a 4-ft by 4-ft by 8-ft steel shelter. The primary reference is outside staff gage on LEW. Sutron Accubar non-submersible pressure transducer is set to average stage over 10 seconds.

Hydrologic Conditions.-- Mainly alpine basin above 11,120 ft in elevation, with some subalpine terrain and large reclaimed open pit mine.

Gage-Height Record.-- Record is complete for period of operation from Oct 1 to Nov 2 and from May 6 to Sep 30 except for Oct 22 - Nov 2 due ice in gage pool isolating the pressure transducer from streamflow and Oct 13 and Sep 28 when it appears that ice blocked off pressure transducer orifice producing unrealistic gage height values. The stage-discharge relation was affected by ice Oct 7-10 and 14-21. There were two instrument calibration corrections of -0.01 ft, which were prorated back to the previous visit.

Datum Corrections.-- Levels are not run at this site.

Rating.-- Control is small, low rock and log dam and at very low flows rock in gage pool. The control is subject to change from material moving through gage pool and control section and excavations in the channel upstream. Rating WFKCRO05-1, first used July 3, 2009, was used all year and is poorly defined. Seven measurements (nos 68-74) were made this year ranging in discharge from 1.68 to 18.9 cfs. Measurements cover the discharge range experienced except for the higher daily flows on May 14-18 and 22-25, and lower daily flows on Oct 1-22, 25, 26; Nov 2; Aug 29-31; Sep 1, 2, 7-10, and 12. The peak flow of 56.7 cfs (rated poor) occurred at 1830 on May 16, 2013, at gage-height of 5.48 ft with a shift of -0.20 ft. It exceeded high measurement no. 69 made May 19 (G.H. 4.86 ft) by 0.62 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record. Shift curves (WFKCROCOVS12-F, WFKCROVS13-C) were developed and used to distribute shifts by time and stage. From Oct 1 to Nov 2 VS12-F was used; from May 6 to Sep 30 VS13-C was used. The bottom ends of these shift curves were left open ended due to PZF changing as material moved through the gage pool and control section. The upper end of VS13-C was left open because measurement shift trend does not indicate convergence with the the rating in the defined portion. Open-water measurement shifts ranged from -0.22 to -0.13 ft; applied shift range from -0.20 ft to -0.13 ft. All open water measurements were given full weight except for nos. 68, 70, and 71 which were adjusted as much as 8.6 percent to smooth the shift trend. Periods of ice affected and unreliable gage-height record were estimated. Due to uncertainties in the upper end of the rating and variable shift curves WFKCROCOVS12-F and WFKCROVS13-C, all flows greater than 20 cfs should be considered poor.

Special Computations.-- Discharge for periods of isolated pressure transducer orifice record, and ice affected record were estimated based on hydrographic comparison with Wightman Fork at Mouth near Jasper (WFKMOUCO) and air temperature data from ALATERCO.

Remarks.-- Record is fair except estimated daily discharges and flows greater than 20 cfs and less than 1 cfs, which are poor. The peak flow is considered poor. Station maintained and record developed by private consultant; record reviewed by Div 3 hydrographic staff.

Recommendations.-- PZF measurements at every opportunity.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08235270 WIGHTMAN FORK BELOW CROPSY CREEK AT SUMMITVILLE

RATING TABLE-- WFKCROCO05-1 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

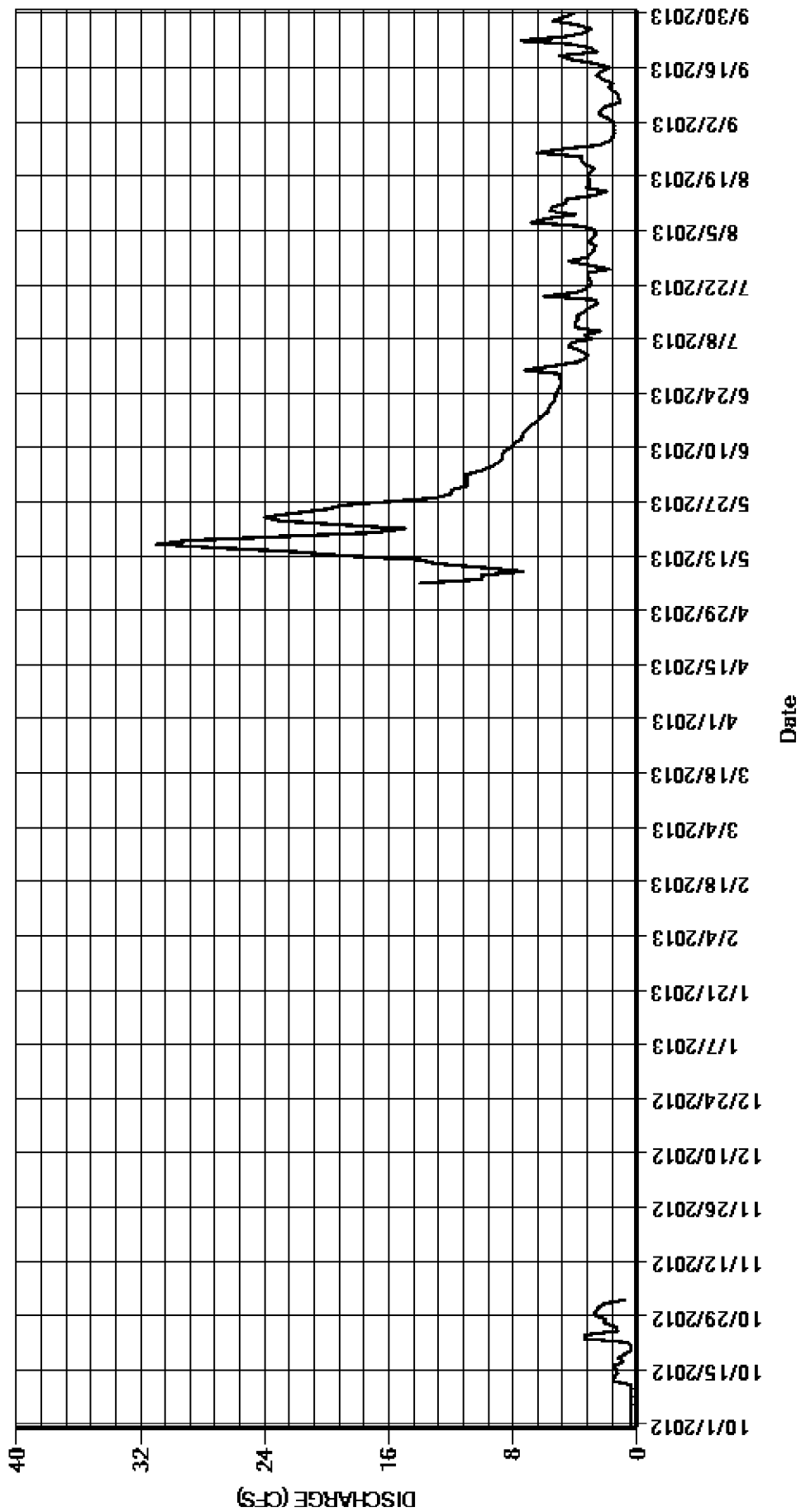
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.42	e2.1	---	---	---	---	---	---	11	5.5	2.7	1.5
2	0.42	e0.80	---	---	---	---	---	---	11	3.9	3.1	1.5
3	0.40	---	---	---	---	---	---	---	11	3.3	2.9	1.9
4	0.39	---	---	---	---	---	---	---	10	3.2	2.7	2.5
5	0.38	---	---	---	---	---	---	---	9.4	3.7	2.7	2.3
6	0.38	---	---	---	---	---	---	14	9.0	4.4	3.5	2.0
7	e0.38	---	---	---	---	---	---	10	8.7	4.2	6.8	1.1
8	e0.38	---	---	---	---	---	---	10	8.7	2.9	5.8	1.2
9	e0.38	---	---	---	---	---	---	7.4	8.6	3.4	4.0	1.2
10	e0.38	---	---	---	---	---	---	10	8.1	2.4	5.6	1.6
11	0.40	---	---	---	---	---	---	13	8.0	4.0	5.5	1.8
12	1.5	---	---	---	---	---	---	14	7.5	4.0	4.6	1.6
13	e1.5	---	---	---	---	---	---	19	7.4	3.8	4.6	2.2
14	e1.3	---	---	---	---	---	---	22	7.3	3.9	2.8	2.6
15	e1.3	---	---	---	---	---	---	27	7.0	3.4	2.0	2.3
16	e1.5	---	---	---	---	---	---	31	6.7	3.1	3.3	1.8
17	e0.90	---	---	---	---	---	---	29	6.4	2.6	3.1	2.7
18	e1.2	---	---	---	---	---	---	23	6.2	2.7	3.1	4.2
19	e0.80	---	---	---	---	---	---	17	5.8	6.0	3.2	5.0
20	e0.40	---	---	---	---	---	---	15	5.7	3.9	3.0	2.6
21	e0.40	---	---	---	---	---	---	19	5.6	3.3	2.8	3.0
22	e0.60	---	---	---	---	---	---	23	5.3	3.0	3.3	4.3
23	e3.4	---	---	---	---	---	---	24	5.3	3.0	3.6	7.5
24	e3.4	---	---	---	---	---	---	22	5.2	3.2	3.6	4.7
25	e1.3	---	---	---	---	---	---	20	5.1	3.2	6.4	3.4
26	e1.3	---	---	---	---	---	---	19	4.9	1.8	4.8	3.0
27	e2.1	---	---	---	---	---	---	16	4.9	3.2	2.4	3.8
28	e2.1	---	---	---	---	---	---	13	5.0	4.4	1.8	e5.4
29	e2.7	---	---	---	---	---	---	12	5.0	3.2	1.6	4.7
30	e2.7	---	---	---	---	---	---	12	7.2	3.0	1.5	4.1
31	e2.5	---	---	---	---	---	---	11	---	2.8	1.5	---
TOTAL	37.21	2.90	---	---	---	---	---	452.4	217.0	108.4	108.3	87.5
MEAN	1.20	1.45	---	---	---	---	---	17.4	7.23	3.50	3.49	2.92
AC-FT	74	5.8	---	---	---	---	---	897	430	215	215	174
MAX	3.4	2.1	---	---	---	---	---	31	11	6.0	6.8	7.5
MIN	0.38	0.80	---	---	---	---	---	7.4	4.9	1.8	1.5	1.1

CAL YR	2012	TOTAL	973.61	MEAN	5.18	MAX	22	MIN	0.32	AC-FT	1930 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	1013.71	MEAN	5.60	MAX	31	MIN	0.38	AC-FT	2010 (PARTIAL YEAR RECORD)

MAX DISCH: 56.7 CFS AT 18:30 ON MAY 16, 2013 GH 5.48 FT SHIFT -0.20 FT (Poor)  
 MAX GH: 5.48 FT AT 18:30 ON MAY 16, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08235270 WIGHTMAN FORK BELOW CROPSEY CREEK AT SUMMITVILLE  
 WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08235290 WIGHTMAN FORK AT MOUTH NEAR JASPER  
Water Year 2013

Location.-- Lat. 37°24'14", Long. 106°31'16", in SE¼SW¼ sec. 35, T.37 N., R.4 E., Rio Grande County, Hydrologic Unit 13010002, on right bank 25' downstream from bridge on Forest Development Road No. 250, about 300' upstream from confluence with Alamosa River, and 4.3 mi southwest of Jasper.

Drainage Area and Period of Record.-- 16.1 mi<sup>2</sup>; July 1995 to current year (seasonal record only).

Equipment.-- Satellite-monitored data collection platform (high data rate Sutron Satlink2) and Sutron Accubar Pressure Transducer and Hydrolab water quality sonde in 4 ft x 4 ft x 8 ft steel shelter. The primary reference gage is an outside staff gage.

Hydrologic Conditions.-- Alpine and subalpine National Forest, also large area of reclaimed open pit mine. Flows influenced by water treatment plant operations at open pit mine.

Gage-Height Record.-- Primary record is 15-minute transmitted data with Satlink2 log as backup. Record is complete and reliable for the period of operation, Oct 1 to Nov 3 and May 5 to Sep 30, except for Jun 5-8 when orifice was buried isolating the gage, and May 28 - Jun 4; Jul 13, 14; Aug 2-4, 27, 28 when the orifice line was covered with silt, which elevated gage heights during parts of the days. The stage-discharge relation was affected by ice Oct 25-31 and Nov 3. There were no instrument calibration corrections.

Datum Corrections.-- Levels are not run at this gage.

Rating.-- Control is a cobble stream channel and banks. Rating no. 7-2, first used May 1, 2011, was used again this year. Eight discharge measurements (nos. 87-94) were made during the water year ranging in discharge from 1.47 to 66.0 cfs. Measurements cover the discharge range experienced except for lower daily flows on Oct 1-11 and 19-22 and higher daily flows on May 15-17. The peak flow of 188 cfs occurred at 1845 on May 16, 2013 at a gage height of 4.79 feet with a shift of -0.05 ft. It exceeded high measurement no. 89 (GH = 4.38 ft), made May 18 by 0.41 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record. Shift curves (WFKMOUCOV12-G and 13-A) were developed and used Oct 1 - Nov 4 and May 4 - Jul 14 to distribute shifting by stage and time. Shifts were applied as defined by measurements and distributed by time Jul 14 - Sep 30. Both variable shift curves were left open on both ends due to aggradation of the stream in and below the control section causing the negative shift trend. Open-water measurement shifts ranged from -0.07 to -0.03 ft; applied shifts ranged from -0.07 to -0.04 ft. All open water measurements were given full weight except for nos. 88 - 91, which were adjusted as much as 5.4 percent to smooth the shift trend. Periods of ice affected and unreliable gage-height record were estimated.

Special Computations.-- Discharge for periods of ice affected record and days when the pressure transducer line orifice was silted over were estimated using temperature records, partial day good record and good record before and after affected periods.

Remarks.-- Record is good except for estimated daily discharges, which are poor. The peak for the water year is rated fair. Station maintained and record developed by private consultant; record reviewed by Div 3 personnel.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08235290 WIGHTMAN FORK AT MOUTH NEAR JASPER

RATING TABLE-- WFKMOUCO07-2 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.4	3.2	---	---	---	---	---	---	e13	12	4.3	3.5
2	1.3	1.7	---	---	---	---	---	---	e12	8.3	e7.2	3.6
3	1.3	e1.9	---	---	---	---	---	---	e11	6.9	e6.0	4.3
4	1.3	---	---	---	---	---	---	---	e11	6.0	e4.8	4.7
5	1.3	---	---	---	---	---	---	36	e11	6.5	4.3	4.0
6	1.3	---	---	---	---	---	---	29	e11	8.3	4.9	3.7
7	1.2	---	---	---	---	---	---	21	e11	8.0	13	2.9
8	1.2	---	---	---	---	---	---	22	e11	5.9	15	2.8
9	1.2	---	---	---	---	---	---	15	12	6.8	13	3.0
10	1.3	---	---	---	---	---	---	17	11	5.0	12	3.0
11	1.3	---	---	---	---	---	---	23	11	7.3	16	4.5
12	2.2	---	---	---	---	---	---	26	10	8.6	11	3.8
13	2.4	---	---	---	---	---	---	40	9.6	e6.9	11	6.5
14	2.2	---	---	---	---	---	---	50	9.3	e6.8	7.3	5.5
15	2.3	---	---	---	---	---	---	68	8.8	6.7	5.5	5.5
16	2.5	---	---	---	---	---	---	89	8.5	5.5	5.7	5.2
17	1.9	---	---	---	---	---	---	79	8.1	5.0	5.3	4.8
18	1.5	---	---	---	---	---	---	56	7.8	4.0	5.5	6.7
19	1.4	---	---	---	---	---	---	40	7.4	12	5.8	13
20	1.4	---	---	---	---	---	---	32	7.0	8.1	5.0	6.2
21	1.4	---	---	---	---	---	---	39	6.8	5.8	4.7	5.8
22	1.4	---	---	---	---	---	---	49	6.7	5.0	5.1	8.5
23	4.1	---	---	---	---	---	---	50	6.5	4.8	6.4	17
24	4.7	---	---	---	---	---	---	49	6.4	4.9	5.5	12
25	e2.3	---	---	---	---	---	---	40	6.2	5.2	10	7.8
26	e2.3	---	---	---	---	---	---	35	6.1	4.1	11	6.6
27	e3.0	---	---	---	---	---	---	28	6.2	4.6	e5.0	8.3
28	e3.0	---	---	---	---	---	---	e22	6.5	8.0	e4.0	9.7
29	e4.0	---	---	---	---	---	---	e19	6.6	6.1	3.8	10
30	e4.0	---	---	---	---	---	---	e17	9.7	4.9	3.4	8.6
31	e3.4	---	---	---	---	---	---	e14	---	4.5	3.3	---
TOTAL	65.5	6.8	---	---	---	---	---	1005	269.2	202.5	224.8	191.5
MEAN	2.11	2.27	---	---	---	---	---	37.2	8.97	6.53	7.25	6.38
AC-FT	130	13	---	---	---	---	---	1990	534	402	446	380
MAX	4.7	3.2	---	---	---	---	---	89	13	12	16	17
MIN	1.2	1.7	---	---	---	---	---	14	6.1	4.0	3.3	2.8

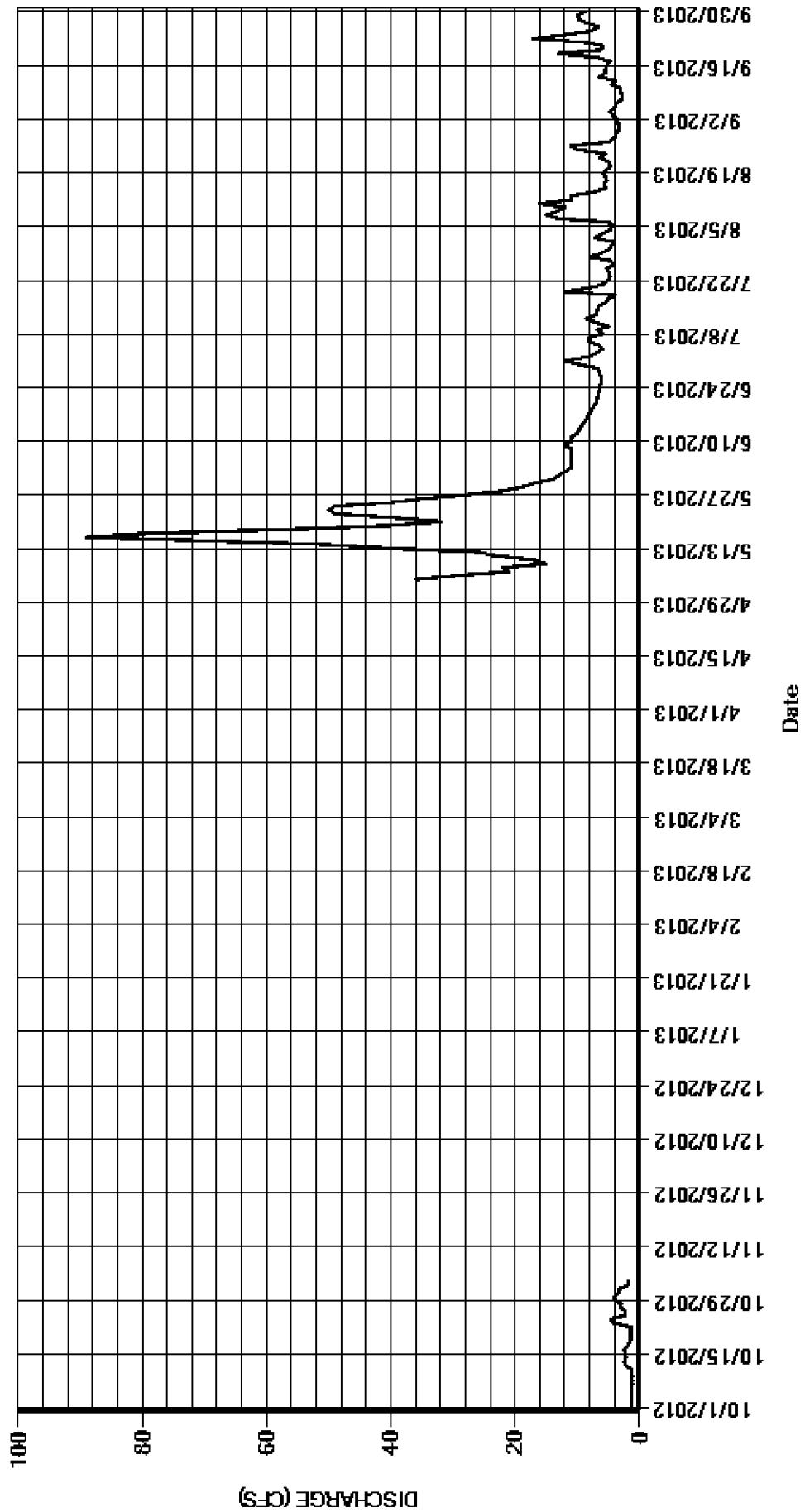
CAL YR	2012	TOTAL	2333.3	MEAN	11.6	MAX	86	MIN	1.0	AC-FT	4630 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	1965.3	MEAN	10.7	MAX	89	MIN	1.2	AC-FT	3900 (PARTIAL YEAR RECORD)

MAX DISCH: 188 CFS AT 18:45 ON MAY 16, 2013 GH 4.79 FT SHIFT -0.05 FT  
 MAX GH: 4.79 FT AT 18:45 ON MAY 16, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



08235290 WIGHTMAN FORK AT MOUTH NEAR JASPER  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
ALAMOSA RIVER BELOW RANGER CREEK NEAR JASPER

Water Year 2013

Location.-- Lat 37° 23' 23", long 106° 22' 43" referenced to North American Datum of 1983 (Jasper, CO quad, scale 1:24,000), UTM Zone 13 377962 E and 4138995 N, in SW ¼ NE ¼ sec. 11, T.36 N., R.5 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010002, on right bank 30 ft above Silver Lakes Road Bridge, 0.4 mi below Ranger Creek and 4 mi above Terrace Reservoir.

Drainage Area and Period of Record.-- Not determined; 2003 to current year.

Equipment.-- Shelter is 4 ft x 4 ft x 8 ft steel building equipped with Sutron Accubar to measure stream stage and Hydrolab to measure water temperature, specific conductance, and pH data. Sutron Satlink2 used to transmit and store data. Outside staff gage is primary reference gage. No change.

Hydrologic Conditions.-- Undeveloped steep alpine and subalpine terrain.

Gage-Height Record.-- Primary record is 15-minute transmitted data with Satlink2 log as backup. Record is complete and reliable for the period of operation, Oct 1 to Nov 3 and May 5 to Sep 30, except for May 5-19; Jul 11-14, 27-31; Aug 1-3, 9, 10, 14-18; and Sep 20-22, 26-29 when the orifice line was buried in silt causing gage height to be elevated part of the time. There were four calibration corrections ranging from a -0.02 ft to +0.01 ft applied; all were prorated back to the last measurement or gage visit. A +0.04 pressure transducer correction was applied on Sep 29 for a forty five minute period due to an overcorrection. Peak logged gage-height (4.40 ft at 2045 on May 17) was affected by pressure spike from orifice line being affected by silt. Due to the potential uncertainty, this value should be considered fair. Gage height was affected by backwater from ice Oct 26-28.

Datum Corrections.-- Levels are not run at this station.

Rating.-- Control is primarily stream channel of rock and earthen banks. Bridge on downstream side of gage is also part of the control. Channel is stable at low and medium flows but can change at very high flows. Rating no. 5\_1, first used Oct 1, 2008, was used again this year. Nine discharge measurements (nos. 87-95) were made this year ranging in discharge from 17.1 to 299 cfs. Measurements cover the discharge range experienced except for lower daily flows on Oct 1-12, 14-31; Nov 1-3; and higher daily flows on May 17, 24, and 25. The peak flow, during reliable record, of 454 cfs occurred at 2215 on May 24, 2013 at a gage height of 4.31 ft with a 0.00 ft shift. It exceeded high measurement no. 89 (GH=3.98 ft), made May 18 by 0.33 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record. Shift curves ALARANCOVS12-B and ALARANCOVS13-A were developed and used Oct 1 - Nov 3 and Sep 29 - 30 respectively to distribute shifting by stage and time. Rating table ALARANCO05\_1 was applied with no shift from Apr 30 - Aug 28, then prorated to ALARANCOVS13-A from Aug 28 to Sep 29 during a period of fill. Open-water measurement shifts ranged from -0.04 ft to +0.02 ft; applied shifts ranged from -0.03 ft to 0.00 ft. All open water measurements were given full weight except for nos. 87, 88, 89, 92, 93, and 94 which were adjusted as much as 7.7 percent to smooth the shift trend. Periods of ice affected and unreliable gage-height record were estimated.

Special Computations.-- Discharge for periods of no gage-height and gage-height not representative of average for day record were estimated using hydrographic comparison with Alamosa River above Terrace Reservoir gaging station and measurements.

Remarks.-- Record is good except for estimated daily discharges and peak stage and discharge, which are poor. Station maintained and record developed by private consultant; record reviewed by Colorado Division of Water Resources, Division 3 personnel.

Recommendations.-- Install radar sensor to eliminate buried orifice issues.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

ALAMOSA RIVER BELOW RANGER CREEK NEAR JASPER

RATING TABLE-- ALARANCO05\_1 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

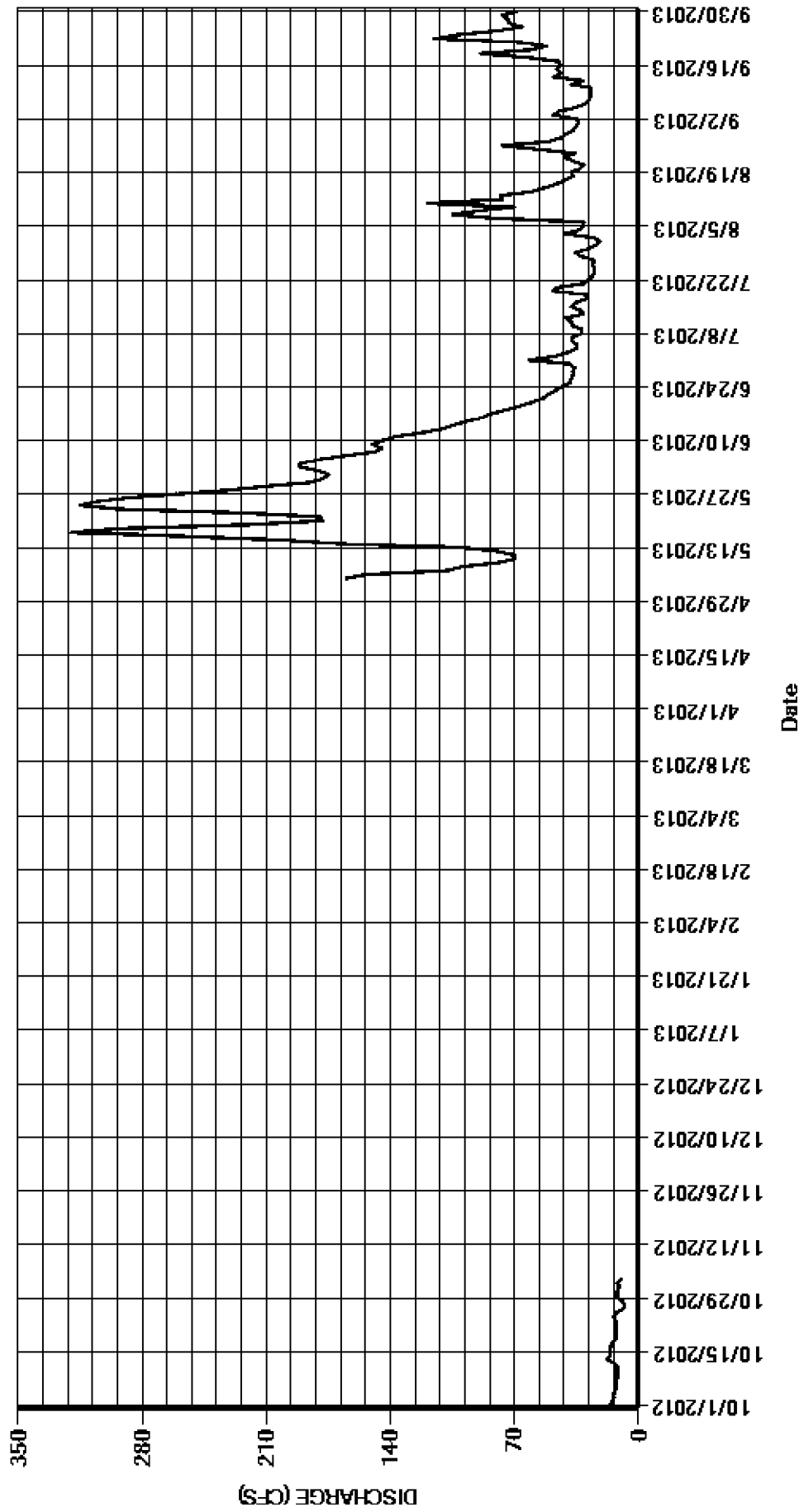
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16	11	---	---	---	---	---	---	175	62	e22	34
2	15	12	---	---	---	---	---	---	180	47	e25	35
3	14	10	---	---	---	---	---	---	191	40	e42	48
4	14	---	---	---	---	---	---	---	191	35	33	45
5	13	---	---	---	---	---	---	e165	180	35	31	35
6	13	---	---	---	---	---	---	e154	166	38	31	30
7	13	---	---	---	---	---	---	e108	149	37	83	28
8	12	---	---	---	---	---	---	e100	145	32	105	27
9	12	---	---	---	---	---	---	e80	150	32	e90	27
10	12	---	---	---	---	---	---	e70	144	37	e70	27
11	12	---	---	---	---	---	---	e70	137	e38	119	38
12	14	---	---	---	---	---	---	e80	122	e41	77	31
13	18	---	---	---	---	---	---	e100	111	e31	78	48
14	16	---	---	---	---	---	---	e168	104	e33	e60	44
15	16	---	---	---	---	---	---	e200	97	38	e53	46
16	16	---	---	---	---	---	---	e256	88	35	e46	44
17	15	---	---	---	---	---	---	e320	83	29	e42	45
18	13	---	---	---	---	---	---	e290	75	29	e37	63
19	13	---	---	---	---	---	---	e220	67	48	38	89
20	13	---	---	---	---	---	---	178	60	46	33	e61
21	13	---	---	---	---	---	---	180	54	31	31	e52
22	13	---	---	---	---	---	---	221	51	28	37	e67
23	13	---	---	---	---	---	---	293	47	26	42	115
24	14	---	---	---	---	---	---	315	43	25	36	102
25	13	---	---	---	---	---	---	306	39	25	56	80
26	e9.0	---	---	---	---	---	---	289	38	26	77	e66
27	e8.0	---	---	---	---	---	---	261	37	e25	51	e73
28	e9.0	---	---	---	---	---	---	232	37	e32	44	e74
29	12	---	---	---	---	---	---	211	36	e36	41	e77
30	12	---	---	---	---	---	---	186	39	e29	37	69
31	12	---	---	---	---	---	---	178	---	e24	35	---
TOTAL	408.0	33	---	---	---	---	---	5231	3036	1070	1602	1620
MEAN	13.2	11.0	---	---	---	---	---	194	101	34.5	51.7	54.0
AC-FT	809	65	---	---	---	---	---	10380	6020	2120	3180	3210
MAX	18	12	---	---	---	---	---	320	191	62	119	115
MIN	8.0	10	---	---	---	---	---	70	36	24	22	27

CAL YR	2012	TOTAL	15124.0	MEAN	74.9	MAX	334	MIN	8.0	AC-FT	30000 (PARTIAL YEAR RECORD)	
WTR YR	2013	TOTAL	13000.0	MEAN	71.0	MAX	320	MIN	8.0	AC-FT	25790 (PARTIAL YEAR RECORD)	

MAX DISCH: 454 CFS AT 22:15 ON MAY 24, 2013 GH 4.31 FT SHIFT 0.00 FT  
 MAX GH: 4.31 FT AT 22:15 ON MAY 24, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ALAMOSA RIVER BELOW RANGER CREEK NEAR JASPER  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08236000 ALAMOSA RIVER ABOVE TERRACE RESERVOIR  
Water Year 2013

Location.-- Lat 37° 22' 28", long 106° 19' 57" referenced to North American Datum of 1983 (Terrace Reservoir, CO quad, scale 1:24,000), UTM Zone 13 382021 E and 4137254 N, in NE ¼ NE ¼ sec. 17, T.36 N., R.6 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010002, on left bank 0.8 mi upstream from high-water line of Terrace Reservoir, 3.0 mi downstream from French Creek, and 15 mi northwest of Capulin.

Drainage Area and Period of Record.-- 107 mi<sup>2</sup> (from topographic maps); Sept. 29, 1911 to June 4, 1912, Apr. 25, 1914 to Sept. 30, 1927, Oct. 1, 1934 to current year.

Equipment.-- Sutron Satlink2, float-operated Sutron Stage Discharge Recorder (SDR), and air temperature sensor in a 4-ft diameter metal shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Cableway located 10 feet below gaging station.

Hydrologic Conditions.-- Undeveloped steep alpine and subalpine terrain.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log and SDR log as backup. Record is complete and reliable except for Nov 28 - Mar 19 when station was closed; Mar 24-27 when the float was frozen; and Apr 28 - May 1 when float tape slipped off pins. There were two instrument calibration corrections: a +0.11 ft on Mar 27 caused by ice in well, which was not applied to record; and a +0.01 ft on Aug 19, which was prorated by time from previous visit. The stage-discharge relation was affected by ice Oct 26-28, Nov 10-27, and Mar 23.

Datum Corrections.-- Levels were last run Sep 9, 2011 to the Reference Point (RP) inside the gage using BM #1 as base. The RP elevation was found to be within allowable limits, so a correction was not made. A two-peg test was performed on the Lietz level (SN 130869) on Sep 26, 2011, and found to be out of tolerance and adjusted.

Rating.-- Control is a cobblestone riffle approximately fifty feet below the gage. Rating no. 18, in use since Mar 20, 2012 was used for the entire water year. Rating no. 18 is fairly well defined from 10 cfs to approximately 1300 cfs. This rating was created because the control was slightly modified by heavy equipment in the gage pool during the fall of WY2011. Seventeen measurements (nos. 235-251) were made this year ranging in discharge from 6.70 to 263 cfs. The measurements cover the discharge range experienced except for the higher daily flows on May 16-18, 23-27. The peak discharge of 441 cfs occurred at 2330 on May 17, 2013 at a gage height of 2.38 ft with a shift of -0.01 ft. The peak exceeded high measurement no. 245 (GH=1.95 ft) made on May 17 by 0.43 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record for all open-water periods. Periods of ice affected, unreliable, and no stage record were estimated. Shift curves (VS13-H, VS13-I, VS13-J, and VS13-RT) were developed and used during the course of the year to distribute shifting by stage and time. Open-water measurement shifts ranged from -0.03 to +0.02 ft and applied shifts ranged from -0.03 to +0.01 ft. All were given full weight except nos. 244, 248, 249, and 251, which were adjusted by as much as 2.3% to smooth the shift trends.

Special Computations.-- Discharge for periods of ice affected, unreliable, and no gage-height record were estimated using measurements, weather records, partial day record, and comparison with Terrace Reservoir gain and outflow.

Remarks.-- Record is good except for periods of estimation, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08236000 ALAMOSA RIVER ABOVE TERRACE RESERVOIR

RATING TABLE-- ALATERCO18 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

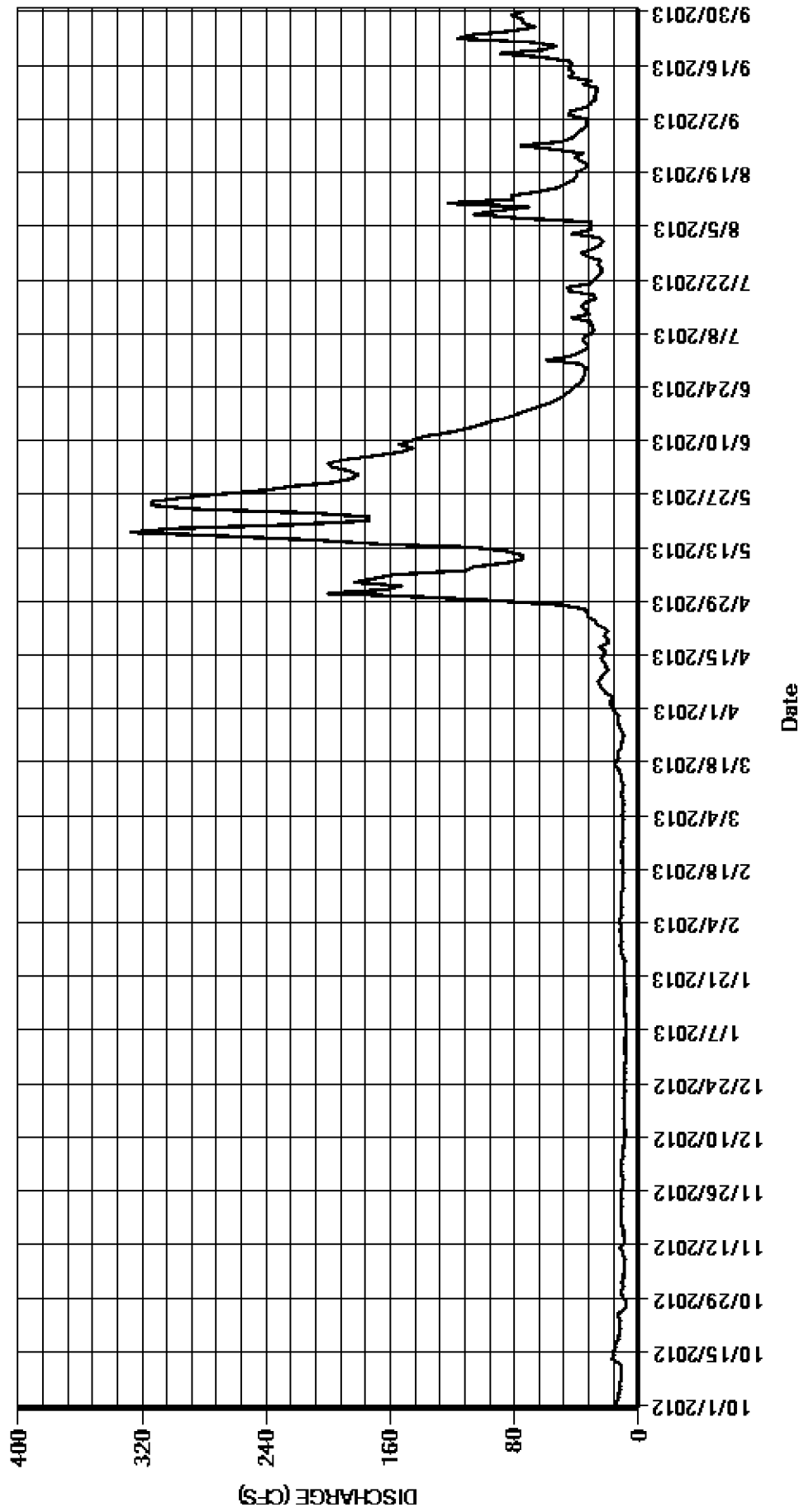
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	10	e11	e8.8	e11	e10	17	e200	181	59	23	34
2	14	11	e11	e8.8	e12	e10	18	162	186	44	26	34
3	13	9.8	e11	e8.6	e11	e10	18	153	198	38	43	45
4	13	9.7	e11	e8.6	e12	e11	17	183	200	33	31	44
5	12	9.0	e10	e8.6	e12	e10	21	170	189	33	31	34
6	12	9.2	e10	e8.4	e11	e10	23	157	171	36	31	31
7	12	9.1	e10	e8.4	e11	e9.8	25	112	153	35	77	28
8	11	8.8	e9.6	e8.4	e11	e10	26	106	146	30	106	28
9	11	10	e9.2	e8.4	e11	e11	24	85	154	29	90	27
10	11	e10	e8.8	e8.4	e11	e11	22	75	146	30	71	27
11	11	e12	e8.6	e8.8	e11	e10	20	75	139	31	123	36
12	13	e9.8	e9.0	e9.2	e11	e10	21	85	123	43	81	31
13	17	e9.2	e9.0	e9.2	e10	e11	22	106	111	32	82	45
14	16	e9.6	e9.2	e9.2	e10	e11	24	171	102	34	64	42
15	16	e9.6	e9.6	e9.0	e10	e12	22	207	95	37	53	45
16	15	e10	e9.4	e8.8	e10	e13	22	264	84	34	47	43
17	15	e11	e9.4	e8.6	e10	e15	25	327	78	28	42	44
18	13	e11	e9.2	e8.8	e10	e15	20	299	71	29	40	61
19	13	e11	e9.4	e9.0	e10	e13	20	222	63	45	40	89
20	12	e11	e9.6	e9.2	e11	13	22	174	56	46	35	62
21	12	e11	e9.2	e9.2	e10	13	20	174	51	31	33	53
22	12	e11	e8.8	e9.2	e10	11	22	210	47	28	37	68
23	12	e11	e9.2	e9.4	e10	e11	27	286	44	26	41	117
24	13	e11	e9.2	e9.0	e11	e10	28	314	41	24	36	107
25	13	e11	e9.0	e8.8	e11	e9.8	33	314	38	24	54	81
26	e9.5	e11	e9.0	e10	e10	e11	33	296	36	26	76	67
27	e8.0	e10	e8.8	e11	e10	e12	35	270	35	25	50	74
28	e8.0	e10	e9.0	e11	e10	13	e50	241	35	33	43	75
29	10	e10	e9.0	e12	---	13	e87	224	34	37	40	82
30	11	e11	e8.4	e11	---	13	e136	197	38	30	37	74
31	11	---	e8.4	e11	---	15	---	185	---	25	34	---
TOTAL	383.5	307.8	292.0	286.8	298	357.6	900	6044	3045	1035	1617	1628
MEAN	12.4	10.3	9.42	9.25	10.6	11.5	30.0	195	102	33.4	52.2	54.3
AC-FT	761	611	579	569	591	709	1790	11990	6040	2050	3210	3230
MAX	17	12	11	12	12	15	136	327	200	59	123	117
MIN	8.0	8.8	8.4	8.4	10	9.8	17	75	34	24	23	27

CAL YR	2012	TOTAL	19906.3	MEAN	54.4	MAX	335	MIN	8.0	AC-FT	39480
WTR YR	2013	TOTAL	16194.7	MEAN	44.4	MAX	327	MIN	8.0	AC-FT	32120

MAX DISCH: 441 CFS AT 23:30 ON MAY 17, 2013 GH 2.38 FT SHIFT -0.01 FT  
 MAX GH: 2.38 FT AT 23:30 ON MAY 17, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08236000 ALAMOSA RIVER ABOVE TERRACE RESERVOIR  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08236500 ALAMOSA RIVER BELOW TERRACE RESERVOIR

Water Year 2013

Location.-- Lat 37° 21' 14", long 106° 16' 42" referenced to North American Datum of 1983 (Terrace Reservoir, CO quad, scale 1:24,000), UTM Zone 13 386788 E and 4134887 N, in NE ¼ SE ¼ sec. 23, T.36 N., R.6 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010002, on left bank 0.5 mi downstream from Terrace Reservoir, 11.0 mi northwest of Capulin, CO.

Drainage Area and Period of Record.-- 116 mi<sup>2</sup>, approximately (from topographic maps) ; 1909-1915, 1917-1928 (partial year records on many years), 1929 to current year.

Equipment.-- Graphic water-stage recorder, data collection platform (Sutron Model Satlink Logger) and a float-operated shaft encoder in a 6-foot square concrete aggregate shelter and 3 ft diameter concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. A bank-operated cableway is located 100 feet downstream. No change.

Hydrologic Conditions.-- Flow at gage is completely regulated by Terrace Reservoir.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Dec 20 - Feb 21 when the well was frozen and Apr 4, 5 when Satlink and chart recorder malfunctioned. A +0.01 ft instrument calibration correction was made on Aug 19 and prorated by time from previous visit.

Datum Corrections.-- Levels were last run Aug 8, 2012 to the Reference Point (RP) inside the gage using BM1 as base. The RP elevation was found to be within limits, so no correction was made or required. Two-peg test was performed on the Lietz level (SN 130869) on Aug 6, 2012 and the instrument was within tolerance.

Rating.-- Control is a gravel and cobblestone riffle approximately one hundred fifty feet below the gage. Rating no. 15, in use since Jan 11, 2012, was used again this year. Rating no. 15 was developed from recent measurements 168-192 made during the 2011-2012 water years along with high flow measurements 70-71 made in 2005; no. 120 made in 2008; and no. 135 made in 2009. The gage was re-located to the current location in 1988. These measurements ranged from a gage-height of 1.90 ft with a discharge of 1.74 cfs to a gage-height of 4.70 ft with a discharge of 951 cfs. A PZF of 1.63 ft was measured on Nov 15, 2011, when the low measurement during this period was made. This PZF measurement along with consistent positive shifts since early spring 2011 indicates control scour. Rating 15 has 6 definition points including the PZF, 2 breakpoints, and 3 offsets. The high end offset is 2.70 ft which was determined by observation of best fit. A breakpoint at 3.65 ft defines the approximate point where the control transitions from section to channel. Rating no. 15 was extended above high flow measurement by 0.80 ft to a streamflow of 1560 cfs, which is 64 percent greater than the highest measurement (no. 70) at this site since 1988. Sixteen measurements (nos. 196-211) were made this year ranging in discharge from 1.31 to 318 cfs. They cover the discharge range experienced except for higher daily flows May 18, 19, 25, 26. The peak flow of 507 cfs occurred at 0930 on May 18, 2013 at a gage height of 4.02 with a shift of 0.00 ft. It exceeded high measurement no. 205 (GH = 3.69 ft), made May 17, by 0.33 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record during all periods of reliable stage record. Periods of unreliable stage record were estimated. Shift curve (VS12-A) was carried from last year into period of frozen well. Shift curves (VS13-D, VS13-E, and VS13-F) were developed and used coming out of frozen well period through the end of the year. These shift curves are very similar and indicate very minimal shift change. Measurement shifts ranged from -0.02 to +0.06 ft and applied shifts ranged from 0 to +0.04 ft. All measurements were given full weight and applied except nos. 196, 197, 205, 206, 207, and 208, which were adjusted as much as 6.8% to smooth shift trends.

Special Computations.-- Discharge for periods of unreliable gage-height was estimated using measurements, partial day records, temperature records, and Terrace Reservoir storage elevation.

Remarks.-- Record is good except for periods of estimation, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08236500 ALAMOSA RIVER BELOW TERRACE RESERVOIR

RATING TABLE-- ALABELCO15 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

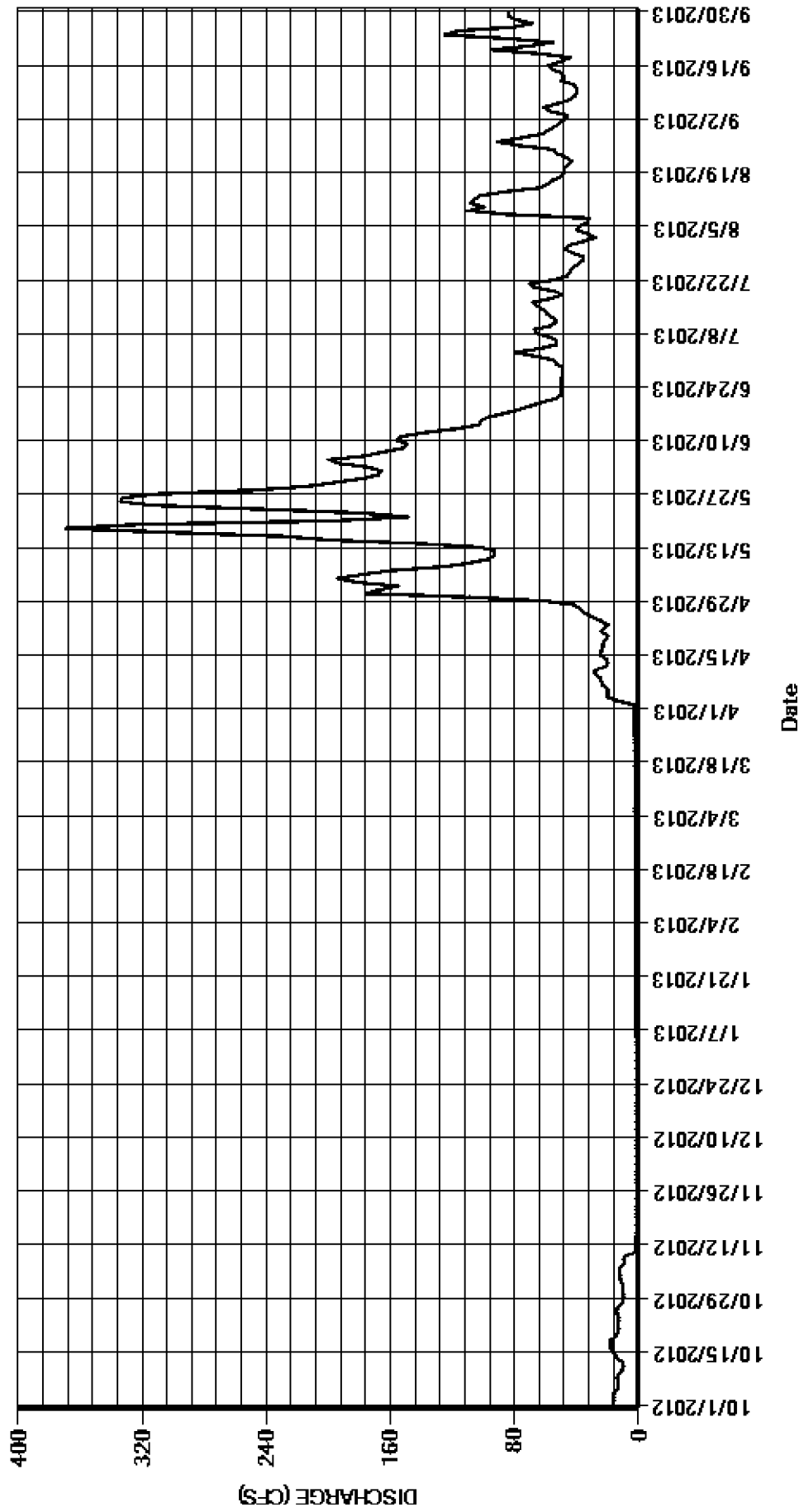
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	10	1.4	e1.4	e1.9	2.1	2.8	176	168	55	36	51
2	16	11	1.4	e1.4	e1.9	2.3	2.8	166	166	67	28	47
3	16	12	1.4	e1.4	e1.9	2.3	14	155	175	79	33	46
4	16	12	1.4	e1.4	e2.0	2.4	e20	182	194	63	40	57
5	14	12	1.4	e1.4	e2.0	2.4	e20	194	200	53	38	61
6	13	12	1.4	e1.5	e2.0	2.4	20	178	176	53	33	52
7	13	9.2	1.4	e1.5	e2.0	2.3	23	160	165	58	32	44
8	14	9.7	1.4	e1.5	e2.0	2.2	24	126	152	66	85	41
9	13	8.2	1.4	e1.5	e2.0	2.2	25	108	149	67	110	40
10	11	1.6	1.4	e1.5	e2.0	2.3	28	97	156	57	100	40
11	9.8	1.5	1.4	e1.6	e2.0	2.3	28	93	153	53	108	42
12	10	1.5	1.4	e1.6	e2.0	2.2	21	93	138	55	106	50
13	13	1.5	1.4	e1.6	e2.1	2.3	20	101	118	59	102	48
14	15	1.5	1.4	e1.6	e2.1	2.3	21	138	103	61	85	50
15	17	1.4	1.4	e1.6	e2.1	2.3	25	197	102	65	64	56
16	18	1.4	1.4	e1.7	e2.1	2.3	24	230	98	68	58	58
17	18	1.4	1.4	e1.7	e2.1	2.3	23	303	88	57	55	50
18	18	1.4	1.4	e1.7	e2.1	2.3	23	369	78	49	50	44
19	15	1.4	1.4	e1.7	e2.1	2.3	21	325	70	54	48	64
20	13	1.4	e1.3	e1.7	e2.1	2.3	20	195	62	67	48	94
21	13	1.4	e1.3	e1.8	e2.1	2.4	24	149	53	70	46	70
22	13	1.4	e1.3	e1.8	2.1	2.4	22	178	50	54	43	55
23	13	1.4	e1.3	e1.8	2.1	2.4	20	244	50	46	47	83
24	13	1.4	e1.3	e1.8	2.1	2.4	25	314	50	44	53	125
25	14	1.4	e1.3	e1.8	2.1	2.5	30	334	50	43	55	116
26	14	1.4	e1.3	e1.8	2.1	2.6	35	333	50	39	77	80
27	12	1.4	e1.3	e1.8	2.1	2.6	38	312	49	36	91	69
28	10	1.4	e1.3	e1.9	2.0	2.6	41	249	49	36	76	80
29	9.9	1.4	e1.3	e1.9	---	2.7	60	214	49	43	62	84
30	9.9	1.4	e1.3	e1.9	---	2.7	109	196	53	48	58	84
31	10	---	e1.3	e1.9	---	2.8	---	178	---	45	54	---
TOTAL	421.6	126.1	42.2	51.2	57.2	73.9	809.6	6287	3214	1710	1921	1881
MEAN	13.6	4.20	1.36	1.65	2.04	2.38	27.0	203	107	55.2	62.0	62.7
AC-FT	836	250	84	102	113	147	1610	12470	6370	3390	3810	3730
MAX	18	12	1.4	1.9	2.1	2.8	109	369	200	79	110	125
MIN	9.8	1.4	1.3	1.4	1.9	2.1	2.8	93	49	36	28	40

CAL YR	2012	TOTAL	21526.9	MEAN	58.8	MAX	366	MIN	1.3	AC-FT	42700
WTR YR	2013	TOTAL	16594.8	MEAN	45.5	MAX	369	MIN	1.3	AC-FT	32920

MAX DISCH: 507 CFS AT 09:30 ON MAY 18, 2013 GH 4.02 FT SHIFT 0.00 FT  
 MAX GH: 4.02 FT AT 09:30 ON MAY 18, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08236500 ALAMOSA RIVER BELOW TERRACE RESERVOIR  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08238000 LAJARA CREEK AT GALLEGOS RANCH NEAR CAPULIN  
Water Year 2013

Location.-- Lat 37°12'36", long 106°11'16" referenced to North American Datum of 1983 (Vicente Canyon, CO quad, scale 1:24,000), UTM Zone 13 394608 E and 4118841 N, in NW ¼ NE ¼ sec. 10, T.34 N., R.7 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010002, on left bank 2.7 mi downstream from Canyon Del Rancho, 7 mi southwest of Capulin, CO, and 16.5 mi downstream from La Jara Reservoir.

Drainage Area and Period of Record.-- Approximately 98 mi<sup>2</sup>; April 1916 to November 1917, April 1919 to Nov 1923, May 1936 to current year. No winter records prior to 1950 except water year 1944. Monthly discharge only for some periods.

Equipment.-- Sutron Satlink2 and float-operated SDR and a tipping-bucket rain gauge in a 42-inch diameter CMP shelter and well. The primary reference gage is a drop tape from reference point on shelf. The secondary reference is an outside cantilever staff gage.

Hydrologic Conditions.-- Basin predominately subalpine, undeveloped National Forest with flow somewhat regulated by La Jara Reservoir (capacity 14,040 acre-ft) 16 1/2 mi upstream. Small diversions above station for irrigation.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted data with DCP and SDR log as backup. Record is complete and reliable except for Dec 9 through Mar 17, 24-27, when the well or inlets were frozen. Two erroneous unit values were corrected on May 30 during a measurement. There were 3 instrument calibration corrections ranging from -0.01 to +0.01 ft, which were prorated from the previous visit. The float tape was slightly off pulley pins on Aug 8 and a -0.03 ft correction was applied from the assumed point of slippage on Aug 7. The stage-discharge relation was affected by ice Oct 26-31; Nov 1-30; Dec 1 -8; and Mar 18-23, Apr 10,11,18,19.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on Sep 9, 2011 using B.M. No. 1 as base. The RP was outside allowable limits and a -0.02 ft correction was made. Two-peg test was performed on the Lietz level (SN 130869) on Jul 28, 2011 and the instrument was within allowable limits and no correction was made.

Rating.-- The control is a concrete broad crested weir with a v-notch cut into its center, approximately 15 feet below the gage. Minor shifting occurs mainly due to scour and fill in and above gage pool. Rating No. 19TMP, in use since October 1, 2004, was used again this year. It is well defined from 1.7 to 142 cfs. Seventeen measurements (Nos. 193-209) were made this year ranging in discharge from 2.71 to 10.6 cfs. They cover the discharge range experienced except for higher daily flows Mar 31; Apr 1, 2, and Aug 7. The peak flow of 579 cfs occurred at 1645 on Aug 7, 2013 at a gage height of 3.48 with a shift of 0.00 feet as a result of rainfall. The peak exceeded high Measurement No. 201 (GH=1.09 feet), made Apr 5, 2013 by 2.39 feet in stage.

Discharge.-- Shifting-control method was used to compute the discharge record for all open water periods. Shift curve VS12-5 was carried from previous water year into ice to Dec 31. Shift curves (VS13-D, VS13-E, and VS13-F) were developed and used to distribute shifts by stage during remainder of water year. Open-water measurement shifts ranged from -0.03 ft to +0.07 ft and applied shifts ranged from -0.01 to +0.05 ft. All measurements were given full weight except for nos. 194, 200-202, 204, 205, 208, and 209, which were adjusted as much as 7.8% to smooth the shift trends. Periods of ice affected and unreliable gage-height record were estimated.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using discharge measurements, hydrographic comparison with Alamosa River above Terrace Reservoir, and temperature records from Alamosa River above Terrace Reservoir.

Remarks.-- Record is good except for periods of estimation, which are poor and Mar 28 to Apr 17, which is fair. The peak discharge should also be considered poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Catch some high flow measurements.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08238000 LAJARA CREEK AT GALLEGOS RANCH NEAR CAPULIN

RATING TABLE-- LAJCAPCO19TMP USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

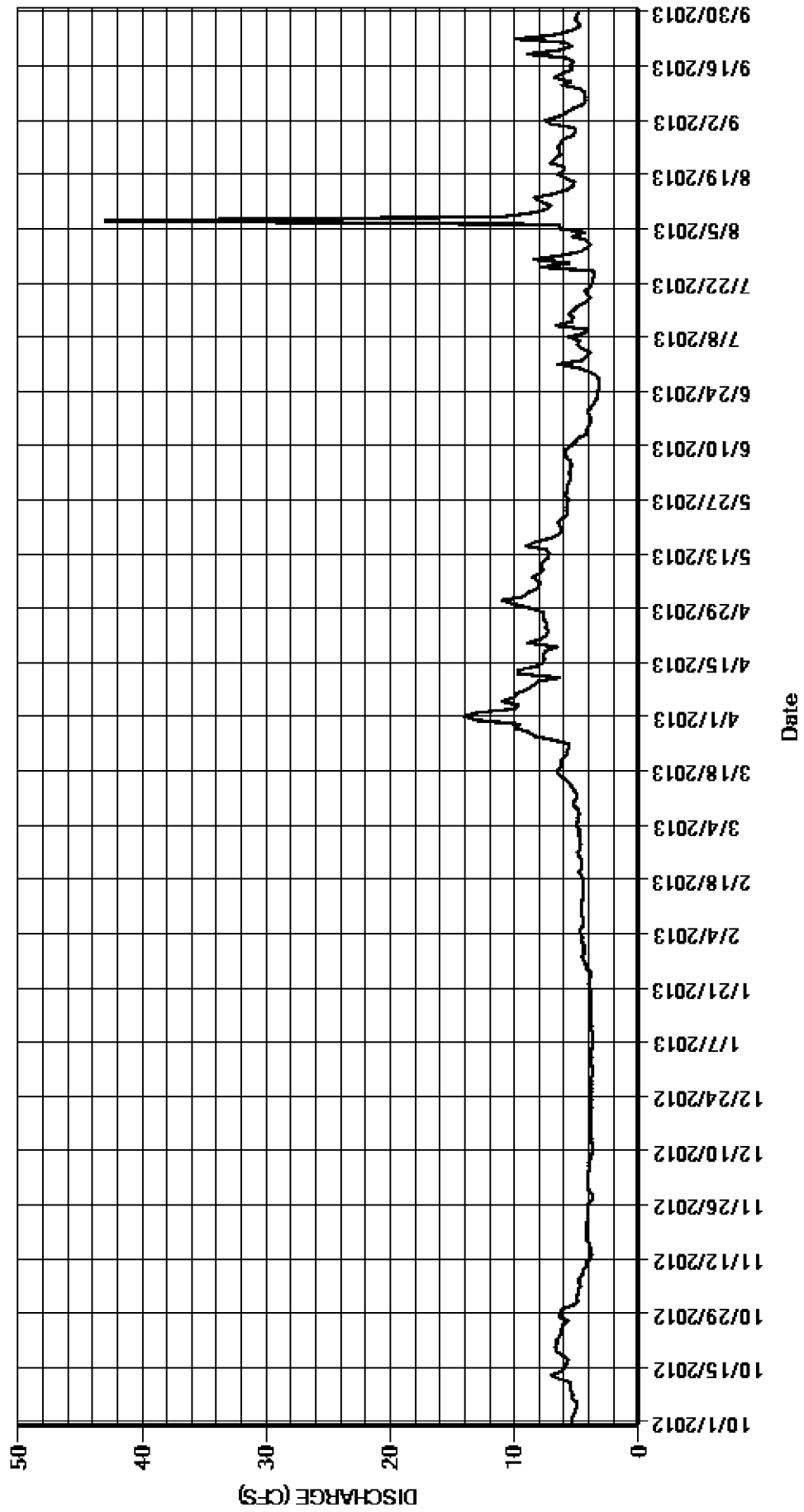
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.4	e4.9	e4.1	e3.8	e4.4	e4.8	14	11	5.5	6.5	3.9	7.1
2	5.4	e5.0	e4.1	e3.8	e4.6	e4.8	13	9.2	5.5	4.5	4.2	7.5
3	5.2	e4.9	e4.1	e3.8	e4.5	e4.8	10	8.9	5.6	4.2	5.3	6.4
4	5.1	e4.9	e4.1	e3.8	e4.7	e5.0	9.7	8.2	5.5	3.9	4.4	5.8
5	5.0	e4.7	e4.0	e3.8	e4.7	e4.9	11	8.0	5.4	4.6	6.3	5.3
6	5.0	e4.8	e4.0	e3.7	e4.5	e4.9	10	8.0	5.5	4.9	6.4	4.5
7	5.4	e4.8	e4.0	e3.7	e4.5	e4.8	9.8	8.6	5.8	4.8	4.3	4.3
8	5.3	e4.5	e3.9	e3.7	e4.5	e4.9	9.0	8.0	5.9	5.7	1.1	4.3
9	5.5	e4.5	e3.8	e3.7	e4.6	e5.2	8.5	7.7	5.9	4.4	8.6	4.3
10	5.5	e4.2	e3.7	e3.8	e4.6	e5.2	e8.1	7.9	5.4	4.1	7.4	4.7
11	5.5	e4.2	e3.7	e3.8	e4.6	e5.0	e6.4	7.7	5.1	6.7	7.1	6.2
12	6.4	e3.9	e3.8	e3.9	e4.6	e5.0	9.7	7.3	4.8	5.4	7.9	5.5
13	7.0	e3.8	e3.8	e3.9	e4.5	e5.2	9.7	7.2	4.2	5.3	8.4	6.8
14	6.2	e3.9	e3.8	e3.9	e4.5	e5.4	8.2	7.4	4.2	5.6	6.8	6.2
15	5.9	e3.9	e3.9	e3.9	e4.5	e5.6	7.7	9.1	4.0	5.2	5.8	5.4
16	5.8	e4.0	e3.9	e3.9	e4.5	e6.0	7.6	8.4	3.9	4.9	5.3	5.5
17	5.7	e4.2	e3.9	e3.8	e4.5	e6.4	7.7	7.2	3.9	4.2	5.2	5.2
18	6.1	e4.2	e3.8	e3.9	e4.5	e6.6	e7.5	6.5	4.0	3.9	5.9	5.8
19	6.6	e4.2	e3.9	e3.9	e4.6	e6.2	e6.6	6.2	4.1	4.2	6.5	9.0
20	6.7	e4.2	e3.9	e3.9	e4.8	e6.2	8.9	6.3	3.8	4.3	6.0	6.4
21	6.6	e4.2	e3.8	e4.0	e4.6	e6.2	7.9	6.5	3.6	3.9	6.1	5.4
22	6.6	e4.1	e3.8	e4.0	e4.6	e5.8	7.4	6.2	3.4	3.7	7.1	5.9
23	6.4	e4.1	e3.8	e4.0	e4.6	e5.8	7.3	5.8	3.3	3.7	6.8	9.8
24	6.2	e4.1	e3.8	e3.9	e4.8	e5.6	7.5	5.8	3.3	3.6	6.3	6.8
25	6.2	e4.1	e3.8	e3.9	e4.9	e5.6	7.4	5.8	3.2	3.6	6.4	5.6
26	e6.1	e4.1	e3.8	e4.2	e4.7	e7.0	7.6	5.8	3.2	7.8	6.5	4.8
27	e5.7	e3.8	e3.8	e4.3	e4.7	e8.4	7.7	5.6	3.2	5.6	6.3	4.8
28	e6.4	e3.7	e3.8	e4.4	e4.7	8.9	7.7	5.9	3.4	8.4	6.1	5.1
29	e6.3	e3.8	e3.8	e4.6	---	9.9	8.8	5.8	3.9	6.2	5.3	5.0
30	e6.2	e4.1	e3.7	e4.4	---	9.6	10	5.8	4.8	4.7	5.1	4.8
31	e5.3	---	e3.7	e4.4	---	13	---	5.7	---	4.2	5.2	---
TOTAL	182.7	127.8	119.8	122.5	128.8	192.7	262.4	223.5	133.3	152.7	232.6	174.2
MEAN	5.89	4.26	3.86	3.95	4.60	6.22	8.75	7.21	4.44	4.93	7.50	5.81
AC-FT	362	253	238	243	255	382	520	443	264	303	461	346
MAX	7.0	5.0	4.1	4.6	4.9	13	14	11	5.9	8.4	43	9.8
MIN	5.0	3.7	3.7	3.7	4.4	4.8	6.4	5.6	3.2	3.6	3.9	4.3

CAL YR	2012	TOTAL	2909.8	MEAN	7.95	MAX	48	MIN	3.7	AC-FT	5770
WTR YR	2013	TOTAL	2053.0	MEAN	5.62	MAX	43	MIN	3.2	AC-FT	4070

MAX DISCH: 579 CFS AT 16:45 ON AUG 07, 2013 GH 3.48 FT SHIFT 0.00 FT  
 MAX GH: 3.48 FT AT 16:45 ON AUG 07, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08238000 LAJARA CREEK AT GALLEGOS RANCH NEAR CAPULIN  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
SOUTH CHANNEL NORTON DRAIN DITCH NEAR LA SAUSES  
Water Year 2013

Location.-- Lat 37°17'55", long 105°51'17" referenced to North American Datum of 1983 (Pikes Stockade, CO quad, scale 1:24,000), UTM Zone 13 424251 E and 4128328 N, in SW ¼ SW ¼ sec. 2, T.35 N., R.10 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010002, on right bank 150 ft north of road, 13 mi south of Alamosa, CO, 7 mi northwest of LaSausés, CO.

Drainage Area and Period of Record.-- Not determined; 1989 to present.

Equipment.-- Data collection platform (Sutron Satlink 2) and a float-operated shaft encoder in a steel shelter on top of 2 ft diameter CMP well at a modified 3 ft Parshall Flume. The flume was modified by inserting a steel V-ramp on Aug 16, 2010. The primary reference gage is drop tape from a RP mounted on shelf support frame. The RP was installed on May 5, 2011 and the tape length was changed to match the outside staff reading. The secondary reference is outside staff gage in flume.

Hydrologic Conditions.-- Manmade canal to return sub-irrigation water from fields and pastures to Rio Grande River.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted data with DCP log and SDR log as backup. Record is complete and reliable except for Dec 11-18 when float was frozen and Dec 19 through Mar 13 when station was closed. There was two instrument calibration corrections, which were prorated back to previous visit. The stage-discharge relation was affected by ice Nov 1, 3-5, 11-30; Dec 1-10 and Mar 14-27.

Datum Corrections.-- The Parshall flume was last inspected with levels completed four years ago on Jul 30, 2008. The flume is in poor condition. The levels indicate considerable lateral slope away from well on REW and downward toward staff on LEW. A brass RP was installed on May 5, 2011 and the tape length was changed to match the outside staff reading.

Rating.-- Control is a 3 ft modified Parshall Flume. A steel insert was placed in the throat of the flume on August 16, 2010 to prevent the flume from isolating. Shifting is caused by the unlevel flume and sand and aquatic plant growth accumulating in front of and in flume. Rating no. 02TMP was used for the entire water year and is well defined from 0 cfs to 8 cfs. Sixteen measurements (nos. 371-386) were made this water year ranging in discharge from 0 to 3.12 cfs. They cover the discharge range experienced except for higher daily flows on Jun 1-3 and 20. The peak flow of 14.6 cfs occurred at 0400 on Jun 20, 2013 at a gage height of 1.30 ft with a shift of 0.00 ft. It exceeded high measurement no. 381 (GH = 0.55 ft), made May 31, by 0.75 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record during open-water periods. Periods of ice affected, unreliable, and no gage-height record were estimated. Shift curves were developed and used to distribute shifting by stage and time. Shifting results from deposition, scour, and aquatic vegetation growth in flume and approach so shifting was applied by time between measurements. Measurement shifts ranged from -0.05 to +0.01 ft and applied shifts ranged from -0.04 to 0 ft. All were given full weight except nos. 371, 373, 379, 381, and 382 which were adjusted as much as -8.8% to smooth the shift trends. There was no flow Jan 3 through Feb 13.

Special Computations.-- Discharge for periods of unreliable and no gage-height, and ice affected record was estimated using measurements, partial record days, weather records, and comparison with the station "Norton Drain near LaSausés".

Remarks.-- Record is fair, except for periods of estimation, which are poor. The peak discharge should also be considered poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Develop new rating if recent shift trend continues. Consider installing new flume.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

SOUTH CHANNEL NORTON DRAIN DITCH NEAR LA SAUSES

RATING TABLE-- NORDSCCO02TMP USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

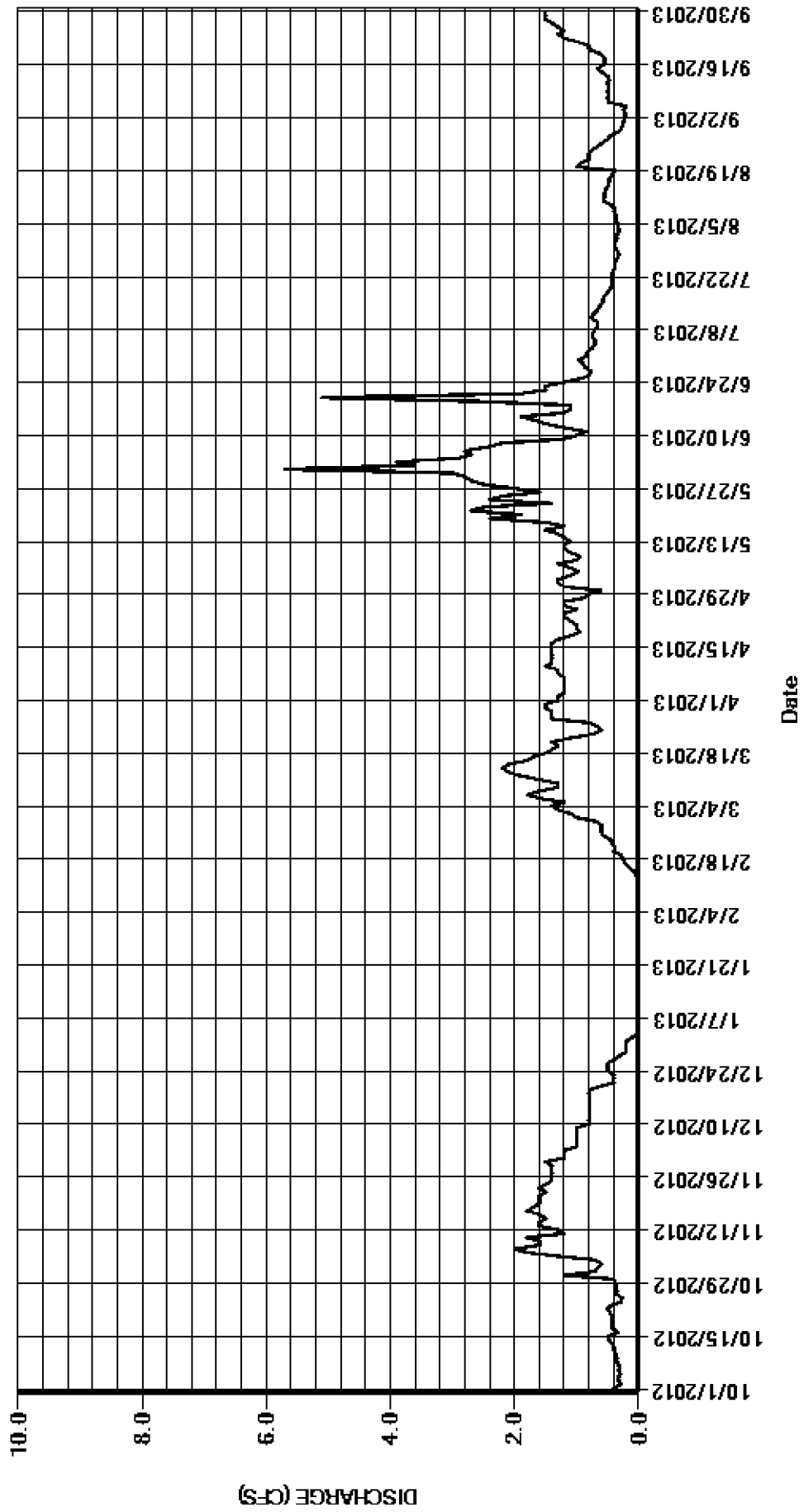
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.41	e0.70	e1.2	e0.20	e0.00	e1.0	1.3	1.2	5.7	0.85	0.35	0.24
2	0.29	0.66	e1.2	e0.10	e0.00	e1.1	1.3	1.3	3.6	0.83	0.35	0.23
3	0.32	e0.60	e1.2	e0.00	e0.00	e1.3	1.2	1.3	3.9	0.75	0.31	0.21
4	0.33	e0.70	e1.0	e0.00	e0.00	e1.4	1.2	1.1	2.9	0.70	0.33	0.24
5	0.30	e1.3	e1.0	e0.00	e0.00	e1.2	1.2	0.98	2.7	0.70	0.34	0.20
6	0.32	1.8	e1.0	e0.00	e0.00	e1.6	1.2	1.1	2.8	0.74	0.37	0.48
7	0.31	2.0	e1.0	e0.00	e0.00	e1.8	1.2	1.3	2.4	0.74	0.37	0.50
8	0.35	1.6	e1.0	e0.00	e0.00	e1.6	1.3	1.0	2.2	0.71	0.39	0.49
9	0.35	1.6	e1.0	e0.00	e0.00	e1.3	1.3	0.95	1.2	0.66	0.39	0.50
10	0.37	1.8	e0.80	e0.00	e0.00	e1.3	1.5	1.1	1.0	0.66	0.45	0.48
11	0.39	e1.2	e0.80	e0.00	e0.00	e1.6	1.4	1.2	0.85	0.76	0.56	0.51
12	0.40	e1.3	e0.80	e0.00	e0.00	e1.9	1.4	1.2	1.2	0.73	0.55	0.48
13	0.43	e1.6	e0.80	e0.00	e0.00	e2.1	1.4	1.1	1.5	0.67	0.55	0.50
14	0.48	e1.6	e0.80	e0.00	e0.05	e2.2	1.4	1.2	1.7	0.63	0.53	0.59
15	0.48	e1.5	e0.80	e0.00	e0.09	e2.1	1.4	1.3	1.9	0.58	0.49	0.66
16	0.33	e1.6	e0.80	e0.00	e0.16	e1.8	1.4	1.5	1.2	0.57	0.48	0.57
17	0.43	e1.8	e0.80	e0.00	e0.22	e1.7	1.3	1.2	1.1	0.54	0.47	0.54
18	0.42	e1.7	e0.80	e0.00	e0.26	e1.5	1.1	1.5	1.1	0.49	0.42	0.56
19	0.42	e1.6	e0.80	e0.00	e0.28	e1.4	0.95	2.4	2.6	0.45	0.39	0.64
20	0.42	e1.6	e0.60	e0.00	e0.40	e1.3	1.0	1.9	5.1	0.43	1.0	0.80
21	0.46	e1.6	e0.40	e0.00	e0.38	e1.4	1.0	2.7	1.9	0.44	0.93	0.81
22	0.51	e1.5	e0.40	e0.00	e0.44	e1.1	1.1	2.5	1.5	0.43	0.80	0.97
23	0.44	e1.6	e0.40	e0.00	e0.44	e0.75	1.2	1.4	1.5	0.42	0.81	1.2
24	0.28	e1.5	e0.50	e0.00	e0.55	e0.60	1.2	2.4	1.2	0.39	0.79	1.3
25	0.27	e1.4	e0.50	e0.00	e0.60	e0.65	1.0	2.2	0.93	0.39	0.69	1.2
26	0.36	e1.4	e0.50	e0.00	e0.60	e0.80	1.2	1.6	0.79	0.37	0.61	1.3
27	0.35	e1.4	e0.40	e0.00	e0.60	e1.4	1.2	2.0	0.77	0.33	0.52	1.4
28	0.36	e1.4	e0.30	e0.00	e0.70	1.4	0.87	2.5	0.86	0.32	0.47	1.5
29	0.37	e1.4	e0.20	e0.00	---	1.4	0.82	2.7	0.90	0.35	0.35	1.5
30	0.41	e1.5	e0.20	e0.00	---	1.5	0.61	2.8	0.96	0.39	0.28	1.5
31	1.2	---	e0.20	e0.00	---	1.5	---	3.0	---	0.39	0.26	---
TOTAL	12.56	42.96	22.20	0.30	5.77	43.70	35.65	51.63	57.96	17.41	15.60	22.10
MEAN	0.41	1.43	0.72	0.010	0.21	1.41	1.19	1.67	1.93	0.56	0.50	0.74
AC-FT	25	85	44	0.6	11	87	71	102	115	35	31	44
MAX	1.2	2.0	1.2	0.20	0.70	2.2	1.5	3.0	5.7	0.85	1.0	1.5
MIN	0.27	0.60	0.20	0.00	0.00	0.60	0.61	0.95	0.77	0.32	0.26	0.20

CAL YR	2012	TOTAL	737.57	MEAN	2.02	MAX	11	MIN	0.20	AC-FT	1460
WTR YR	2013	TOTAL	327.84	MEAN	0.90	MAX	5.7	MIN	0.00	AC-FT	650

MAX DISCH: 14.6 CFS AT 04:00 ON JUN 20, 2013 GH 1.30 FT SHIFT 0.00 FT  
 MAX GH: 1.30 FT AT 04:00 ON JUN 20, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH CHANNEL NORTON DRAIN DITCH NEAR LA SAUSES  
WY2013 HYDROGRAPH





RIO GRANDE RIVER BASIN  
NORTON DRAIN NEAR LA SAUSES

Water Year 2013

Location.-- Lat 37°20'5", long 105°46'17" referenced to North American Datum of 1983 (Pikes Stockade, CO quad, scale 1:24,000), UTM Zone 13 431659 E and 4132271 N, in NW ¼ SE ¼ sec. 28, T.36 N., R.11 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010002, on left bank 1.5 mi above confluence with Rio Grande River, 11 mi south of Alamosa, CO, 5 mi North of LaSausas, CO.

Drainage Area and Period of Record.-- Not determined; 1970 to present.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Satlink), and a float-operated shaft encoder in a 36-inch diameter CMP shelter and well at a modified six-foot Parshall Flume. The primary reference gage is drop tape from an inside reference point. The secondary reference is outside staff gage in flume. No changes.

Hydrologic Conditions.-- Manmade canal to return sub-irrigation water from fields and pastures to Rio Grande River.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Dec 10-18, when the well was frozen, Dec 19 - Mar 13 when the station was closed for the winter, and Jul 28 - Aug 20 and Aug 28 - Sep 11 when the gage was isolated. Many unit values were filled from DCP log without loss of accuracy. Stage-discharge relation was affected by ice Oct 25, 26; Nov 11-30; Dec 1-9; Mar 14-26; and Apr 9-11, 18, 24. One instrument calibration correction of -0.01 ft was made to the shaft encoder on Jul 8 and prorated back to the previous visit.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on Jun 19, 2013 using BM no. 1 as base. The RP was within allowable limits, so a correction was not made. Two-peg test was performed on the Lietz level (SN 130869) on Jun 19, 2013 and the instrument was within allowable limits and no correction was made.

Rating.-- The control is a modified six-foot Parshall Flume. Since this Parshall Flume has been modified with ramp inserts at the throat, it is not expected to perform as a Parshall flume. Rating NORDLSCO05a, in use since Sep 1, 2010 was used all year. Rating 05a is intended to better define the very low end of the curve. Shifting is caused by sand and moss accumulating in front of and in the flume. Seventeen measurements (Nos. 787-803) were made this year ranging in discharge from 0 to 5.72 cfs, open-water discharge measurements ranged from 0 to 3.17 cfs. The measurements cover the flow range experienced except for higher daily flows on Sep 30. The peak flow of 7.95 cfs occurred at 1600 on Jun 1, 2013 at a gage height of 0.59 feet with a shift of 0.00 feet. It exceeded ice affected high measurement no. 794 (GH = 0.40 ft), made Mar 13, by 0.19 feet in stage and open-water high measurement no. 798 (GH = 0.38 ft), made May 31, by 0.21 feet in stage.

Discharge.-- Shifting control method was used to compute discharge record for all open-water periods. Discharge was estimated during periods of ice-affected, unreliable, and no gage-height record. Shift curves (VS13-A, VS13-B, VS13-C, and VS13-E) were developed and used to distribute shifting by stage and time. Shifts were prorated by time from Jun 23 to Jul 29 to define effect of vegetative growth in approach section. Open-water measurement shifts ranged from -0.07 to +0.03 feet. All measurements were given full weight and applied except nos. 787, 795-797, and 800 which were adjusted as much as 9.7% to smooth shift trends.

Special Computations.-- Discharge for periods of gage isolation, no gage-height, and ice affected record was estimated using measurements, partial record days, weather records, and comparison with the station "South Channel Norton Drain near LaSausas".

Remarks.-- Record is good except for periods estimation, which are poor; and the peak and days with average flow less than 1 cfs are fair. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

NORTON DRAIN NEAR LA SAUSES

RATING TABLE-- NORDLSCO05a USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

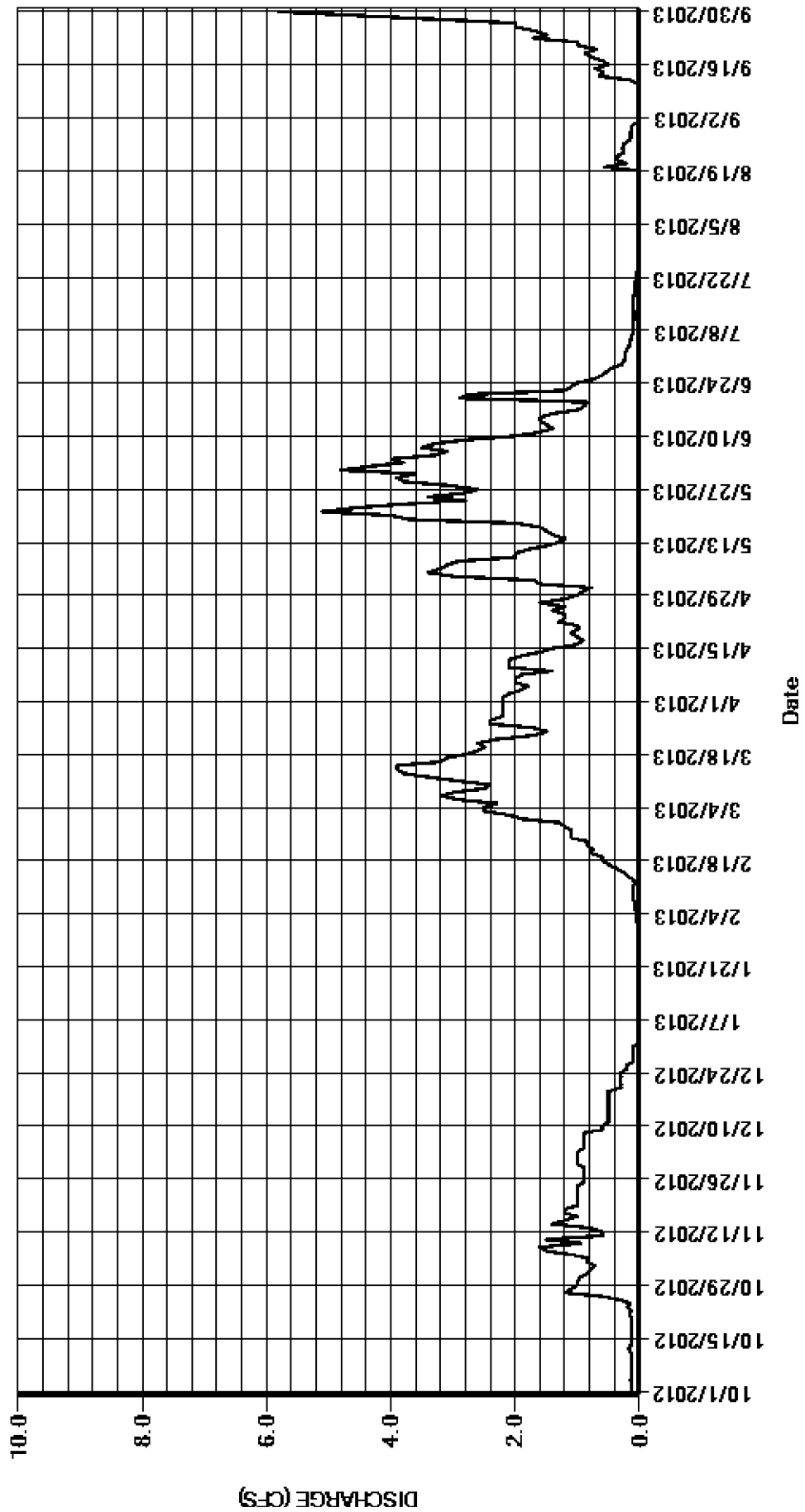
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.13	0.84	e1.0	e0.00	e0.03	e1.9	2.2	0.78	4.8	0.23	e0.00	e0.00
2	0.13	0.78	e1.0	e0.00	e0.04	e2.1	2.2	1.6	4.3	0.23	e0.00	e0.00
3	0.13	0.72	e1.0	e0.00	e0.04	e2.5	2.1	1.7	3.8	0.20	e0.00	e0.00
4	0.14	0.85	e0.90	e0.00	e0.06	e2.5	1.9	3.0	4.0	0.16	e0.00	e0.00
5	0.13	0.82	e0.90	e0.00	e0.06	e2.3	1.8	3.4	3.3	0.15	e0.00	e0.00
6	0.13	1.1	e0.90	e0.00	e0.07	e2.9	2.0	3.2	3.1	0.13	e0.00	e0.00
7	0.13	1.5	e0.90	e0.00	e0.08	e3.2	2.0	3.1	3.5	0.11	e0.00	e0.00
8	0.13	1.6	e0.90	e0.00	e0.10	e3.0	1.9	2.9	3.3	0.11	e0.00	e0.00
9	0.13	0.95	e0.60	e0.00	e0.10	e2.5	e1.4	2.0	2.8	0.10	e0.00	e0.00
10	0.13	1.5	e0.60	e0.00	e0.10	e2.4	e2.1	2.0	2.0	0.10	e0.00	e0.00
11	0.13	e0.60	e0.50	e0.00	e0.10	e2.9	e2.1	1.8	1.6	0.09	e0.00	e0.03
12	0.17	e0.60	e0.50	e0.00	e0.08	e3.4	2.1	1.5	1.4	0.09	e0.00	0.15
13	0.14	e0.80	e0.50	e0.00	e0.10	e3.8	1.9	1.3	1.5	0.09	e0.00	0.65
14	0.13	e1.4	e0.50	e0.00	e0.20	e3.9	1.6	1.2	1.6	0.10	e0.00	0.59
15	0.13	e1.2	e0.50	e0.00	e0.26	e3.9	1.4	1.4	1.6	0.10	e0.00	0.71
16	0.13	e1.0	e0.50	e0.00	e0.38	e3.2	1.0	1.5	1.4	0.10	e0.00	0.51
17	0.13	e1.2	e0.50	e0.00	e0.50	e3.1	0.91	1.6	0.98	0.09	e0.00	0.59
18	0.13	e1.2	e0.50	e0.00	e0.60	e2.8	e1.0	2.0	0.88	0.08	e0.00	0.77
19	0.13	e1.0	e0.50	e0.00	e0.60	e2.6	1.1	3.7	0.85	0.07	e0.00	0.87
20	0.13	e1.0	e0.30	e0.00	e0.80	e2.5	0.98	4.0	2.9	0.07	e0.56	0.68
21	0.15	e1.0	e0.30	e0.00	e0.75	e2.6	0.99	5.1	2.7	0.06	0.21	0.98
22	0.14	e1.0	e0.30	e0.00	e0.85	e2.3	1.3	4.6	1.2	0.05	0.37	1.0
23	0.19	e1.0	e0.30	e0.00	e0.85	e1.7	1.2	3.8	1.1	0.05	0.34	1.7
24	0.15	e1.0	e0.30	e0.00	e1.1	e1.5	e1.2	2.8	1.0	0.02	0.25	1.5
25	e0.30	e0.90	e0.20	e0.00	e1.1	e1.7	1.4	3.4	0.73	0.01	0.27	1.7
26	e0.60	e0.90	e0.20	e0.00	e1.1	e2.4	1.2	2.8	0.61	0.03	0.26	2.0
27	1.2	e0.90	e0.10	e0.00	e1.2	2.4	1.6	2.6	0.53	0.03	0.16	2.0
28	1.1	e0.90	e0.10	e0.00	e1.3	2.2	1.2	3.1	0.45	e0.01	e0.14	3.3
29	1.0	e0.90	e0.10	e0.01	---	2.2	1.0	3.8	0.28	e0.00	e0.14	4.6
30	0.99	e1.0	e0.10	e0.01	---	2.2	0.90	3.9	0.24	e0.00	e0.13	5.8
31	0.96	---	e0.10	e0.02	---	2.2	---	3.6	---	e0.00	e0.12	---
TOTAL	9.44	30.16	15.60	0.04	12.55	80.8	45.68	83.18	58.45	2.66	2.95	30.13
MEAN	0.30	1.01	0.50	0.001	0.45	2.61	1.52	2.68	1.95	0.086	0.095	1.00
AC-FT	19	60	31	.08	25	160	91	165	116	5.3	5.9	60
MAX	1.2	1.6	1.0	0.02	1.3	3.9	2.2	5.1	4.8	0.23	0.56	5.8
MIN	0.13	0.60	0.10	0.00	0.03	1.5	0.90	0.78	0.24	0.00	0.00	0.00

CAL YR	2012	TOTAL	1270.02	MEAN	3.47	MAX	15	MIN	0.00	AC-FT	2520
WTR YR	2013	TOTAL	371.64	MEAN	1.02	MAX	5.8	MIN	0.00	AC-FT	737

MAX DISCH: 7.95 CFS AT 16:00 ON JUN 01, 2013 GH 0.59 FT SHIFT 0.00 FT  
 MAX GH: 0.70 FT AT 12:00 ON MAR 15, 2013 (Backwater from ice.)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

NORTON DRAIN NEAR LA SAUSES  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08240000 RIO GRANDE RIVER ABOVE TRINCHERA CREEK NEAR LA SAUSES  
Water Year 2013

Location.-- Lat 37°18'59", long 105°44'34" referenced to North American Datum of 1983 (La Sauses, CO quad, scale 1:24,000), UTM Zone 13 434180 E and 4130242 N, in NE ¼ SE ¼ sec. 35, T.36 N., R.11 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010002, on right bank 0.2 mi upstream from the historical channel of Trinchera Creek, 3.2 mi north of La Sauses, CO, and 13 mi southeast of Alamosa, CO.

Drainage Area and Period of Record.-- Approximately 5,740 mi<sup>2</sup>, includes 2,940 mi<sup>2</sup> in closed basin in northern part of San Luis Valley, CO; May 1936 to current year. Water quality data from 1993 to 1996.

Equipment.-- Data collection platform (Sutron Satlink2), and a float-operated Sutron Stage Discharge Recorder (SDR) in a 7 ft by 7 ft exposed aggregate building with 4 ft diameter concrete well. Primary reference gage is a drop tape from reference point on shelf. Outside cantilever gage installed on Aug 10, 2012.

Hydrologic Conditions.-- Watershed is comprised of valley floor and steep mountain headwaters. Headwaters areas are generally undeveloped with only sparse minimally populated areas. Valley floor is highly agriculturally based and flows from watershed are diverted for irrigation, livestock watering, domestic, commercial, recharge, and groundwater withdrawals. Flow at gage also includes return flows from all uses.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted data with DCP log and SDR log as backup. Record is complete and reliable except for Dec 12 through Mar 6 when float was frozen. There was one -0.01 ft instrument calibration correction on Sep 30, which was prorated from previous visit. The stage-discharge relation was affected by ice Nov 11-15, 27-30, Dec 9-11, and Mar 7-13.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on Jun 22, 2012 using BM2 as base. The RP elevation was found within allowable limits and no correction was made. Two-peg test was performed on the Lietz level (SN 130869) on Jun 11, 2012 and the instrument was within allowable limits so no adjustment was made.

Rating.-- The control is a sand streambed and channel. The sand movement causes numerous shift changes. Rating no. 12 in use since Oct 1, 2006 was used until Oct 4, 2012. Rating no. 13 was developed and used from Oct 4 to the end of the water year. Twenty measurements (nos. 255-274) were made this year ranging in discharge from 24.2 to 616 cfs. They cover the discharge range experienced except for the lower daily flows Jun 24, 25; Jul 12-16, 19-25; and the higher daily flow of Sep 30. The peak flow of 633 cfs occurred at 0500 on Sep 30, 2013 at a gage height of 4.11 ft with a shift of -0.26 ft. It exceeded high measurement no. 274 (GH = 4.05 ft) by 0.06 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record for all open-water periods. Eleven variable stage-shift relationships were used during the year to distribute shifts by stage, event, and time. Measurement shifts ranged from -0.34 to -0.04 ft and applied shifts ranged from -0.26 to -0.04 ft. All shifts were given full weight except for nos. 255, 257, 258, 261-263, 266 and 270-274, which were adjusted as much as 4.9% to smooth shift trends. Discharge was estimated during periods of ice affected gage-height and unreliable gage-height record.

Special Computations.-- Discharge for periods of winter no gage-height and ice affected record was estimated using comparison with nearby stations with a river accounting sheet.

Remarks.-- Record is good except for estimated periods, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08240000 RIO GRANDE RIVER ABOVE TRINCHERA CREEK NEAR LA SAUSES

RATING TABLE-- RIOTRICO12 USED FROM 01-OCT-2012 TO 04-OCT-2012  
 RIOTRICO13 USED FROM 04-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

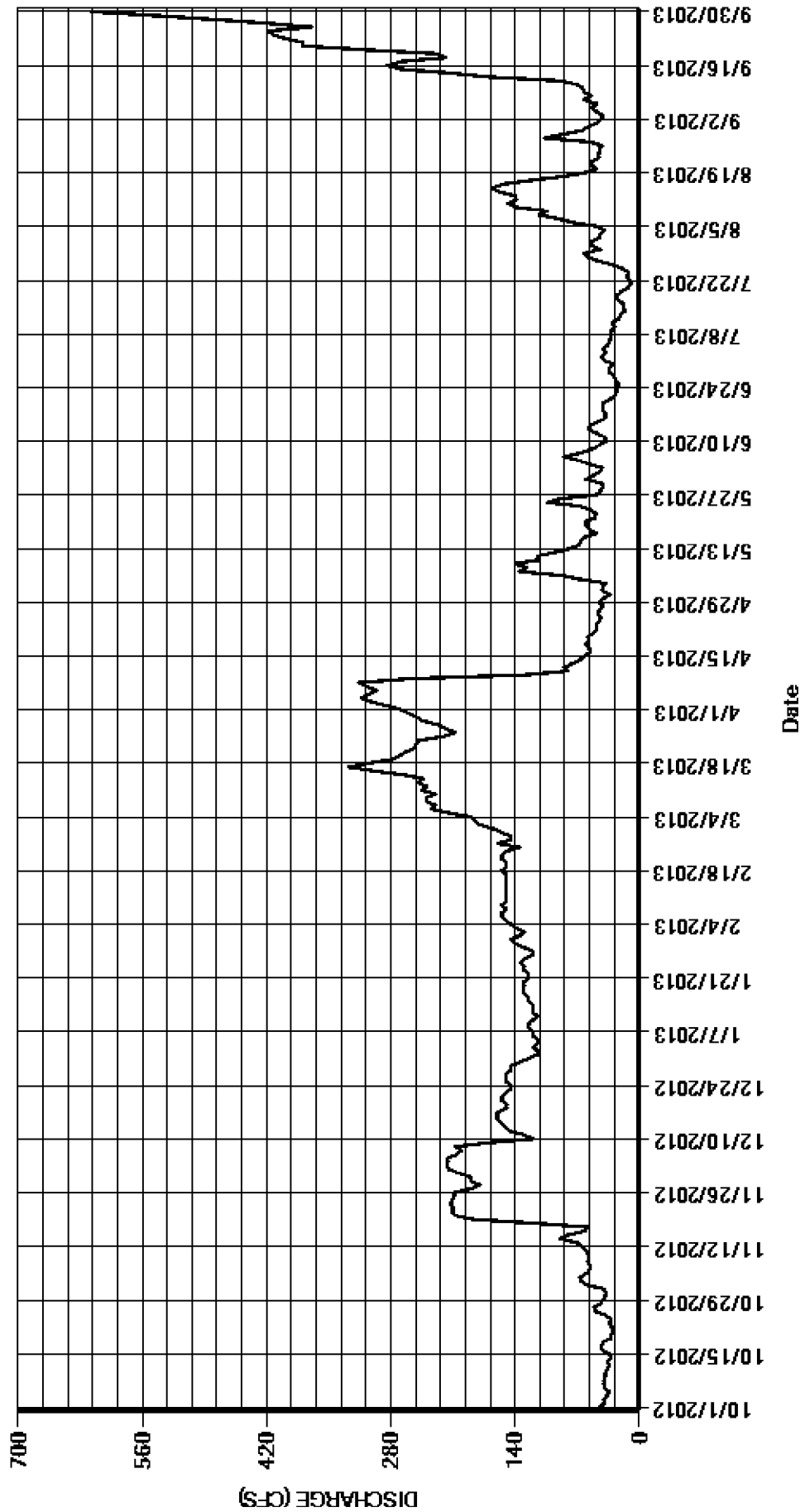
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	45	41	202	e115	e135	e165	269	33	52	39	54	48
2	40	60	214	e115	e130	e180	284	42	45	43	45	43
3	40	66	217	e120	e140	e185	302	41	42	38	44	41
4	37	67	216	e115	e145	e190	313	38	57	41	40	49
5	34	59	216	e115	e150	e215	305	67	69	36	49	53
6	39	56	206	e120	e155	e235	296	87	85	34	75	48
7	40	56	201	e120	e155	e230	308	135	65	32	92	63
8	40	58	207	e125	e150	e240	316	127	53	33	113	55
9	39	57	e170	e125	e155	e240	258	140	45	31	104	63
10	38	58	e120	e120	e150	e230	127	114	38	28	139	64
11	36	e60	e130	e115	e150	e245	81	115	39	31	148	70
12	34	e65	e145	e120	e150	e240	85	94	48	23	139	88
13	36	e70	e150	e120	e150	e250	76	77	57	21	140	168
14	32	e90	e155	e120	e150	244	67	68	56	16	158	213
15	34	e80	e160	e125	e150	266	62	66	47	18	166	269
16	42	61	e160	e125	e150	301	55	62	39	19	154	284
17	43	59	e160	e130	e150	327	57	49	38	25	121	268
18	41	119	e150	e130	e155	305	60	56	41	25	85	218
19	32	188	e150	e130	e150	278	57	60	41	21	60	228
20	32	207	e155	e130	e150	270	58	61	41	13	48	308
21	30	211	e155	e125	e155	263	51	50	33	9.6	54	379
22	31	210	e150	e125	e155	254	48	49	27	12	53	380
23	34	213	e145	e130	e150	252	49	55	26	14	46	398
24	32	211	e145	e130	e135	248	46	68	24	12	46	413
25	38	209	e150	e135	e160	220	43	104	24	19	45	418
26	49	208	e150	e130	e145	208	47	90	27	30	42	370
27	51	e190	e150	e120	e145	218	45	49	29	48	55	420
28	44	e180	e145	e120	e155	227	41	44	34	59	107	482
29	41	e190	e145	e130	---	244	45	41	34	62	85	549
30	39	e190	e135	e140	---	251	40	42	29	44	64	618
31	37	---	e125	e145	---	260	---	60	---	53	58	---
TOTAL	1180	3589	5079	3865	4170	7481	3891	2184	1285	929.6	2629	7068
MEAN	38.1	120	164	125	149	241	130	70.5	42.8	30.0	84.8	236
AC-FT	2340	7120	10070	7670	8270	14840	7720	4330	2550	1840	5210	14020
MAX	51	213	217	145	160	327	316	140	85	62	166	618
MIN	30	41	120	115	130	165	40	33	24	9.6	40	41

CAL YR	2012	TOTAL	44627.0	MEAN	122	MAX	657	MIN	17	AC-FT	88520
WTR YR	2013	TOTAL	43350.6	MEAN	119	MAX	618	MIN	9.6	AC-FT	85990

MAX DISCH: 633 CFS AT 05:00 ON SEP 30, 2013 GH 4.11 FT SHIFT -0.26 FT  
 MAX GH: 4.11 FT AT 05:00 ON SEP 30, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08240000 RIO GRANDE RIVER ABOVE TRINCHERA CREEK NEAR LA SAUSES  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08240500 TRINCHERA CREEK ABOVE TURNER'S RANCH  
Water Year 2013

Location.-- Lat 37°22'29", long 105°17'42" referenced to North American Datum of 1983 (Ojito Peak, CO quad, scale 1:24,000), UTM Zone 13 473885 E and 4136482 N, in SW ¼ SE ¼ sec. 2, T.31 S., R.71 W., 6th Principal Meridian, Costilla County, CO, Hydrologic Unit 13010002, on right bank 0.9 mi downstream from North Fork Trinchera Creek, 1.0 mi upstream from Turners Ranch, and 8.3 mi southeast of Fort Garland, CO.

Drainage Area and Period of Record.-- 45 mi<sup>2</sup>; April 1923 to curent year. Monthly records only for some periods. 1923 to 1948 seasonal records only, some missing records estimated.

Equipment.-- Graphic water-stage recorder, data collection platform (Sutron Satlink2), and a float-operated shaft encoder in a 6 ft by 6 ft exposed aggregate shelter and 3 ft concrete well. The primary reference gage is a drop tape from reference point on shelf, secondary outside cantilever gage. A tipping bucket rain gage and air temperature sensor are also monitored by the DCP.

Hydrologic Conditions.-- Undeveloped steep alpine and subalpine terrain.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Dec 19-27 when the DCP failed and Dec 31 - Mar 14, when the inlets were frozen. There was one -0.01 ft flush correction on Nov 7, which was prorated back to previous inflection point. There were no instrument calibration corrections required or made to the shaft encoder. Stage-discharge relation was affected by ice Nov 10 - Dec 18, Dec 28-30, Mar 15-28, Apr 11, 18, 19, 24 and May 2, 3.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on Aug 3, 2011 using BM4 as base. The RP elevation was within allowable limits and no correction was made. Two-peg tests were performed on the Lietz level (SN 130869) on Jul 28, 2011 and Sep 26, 2011. The first test showed instrument was within tolerance, but a slight adjustment was made on Sep 26.

Rating.-- The control is a small rock weir approximately 10 feet below the gage. Minor shifting occurs mainly due to the movement of streambed materials in and above gage-pool. Rating no. 15-2, in use since Nov 9, 2011 was used for the entire water year. Sixteen measurements (Nos. 223-238) were made this year ranging in discharge from 5.49 to 25.2 cfs. They cover the discharge range experienced except for lower daily flows on Dec 7-30; Jan 2-5, 12-17, 30; Feb 11-16, 21-28; Mar 1. The peak flow of 26.2 cfs occurred at 0530 on Jul 15, 2013 at a gage height of 3.65 ft with a shift of +0.02 ft. It exceeded high measurement no. 235 (GH=3.63 ft), made Jul 15 by 0.02 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record for all open-water periods. Minor shifting was applied by time from Oct 1 to Mar 27. From Mar 27 to the end of the water year one shift curve TRUTURVS13-G was developed to apply shifts by stage. Measurement shifts ranged from -0.01 ft to +0.04 ft, applied shifts ranged from 0.00 ft to +0.03 ft. All measurements were given full weight except nos. 225, 229, 232, 234, and 236, which were adjusted by as much as 7.9% to smooth the shift trend. Periods of missing, unreliable, and ice affected stage record were estimated.

Special Computations.-- Discharge for periods of missing, unreliable, and ice affected stage record were estimated using discharge measurements, comparison with nearby station (TRIMTNCO), and weather records.

Remarks.-- Record is good except for periods of estimation, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08240500 TRINCHERA CREEK ABOVE TURNER'S RANCH

RATING TABLE-- TRITURCO15-2 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.7	7.1	e5.8	e5.6	e5.6	e5.4	7.4	14	19	11	7.7	7.3
2	7.4	7.2	e5.8	e5.4	e5.6	e5.6	7.3	e11	19	10	8.1	7.9
3	7.2	7.1	e5.8	e5.2	e5.6	e6.0	7.2	e10	18	9.7	9.5	7.5
4	7.0	6.9	e5.6	e5.2	e5.8	e6.0	6.8	12	18	9.5	11	7.5
5	6.9	7.0	e5.6	e5.4	e5.8	e6.0	7.7	11	18	9.2	9.5	7.0
6	7.0	7.1	e5.6	e5.6	e5.8	e6.2	8.2	11	18	8.9	9.0	6.7
7	7.2	6.8	e5.4	e5.6	e5.8	e6.2	8.5	11	18	9.9	11	6.6
8	7.2	6.7	e5.4	e5.6	e5.8	e6.2	8.5	12	17	9.8	15	6.6
9	7.3	6.9	e5.0	e5.8	e5.6	e6.0	9.1	11	17	9.1	11	6.6
10	7.3	e6.8	e4.9	e5.8	e5.6	e6.0	7.9	11	16	9.3	9.7	6.8
11	7.3	e6.0	e4.8	e5.8	e5.4	e6.0	e7.3	11	16	9.9	9.3	7.6
12	8.1	e5.8	e4.9	e5.4	e5.2	e6.2	7.7	12	16	9.2	9.0	8.5
13	9.9	e5.8	e5.2	e5.2	e5.4	e6.4	7.6	12	16	9.5	9.3	14
14	8.3	e6.0	e5.2	e5.2	e5.4	e6.6	8.1	13	15	11	8.4	12
15	8.1	e6.0	e5.4	e5.2	e5.4	e6.6	7.5	15	15	22	8.0	11
16	7.9	e6.2	e5.2	e5.4	e5.4	e6.6	8.4	16	15	14	7.7	15
17	7.7	e6.2	e5.2	e5.4	e5.6	e6.2	9.3	17	15	12	7.5	11
18	7.5	e6.2	e5.4	e5.6	e5.6	e6.2	e7.0	18	14	11	7.6	11
19	7.5	e6.0	e5.4	e5.6	e5.6	e6.0	e7.7	18	13	9.8	8.3	13
20	7.6	e6.0	e5.0	e5.6	e5.6	e6.0	8.4	17	13	11	7.8	11
21	7.6	e6.0	e4.9	e5.6	e5.4	e6.0	7.7	17	12	9.6	7.8	10
22	7.6	e6.0	e4.9	e5.8	e5.4	e6.0	8.0	18	12	9.1	9.7	10
23	7.5	e6.0	e5.0	e5.8	e5.4	e5.6	8.4	18	11	8.6	9.4	15
24	7.2	e5.8	e5.4	e5.8	e5.4	e5.6	e7.2	20	11	8.9	8.1	13
25	6.9	e5.8	e5.4	e5.8	e5.4	e5.6	8.5	21	11	9.0	7.9	11
26	6.4	e5.8	e5.4	e6.0	e5.2	e5.8	8.5	21	10	8.4	8.8	9.9
27	6.4	e5.6	e5.4	e6.0	e5.2	e6.0	8.6	21	10	9.0	7.8	10
28	7.0	e5.6	e5.2	e6.0	e5.2	e6.0	10	21	11	9.5	7.6	11
29	7.2	e5.6	e5.2	e5.8	---	6.3	12	21	11	11	7.6	10
30	7.2	e5.8	e5.4	e5.4	---	6.5	13	21	11	8.7	7.3	9.7
31	7.1	---	e5.8	e5.6	---	6.9	---	20	---	7.8	7.1	---
TOTAL	230.2	187.8	164.6	173.2	154.2	188.7	249.5	482	436	315.4	273.5	294.2
MEAN	7.43	6.26	5.31	5.59	5.51	6.09	8.32	15.5	14.5	10.2	8.82	9.81
AC-FT	457	373	326	344	306	374	495	956	865	626	542	584
MAX	9.9	7.2	5.8	6.0	5.8	6.9	13	21	19	22	15	15
MIN	6.4	5.6	4.8	5.2	5.2	5.4	6.8	10	10	7.8	7.1	6.6

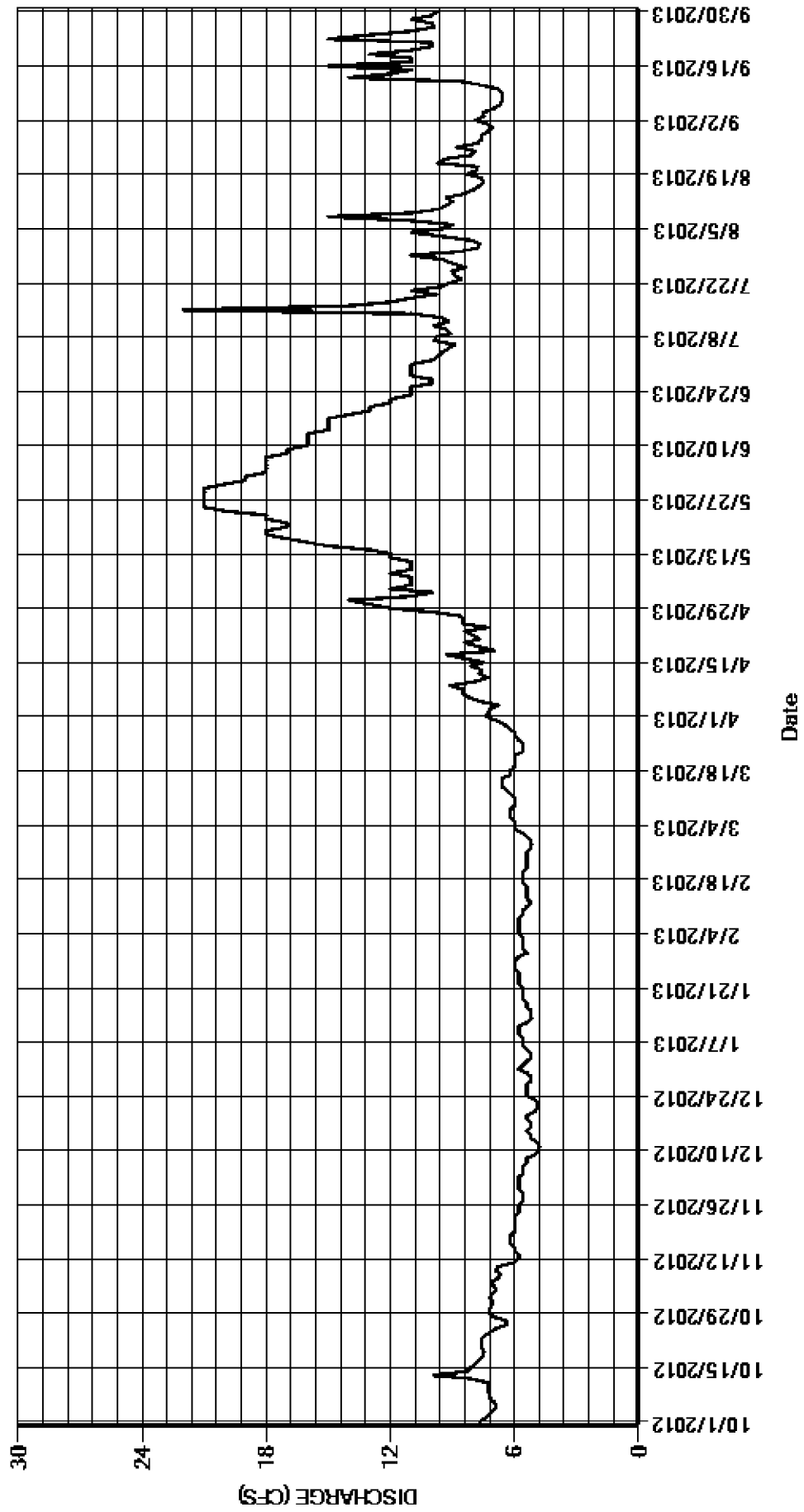
CAL YR	2012	TOTAL	5108.1	MEAN	14.0	MAX	68	MIN	4.8	AC-FT	10130
WTR YR	2013	TOTAL	3149.3	MEAN	8.63	MAX	22	MIN	4.8	AC-FT	6250

MAX DISCH: 26.2 CFS AT 05:30 ON JUL 15, 2013 GH 3.65 FT SHIFT 0.02 FT  
 MAX GH: 3.65 FT AT 05:30 ON JUL 15, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



08240500 TRINCHERA CREEK ABOVE TURNER'S RANCH  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08241000 TRINCHERA CREEK ABOVE MOUNTAIN HOME RESERVOIR  
Water Year 2013

Location.-- Lat 37°23'41", long 105°22'9" referenced to North American Datum of 1983 (Trinchera Ranch, CO quad, scale 1:24,000), UTM Zone 13 467324 E and 4138724 N, in NE ¼ SW ¼ sec. 31, T.30 S., R.71 W., 6th Principal Meridian, Costilla County, CO, Hydrologic Unit 13010002, on right bank 200 ft west of road, 1 1/2 miles above Mountain Home Reservoir dam, 4 miles southeast of Fort Garland, CO.

Drainage Area and Period of Record.-- Approximately 61 mi<sup>2</sup>, (from State Engineers Office).; May 1, 1923 to Mar 31, 1935 - missing some winter months; Apr 1, 1935 to present - missing water years 1957 and 1958.

Equipment.-- Graphic water-stage recorder, data collection platform (Sutron Satlink2) and a float-operated shaft encoder in a 4-ft diameter corrugated metal shelter and well at a concrete weir. The primary reference gage is a drop tape from reference point on shelf. No change.

Hydrologic Conditions.-- Drainage area is largely undeveloped. Flows may be affected by a few minor developments and irrigation on Trinchera Ranch.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Nov 11-14; Dec 3, 10, 11; Jan 6-29; Feb 23-28; and Mar 1, when ice in well was affecting float. There were five instrument corrections ranging from -0.01 ft to +0.01 ft made to the shaft encoder, which were prorated from the previous visit. Stage-discharge relation was affected by ice Nov 3, 5, 15-30; Dec 1, 2, 4-9, 12-31; Jan 1-5, 30, 31; Feb 1-22; Mar 2-5, 9-11, 18, 22-26; and Apr 9-12, 17, 19, 24. Stage-discharge relation was affected by backwater from beaver dams on Oct 2-4, 9; May 14; Jun 22-26; Jul 16, 17; and Sep 12-16, 28-30.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on June 26, 2013 using B.M. No. 1 as base. The RP elevation was within allowable limits and a correction was not required or made. Two-peg test was performed on the Lietz level (SN 130869) on June 25, 2013, the instrument was within allowable limits and no correction was made.

Rating.-- The control is a concrete weir approximately 15 feet below the gage. Rating no. 9, in use since Jan 5, 2012, was used again this year. Rating no. 9 was developed to adjust the base rating to the right to account for the trend in high water measurements plotting to the right of the rating likely as a result of fill in the gage pool. Rating no. 9 is well defined from 2 cfs to 120 cfs. Recent PZF measurements suggest that the concrete weir is possibly moving in addition to the gage pool filling causing the changes in the stage-discharge relationship. Seventeen measurements (nos. 919-935) were made this year ranging in discharge from 2.68 to 16.1 cfs. They cover the discharge range experienced except for the lower daily flows on Jan 3, 4, Feb 12, Jul 8-11, Aug 27, and Sep 9, 10. The peak flow of 30.8 cfs occurred at 1915 on Aug 7, 2013 at a gage height of 0.76 ft with a shift of +0.00 ft. It exceeded high measurement no. 932 (GH = 0.60 ft), made July 15, 2013 by 0.16 ft in stage. High measurement no. 932 was adjusted toward the base rating from a -0.01 ft shift to a 0 ft shift to better fit recent historic high flow measurements. The peak stage of 0.92 ft occurred at 0645 Feb 28, 2013 because of backwater from ice.

Discharge.-- Rating no. 9 was used directly to compute the record from Oct 1 to Feb 27. Shifting control method was used to compute the discharge record from Feb 27 to the end of Water Year 2013; during this period shifts were applied by stage using three variable stage-shift relationships. Measurement shifts ranged from -0.02 to +0.03 ft. All measurements were given full weight except nos. 922, 926, 931, 932, and 935, which were adjusted as much as 7.9% to smooth shift trends. Numerous cleaning corrections were observed due to trash on the inlets, beaver debris on control, and backwater from beaver dams. Variability in measurements made with gage-heights greater than 0.75 ft and prevalence of flush corrections suggest hydraulics around inlets may be affecting stage record. During periods of submergence mean daily streamflow was estimated by hydrographic comparison with upstream site Trinchera Creek above Turner's Ranch (TRITURCO). Periods of unreliable stage and backwater from ice and beaver dams were estimated.

Special Computations.-- Discharge for periods of unreliable stage and ice affected record were estimated using discharge measurements, hydrographic comparison with Trinchera Creek above Turner's Ranch (TRITURCO) and temperature records from Mountain Home Reservoir. Discharge for periods of backwater from beaver dams was estimated using hydrographic comparison with Trinchera Creek above Turner's Ranch (TRITURCO) and adjacent good record.

Remarks.-- Record is good except for flows above 20 cfs, which are fair, and periods of estimation, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08241000 TRINCHERA CREEK ABOVE MOUNTAIN HOME RESERVOIR

RATING TABLE-- TRIMTNC009 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

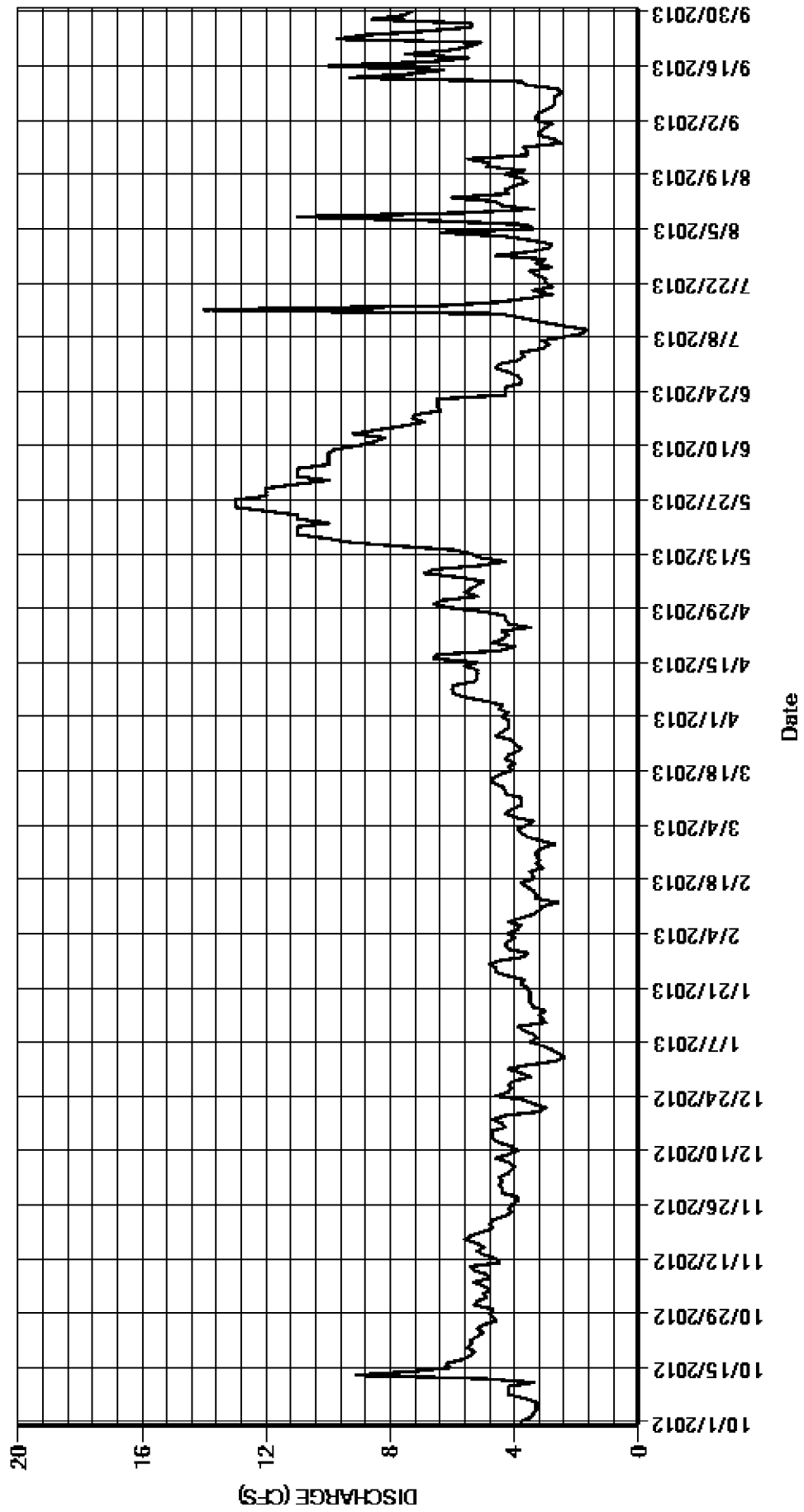
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.8	5.2	e4.5	e3.6	e4.3	e3.6	4.4	6.3	10	4.5	2.8	2.8
2	e3.5	4.9	e4.4	e2.7	e4.2	e3.8	4.2	5.2	11	3.9	3.5	3.3
3	e3.4	e5.0	e4.5	e2.4	e4.0	e3.9	4.5	5.6	11	3.7	4.3	3.3
4	e3.3	4.8	e4.2	e2.6	e4.2	e3.6	4.4	5.4	11	3.8	6.4	3.2
5	3.3	e5.0	e4.1	e2.8	e3.9	e3.4	4.9	5.2	10	3.1	3.4	2.9
6	3.3	5.3	e4.0	e3.1	e3.8	4.0	5.6	5.0	10	2.9	3.6	2.7
7	3.7	4.8	e4.2	e3.5	e4.2	4.3	6.0	5.8	10	3.1	6.7	2.7
8	4.2	4.9	e4.6	e3.3	e3.8	4.1	6.0	6.9	10	2.4	11	2.7
9	e4.2	5.3	e4.2	e3.4	e3.4	e3.8	e6.0	6.6	9.8	1.8	5.7	2.5
10	4.2	5.4	e3.9	e3.7	e3.2	e3.8	e5.3	5.1	9.0	1.7	3.4	2.6
11	3.4	e4.5	e4.1	e3.9	e3.1	e3.8	e5.2	4.3	8.5	2.5	4.4	3.6
12	4.9	e4.6	e4.5	e3.0	e2.6	4.3	e5.2	5.1	8.2	3.2	4.6	e3.8
13	9.1	e5.0	e4.7	e3.1	e3.3	4.3	5.2	5.4	9.2	3.8	6.0	e9.3
14	7.2	e5.2	e4.7	e3.2	e3.3	4.4	5.6	e6.0	8.4	4.5	4.2	e7.3
15	6.1	e5.0	e4.7	e3.0	e3.4	4.7	5.2	7.8	7.6	14	4.3	e6.3
16	6.2	e5.2	e4.3	e3.4	e3.6	4.7	6.6	9.3	6.9	e6.5	4.0	e10
17	5.7	e5.6	e4.4	e3.5	e3.8	4.5	e6.5	10	7.3	e4.5	3.6	6.8
18	5.4	e5.4	e4.7	e3.5	e3.4	e4.1	4.5	11	7.2	3.5	3.8	5.5
19	5.3	e5.0	e4.3	e3.5	e3.4	4.2	e4.0	11	6.4	2.8	4.3	7.5
20	5.5	e4.7	e3.2	e3.5	e3.5	4.0	4.7	11	6.5	3.4	3.7	6.1
21	5.4	e4.8	e3.0	e3.6	e3.1	4.3	4.4	10	6.5	2.8	4.9	5.4
22	5.4	e4.7	e3.4	e3.8	e3.3	e4.2	4.2	11	e6.5	3.0	4.8	5.1
23	5.2	e4.3	e3.7	e3.7	e3.2	e3.9	4.4	11	e4.3	3.0	5.5	9.7
24	5.0	e4.1	e4.6	e4.2	e3.3	e3.8	e3.5	12	e4.3	3.3	3.6	8.8
25	5.2	e4.2	e4.2	e4.6	e3.3	e4.0	4.2	13	e4.3	3.5	3.6	6.9
26	5.0	e4.1	e4.1	e4.6	e3.1	e4.1	4.3	13	e3.8	2.8	3.7	5.4
27	4.6	e3.9	e4.2	e4.8	e2.7	4.6	4.3	13	3.8	3.3	2.5	5.4
28	4.7	e3.9	e4.0	e4.5	e3.2	4.4	4.9	12	3.9	3.0	2.7	e8.6
29	4.8	e4.4	e3.5	e3.7	---	4.2	6.0	12	4.2	4.6	3.2	e7.6
30	4.7	e4.4	e3.8	e3.6	---	4.2	6.6	12	4.6	3.5	3.2	e7.3
31	5.3	---	e4.2	e4.2	---	4.2	---	11	---	2.9	3.0	---
TOTAL	151.0	143.6	128.9	110.0	97.6	127.2	150.8	268.0	224.2	115.3	134.4	165.1
MEAN	4.87	4.79	4.16	3.55	3.49	4.10	5.03	8.65	7.47	3.72	4.34	5.50
AC-FT	300	285	256	218	194	252	299	532	445	229	267	327
MAX	9.1	5.6	4.7	4.8	4.3	4.7	6.6	13	11	14	11	10
MIN	3.3	3.9	3.0	2.4	2.6	3.4	3.5	4.3	3.8	1.7	2.5	2.5

CAL YR	2012	TOTAL	3513.4	MEAN	9.60	MAX	54	MIN	1.9	AC-FT	6970
WTR YR	2013	TOTAL	1816.1	MEAN	4.98	MAX	14	MIN	1.7	AC-FT	3600

MAX DISCH: 30.8 CFS AT 19:15 ON AUG 07, 2013 GH 0.76 FT SHIFT 0.00 FT (Rainfall)  
 MAX GH: 0.92 FT AT 06:45 ON FEB 28, 2013 (Backwater from ice)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08241000 TRINCHERA CREEK ABOVE MOUNTAIN HOME RESERVOIR  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08241500 SANGRE DE CRISTO CREEK NEAR FORT GARLAND

Water Year 2013

Location.-- Lat 37°25'30", long 105°24'54" referenced to North American Datum of 1983 (Fort Garland, CO quad, scale 1:24,000), UTM Zone 13 463292 E and 4142091 N, in NE ¼ SE ¼ sec. 22, T.30 S., R.72 W., 6th Principal Meridian, Costilla County, CO, Hydrologic Unit 13010002, on left bank at ice house road bridge, 2,200 ft upstream from Garland Canal, 1.0 mi east of Fort Garland, CO, and 6.3 mi upstream from Ute Creek.

Drainage Area and Period of Record.-- 190 mi<sup>2</sup>; Feb 17, 1915 to Apr 17, 1915, Apr 1916 to Sept. 30, 1916, 1923 to 1930, 1932 to current year (partial year record only for some years).

Equipment.-- Graphic water-stage recorder, data collection platform (Sutron Satlink2) and a float-operated shaft encoder in a 48-inch diameter CMP shelter and well. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. No changes were made this year.

Hydrologic Conditions.-- Station is located in foothills of mountain canyon with moderate development of homesites in area. There are major diversions above gage for irrigation use.

Gage-Height Record.-- Primary record is fifteen minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Jan 2 - Feb 27 when float was affected by ice in oil cylinder. The stage-discharge relation was affected by backwater from ice Nov 29, 30; Dec 9-31; Jan 1; Feb 28; Mar 1-12, 23-26; and Apr 10, 11, 18, 19. The stage discharge relation was affected by backwater from beaver dams Sep 13-17. Two instrument corrections were made to the shaft encoder during the year, +0.01 ft and -0.02 ft; which were prorated by time from the previous gage visits. One +0.01 ft correction was applied during the measurement on Feb 27 after ice was removed from oil cylinder.

Datum Corrections.-- Levels were ran to the RP inside the shelter on Jun 26, 2013, using BM no. 7 as base. The RP elevation was within allowable limits, so a correction was not made. BM no. 8 was established June 26, 2013. A two peg test was ran on the Lietz level (SN 130869) on Jun 25, 2013, the instrument was within allowable tolerance and no correction was made.

Rating.-- The control is a concrete weir approximately 14 feet downstream of the gage. Shifting occurs mainly due to the movement of streambed materials in and above gage pool. At higher flows the channel becomes the control and is subject to backwater from a downstream diversion structure. Rating no. 19-2 first used Oct 1, 2009 was used again this year. Rating no. 19-2 was drawn so that the upper end is the same as Rating no. 18, in use since October 1, 1979, and represents base rating conditions with minimal backwater. Sixteen measurements (nos. 930-945) were made this year ranging in discharge from 0.19 to 17.1 cfs. They cover the discharge range experienced except for lower daily flows on Jul 17, 25; Aug 18, 22, 23, 29, 31; Sep 1, 2, 6, 9, 10 and higher daily flows on Apr 6-9 and 12. The peak flow of 22.4 cfs occurred at 16:45 on Apr 6, 2013 at a gage height of 1.59 ft with a shift of 0 ft. It exceeded high measurement no. 937, (GH = 1.49 ft), made Apr 4, by 0.10 ft in stage.

Discharge.-- Shifting control method was used during all open-water periods to compute the discharge record. Three variable stage-shift relationship (VS12-B, VS13-A, and VS13-B) were developed and used Oct 1 through Sep 13 and Sep 17 through Sep 30 to distribute shifts by stage and time. From Sep 13 through Sep 17 shifts were applied as defined by measurements and distributed by time and beaver activity events. Open-water measurement shifts ranged from -0.02 to +0.02 ft; applied shifts ranged from 0 ft to -0.01 ft. All open water measurements were given full weight except for nos. 931, 936, 937, which were adjusted as much as 5.6 percent (rated good and fair) to smooth the shift trend and measurement nos. 930, 939, 942, 943, and 945 were rated poor and adjusted as much as 22.6 percent to smooth the shift trend. Periods of ice affected and unreliable gage-height record were estimated. The -0.10 ft correction from the control being submerged by backwater from a beaver dam on Sep 17 was prorated by time back to Sep 13 based on identified periods of beaver activity.

Special Computations.-- Discharge for periods of trash, ice affected and unreliable stage record was estimated using discharge measurements, fair record before and after the period, air temperature records from Trinchera Creek above Turners Ranch and Mountain Home Reservoir, and precipitation records from Ute Creek near Fort Garland.

Remarks.-- Record is fair except for daily discharges less than 1 cfs and estimated periods, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08241500 SANGRE DE CRISTO CREEK NEAR FORT GARLAND

RATING TABLE-- SANFTGCO19-2 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

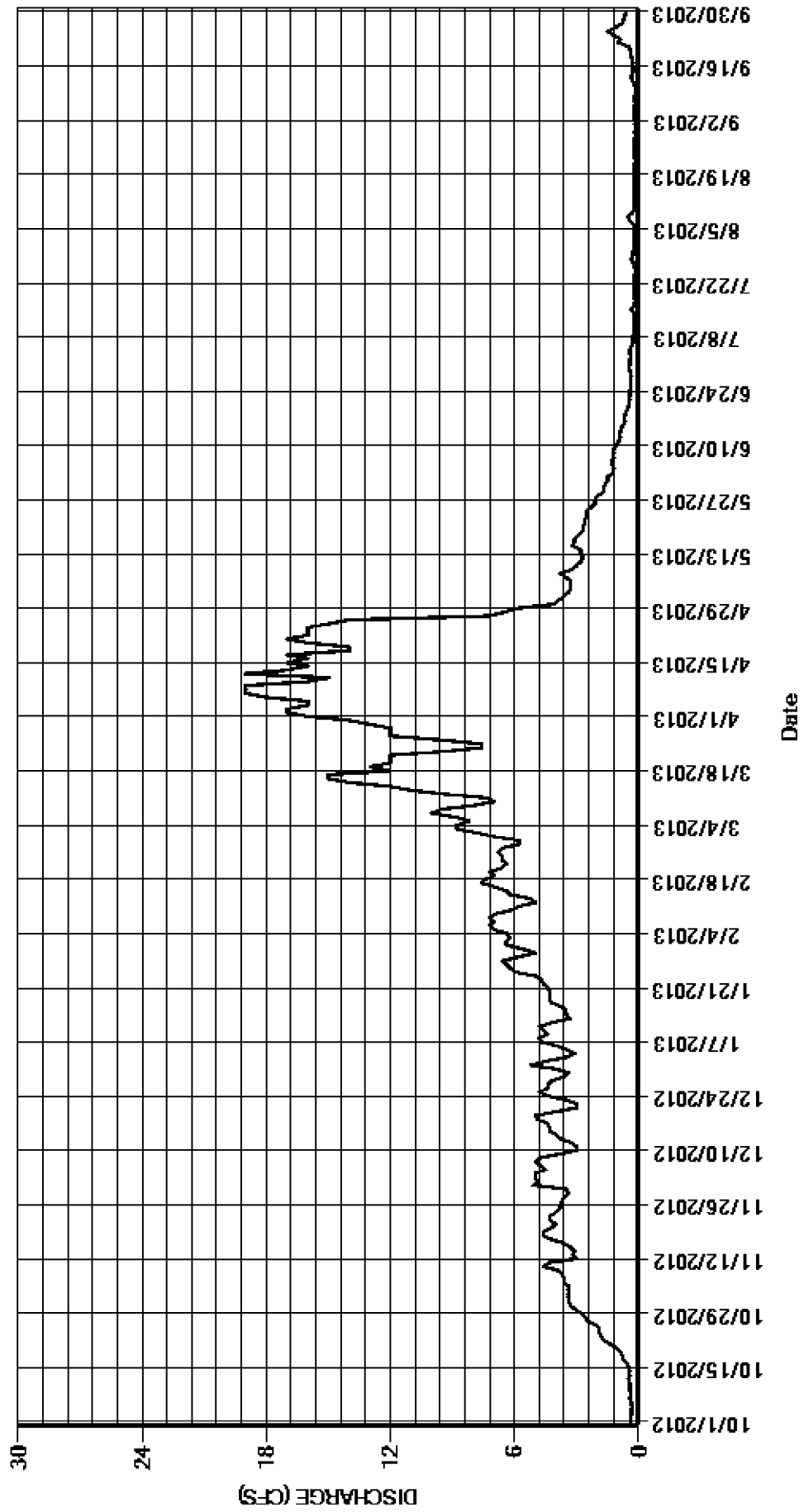
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.39	3.4	5.1	e5.2	e6.4	e7.0	16	3.9	1.5	0.40	0.19	0.18
2	0.40	3.4	4.9	e4.5	e6.4	e7.8	17	3.6	1.5	0.44	0.22	0.18
3	0.34	3.4	5.0	e3.5	e6.2	e8.8	17	3.4	1.2	0.36	0.20	0.21
4	0.36	3.4	5.0	e3.1	e6.4	e8.8	16	3.3	1.2	0.44	0.25	0.19
5	0.32	3.4	4.5	e3.5	e7.0	e8.2	16	3.3	1.3	0.41	0.26	0.22
6	0.37	3.6	4.7	e4.0	e7.2	e8.8	18	3.3	1.3	0.30	0.23	0.18
7	0.43	3.6	5.0	e4.7	e7.0	e10	19	3.5	1.2	0.26	0.42	0.19
8	0.40	3.7	4.8	e4.8	e7.2	e9.6	19	3.8	1.2	0.27	0.55	0.20
9	0.42	3.9	e3.9	e4.4	e7.0	e8.0	19	3.2	1.2	0.25	0.30	0.15
10	0.43	4.6	e3.0	e4.6	e6.2	e7.0	e16	3.0	1.1	0.24	0.23	0.13
11	0.44	4.3	e3.0	e4.8	e5.8	e7.4	e15	2.8	0.98	0.22	0.23	0.21
12	0.49	3.0	e3.3	e4.2	e5.0	e9.4	19	2.7	0.89	0.20	0.24	0.27
13	0.44	3.2	e3.8	e3.3	e5.2	11	17	2.8	0.93	0.23	0.24	e0.38
14	0.44	3.1	e4.0	e3.5	e6.2	12	16	2.8	0.85	0.22	0.24	e0.30
15	0.46	3.3	e4.3	e3.5	e6.4	14	17	3.2	0.79	0.36	0.22	e0.24
16	0.55	3.6	e4.3	e3.7	e7.0	15	16	3.1	0.66	0.23	0.20	e0.31
17	0.76	4.2	e4.4	e4.2	e7.6	15	17	3.1	0.69	0.18	0.21	e0.28
18	0.78	4.6	e4.9	e4.3	e7.4	12	e14	2.9	0.67	0.19	0.17	0.34
19	0.90	4.6	e5.0	e4.3	e7.0	13	e14	2.7	0.57	0.22	0.25	0.39
20	1.1	4.2	e4.0	e4.3	e7.2	12	16	2.7	0.49	0.20	0.20	0.40
21	1.4	4.0	e3.0	e4.4	e6.6	12	17	2.6	0.48	0.25	0.24	0.50
22	1.7	4.3	e3.0	e4.6	e6.4	12	16	2.6	0.44	0.20	0.17	1.0
23	1.8	4.3	e3.5	e4.7	e6.6	e9.4	16	2.5	0.43	0.19	0.18	0.89
24	1.9	4.0	e4.4	e5.0	e6.6	e7.6	16	2.5	0.42	0.20	0.19	1.2
25	1.9	3.8	e4.8	e6.0	e6.8	e7.6	15	2.3	0.40	0.16	0.19	1.5
26	2.1	3.8	e4.4	e6.2	e6.6	e9.6	14	2.1	0.40	0.20	0.20	1.1
27	2.5	3.7	e4.4	e6.4	e5.8	12	7.2	2.1	0.39	0.25	0.19	0.79
28	2.6	3.6	e4.2	e6.6	e5.8	12	6.5	2.0	0.36	0.35	0.19	0.73
29	2.8	e3.4	e3.6	e5.8	---	12	5.8	1.7	0.40	0.29	0.18	0.67
30	3.1	e3.5	e3.4	e5.0	---	13	4.1	1.7	0.47	0.27	0.19	0.61
31	3.3	---	e4.0	e5.6	---	14	---	1.6	---	0.23	0.17	---
TOTAL	35.32	112.9	129.6	142.7	183.0	326.0	451.6	86.8	24.41	8.21	7.14	13.94
MEAN	1.14	3.76	4.18	4.60	6.54	10.5	15.1	2.80	0.81	0.26	0.23	0.46
AC-FT	70	224	257	283	363	647	896	172	48	16	14	28
MAX	3.3	4.6	5.1	6.6	7.6	15	19	3.9	1.5	0.44	0.55	1.5
MIN	0.32	3.0	3.0	3.1	5.0	7.0	4.1	1.6	0.36	0.16	0.17	0.13

CAL YR	2012	TOTAL	3231.40	MEAN	8.83	MAX	79	MIN	0.16	AC-FT	6410
WTR YR	2013	TOTAL	1521.62	MEAN	4.17	MAX	19	MIN	0.13	AC-FT	3020

MAX DISCH: 22.4 CFS AT 16:45 ON APR 06, 2013 GH 1.59 FT SHIFT 0.00 FT  
 MAX GH: 1.59 FT AT 16:45 ON APR 06, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08241500 SANGRE DE CRISTO CREEK NEAR FORT GARLAND  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08242500 UTE CREEK NEAR FORT GARLAND  
Water Year 2013

Location.-- Lat 37°26'50", long 105°25'33" referenced to North American Datum of 1983 (Fort Garland, CO quad, scale 1:24,000), UTM Zone 13 462334 E and 4144571 N, in NE ¼ NW ¼ sec. 15, T.30 S., R.72 W., 6th Principal Meridian, Costilla County, CO, Hydrologic Unit 13010002, on left bank 1.5 mi north of Fort Garland, CO, and 6 mi upstream from mouth.

Drainage Area and Period of Record.-- 32 square miles, approximately.; 1916, 1923 to present.

Equipment.-- Data collection platform (Sutron Satlink2), a float-operated SDR shaft encoder, and a tipping bucket rain gage in a 4-ft CMP shelter and well. The primary reference gage is a drop tape from reference point on shelf.

Hydrologic Conditions.-- The majority of the drainage above the gage is undeveloped steep alpine and subalpine terrain. There are five active irrigation diversions above the gage.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log and SDR log as backup. Record is complete and reliable except for Nov 28-30, Dec 1, 2, Mar 26, 27, Apr 9, 10 when float was affected by ice in well; and Dec 3 through Mar 25 when station was closed for the winter. The stage-discharge relation was affected by ice Oct 26-28; Nov 4, 5, 11-27; Apr 18, 19, 23, 24, and May 2, 3. There were three +/- 0.01 ft corrections made to the SDR. These corrections were prorated by time from previous visit.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on Aug 29, 2012 using BM1 as base. The reference point was outside allowable limits, so a -0.041 ft correction was made. Two-peg test was performed on the Lietz level (SN 130869) on Aug 6, 2012, the instrument was within allowable limits and no correction was made.

Rating.-- The control is a concrete broad crested weir approximately 10 feet below the gage. Shifting occurs mainly due to the scour and fill in the gage pool. Rating no. 19-1, in use since March 20, 2012, was used again this water year. Seventeen measurements (nos. 273-289) were made this year ranging in discharge from 3.24 to 56.4 cfs. They cover the flow range experienced except for lower daily flows on Nov 12; Jan 2-9, 14-16 and higher daily flows on Sep 3, 13-14. The peak flow of 159 cfs occurred at 1930 on Sep 13, 2013 at a gage height of 2.94 feet with a shift of 0.00 feet. It exceeded high measurement no. 288 (GH = 2.27 ft), made Sep 3 by 0.67 feet in stage.

Discharge.-- Shifting control method was used to compute the discharge record for all open-water periods. Two variable stage-shift relationships, VS13-A and VS13-B, were used to define shifting for the entire water year. VS13-A defines the scoured gage-pool condition and VS13-B defines the filled gage-pool condition. Open-water measurement shifts ranged from -0.01 to +0.05 ft and applied shifts ranged from 0.00 to +0.03 ft. All measurements were given full weight except nos. 273, 279, 280, 283, 285, and 289, which were adjusted by as much as 7.6% to smooth shift trends. Periods of ice affected, unreliable, and no stage record were estimated.

Special Computations.-- Discharge for periods of ice affected, unreliable, and no stage record was estimated using discharge measurements and temperature records from Mountain Home Reservoir.

Remarks.-- Record is good, except for periods of estimation, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- The gage pool at this site requires regular cleaning to enable the concrete control to be the controlling feature at lower flows.



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08242500 UTE CREEK NEAR FORT GARLAND

RATING TABLE-- UTEFTGCO19-1 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

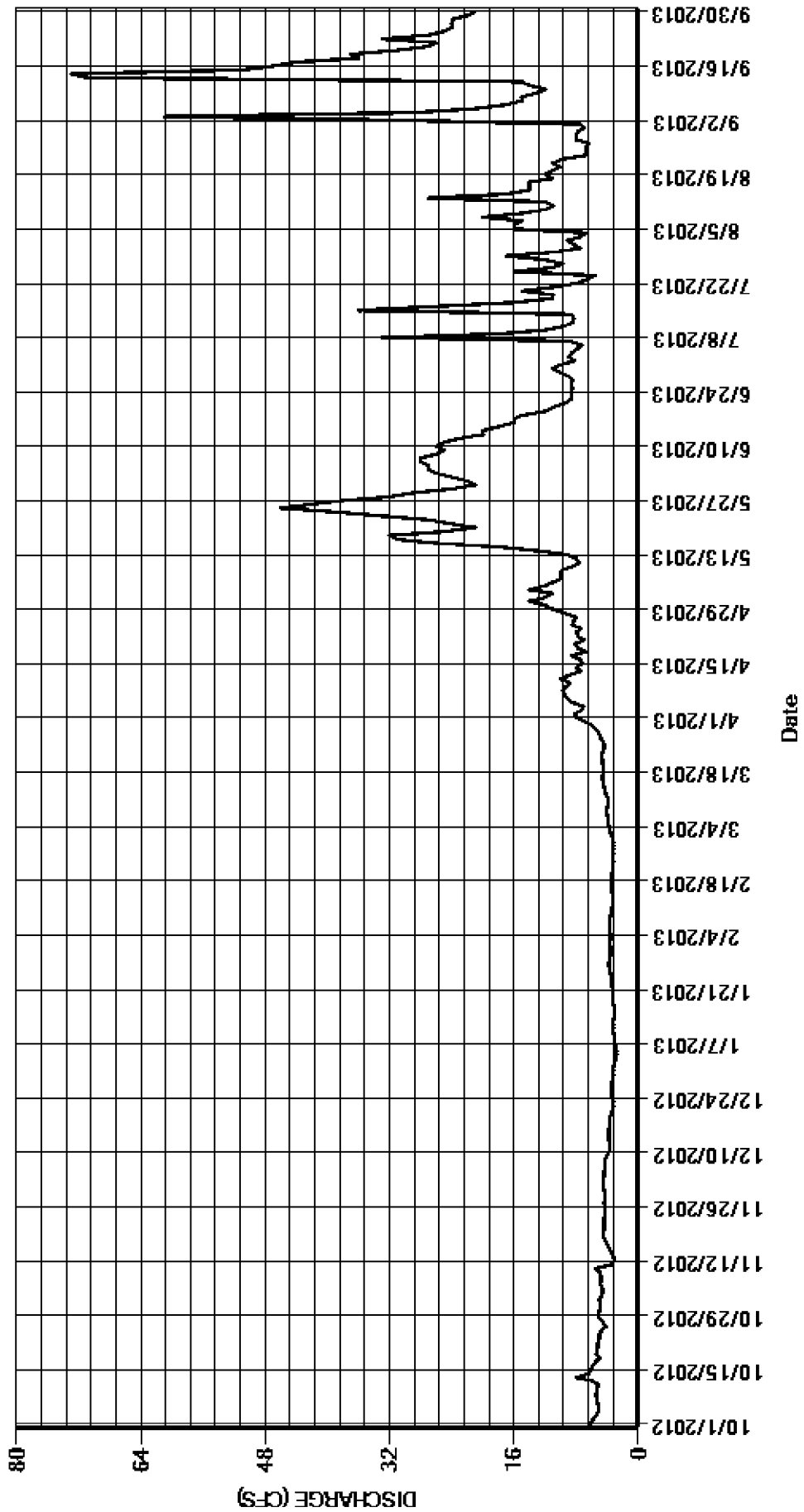
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.2	4.9	e4.5	e3.2	e3.6	e3.3	8.0	14	22	10	8.3	7.5
2	5.9	5.1	e4.5	e3.1	e3.7	e3.5	8.2	e12	24	8.2	9.1	29
3	5.5	4.7	e4.5	e2.9	e3.6	e3.7	7.3	e11	26	8.9	7.4	61
4	5.2	e4.6	e4.4	e2.8	e3.6	e3.8	7.1	14	27	8.6	6.7	29
5	5.1	e4.6	e4.4	e2.8	e3.7	e3.9	8.5	12	27	7.9	16	21
6	5.2	4.9	e4.3	e2.9	e3.7	e3.9	9.1	11	28	7.3	16	17
7	5.3	4.8	e4.3	e3.0	e3.7	e4.0	9.5	9.8	28	8.8	15	15
8	5.4	4.8	e4.3	e3.1	e3.7	e4.1	9.7	10	26	33	20	15
9	5.4	4.9	e4.1	e3.1	e3.6	e4.0	e9.3	9.9	25	18	15	13
10	5.3	5.5	e3.8	e3.2	e3.5	e3.9	e8.8	8.5	26	12	12	12
11	5.1	e3.5	e3.7	e3.2	e3.4	e3.9	10	7.5	25	9.5	11	14
12	5.9	e3.0	e3.7	e3.2	e3.3	e4.1	8.8	8.0	23	8.4	12	15
13	8.0	e3.2	e3.8	e3.2	e3.3	e4.3	7.4	9.1	20	8.3	27	71
14	6.4	e3.4	e3.8	e3.1	e3.3	e4.4	8.0	13	20	8.7	17	73
15	6.1	e3.7	e3.8	e3.1	e3.4	e4.5	7.2	18	18	36	14	51
16	5.9	e3.9	e3.8	e3.1	e3.4	e4.6	7.5	26	16	26	14	47
17	5.5	e4.2	e3.7	e3.2	e3.5	e4.6	8.6	31	16	16	14	44
18	5.0	e4.5	e3.7	e3.3	e3.5	e4.5	e6.8	32	15	11	11	36
19	5.4	e4.5	e3.7	e3.3	e3.4	e4.5	e7.8	25	12	11	12	37
20	5.3	e4.4	e3.5	e3.3	e3.4	e4.6	8.2	21	11	15	11	31
21	5.2	e4.4	e3.3	e3.3	e3.3	e4.6	7.0	24	9.6	11	10	27
22	5.2	e4.4	e3.2	e3.4	e3.3	e4.7	7.8	27	8.7	8.0	11	26
23	5.0	e4.4	e3.2	e3.4	e3.2	e4.6	e8.0	33	8.6	6.6	9.7	33
24	5.0	e4.3	e3.4	e3.5	e3.3	e4.4	e7.3	39	8.6	5.6	6.9	27
25	4.8	e4.3	e3.5	e3.6	e3.2	e4.4	8.5	46	8.5	16	6.6	25
26	e4.2	e4.3	e3.5	e3.7	e3.2	e4.6	8.3	42	8.6	11	6.8	24
27	e4.5	e4.4	e3.4	e3.8	e3.2	e4.9	8.0	38	8.4	9.7	6.4	24
28	e4.9	e4.3	e3.4	e3.8	e3.2	5.1	9.5	32	8.9	12	8.0	24
29	5.2	e4.3	e3.3	e3.7	---	5.5	11	29	10	17	8.0	22
30	5.0	e4.4	e3.2	e3.6	---	5.9	12	24	11	11	7.8	21
31	4.9	---	e3.2	e3.6	---	6.9	---	21	---	7.5	7.0	---
TOTAL	167.0	130.6	116.9	101.5	96.2	137.7	253.2	657.8	525.9	388.0	356.7	891.5
MEAN	5.39	4.35	3.77	3.27	3.44	4.44	8.44	21.2	17.5	12.5	11.5	29.7
AC-FT	331	259	232	201	191	273	502	1300	1040	770	708	1770
MAX	8.0	5.5	4.5	3.8	3.7	6.9	12	46	28	36	27	73
MIN	4.2	3.0	3.2	2.8	3.2	3.3	6.8	7.5	8.4	5.6	6.4	7.5

CAL YR	2012	TOTAL	3149.3	MEAN	8.60	MAX	30	MIN	3.0	AC-FT	6250
WTR YR	2013	TOTAL	3823.0	MEAN	10.5	MAX	73	MIN	2.8	AC-FT	7580

MAX DISCH: 159 CFS AT 19:30 ON SEP 13, 2013 GH 2.94 FT SHIFT 0.00 FT  
 MAX GH: 2.94 FT AT 19:30 ON SEP 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08242500 UTE CREEK NEAR FORT GARLAND  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08243500 TRINCHERA CREEK BELOW SMITH RESERVOIR  
Water Year 2013

Location.-- Lat 37°23'10", long 105°33'6" referenced to North American Datum of 1983 (Blanca, CO quad, scale 1:24,000), UTM Zone 13 451172 E and 4137863 N, in NE ¼ NW ¼ sec. 4, T.31 S., R.73 W., 6th Principal Meridian, Costilla County, CO, Hydrologic Unit 13010002, on right bank 0.6 mi downstream from Smith Reservoir, and 5.0 mi southwest of Blanca, CO.

Drainage Area and Period of Record.-- 396 mi<sup>2</sup>; Oct. 1, 1928 to current year, records mostly complete.

Equipment.-- Graphic water-stage recorder, data collection platform (Sutron Satlink2) and a float-operated shaft encoder in a 42-inch diameter corrugated metal shelter and well. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrologic Conditions.-- Station is located below Smith Reservoir and all but the smallest flows are regulated. There are small springs located below the dam and are measured during the periods the outlet is shut off.

Gage-Height Record.-- Primary record is fifteen-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Dec 30 to Mar 21 when inlets were froze. One fifteen minute value was corrected on Mar 27 due to an erroneous value from a gage visit. One +0.01 ft instrument calibration correction was prorated from previous visit. Three cleaning corrections were distributed as modified shifts. The stage-discharge relationship was affected by ice Dec 20-23, 28 and 29.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage Apr 6, 2012 using BM No. 5 as base. The RP elevation was within allowable limits, so a correction was not made. Two-peg test was performed on the Lietz level (SN 130869) on Apr 6, 2012 and the instrument was within allowable limits and no correction was made.

Rating.-- The control is a concrete weir approximately five feet downstream of the gage. Shifting primarily results from plant growth and the movement of streambed materials in gage pool and approach. Rating No. 12, in use since Oct 1, 2009, was used again this year. Thirteen measurements (nos. 900-912) were made this year ranging in discharge from 0.01 to 16.3 cfs. The measurements cover the discharge range experienced except for higher daily flows on May 18 and 19 and the lower daily flows on Jul 26-31, Aug 1-6, 9. The peak flow of 26.8 cfs occurred at 1200 on Apr 16, 2013 at a gage height of 3.42 ft with a shift of 0.00 ft. It exceeded high measurement no. 905 (GH = 3.24 ft), made on Apr 16, 2013, by 0.18 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record during all open-water periods with reliable stage record. Shifts were applied by time from Oct 1 to Apr 16 and Jun 24 to end of water year. Shift curve TRISMIVS13-A was developed and used from Apr 16 to Jun 24 to apply shifts by stage. Measurement shifts ranged from -0.05 to +0.03 ft and applied shifts ranged from -0.05 to +0.02. All were given full weight, except for nos. 903, 906, and 907, which were adjusted as much as 21.2 percent. Measurements 910 and 912 weren't used for shift development due to extremely poor conditions and shallow depths. Discharge was estimated for periods of ice affected and unreliable gage-height record.

Special Computations.-- Discharge for periods of ice affected and unreliable gage-height record was estimated using discharge measurements, good record before and after ice periods, and weather records. Winter flows are primarily reservoir seepage and small springs. Winter measurements are poor and no single measurement is given more weight than any other.

Remarks.-- Record is good except for periods of estimation and daily discharges less than 1 cfs, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Survey weir and acquire accurate PZF to develop more accurate low end rating.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08243500 TRINCHERA CREEK BELOW SMITH RESERVOIR

RATING TABLE-- TRISMICO12 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

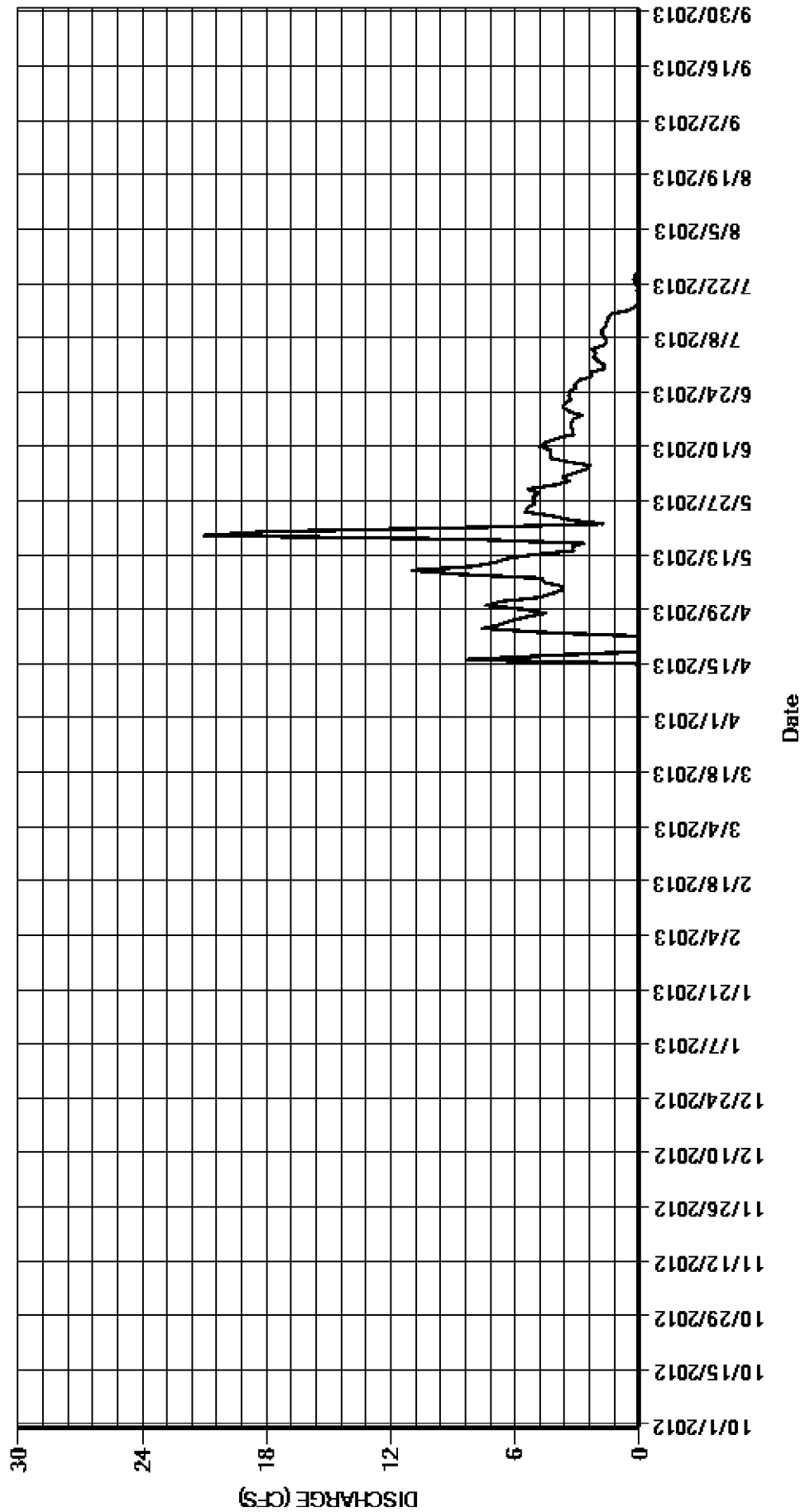
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.06	0.06	0.06	e0.06	e0.06	e0.05	0.05	6.6	3.4	1.7	0.00	0.01
2	0.07	0.06	0.06	e0.06	e0.06	e0.05	0.05	4.8	3.7	2.0	0.00	0.01
3	0.06	0.05	0.06	e0.06	e0.06	e0.05	0.04	4.2	3.2	2.2	0.00	0.01
4	0.07	0.05	0.05	e0.05	e0.06	e0.05	0.04	3.7	2.6	2.1	0.00	0.01
5	0.06	0.05	0.05	e0.05	e0.06	e0.05	0.05	3.8	2.4	2.3	0.00	0.01
6	0.05	0.05	0.05	e0.05	e0.06	e0.05	0.05	4.6	3.5	1.7	0.00	0.01
7	0.06	0.05	0.06	e0.05	e0.06	e0.05	0.07	4.7	4.3	1.6	0.02	0.01
8	0.07	0.06	0.06	e0.05	e0.06	e0.05	0.08	8.7	4.3	1.7	0.01	0.01
9	0.08	0.06	0.06	e0.05	e0.06	e0.04	0.08	11	4.3	1.8	0.00	0.02
10	0.07	0.06	0.05	e0.05	e0.06	e0.04	0.08	8.1	4.8	1.8	0.01	0.02
11	0.06	0.06	0.05	e0.05	e0.05	e0.04	0.07	7.0	4.5	1.6	0.01	0.03
12	0.08	0.06	0.05	e0.05	e0.05	e0.04	0.07	6.4	4.0	1.6	0.03	0.03
13	0.07	0.06	0.05	e0.05	e0.05	e0.05	0.07	5.1	3.2	1.5	0.01	0.04
14	0.05	0.06	0.05	e0.05	e0.05	e0.06	0.09	3.2	3.2	1.4	0.01	0.04
15	0.05	0.06	0.05	e0.05	e0.05	e0.07	0.10	3.2	3.3	0.58	0.01	0.03
16	0.06	0.06	0.06	e0.06	e0.05	e0.07	8.3	2.7	3.3	0.15	0.01	0.02
17	0.06	0.06	0.06	e0.06	e0.05	e0.07	4.8	7.8	3.2	0.07	0.01	0.02
18	0.06	0.06	0.05	e0.06	e0.05	e0.07	0.04	21	2.8	0.04	0.01	0.03
19	0.05	0.06	0.06	e0.06	e0.05	e0.07	0.02	18	3.4	0.06	0.02	0.03
20	0.05	0.06	e0.05	e0.06	e0.05	e0.07	0.01	8.3	3.7	0.10	0.03	0.03
21	0.07	0.06	e0.05	e0.06	e0.05	e0.07	0.01	1.8	3.6	0.09	0.03	0.02
22	0.08	0.06	e0.05	e0.06	e0.05	0.07	0.14	3.4	3.3	0.17	0.03	0.03
23	0.04	0.06	e0.05	e0.06	e0.05	0.07	4.9	4.2	3.4	0.27	0.03	0.02
24	0.04	0.06	0.05	e0.06	e0.05	0.06	7.6	5.5	3.4	0.20	0.03	0.02
25	0.05	0.06	0.04	e0.06	e0.05	0.04	6.8	5.4	3.1	0.01	0.03	0.02
26	0.06	0.06	0.04	e0.06	e0.05	0.06	6.2	5.1	3.1	0.00	0.03	0.02
27	0.07	0.06	0.04	e0.06	e0.05	0.04	5.5	5.1	2.9	0.00	0.03	0.01
28	0.06	0.06	e0.05	e0.06	e0.05	0.05	4.5	5.1	2.3	0.00	0.03	0.01
29	0.05	0.06	e0.05	e0.06	---	0.04	5.7	4.9	2.4	0.00	0.04	0.02
30	0.06	0.06	e0.06	e0.06	---	0.05	7.4	5.4	1.7	0.00	0.02	0.02
31	0.06	---	e0.06	e0.06	---	0.04	---	4.1	---	0.00	0.01	---
TOTAL	1.88	1.75	1.63	1.74	1.50	1.68	62.91	192.9	100.3	26.74	0.50	0.61
MEAN	0.061	0.058	0.053	0.056	0.054	0.054	2.10	6.22	3.34	0.86	0.016	0.020
AC-FT	3.7	3.5	3.2	3.5	3.0	3.3	125	383	199	53	1.0	1.2
MAX	0.08	0.06	0.06	0.06	0.06	0.07	8.3	21	4.8	2.3	0.04	0.04
MIN	0.04	0.05	0.04	0.05	0.05	0.04	0.01	1.8	1.7	0.00	0.00	0.01

CAL YR	2012	TOTAL	1356.70	MEAN	3.71	MAX	45	MIN	0.04	AC-FT	2690
WTR YR	2013	TOTAL	394.14	MEAN	1.08	MAX	21	MIN	0.00	AC-FT	782

MAX DISCH: 26.8 CFS AT 12:00 ON APR 16, 2013 GH 3.42 FT SHIFT 0.00 FT  
 MAX GH: 3.42 FT AT 12:00 ON APR 16, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08243500 TRINCHERA CREEK BELOW SMITH RESERVOIR  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08245000 CONEJOS RIVER BELOW PLATORO RESERVOIR  
Water Year 2013

Location.-- Lat 37°21'18", long 106°32'39" referenced to North American Datum of 1983 (Platoro, CO quad, scale 1:24,000), UTM Zone 13 363240 E and 4135374 N, in SW ¼ NW ¼ sec. 22, T.36 N., R.4 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010005, on left bank 1,100 ft downstream from Platoro Reservoir valve house and 0.7 mi northwest of Platoro, CO.

Drainage Area and Period of Record.-- 40 mi<sup>2</sup>; May 1952 to current year.

Equipment.-- Constant flow bubbler (CFB) used as primary record. Graphic water-stage recorder (removed 11/2012) and float-operated stage discharge recorder (SDR) ran as backup in a timber shelter and concrete well equipped with data collection platform (Satlink2) and air temperature sensor. The primary reference gage is the outside cantilever gage. Cableway located 150 feet below gaging station.

Hydrologic Conditions.-- Gage is below Platoro Reservoir and regulated at all stages.

Gage-Height Record.-- Primary record is 15-minute transmitted CFB data with DCP log, SDR log, and graphic chart record as backup. Record is complete and reliable. The SDR log was used from Aug 22 0800 to Aug 29 1200 since CFB was malfunctioning. One 15 -minute value was filled from SDR log and/or linear interpolation on the following days without loss of accuracy: Oct 12; Nov 1, Dec 28, Feb 28, Mar 25, May 5, May 16, Jul 10, Jul 18, Aug 29, Sep 8, Sep 11, and Sep 18. There were six instrument calibration corrections made to the bubbler ranging from -0.03 to +0.04 ft, which were prorated from the previous visit. A +0.01 ft calibration correction was applied to SDR data on Aug 22-29 based on comparison with CFB data.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage and the outside cantilever gage on Aug 20, 2013 using B.M. No. 1 as base. The outside cantilever gage was corrected +0.02 ft. A two-peg test was performed on the Lietz level (SN 130869) on Aug 20, 2013. The instrument was within allowable limits and no correction was made.

Rating.-- The control is a concrete slab weir with sloping sides. Rating no. 15-1 in use since Jan 1, 2011 was used again this year. Rating no. 15-1 is well defined from 7 to 825 cfs. Twelve measurements (nos. 909-920) were made this year ranging in discharge from 1.15 to 425 cfs. Measurements cover the discharge range experienced except for higher daily flows on May 24-26. The peak flow of 473 cfs occurred at 1230 on May 24, 2013 at a gage height of 2.86 ft with a shift of -0.01 ft. It exceeded high measurement no. 915 (GH = 2.80 ft), made May 24, by 0.06 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record. Three variable shift curves (VS12-02, VS13-A, VS13-D) were developed and used to distribute shifting by stage and time. VS12-02 was ran from the previous water year until Mar 28 when levels correction was first applied. VS13-A and VS13-D were used throughout the rest of the year to define minimal shifting trends. Measurement shifts ranged from -0.05 ft to +0.05 ft and applied shifts ranged from -0.02 ft to +0.01 ft. All measurements were given full weight except numbers 911-915 and 917-919, which were adjusted as much as 7.7 percent to smooth the shift distribution and measurement no. 910 which was not used for record development.

Special Computations.--

Remarks.-- Record is good except for period of Nov 7 to Mar 28, which should be considered fair due to minimal number of visits. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Experiment to discover cause of measurement variation at this station between ADCP and standard meters.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08245000 CONEJOS RIVER BELOW PLATORO RESERVOIR

RATING TABLE-- CONPLACO15-1 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

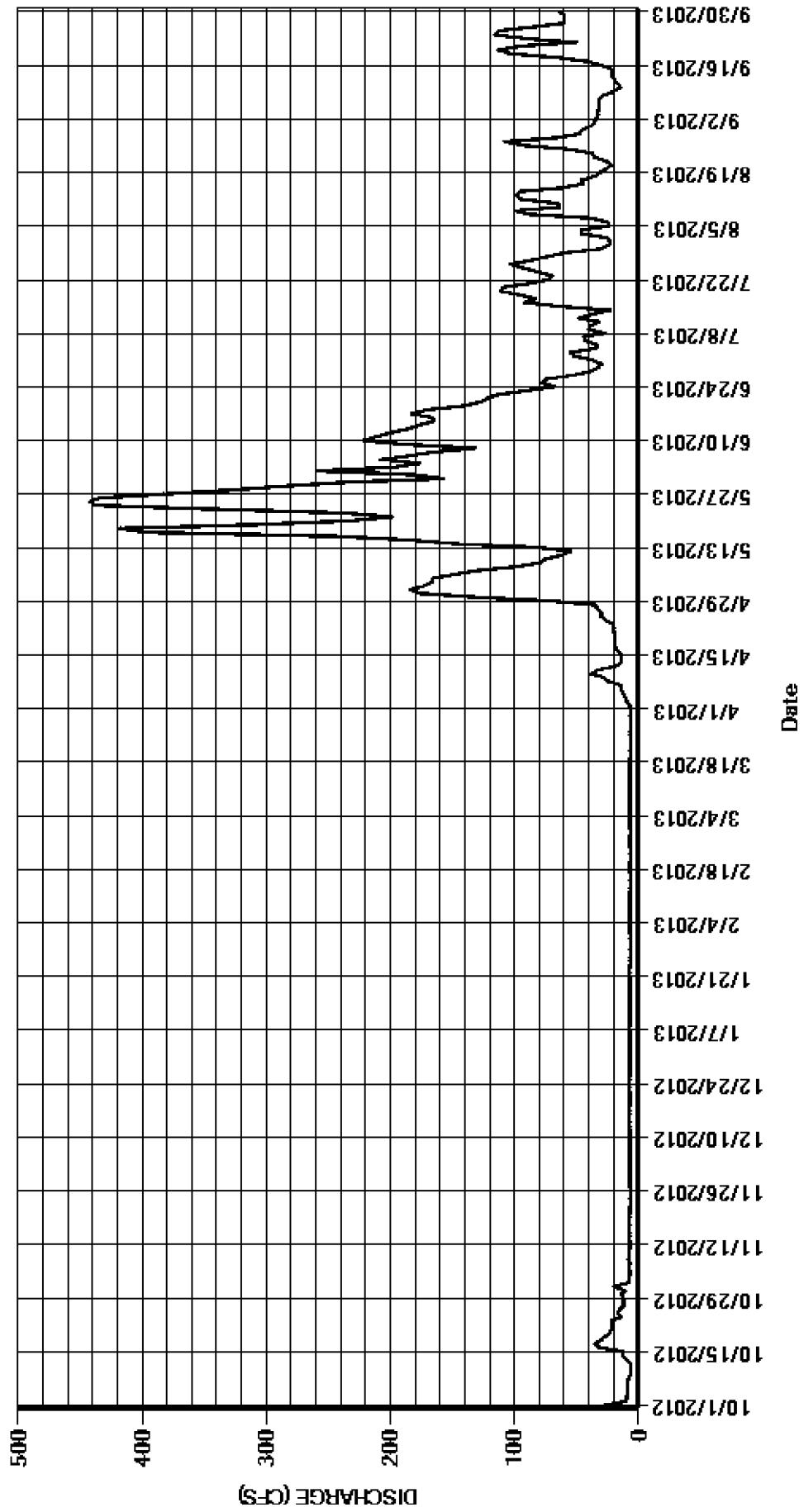
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	27	20	7.0	7.0	6.9	7.0	6.8	176	180	37	23	36
2	10	8.0	7.1	7.0	6.9	6.9	7.4	184	259	52	26	34
3	9.6	8.0	7.1	7.0	7.0	7.0	9.7	173	195	55	46	33
4	9.2	6.9	7.0	7.0	7.0	7.0	11	167	177	34	46	33
5	9.1	7.0	7.0	7.0	7.1	7.1	13	166	208	34	24	32
6	9.0	7.7	7.0	7.1	7.0	7.0	14	149	186	43	25	32
7	9.1	6.8	7.0	7.2	7.0	6.9	14	130	164	44	38	32
8	8.0	8.3	7.0	7.2	7.0	7.0	24	99	132	27	88	29
9	6.3	7.4	7.0	7.1	7.0	7.0	28	80	190	40	100	21
10	6.3	7.6	7.0	7.1	7.0	7.0	38	75	222	39	64	15
11	6.4	7.0	7.1	7.1	7.0	7.0	33	62	211	32	65	16
12	6.7	6.9	7.2	7.0	7.0	7.1	19	55	199	48	95	19
13	9.8	7.4	7.2	7.0	6.8	7.0	14	82	186	37	99	21
14	13	7.3	7.3	7.0	6.7	7.0	14	148	176	23	96	22
15	13	7.4	7.3	6.9	6.8	7.0	14	183	165	64	62	22
16	32	7.3	7.3	7.0	6.8	7.0	17	243	166	92	45	30
17	35	7.4	7.3	7.1	6.9	7.0	19	396	183	83	46	42
18	30	7.4	7.3	7.1	7.0	7.0	19	418	171	96	35	66
19	27	7.4	7.1	7.1	7.0	6.9	19	308	142	111	31	104
20	23	7.3	7.0	7.1	6.9	6.8	19	232	128	110	26	113
21	22	7.0	7.1	7.2	6.7	6.8	20	199	122	89	22	93
22	22	6.8	7.3	7.3	6.8	6.8	20	236	113	73	26	50
23	22	6.7	7.3	7.2	6.8	6.7	20	343	89	70	36	90
24	14	6.8	7.3	6.8	7.0	6.7	26	439	68	81	37	116
25	17	6.8	7.4	6.9	7.0	6.8	30	442	78	93	55	113
26	15	6.8	7.2	6.8	7.0	6.8	30	435	74	103	91	85
27	12	6.9	7.0	6.9	6.9	6.7	33	383	54	87	108	60
28	12	6.9	7.0	6.8	6.8	6.6	35	331	39	73	67	60
29	13	7.0	7.0	6.8	---	6.6	69	288	33	59	48	60
30	14	7.0	7.1	6.7	---	6.8	130	240	30	32	46	64
31	11	---	7.3	6.8	---	6.8	---	158	---	24	39	---
TOTAL	473.5	229.2	221.3	217.3	193.8	213.8	765.9	7020	4340	1885	1655	1543
MEAN	15.3	7.64	7.14	7.01	6.92	6.90	25.5	226	145	60.8	53.4	51.4
AC-FT	939	455	439	431	384	424	1520	13920	8610	3740	3280	3060
MAX	35	20	7.4	7.3	7.1	7.1	130	442	259	111	108	116
MIN	6.3	6.7	7.0	6.7	6.7	6.6	6.8	55	30	23	22	15

CAL YR	2012	TOTAL	24923.5	MEAN	68.1	MAX	364	MIN	6.3	AC-FT	49440
WTR YR	2013	TOTAL	18757.8	MEAN	51.4	MAX	442	MIN	6.3	AC-FT	37210

MAX DISCH: 473 CFS AT 12:30 ON MAY 24, 2013 GH 2.86 FT SHIFT -0.01 FT  
 MAX GH: 2.86 FT AT 12:30 ON MAY 24, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08245000 CONEJOS RIVER BELOW PLATORO RESERVOIR  
WY2013 HYDROGRAPH





RIO GRANDE RIVER BASIN  
08246500 CONEJOS RIVER NEAR MOGOTE

Water Year 2013

Location.-- Lat. 37°03'14", Long. 106°11'13", UTM X 394411.1, Y 4101511.0, in SE¼SE¼ sec. 34, T.33 N., R.7 E., Conejos County, Hydrologic Unit 13010005, on left bank 75 ft downstream from bridge on State Highway 174, 0.4 mi downstream from Fox Creek, 5.3 mi west of Mogote, and 10 mi west of Antonito.

Drainage Area and Period of Record.-- 282 mi<sup>2</sup>; April 1903 to October 1905, October 1911 to current year. Monthly discharge only for some periods. Records for March 1900 at site 5.5 mi upstream and May 1905 to September 1911 (some missing periods most years) at site 3.2 mi upstream not equivalent to present site due to inflow.

Equipment.-- Graphic water-stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio and phone modem) and a float-operated shaft encoder, air temperature sensor, and tipping bucket rain gauge in a 5-ft diameter metal shelter and well. On-site AC-power provides electricity for heat lamp to prevent well from freezing in winter. The primary reference gage is a drop tape from reference point on shelf. Outside gage is a cantilever wire weight gage located on the upstream side of shelter, established May 26, 2011.

Hydrologic Conditions.-- Flows partially regulated by Platoro Reservoir (capacity 60,000 acre-feet) and a few other minor reservoirs. Flood irrigation of approximately 225 acres of pasture grass may have a minor impact on flows at gage, 2005 CDSS irrigated area. Drainage area is predominantly undeveloped national forest.

Gage-Height Record.-- Primary record is 15-minute transmitted stage data with electronic DCP log and chart record as backup. Record is complete and reliable except for Dec 25-31, Jan 1-3 when well was froze. The stage-discharge relationship was affected by ice on the control Nov 12-30; Dec 1, 2, 5-24; Jan 4-31; Feb 1-28; and Mar 1-12, 23-26. There were five instrument calibration corrections made ranging from -0.01 to +0.01 on the following days: Jan 15, Mar 15, Apr 1, May 15, and May 20. All corrections were prorated from previous visit.

Datum Corrections.-- Levels were last ran Sep 27, 2011. All existing reference marks were stable and within allowable tolerance. Outside wire-weight gage was set to gage datum. No other adjustments were made. Two-peg tests were performed on the instrument on Jul 28, and Sep 26, 2011. The instrument was adjusted slightly on Sep 26, 2011.

Rating.-- Low flow control is a cobblestone riffle approximately fifty feet below the gage and medium to high flows are channel control. Rating no. 13, in use since March 3, 2008, was used for the entire water year. It is well defined from 10 to 2100 cfs. The rating was extended to 9200 cfs using the high end of the results of a cooperative rating curve extension project using step-backwater analysis method with the USGS in 2002. Twenty-eight measurements (nos. 253-280) were made this year ranging in discharge from 33.4 to 1000 cfs. The measurements cover the discharge range experienced except for lower daily flows on Nov 11, 12; Dec 9-12, 20; and higher daily flows on May 18, 24-27. The peak flow of 1270 cfs occurred at 0315 on May 25, 2013 at a gage height of 4.35 ft with a shift of 0.00 ft. It exceeded high measurement no. 271 (GH=4.06 ft), made May 24 by 0.29 feet in stage.

Discharge.-- Shifting control method was used during all periods of good record. Discharge was computed by direct application of the rating to the gage height record Oct 1-17. Shift curves VS13-A, VS13-AD, and VS13-AE were developed and used during the remainder of the year to distribute shifts by stage and time to account for vegetation growth. Periods of ice affected and unreliable gage-height record were estimated. Open-water measurement shifts ranged from -0.09 to +0.14 ft and applied shifts ranged from -0.01 to +0.09 ft. All measurements were given full weight except for nos. 256, 264, 267-273, 277, 280, which were adjusted as much as 8.2% to smooth shift trends.

Special Computations.-- Discharge for periods of ice-affected record was estimated using discharge measurements, weather records, partial day record, and comparison with nearby stations.

Remarks.-- Record is good except for periods unreliable gage-heights and ice-affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08246500 CONEJOS RIVER NEAR MOGOTE

RATING TABLE-- CONMOGCO13 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

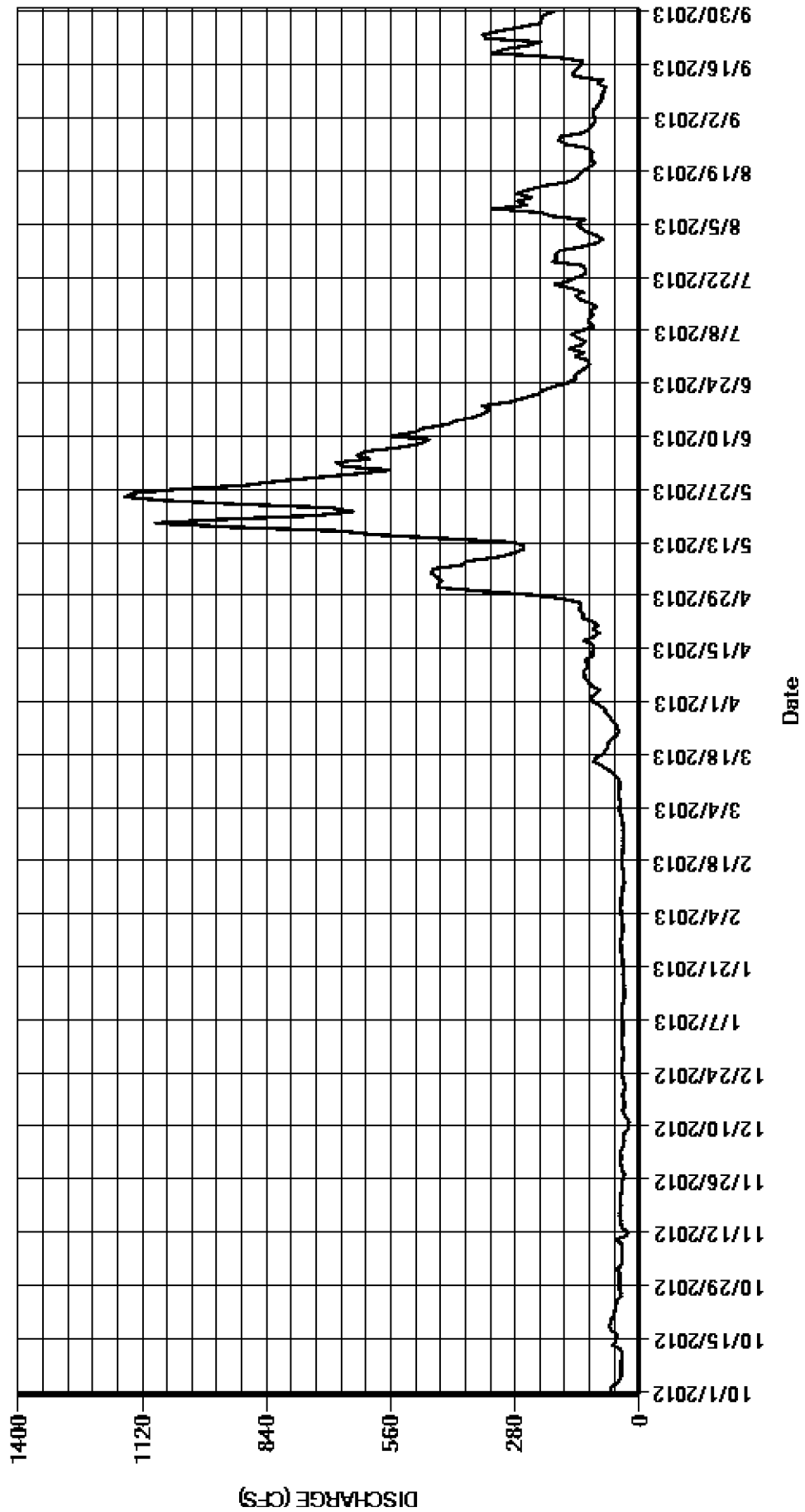
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	66	44	e42	e39	e38	e39	104	454	562	144	82	101
2	64	50	e41	e39	e39	e42	110	454	669	126	98	100
3	50	43	43	e38	e40	e44	99	446	684	159	121	105
4	45	39	39	e37	e41	e45	91	459	609	132	133	104
5	42	40	e36	e38	e42	e43	106	470	636	122	141	95
6	41	40	e35	e38	e42	e45	115	463	617	142	124	89
7	41	39	e35	e38	e41	e47	123	399	542	152	195	85
8	41	39	e34	e39	e41	e47	124	389	493	127	226	84
9	41	42	e26	e39	e39	e45	126	319	475	103	331	80
10	40	53	e25	e40	e38	e45	117	286	560	114	254	76
11	39	28	e24	e38	e37	e45	119	263	508	114	274	94
12	43	e26	e28	e36	e34	e51	121	261	489	103	244	83
13	61	e40	e34	e34	e35	60	106	282	434	112	277	148
14	53	e42	e38	e34	e36	71	106	438	415	96	250	149
15	52	e42	e34	e34	e36	85	104	595	375	109	217	141
16	51	e44	e34	e35	e38	103	106	677	351	134	163	131
17	63	e44	e36	e36	e40	98	124	923	337	143	142	129
18	69	e42	e38	e36	e38	82	103	1090	353	126	135	195
19	65	e42	e36	e37	e39	79	91	943	291	152	126	332
20	63	e44	e32	e37	e38	71	104	731	262	191	114	306
21	58	e44	e34	e37	e37	70	95	647	230	159	101	253
22	56	e42	e36	e38	e37	63	103	691	218	139	109	221
23	54	e40	e38	e38	e37	e52	130	905	195	121	110	346
24	53	e40	e40	e40	e37	e46	125	1070	162	121	106	352
25	50	e40	e40	e41	e37	e50	135	1160	144	128	117	312
26	42	e36	e39	e41	e37	e53	134	1140	146	195	165	265
27	42	e34	e38	e42	e37	62	133	1040	135	188	183	221
28	45	e38	e37	e42	e38	68	172	889	122	188	177	221
29	45	e40	e36	e40	---	77	236	823	113	177	125	216
30	45	e42	e37	e38	---	77	352	733	116	129	114	193
31	45	---	e38	e38	---	91	---	637	---	97	106	---
TOTAL	1565	1219	1103	1177	1069	1896	3814	20077	11243	4243	5060	5227
MEAN	50.5	40.6	35.6	38.0	38.2	61.2	127	648	375	137	163	174
AC-FT	3100	2420	2190	2330	2120	3760	7570	39820	22300	8420	10040	10370
MAX	69	53	43	42	42	103	352	1160	684	195	331	352
MIN	39	26	24	34	34	39	91	261	113	96	82	76

CAL YR	2012	TOTAL	68132	MEAN	186	MAX	1020	MIN	24	AC-FT	135100
WTR YR	2013	TOTAL	57693	MEAN	158	MAX	1160	MIN	24	AC-FT	114400

MAX DISCH: 1270 CFS AT 03:15 ON MAY 25, 2013 GH 4.35 FT SHIFT 0 FT  
 MAX GH: 4.35 FT AT 03:15 ON MAY 25, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08246500 CONEJOS RIVER NEAR MOGOTE  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08247500 SAN ANTONIO RIVER AT ORTIZ  
Water Year 2013

Location.-- Lat 36°59'35", long 106°2'17" referenced to North American Datum of 1983 (Los Pinos, NM quad, scale 1:24,000), UTM Zone 13 407628 E and 4094606 N, in L1 ¼ SE ¼ sec. 24, T.32 N., R.8 E., New Mexico Principal Meridian, Rio Arriba County, NM, Hydrologic Unit 13010005, on left bank 800 ft south of Colorado-New Mexico State line, 0.4 mi southeast of Ortiz, CO, and 0.4 mi upstream from Los Pinos River.

Drainage Area and Period of Record.-- 110 mi<sup>2</sup>; April 1919 to current year (no winter record prior to 1941). Monthly data only for some periods.

Equipment.-- Graphic water-stage recorder, data collection platform (Sutron Satlink2) and a float-operated shaft encoder in a 42-inch metal pipe shelter and well. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. A cantilever staff gage was installed on May 4, 2011. Bank operated cableway installed October 2010.

Hydrologic Conditions.-- Basin is alpine and predominately subalpine terrain. Minor diversions affect flows at gage.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Dec 9 - Mar 14, and Mar 24-26 when inlets and/or float was frozen. Two instrument corrections were made to the shaft encoder ranging from -0.01 to +0.01 ft and were prorated by time from the previous visit. The stage-discharge relation was affected by ice Nov 10 - Dec 8, Mar 15-23, 27. The stage-discharge relation was affected by backwater from beaver dam Oct 13-24 and beaver debris Sep 2 and 3.

Datum Corrections.-- Levels were last ran to the Reference Point (RP) inside the gage on Sep 27, 2011 using B.M. no. 4 as base. The gage was within allowable limits, therefore no correction was required or made. Two-peg test was performed on the Lietz level (SN 130869) on Sep 26, 2011, and a 0.0017 adjustment was made to bring level back into tolerance.

Rating.-- Control is a rock weir which is subject to settling and silting. SANORTCO 18-1, in use since Mar 15, 2012, was used for the entire water year. Twenty-five measurements (nos. 148 - 172) were made this year, ranging in discharge from 0 to 47.1 cfs. The measurements cover the discharge range experienced except for higher daily flow on Apr 30. The peak flow of 89.5 cfs occurred at 1715 on Sep 16, 2013 at a gage height of 2.34 ft with a shift of 0.00 ft. It exceeded high measurement no. 163 (GH=1.92 ft), made May 1 by 0.42 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record during all open-water periods. Periods of unreliable stage, ice-affected stage, and backwater-affected stage were estimated. Variable shift curves were developed and used to distribute shifts by stage and time based on events. Shifting results from debris catching and scouring from the cracks in the rock control. Beaver activity also causes shift changes throughout the year. All open-water measurements were given full weight and applied except for nos. 159, 160, 163, 170, and 171 which were adjusted as much as 6.5% to smooth shift trends. There was no flow Jun 21 - Jul 13, and Aug 22.

Special Computations.-- Discharge for periods of unreliable gage-height and ice affected record was estimated using discharge measurements, weather records, partial day records, and hydrographic comparison with the station 'Los Pinos River near Ortiz'. Discharge for periods of backwater and no stable stage-discharge relationship were estimated by site observations and measurements.

Remarks.-- Record is good except for periods of estimation, which are poor. Periods of flow less than 3.0 cfs should also be considered poor due to lack of definition in this part of rating. Station maintained and record developed by Div. 3 hydrographic staff.

Recommendations.-- High flow measurements are needed to define upper end of rating.

STATE OF COLORADO  
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08247500 SAN ANTONIO RIVER AT ORTIZ

RATING TABLE-- SANORTCO18-1 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

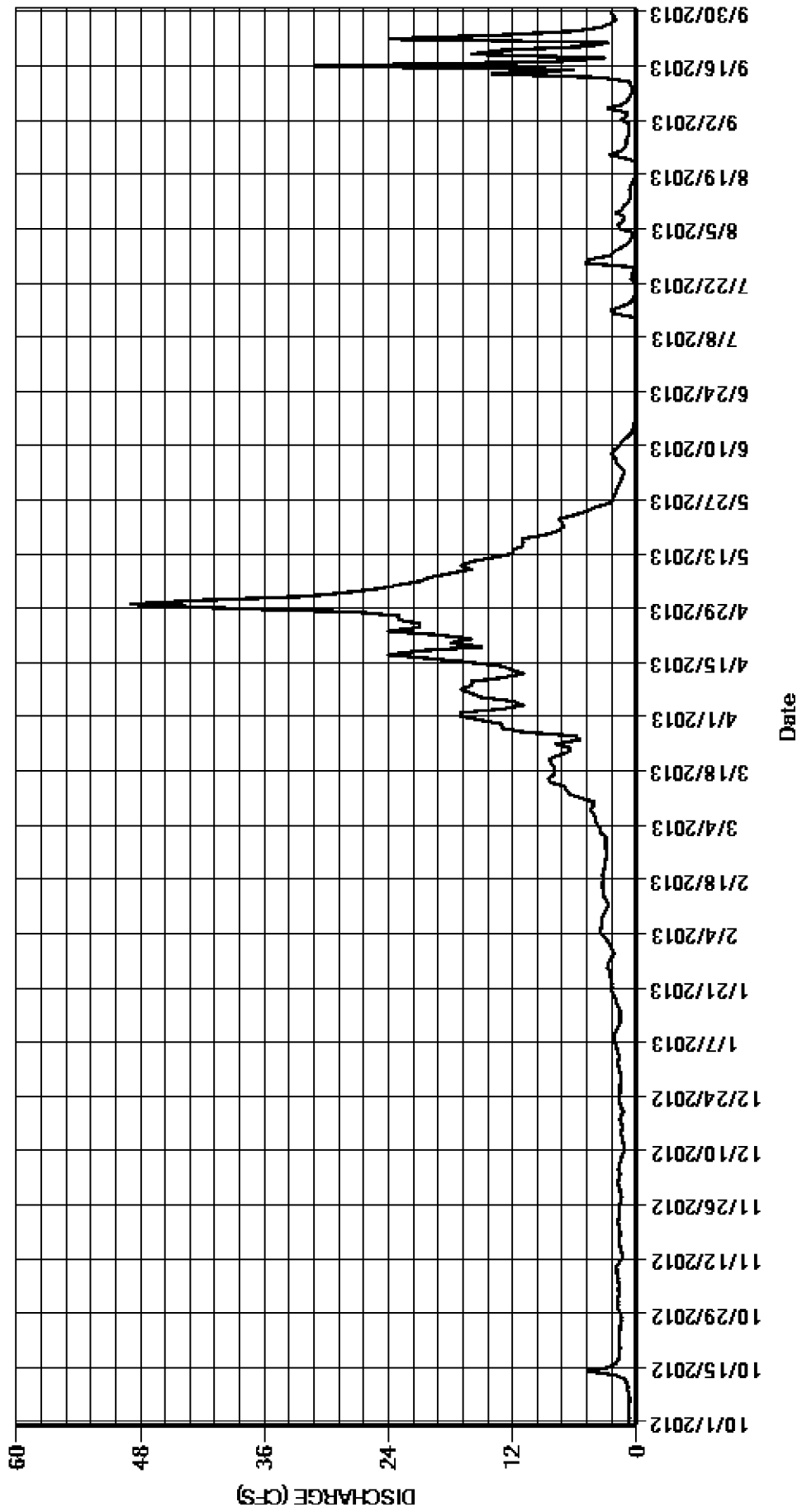
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.76	1.8	e1.8	e1.8	e2.6	e3.0	17	42	1.5	0.00	0.96	0.74
2	0.72	1.8	e1.8	e1.8	e2.8	e3.5	17	32	1.4	0.00	0.62	e1.5
3	0.79	1.7	e1.7	e1.7	e3.1	e3.5	13	28	1.2	0.00	0.40	e1.0
4	0.75	1.8	e1.6	e1.8	e3.5	e3.8	11	25	1.4	0.00	0.41	1.0
5	0.76	1.7	e1.8	e1.9	e3.5	e4.0	12	23	1.9	0.00	1.7	2.8
6	0.71	1.8	e1.7	e2.0	e3.4	e4.0	15	21	2.0	0.00	1.8	1.4
7	0.68	1.8	e1.6	e2.1	e3.4	e4.2	16	20	2.1	0.00	1.3	0.92
8	0.74	1.9	e1.5	e2.2	e3.4	e4.5	17	18	2.4	0.00	1.2	0.68
9	0.89	1.9	e1.4	e2.2	e3.2	e4.2	16	16	2.1	0.00	2.0	0.48
10	0.84	e2.0	e1.2	e2.0	e3.0	e4.2	16	17	1.7	0.00	1.4	0.42
11	0.97	e1.7	e1.2	e1.8	e2.8	e5.5	13	16	1.4	0.00	1.2	0.58
12	1.2	e1.4	e1.3	e1.6	e2.8	e6.5	11	14	1.0	0.00	0.79	0.73
13	e2.0	e1.4	e1.4	e1.6	e3.1	e6.8	12	12	0.58	0.00	0.65	3.4
14	e4.7	e1.5	e1.5	e1.6	e3.2	e7.0	13	12	0.34	2.1	0.63	14
15	e2.7	e1.6	e1.5	e1.6	e3.2	e8.3	16	11	0.32	2.5	0.69	6.2
16	e2.0	e1.7	e1.4	e1.8	e3.3	e8.5	20	11	0.19	1.3	0.59	31
17	e1.8	e1.7	e1.5	e2.0	e3.3	e8.0	24	11	0.14	0.56	0.40	8.6
18	e1.7	e1.6	e1.6	e2.0	e3.2	e8.0	21	8.8	0.11	0.28	0.15	3.1
19	e1.7	e1.6	e1.5	e2.2	e3.3	e8.0	15	7.6	0.03	0.13	0.12	16
20	e1.6	e1.7	e1.3	e2.4	e3.2	e8.3	18	7.1	0.01	0.02	0.05	13
21	e1.7	e1.8	e1.5	e2.4	e3.1	e8.5	16	7.2	0.00	0.00	0.02	4.6
22	e1.7	e1.8	e1.6	e2.4	e3.1	e7.5	19	7.5	0.00	0.29	0.00	2.8
23	e1.7	e1.7	e1.7	e2.4	e3.0	e6.5	24	6.1	0.00	0.52	0.83	24
24	e1.7	e1.7	e1.7	e2.6	e2.9	e6.5	21	4.8	0.00	0.46	2.6	13
25	1.6	e1.7	e1.6	e2.6	e2.9	e7.8	21	4.0	0.00	0.31	1.6	6.0
26	1.6	e1.7	e1.6	e2.8	e3.0	e5.5	23	2.7	0.00	0.10	1.1	3.4
27	1.5	e1.5	e1.6	e2.8	e3.0	e5.9	23	2.3	0.00	4.9	1.0	2.5
28	1.5	e1.5	e1.5	e2.6	e3.0	11	27	2.2	0.00	4.6	0.98	2.0
29	1.6	e1.6	e1.5	e2.4	---	13	40	2.0	0.00	2.5	0.76	2.3
30	1.8	e1.6	e1.6	e2.2	---	13	49	1.9	0.00	2.3	0.79	2.5
31	1.8	---	e1.7	e2.4	---	15	---	1.7	---	1.6	0.72	---
TOTAL	46.21	50.7	47.9	65.7	87.3	214.0	576	394.9	21.82	24.47	27.46	170.65
MEAN	1.49	1.69	1.55	2.12	3.12	6.90	19.2	12.7	0.73	0.79	0.89	5.69
AC-FT	92	101	95	130	173	424	1140	783	43	49	54	338
MAX	4.7	2.0	1.8	2.8	3.5	15	49	42	2.4	4.9	2.6	31
MIN	0.68	1.4	1.2	1.6	2.6	3.0	11	1.7	0.00	0.00	0.00	0.42

CAL YR	2012	TOTAL	4363.12	MEAN	11.9	MAX	147	MIN	0.00	AC-FT	8650
WTR YR	2013	TOTAL	1727.11	MEAN	4.73	MAX	49	MIN	0.00	AC-FT	3430

MAX DISCH: 89.5 CFS AT 17:15 ON SEP 16, 2013 GH 2.34 FT SHIFT 0 FT  
MAX GH: 2.34 FT AT 17:15 ON SEP 16, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08247500 SAN ANTONIO RIVER AT ORTIZ  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08248000 LOS PINOS RIVER NEAR ORTIZ

Water Year 2013

Location.-- Lat 36°58'56", long 106°4'25" referenced to North American Datum of 1983 (Los Pinos, NM quad, scale 1:24,000), UTM Zone 13 404448 E and 4093440 N, in SW ¼ NW ¼ sec. 26, T.32 N., R.8 E., New Mexico Principal Meridian, Rio Arriba County, NM, Hydrologic Unit 13010005, on left bank 0.9 mi south of Colorado-New Mexico State line, 2.1 mi southwest of Ortiz, CO, and 2.9 mi upstream from mouth.

Drainage Area and Period of Record.-- 167 mi<sup>2</sup>; Jan. 1915 to present.

Equipment.-- Data collection platform (Sutron Satlink 2) and shaft encoder in a 42-inch metal pipe shelter and stilling well. Graphic water-stage recorder as backup. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. The supplemental outside chain gage is located 10 feet upstream from gage. Cableway located 190 feet above gaging station is condemned.

Hydrologic Conditions.-- Basin is alpine and predominately subalpine terrain. Reservoir operations at Trujillo Meadows Reservoir and irrigation diversions affect flows at gage.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Dec 11 - Feb 4 when float was frozen. One erroneous unit value was corrected on each of the following days with no loss in accuracy: Apr 1 due to chopping ice from well; and Apr 15 due to repairing flush valve. The stage-discharge relation was affected by ice Nov 12 to Dec 10 and Feb 5 to Mar 27. There were four instrument calibration corrections ranging from -0.02 to +0.01 ft, which were prorated from previous visit, and one +0.01 ft correction on Nov 13 after installing oil cylinder, which was applied from time of oil cylinder installation.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on Sep 27, 2011, using BM #5 as base. The RP was within allowable limits, so no correction was made or required. A two-peg test was performed on the Lietz level (SN 130869) on Sep 26, 2011, and a slight adjustment was made.

Rating.-- Control is a gravel and cobble riffle approximately 300 feet below the gage. Rating no. 16 in use since Mar 1, 2011 was used until Mar 15. It is fairly well defined from 14 to 1210 cfs, but shifts are trending negative due to control fill and vegetation growth on banks during recent drought conditions with no scouring high flows. Rating no. 17-1 was developed and used from Mar 15 through the end of the water year. This rating was developed to reflect recent site conditions. Twenty-six measurements (nos. 692-717) were made this year ranging in discharge from 10.5 to 292 cfs. They cover the discharge range experienced except for the lower daily flows on Oct 24, 25, 27, Nov 12, Dec 10, 11; and higher daily flows on Apr 30, May 1. The peak flow of 424 cfs occurred at 0045 on May 1, 2013 at a gage height of 4.14 feet with a shift of 0 feet. It exceeded high measurement no. 708 (GH = 3.76 ft) made on May 1 by 0.38 feet in stage.

Discharge.-- Shifting control method was used to compute the discharge record during open-water periods. Periods of unreliable gage-height and ice affected record were estimated. Shift curves (VS12-05, 13-A, and 13-B) were developed and used with rating no. 16 to distribute shifts by stage and time. Shift curves (VS13-M, VS13-N, VS13-O, VS13-P, and VS13-Q) were developed and used with rating no. 17-1 to distribute shifts by stage and time. VS13-M is same as VS13-N except it reflects a -0.04 ft cleaning correction. While using rating no. 16, open-water measurement shifts ranged from -0.06 to -0.03 ft and applied shifts ranged from -0.06 to -0.03 ft. While using rating no. 17-1, open-water shifts ranged from -0.04 to +0.06 ft and applied shifts ranged from -0.04 to +0.05 ft. All open-water measurements were given full weight and applied except nos. 706-708, 713, and 716, which were adjusted as much as 3.4% to smooth shift trends.

Special Computations.-- Discharge for periods of winter no gage-height and ice affected record was estimated using measurements, weather records, partial day records, and comparison with the nearby stations "San Antonio River at Ortiz" and "Conejos River near Mogote".

Remarks.-- Record is good except for periods of unreliable gage-height and ice affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Survey control cross-section to better define PZF and rating break-points.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08248000 LOS PINOS RIVER NEAR ORTIZ

RATING TABLE-- LOSORTCO16 USED FROM 01-OCT-2012 TO 15-MAR-2013  
 LOSORTCO17-1 USED FROM 15-MAR-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	12	e16	e12	e13	e16	45	317	136	26	14	19
2	14	14	e15	e11	e13	e16	49	250	125	23	11	16
3	13	12	e14	e10	e14	e17	50	240	119	23	13	18
4	13	11	e13	e10	e14	e17	53	256	113	19	21	14
5	11	12	e14	e10	e14	e19	62	249	103	17	17	14
6	11	13	e13	e11	e14	e19	73	235	97	17	28	14
7	12	13	e12	e11	e14	e20	82	194	90	18	41	13
8	12	12	e11	e11	e14	e19	88	189	83	18	51	13
9	12	14	e10	e11	e13	e18	79	172	77	15	55	13
10	12	18	e8.0	e12	e12	e18	60	156	70	13	42	14
11	12	10	e9.0	e11	e12	e19	51	154	63	12	45	22
12	14	e8.0	e10	e10	e12	e20	53	160	56	14	41	23
13	23	e10	e11	e10	e13	e22	51	170	53	15	37	38
14	18	e15	e12	e10	e14	e22	61	217	49	12	32	57
15	15	e16	e12	e10	e14	e24	67	245	45	13	28	45
16	14	e16	e11	e11	e15	e24	79	224	41	15	25	38
17	13	e16	e12	e11	e15	e22	93	268	38	11	23	34
18	13	e15	e13	e11	e15	e22	71	287	35	13	18	40
19	13	e14	e12	e11	e15	e21	60	255	29	14	16	61
20	12	e14	e10	e12	e14	e20	62	216	23	16	18	43
21	12	e15	e11	e12	e14	e21	55	187	21	14	19	33
22	12	e15	e12	e12	e14	e20	62	185	19	12	19	32
23	11	e15	e13	e13	e15	e19	94	217	20	12	21	73
24	8.2	e15	e13	e13	e14	e18	86	241	19	11	18	68
25	9.6	e15	e12	e14	e15	e16	110	260	18	12	17	48
26	11	e15	e12	e15	e15	e18	103	246	17	18	23	39
27	9.7	e14	e12	e15	e15	e20	105	224	15	26	25	35
28	12	e13	e11	e14	e15	22	169	190	15	23	23	48
29	13	e15	e11	e13	---	27	251	177	17	29	19	46
30	13	e16	e11	e13	---	30	305	158	18	22	15	40
31	13	---	e12	e13	---	38	---	146	---	17	16	---
TOTAL	396.5	413.0	368.0	363	391	644	2629	6685	1624	520	791	1011
MEAN	12.8	13.8	11.9	11.7	14.0	20.8	87.6	216	54.1	16.8	25.5	33.7
AC-FT	786	819	730	720	776	1280	5210	13260	3220	1030	1570	2010
MAX	23	18	16	15	15	38	305	317	136	29	55	73
MIN	8.2	8.0	8.0	10	12	16	45	146	15	11	11	13

CAL YR	2012	TOTAL	24907.5	MEAN	68.1	MAX	522	MIN	8.0	AC-FT	49400
WTR YR	2013	TOTAL	15835.5	MEAN	43.4	MAX	317	MIN	8.0	AC-FT	31410

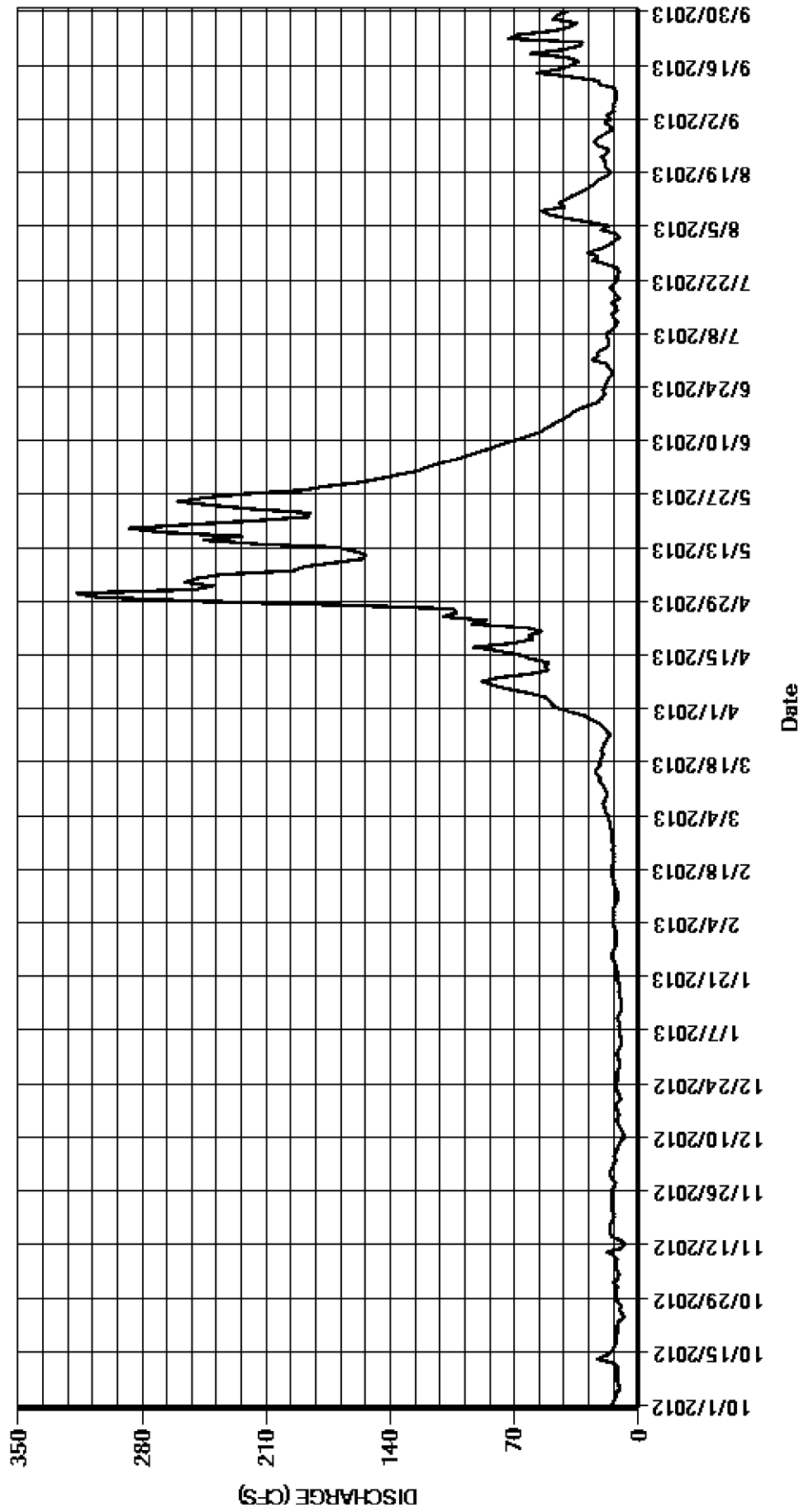
MAX DISCH: 424 CFS AT 00:45 ON MAY 01, 2013 GH 4.14 FT SHIFT 0 FT

MAX GH: 4.14 FT AT 00:45 ON MAY 01, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



08248000 LOS PINOS RIVER NEAR ORTIZ  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08248500 SAN ANTONIO RIVER NEAR MANASSA

Water Year 2013

Location.-- Lat 37°10'38", long 105°52'40" referenced to North American Datum of 1983 (Manassa, CO quad, scale 1:24,000), UTM Zone 13 422076 E and 4114886 N, in SE ¼ NE ¼ sec. 21, T.34 N., R.10 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010005, on right bank 0.3 mi downstream from bridge on State Highway 142, 2.2 mi upstream from mouth, and 3.3 mi east of Manassa, CO.

Drainage Area and Period of Record.-- 348 mi<sup>2</sup>; April 1923 to current year.

Equipment.-- Graphic water-stage recorder, data collection platform (Sutron Satlink), a float-operated shaft encoder, and a tipping bucket rain gage in metal pipe shelter and concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change this water year.

Hydrologic Conditions.-- Flows at gage partially regulated by upstream irrigation diversions and return flows. Stream regularly is braided and dries up most years near gage.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Feb 4 when ice in well was affecting floats, and Feb 5 - Mar 12 when the station was closed. The stage-discharge relation was affected by ice Feb 3 and Mar 13-26. The stage-discharge relation was affected by backwater from beaver dam and debris Apr 9-17, 26; Jun 21 - Jul 2. Two unit values were filled from chart backup Jul 12 without loss of accuracy.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on Jul 12, 2012 using BM no. 4 as base. The RP elevation was within allowable limits, so no correction was made. Two-peg tests were performed on Lietz level (SN 130869) on Jun 11, 2012 and Aug 6, 2012, and the instrument was within allowable limits and no correction was made.

Rating.-- The low flow control is a gravel riffle approximately 150 ft below gage. At low flows all of the water is contained in a minor channel on the left side of the channel. At slightly higher flows the control feature moves approximately 20 to 30 feet upstream to the gravel bar on the right side of the channel. The two gravel bars are submerged at approximately 2.7 ft (2.77 ft breakpoint on rating). Above 2.7 ft the flow characteristics transition to channel control. The top of the right bank occurs at approximately 4.2 ft (4.19 ft breakpoint on rating) where water starts to transition to flood stage. Rating no. 21 was developed and used to compute the discharge record from October 4 to the end of the water year. Rating no 20B was used to compute the first four days of the water year. Twenty-six measurements (nos. 349-374) were made this year, ranging in discharge from 0 to 240 cfs. They cover the daily discharge range experienced this year. The peak flow of 257 cfs occurred at 1030 on May 1, 2013 at a gage height of 3.22 ft with a shift of 0.00 feet. It exceeded high measurement no. 362 (GH=3.15 ft), made on Apr 30 by 0.07 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record during all open-water periods. Shifts were applied by stage (SANMANVS13-A, SANMANVS13-C, and SANMANVS13-D) as defined by measurement shifts. Periods of backwater from ice and beaver dams and periods of no stage record were estimated. Measurement shifts ranged from -0.05 to +0.06 ft excluding shifts of -0.38 and -0.42 from measurement nos. 359 and 360, which were affected by backwater from beaver dams. All were given full weight except nos. 361, 363, 366, 368, and 374, which were adjusted as much as 7.2% to smooth shift trends and nos. 359 and 360 which were affected by beaver debris and used for estimation only. There was no flow Oct 1 - Feb 1, Apr 5-8, 16-25, Jul 4 - Sep 23.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using measurements, weather records, and partial day records. Discharge for periods affected by backwater from beaver dams was estimated by measurements and from stage trend to estimate beaver dam construction.

Remarks.-- Record is fair except for periods estimation, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Evaluate possibility of bank stabilization and beaver control.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08248500 SAN ANTONIO RIVER NEAR MANASSA

RATING TABLE-- SANMANCO20B USED FROM 01-OCT-2012 TO 04-OCT-2012  
 SANMANCO21 USED FROM 04-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	e8.2	4.5	185	66	e2.0	0.00	0.00
2	0.00	0.00	0.00	0.00	1.4	e8.4	2.5	154	57	e1.0	0.00	0.00
3	0.00	0.00	0.00	0.00	e4.5	e9.0	1.2	132	55	0.01	0.00	0.00
4	0.00	0.00	0.00	0.00	e5.0	e8.4	0.25	140	52	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	e7.0	e7.0	0.00	144	47	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	e7.4	e8.4	0.00	134	35	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	e8.4	e8.6	0.00	109	25	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	e9.8	e7.4	0.00	94	23	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	e9.4	e5.6	e1.0	77	23	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	e8.4	e5.0	e1.8	75	25	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	e8.6	e5.6	e1.5	74	19	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	e7.0	e6.0	e1.8	72	15	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	e8.2	e7.2	e1.5	69	15	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	e8.8	e8.6	e1.0	96	17	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	e8.4	e9.6	e0.20	128	22	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	e9.4	e9.0	e0.00	131	15	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	e9.8	e9.6	e0.00	148	13	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	e9.2	e9.8	0.00	179	13	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	e8.0	e10	0.00	160	12	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	e9.4	e11	0.00	129	9.2	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	e7.6	e12	0.00	109	e8.0	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	e7.6	e10	0.00	90	e7.0	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	e6.6	e7.0	0.00	105	e6.0	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	e7.6	e6.2	0.00	127	e5.0	0.00	0.00	12
25	0.00	0.00	0.00	0.00	e7.0	e7.0	0.00	134	e4.0	0.00	0.00	17
26	0.00	0.00	0.00	0.00	e6.4	e9.2	e10	115	e3.0	0.00	0.00	12
27	0.00	0.00	0.00	0.00	e6.0	5.8	11	101	e2.0	0.00	0.00	8.7
28	0.00	0.00	0.00	0.00	e6.2	3.9	27	89	e1.5	0.00	0.00	6.6
29	0.00	0.00	0.00	0.00	---	4.0	100	85	e1.0	0.00	0.00	9.3
30	0.00	0.00	0.00	0.00	---	4.3	173	88	e1.0	0.00	0.00	10
31	0.00	---	0.00	0.00	---	7.5	---	71	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	203.10	239.3	338.25	3544	596.7	3.01	0.00	75.60
MEAN	0.000	0.000	0.000	0.000	7.25	7.72	11.3	114	19.9	0.097	0.000	2.52
AC-FT	0	0	0	0	403	475	671	7030	1180	6.0	0	150
MAX	0.00	0.00	0.00	0.00	9.8	12	173	185	66	2.0	0.00	17
MIN	0.00	0.00	0.00	0.00	0.00	3.9	0.00	69	1.0	0.00	0.00	0.00

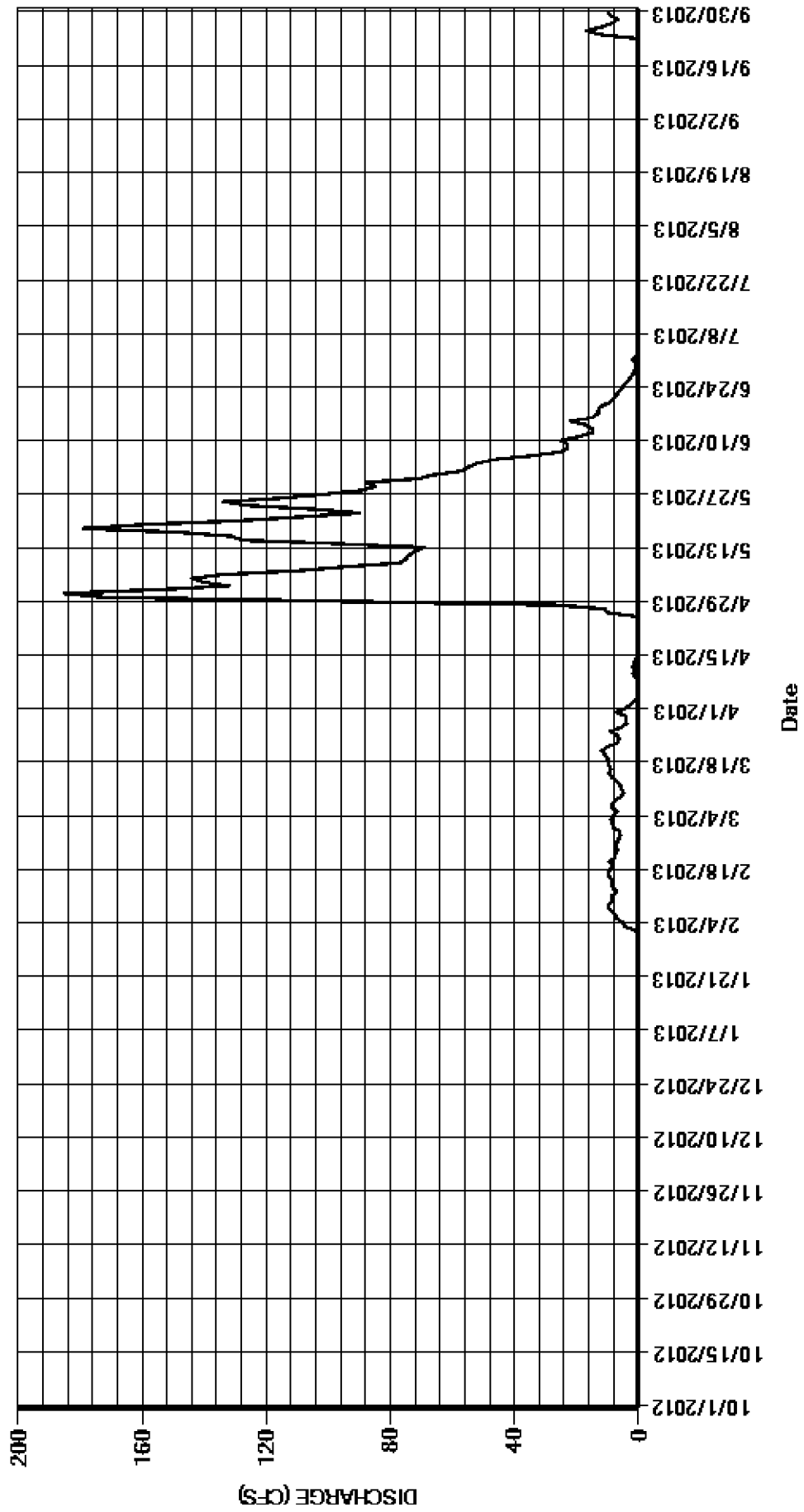
CAL YR	2012	TOTAL	15676.18	MEAN	42.8	MAX	450	MIN	0.00	AC-FT	31090
WTR YR	2013	TOTAL	4999.96	MEAN	13.7	MAX	185	MIN	0.00	AC-FT	9920

MAX DISCH: 257 CFS AT 10:30 ON MAY 01, 2013 GH 3.22 FT SHIFT 0 FT

MAX GH: 3.22 FT AT 10:30 ON MAY 01, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08248500 SAN ANTONIO RIVER NEAR MANASSA  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
NORTH CHANNEL CONEJOS RIVER NEAR LA SAUSES  
Water Year 2013

Location.-- Lat 37°18'1", long 105°44'47" referenced to North American Datum of 1983 (Lasauces, CO quad, scale 1:24,000), UTM Zone 13 433851 E and 4128445 N, in SE ¼ SE ¼ sec. 2, T.35 N., R.11 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010005, on left bank of main channel 125 ft downstream from bridge on State Route 158, 1.0 mi upstream from mouth, 2.1 mi north of LaSausces, CO, and 13 mi southeast of Alamosa, CO.

Drainage Area and Period of Record.-- 887 mi<sup>2</sup>; March 1921 to current year. Monthly discharge only for some periods.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Satlink Logger 2) and a float-operated SDR and air temperature sensor in a four-foot square timber shelter and well. The primary reference gage is a drop tape from reference point on shelf. The cableway is located 100 feet below gaging station. Outside cantilever gage completed May 1, 2012.

Hydrologic Conditions.-- Natural flow of stream affected by diversions for irrigation, groundwater withdrawals, and return flows from irrigated areas. Flows regulated to some extent by Platoro Reservoir about 80 mi upstream since Nov 7 1951.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log, SDR log, and chart record as backup. Record is complete and reliable except for Dec 29 through Feb 1 when well was frozen. The stage-discharge relation was affected by ice Dec 7-28, Feb 2-28, Mar 1-12, 24, 25, Apr 9-11, 18, 19. There were two +0.01 ft instrument calibration corrections made and both were prorated from previous visit. There was one -0.01 ft trash correction after the measurement on Mar 1, which was prorated in shift distribution from previous visit.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on August 27, 2012 using B.M. No. 3 as base. The RP elevation was within allowable limits, so a correction was not made. Two-peg test was performed on the Lietz level (SN 130869) on Aug 6, 2012, the instrument was within allowable limits and no correction was made.

Rating.-- Control is a gravel bar approximately 150 ft below the gage at medium and low flows, and channel at high flows. At low flows the water splits into two channels at the control section. The bank, willows, and high water in the Rio Grande influence gage height during very high flows. Rating NORLASCO17-3, in use since Jan 3, 2012 was used for the entire water year. The rating is fairly well defined from 0 to 1730 cfs. Twenty-five measurements (nos. 323-347) were made this year ranging in discharge from 0 to 87 cfs. The measurements cover the range experienced except for higher daily flows on Mar 16-20. The peak flow of 174 cfs occurred at 0730 on Mar 16, 2013 at a gage height of 3.06 ft with a shift of -0.01 ft. It exceeded high measurement no. 335 (GH = 2.70 ft), made Mar 14, by 0.36 feet in stage. The peak gage-height of 3.12 ft. occurred on Feb 01, 2013 at 0945 as a result of backwater from ice.

Discharge.-- Shifting control method was used to compute the discharge record. Shifts were applied as defined by discharge measurements and distributed by time with respect to events. The rating was applied directly from Feb 1 to Feb 14, and prorated by time from Feb 14 to Mar 1 to account for a small trash correction. Shift curves VS13-A, VS13-B, VS13-D, VS13-E, and VS13-F were developed and used to distribute shifts based on stage and time during all other periods. Open-water measurement shifts ranged from -0.06 ft to +0.09 ft and applied shifts ranged from -0.04 ft to +0.09 ft. All measurements were given full weight except for nos 335 and 336, which were adjusted as much as 4.0% to smooth the shift trend. Periods of ice affected and unreliable gage-height record were estimated.

Special Computations.-- Discharge during periods of ice affected record was estimated using measurements, weather records, partial record days, and comparison with the South Channel Conejos River near La Sausces gage.

Remarks.-- Record is good except for periods of unreliable gage-height, ice affected record, and flow less than 1 cfs, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Survey control cross-sections and note gravel riffle location during measurements to better define rating breakpoints.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

NORTH CHANNEL CONEJOS RIVER NEAR LA SAUSES

RATING TABLE-- NORLASCO17-3 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

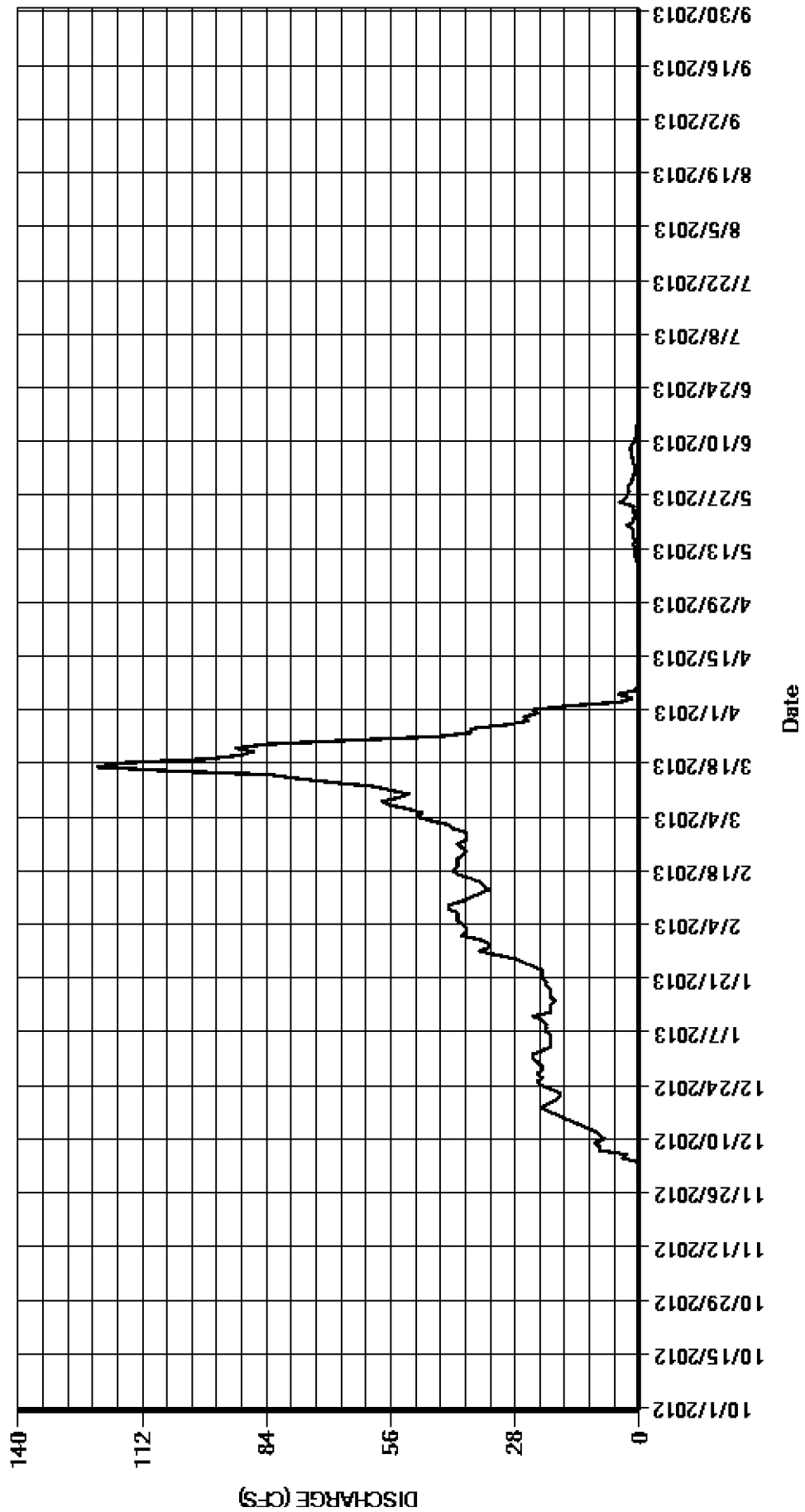
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	e24	e40	e42	24	0.08	1.3	0.00	0.00	0.00
2	0.00	0.00	0.00	e22	e39	e43	16	0.08	1.1	0.00	0.00	0.00
3	0.00	0.00	0.00	e20	e39	e47	4.1	0.08	1.1	0.00	0.00	0.00
4	0.00	0.00	0.00	e20	e40	e50	1.7	0.08	1.3	0.00	0.00	0.00
5	0.00	0.00	3.8	e20	e41	e49	4.8	0.08	1.5	0.00	0.00	0.00
6	0.00	0.00	3.0	e20	e41	e52	0.91	0.09	1.7	0.00	0.00	0.00
7	0.00	0.00	e9.0	e21	e41	e56	0.37	0.11	1.8	0.00	0.00	0.00
8	0.00	0.00	e9.0	e21	e43	e58	0.28	0.12	2.0	0.00	0.00	0.00
9	0.00	0.00	e10	e21	e43	e54	e0.25	0.28	1.7	0.00	0.00	0.00
10	0.00	0.00	e8.0	e22	e40	e52	e0.20	0.61	1.1	0.00	0.00	0.00
11	0.00	0.00	e9.0	e24	e38	e56	e0.18	1.0	0.82	0.00	0.00	0.00
12	0.00	0.00	e10	e20	e36	e60	0.22	1.1	0.71	0.00	0.00	0.00
13	0.00	0.00	e12	e20	e34	69	0.13	1.1	0.54	0.00	0.00	0.00
14	0.00	0.00	e14	e20	e35	77	0.11	1.4	0.53	0.00	0.00	0.00
15	0.00	0.00	e16	e19	e36	83	0.09	1.0	0.37	0.00	0.00	0.00
16	0.00	0.00	e18	e20	e38	106	0.08	1.5	0.20	0.00	0.00	0.00
17	0.00	0.00	e20	e20	e41	122	0.09	1.4	0.12	0.00	0.00	0.00
18	0.00	0.00	e22	e20	e42	117	e0.12	1.4	0.12	0.00	0.00	0.00
19	0.00	0.00	e21	e21	e41	98	e0.13	2.8	0.08	0.00	0.00	0.00
20	0.00	0.00	e19	e21	e41	90	0.15	1.4	0.08	0.00	0.00	0.00
21	0.00	0.00	e18	e22	e41	87	0.14	1.2	0.08	0.00	0.00	0.00
22	0.00	0.00	e18	e22	e40	91	0.08	1.2	0.08	0.00	0.00	0.00
23	0.00	0.00	e20	e22	e39	84	0.08	1.3	0.04	0.00	0.00	0.00
24	0.00	0.00	e22	e24	e40	e65	0.08	1.3	0.00	0.00	0.00	0.00
25	0.00	0.00	e23	e26	e41	e45	0.08	4.5	0.00	0.00	0.00	0.00
26	0.00	0.00	e22	e28	e39	38	0.08	3.2	0.00	0.00	0.00	0.00
27	0.00	0.00	e23	e32	e39	38	0.08	2.8	0.00	0.00	0.00	0.00
28	0.00	0.00	e22	e36	e39	30	0.08	2.4	0.00	0.00	0.00	0.00
29	0.00	0.00	e22	e34	---	25	0.08	2.6	0.00	0.00	0.00	0.00
30	0.00	0.00	e23	e34	---	26	0.07	1.9	0.00	0.00	0.00	0.00
31	0.00	---	e24	e36	---	23	---	1.6	---	0.00	0.00	---
TOTAL	0.00	0.00	440.80	732	1107	1933	54.76	39.71	18.37	0.00	0.00	0.00
MEAN	0.000	0.000	14.2	23.6	39.5	62.4	1.83	1.28	0.61	0.000	0.000	0.000
AC-FT	0	0	874	1450	2200	3830	109	79	36	0	0	0
MAX	0.00	0.00	24	36	43	122	24	4.5	2.0	0.00	0.00	0.00
MIN	0.00	0.00	0.00	19	34	23	0.07	0.08	0.00	0.00	0.00	0.00

CAL YR	2012	TOTAL	14868.77	MEAN	40.6	MAX	697	MIN	0.00	AC-FT	29490
WTR YR	2013	TOTAL	4325.64	MEAN	11.9	MAX	122	MIN	0.00	AC-FT	8580

MAX DISCH: 174 CFS AT 07:30 ON MAR 16, 2013 GH 3.06 FT SHIFT -0.01 FT  
 MAX GH: 3.12 FT AT 09:45 ON FEB 01, 2013 (Backwater from ice)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**NORTH CHANNEL CONEJOS RIVER NEAR LA SAUSES  
WY2013 HYDROGRAPH**



RIO GRANDE RIVER BASIN  
SOUTH CHANNEL CONEJOS RIVER NEAR LA SAUSES  
Water Year 2013

Location.-- Lat 37°17'37", long 105°45'6" referenced to North American Datum of 1983 (Pikes Stockade, CO quad, scale 1:24,000), UTM Zone 13 433367 E and 4127712 N, in SE ¼ NE ¼ sec. 10, T.35 N., R.11 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010002, on left bank of secondary channel 0.3 mi upstream from bridge on State Route 158, 1.5 mi north of LaSausas, CO, and 13 mi southeast of Alamosa, CO.

Drainage Area and Period of Record.-- 887 mi<sup>2</sup>; March 29, 1921 to current year, at various sites close to present location.

Equipment.-- Graphic water-stage recorder, data collection platform (Sutron Satlink 2), and float-operated shaft encoder in a 42-inch metal pipe shelter and concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change this water year.

Hydrologic Conditions.-- Natural flow of stream affected by diversions for irrigation, groundwater withdrawals, and return flows from irrigated areas. Flows regulated to some extent by Platoro Reservoir about 80 mi upstream since Nov 7, 1951.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Jan 1 through Mar 26 when oil cylinder and/or inlets were frozen. One -0.01 ft instrument correction was made on Jul 1 and was prorated by time from previous visit. The stage-discharge relation was affected by ice Dec 9-31 and Apr 9, 10.

Datum Corrections.-- Levels were last shot to the Reference Point (RP) inside the gage on Aug 1, 2013 using BM No. 9 as base. The gage was within allowable limits and no correction was made to the RP. Two-peg test was performed on the Lietz level (SN130869) on Jul 29, 2013 the instrument was within allowable limits and no correction was made.

Rating.-- The control is a steel sheet piling weir with a low flow notch. Rating no. 10-1, in use since Jan 3, 2012 was used for the entire water year. This rating was developed from a shift adjusted Rating no. 9 that was smoothed at the shift transition points. The rating is well defined from 0 to 380 cfs. Twenty-six measurements (nos. 481-506) were made this year ranging in discharge from 0 to 3.07 cfs. They cover the daily discharge range experienced except for higher daily flows on Dec 6 and May 25-27. The peak flow of 9.4 cfs occurred at 0815 on May 26, 2013 at a gage height of 1.90 feet with a shift of -0.05 feet. It exceeded the high measurement M486 (GH=1.55 ft) made Dec 5 by 0.35 ft in stage. The peak gage-height of 1.99 ft. occurred on Dec 31, 2012 at 2315 as a result of backwater from ice.

Discharge.-- Shifting control method was used to compute the discharge record. The rating was applied directly to the gage-height record for the short period of flow before ice affected record in December. Shift curves VS13-I, VS13-J, and VS13-K were developed and used to distribute shifts based on stage and time after the inlets were thawed in the spring. The shift curves were transitioned by time between measurements since it was assumed that most of the shifting was caused by a gradually changing PZF on the steel weir and not driven by events. Open-water measurement shifts ranged from -0.07 ft to +0.02 ft and applied shifts ranged from -0.05 ft to 0 ft. All measurements were given full weight except no. 486, which was rated fair and adjusted 7% and nos. 499-501, which were rated poor and adjusted as much as 33% to smooth shift distribution. Periods of ice affected and unreliable gage-height record were estimated.

Special Computations.-- Discharge for periods of unreliable gage-height and ice affected record was estimated using discharge measurements, weather records, partial record days, and comparison with the North Channel of the Conejos River near LaSausas.

Remarks.-- Record is fair except for periods of estimation, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Pave measuring section to reduce error caused by vegetation growth in channel.



STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

SOUTH CHANNEL CONEJOS RIVER NEAR LA SAUSES

RATING TABLE-- SOULASCO10-1 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

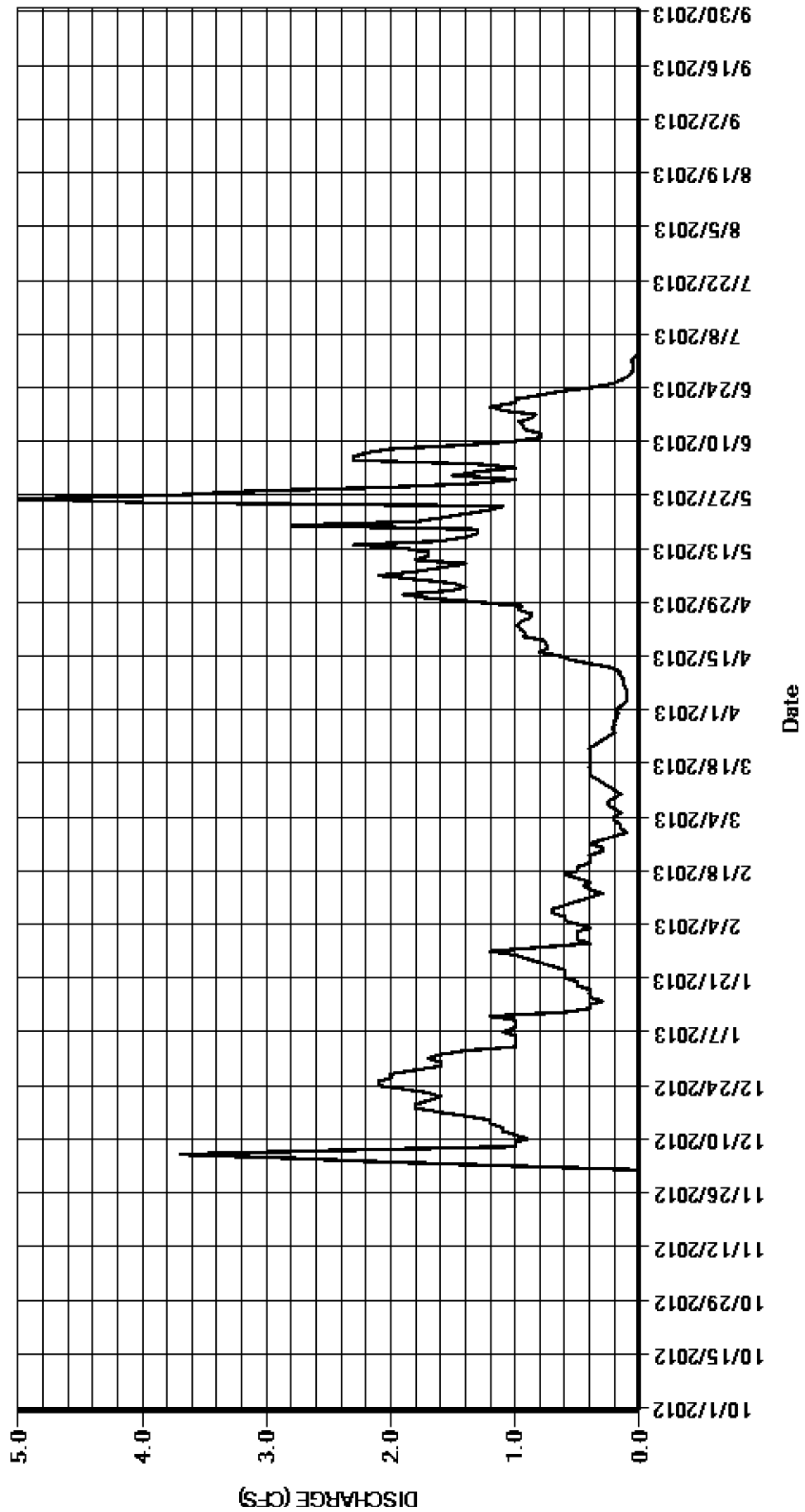
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	e1.6	e0.50	e0.15	0.19	1.9	1.5	0.06	0.00	0.00
2	0.00	0.00	0.00	e1.4	e0.50	e0.15	0.15	1.5	1.3	0.04	0.00	0.00
3	0.00	0.00	0.99	e1.0	e0.40	e0.20	0.11	1.4	1.0	0.01	0.00	0.00
4	0.00	0.00	2.0	e1.0	e0.50	e0.20	0.10	1.5	1.3	0.01	0.00	0.00
5	0.00	0.00	2.8	e1.0	e0.60	e0.15	0.10	1.8	2.3	0.00	0.00	0.00
6	0.00	0.00	3.7	e1.0	e0.60	e0.20	0.10	2.1	2.3	0.00	0.00	0.00
7	0.00	0.00	2.5	e1.1	e0.70	e0.25	0.12	1.8	2.2	0.00	0.00	0.00
8	0.00	0.00	1.0	e1.0	e0.70	e0.25	0.13	1.6	2.0	0.00	0.00	0.00
9	0.00	0.00	e1.0	e1.0	e0.60	e0.20	e0.13	1.4	1.4	0.00	0.00	0.00
10	0.00	0.00	e0.90	e1.0	e0.50	e0.15	e0.16	1.8	1.0	0.00	0.00	0.00
11	0.00	0.00	e1.0	e1.2	e0.40	e0.20	0.16	1.7	0.79	0.00	0.00	0.00
12	0.00	0.00	e1.1	e0.60	e0.30	e0.25	0.23	1.7	0.80	0.00	0.00	0.00
13	0.00	0.00	e1.1	e0.40	e0.40	e0.30	0.39	1.9	0.92	0.00	0.00	0.00
14	0.00	0.00	e1.2	e0.40	e0.45	e0.35	0.56	2.3	0.94	0.00	0.00	0.00
15	0.00	0.00	e1.2	e0.30	e0.40	e0.40	0.64	1.6	0.97	0.00	0.00	0.00
16	0.00	0.00	e1.4	e0.40	e0.50	e0.40	0.80	1.4	0.87	0.00	0.00	0.00
17	0.00	0.00	e1.6	e0.40	e0.60	e0.40	0.74	1.3	0.84	0.00	0.00	0.00
18	0.00	0.00	e1.8	e0.40	e0.50	e0.40	0.75	1.3	1.1	0.00	0.00	0.00
19	0.00	0.00	e1.8	e0.50	e0.50	e0.40	0.77	2.8	1.2	0.00	0.00	0.00
20	0.00	0.00	e1.7	e0.50	e0.40	e0.40	0.93	1.8	1.0	0.00	0.00	0.00
21	0.00	0.00	e1.6	e0.60	e0.40	e0.40	0.92	1.6	0.99	0.00	0.00	0.00
22	0.00	0.00	e1.7	e0.60	e0.40	e0.40	0.96	1.4	0.80	0.00	0.00	0.00
23	0.00	0.00	e1.9	e0.60	e0.30	e0.35	0.99	1.2	0.63	0.00	0.00	0.00
24	0.00	0.00	e2.1	e0.70	e0.30	e0.30	0.95	1.1	0.38	0.00	0.00	0.00
25	0.00	0.00	e2.1	e0.80	e0.40	e0.25	0.88	4.0	0.21	0.00	0.00	0.00
26	0.00	0.00	e2.0	e0.90	e0.30	e0.20	0.87	5.0	0.14	0.00	0.00	0.00
27	0.00	0.00	e2.0	e1.0	e0.20	0.22	0.97	3.7	0.09	0.00	0.00	0.00
28	0.00	0.00	e1.8	e1.2	e0.10	0.20	0.95	3.1	0.06	0.00	0.00	0.00
29	0.00	0.00	e1.6	e0.80	---	0.20	1.3	2.0	0.05	0.00	0.00	0.00
30	0.00	0.00	e1.6	e0.40	---	0.18	1.7	1.3	0.05	0.00	0.00	0.00
31	0.00	---	e1.7	e0.50	---	0.17	---	1.0	---	0.00	0.00	---
TOTAL	0.00	0.00	48.89	24.30	12.45	8.27	17.75	60.0	29.13	0.12	0.00	0.00
MEAN	0.000	0.000	1.58	0.78	0.44	0.27	0.59	1.94	0.97	0.004	0.000	0.000
AC-FT	0	0	97	48	25	16	35	119	58	0.2	0	0
MAX	0.00	0.00	3.7	1.6	0.70	0.40	1.7	5.0	2.3	0.06	0.00	0.00
MIN	0.00	0.00	0.00	0.30	0.10	0.15	0.10	1.0	0.05	0.00	0.00	0.00

CAL YR	2012	TOTAL	866.46	MEAN	2.37	MAX	118	MIN	0.00	AC-FT	1720
WTR YR	2013	TOTAL	200.91	MEAN	0.55	MAX	5.0	MIN	0.00	AC-FT	399

MAX DISCH: 9.40 CFS AT 08:15 ON MAY 26, 2013 GH 1.90 FT SHIFT -0.05 FT  
MAX GH: 1.99 FT AT 23:15 ON DEC 31, 2012 (Backwater from ice)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH CHANNEL CONEJOS RIVER NEAR LA SAUSES  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08249000 COMBINED CONEJOS RIVER (NORLASCO SOULASCO)  
Water Year 2013

Location.-- Lat 37°18'01", long 105°44'47", in SW¼SW¼ sec. 2, and SE¼NE¼ sec. 10 (two channels), T.35 N., R.II E., Conejos County, Hydrologic Unit 13010005, on left bank of main channel 125 ft downstream from bridge on State Highway 158 and on left bank of secondary channel 0.3 mi upstream from bridge on State Route 158, 2.1 mi north of LaSausas, and 13 mi southeast of Alamosa.

Drainage Area and Period of Record.-- 887 mi<sup>2</sup>; Mar. 1921 to present.

Equipment.-- See individual station analyses for gage equipment descriptions.

Hydrologic Conditions.-- Natural flow of stream affected by diversions for irrigation, groundwater withdrawals, and return flows from irrigated areas. Flows regulated to some extent by Platoro Reservoir about 80 mi upstream since Nov 7, 1951.

Gage-Height Record.-- See individual station analyses.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- Daily discharges computed by summing and rounding the individual station daily discharges. A day is considered estimated when both channels are estimated or the estimated daily value for either the North or South channel is greater than 10% of the combined daily sum of both channels. The following days were considered estimated: Dec 7 - Mar 12, Mar 24, 25, Apr 9-11, 18, 19.

Special Computations.--

Remarks.-- Record is good except for periods of estimated record, which are poor. Record developed by Division 3 Hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08249000 COMBINED CONEJOS RIVER (NORLASCO SOULASCO)

RATING TABLE.--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

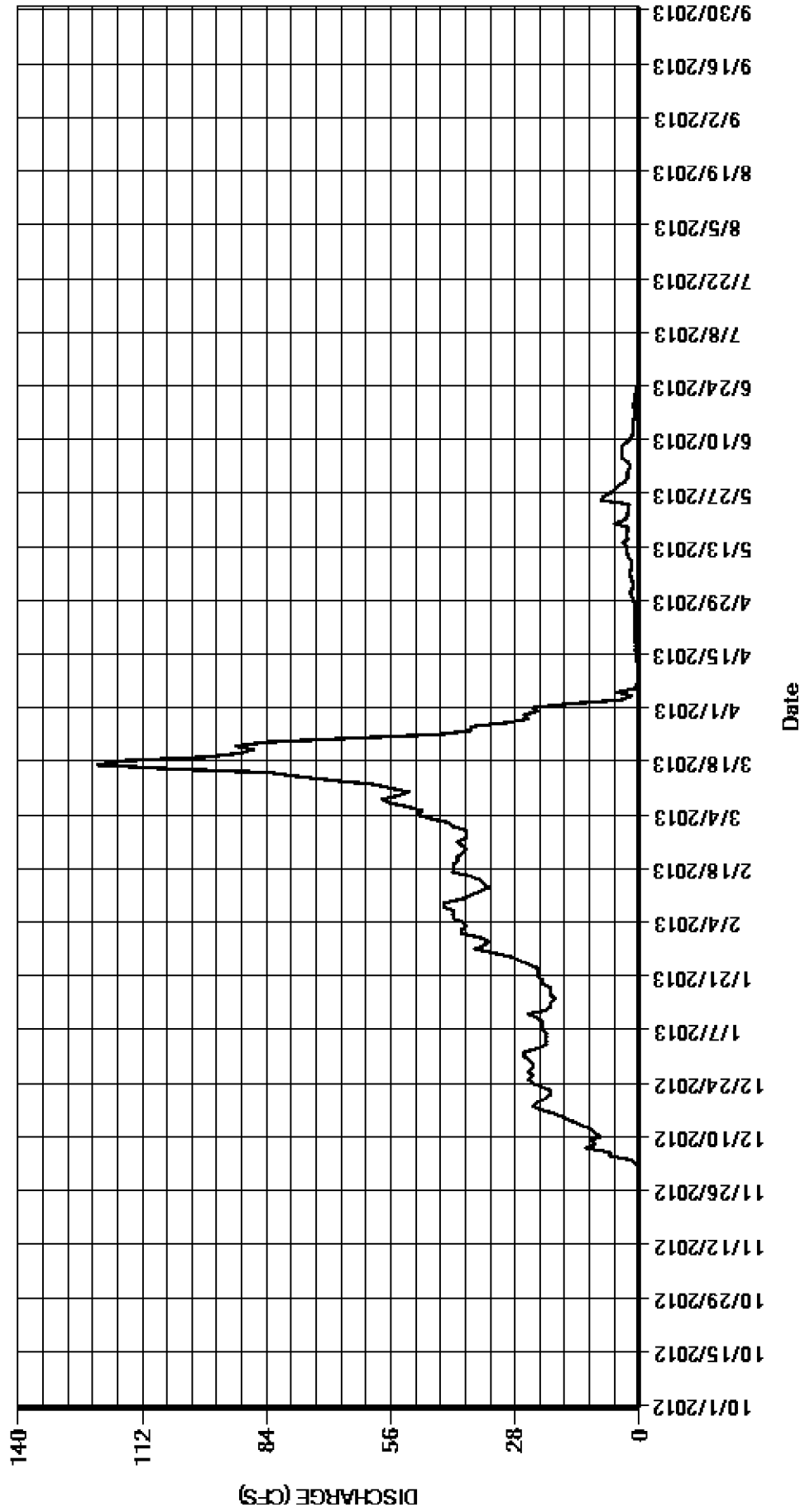
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	e26	e40	e42	24	2.0	2.8	0.06	0.00	0.00
2	0.00	0.00	0.00	e23	e40	e43	16	1.6	2.4	0.04	0.00	0.00
3	0.00	0.00	0.99	e21	e39	e47	4.2	1.5	2.1	0.01	0.00	0.00
4	0.00	0.00	2.0	e21	e40	e50	1.8	1.6	2.6	0.01	0.00	0.00
5	0.00	0.00	6.6	e21	e42	e49	4.9	1.9	3.8	0.00	0.00	0.00
6	0.00	0.00	6.7	e21	e42	e52	1.0	2.2	4.0	0.00	0.00	0.00
7	0.00	0.00	e12	e22	e42	e56	0.49	1.9	4.0	0.00	0.00	0.00
8	0.00	0.00	e10	e22	e44	e58	0.41	1.7	4.0	0.00	0.00	0.00
9	0.00	0.00	e11	e22	e44	e54	e0.38	1.7	3.1	0.00	0.00	0.00
10	0.00	0.00	e8.9	e23	e40	e52	e0.36	2.4	2.1	0.00	0.00	0.00
11	0.00	0.00	e10	e25	e38	e56	e0.34	2.7	1.6	0.00	0.00	0.00
12	0.00	0.00	e11	e21	e36	e60	0.45	2.8	1.5	0.00	0.00	0.00
13	0.00	0.00	e13	e20	e34	69	0.52	3.0	1.5	0.00	0.00	0.00
14	0.00	0.00	e15	e20	e35	77	0.67	3.7	1.5	0.00	0.00	0.00
15	0.00	0.00	e17	e19	e36	83	0.73	2.6	1.3	0.00	0.00	0.00
16	0.00	0.00	e19	e20	e38	106	0.88	2.9	1.1	0.00	0.00	0.00
17	0.00	0.00	e22	e20	e42	122	0.83	2.7	0.96	0.00	0.00	0.00
18	0.00	0.00	e24	e20	e42	117	e0.87	2.7	1.2	0.00	0.00	0.00
19	0.00	0.00	e23	e22	e42	98	e0.90	5.6	1.3	0.00	0.00	0.00
20	0.00	0.00	e21	e22	e41	90	1.1	3.2	1.1	0.00	0.00	0.00
21	0.00	0.00	e20	e23	e41	87	1.1	2.8	1.1	0.00	0.00	0.00
22	0.00	0.00	e20	e23	e40	91	1.0	2.6	0.88	0.00	0.00	0.00
23	0.00	0.00	e22	e23	e39	84	1.1	2.5	0.67	0.00	0.00	0.00
24	0.00	0.00	e24	e25	e40	e65	1.0	2.4	0.38	0.00	0.00	0.00
25	0.00	0.00	e25	e27	e41	e45	0.96	8.5	0.21	0.00	0.00	0.00
26	0.00	0.00	e24	e29	e39	38	0.95	8.2	0.14	0.00	0.00	0.00
27	0.00	0.00	e25	e33	e39	38	1.0	6.5	0.09	0.00	0.00	0.00
28	0.00	0.00	e24	e37	e39	30	1.0	5.5	0.06	0.00	0.00	0.00
29	0.00	0.00	e24	e35	---	25	1.4	4.6	0.05	0.00	0.00	0.00
30	0.00	0.00	e25	e34	---	26	1.8	3.2	0.05	0.00	0.00	0.00
31	0.00	---	e26	e36	---	23	---	2.6	---	0.00	0.00	---
TOTAL	0.00	0.00	492.19	756	1115	1933	72.14	99.8	47.59	0.12	0.00	0.00
MEAN	0.000	0.000	15.9	24.4	39.8	62.4	2.40	3.22	1.59	0.004	0.000	0.000
AC-FT	0	0	976	1500	2210	3830	143	198	94	0.2	0	0
MAX	0.00	0.00	26	37	44	122	24	8.5	4.0	0.06	0.00	0.00
MIN	0.00	0.00	0.00	19	34	23	0.34	1.5	0.05	0.00	0.00	0.00

CAL YR	2012	TOTAL	15733.41	MEAN	43.0	MAX	815	MIN	0.00	AC-FT	31210
WTR YR	2013	TOTAL	4515.84	MEAN	12.4	MAX	122	MIN	0.00	AC-FT	8960

MAX DISCH:  
 MAX GH: 0.00 FT

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08249000 COMBINED CONEJOS RIVER (NORLASCO SOULASCO)  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
08250000 CULEBRA CREEK AT SAN LUIS

Water Year 2013

Location.-- Lat 37°11'2", long 105°25'33" referenced to North American Datum of 1983 (San Luis, CO quad, scale 1:24,000), UTM Zone 13 462202 E and 4115357 N, in NE ¼ NW ¼ sec. 35, T.3 N., R.72 W., Costilla Estates Development Survey so called, Costilla County, CO, Hydrologic Unit 13010002, on left bank at bridge 1.0 mi south of San Luis, CO and 1.0 mi upstream from Rito Seco.

Drainage Area and Period of Record.-- 220 mi<sup>2</sup>, approximately (from base map); 1927 to current year.

Equipment.-- Graphic water-stage recorder, data collection platform (Sutron Model Satlink2 with HDR GOES radio), and a float-operated shaft encoder in a metal shelter and concrete/timber well. The primary reference gage is a drop tape from reference point on shelf. Outside staff gage. No change.

Hydrologic Conditions.-- The majority of Culebra Creek is diverted into Sanchez Reservoir via the Sanchez Canal. The reservoir is approximately 5.6 miles above the gage. Several other small drainages feed this reservoir. Two small tributaries plus the un-diverted portion of Culebra Creek join the outflow from Sanchez Reservoir above the gage. Most of the water at this gage is regulated by the reservoir and irrigation diversions.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted data with DCP log and chart record as backup. Record is complete and reliable for the water year except for Jan 9-18 when the well was frozen. There were no instrument calibration corrections.

Datum Corrections.-- Levels were last run to the drop-tape reference point (RP) inside the gage on Apr 6, 2012 using BM 3 as base. The drop-tape RP was within the allowable limit, so no correction was made. A two peg test was run on same day (Apr 6, 2012) and no adjustment to the level was required or made.

Rating.-- Control is a non-standard 12-ft concrete Parshall flume. Gravel and moss in flume and changes in approach conditions cause shifting. Rating 07, in use since Oct 20, 2011, was used again this year. Rating 07 is well defined from 10 to 440 cfs. Sixteen measurements (No 280-295) were made this year ranging in discharge from 10.1 to 63.1 cfs. Measurements cover the range experienced except for lower daily values on Apr 16, 22-24, 28-30 and higher daily flows on Jun 3-5; Jul 8, 10-12, 19, 20, 24. The peak flow of 128 cfs occurred at 2000 on Aug 22, 2013 at a gage height of 1.62 feet with a shift of 0 feet. It exceeded high Measurement No. 292 (GH=0.94 feet) made Jul 16 by 0.68 feet in stage.

Discharge.-- Shifting control method was used to compute the discharge record for all periods of reliable stage record. Shift curve VS12-4 was carried from last year until Dec 17. Shift curves (VS13-D, D1, E, F, and G) were developed and used during the remainder of year to distribute shifts by stage and time. These curves define minor shifting due to changing approach conditions and vegetation cycle. Measurement shifts ranged from -0.03 to +0.07 ft and applied shifts ranged from -0.02 to +0.04 ft. All measurements were given full weight except nos. 280, 286, 288-292 and 294, which were adjusted as much as 4.4% to smooth shift trends. Period of unreliable gage-height record was estimated.

Special Computations.-- During winter the record may show a pattern of jagged peaks in the late morning hours. While this pattern does appear to be ice affected record, it has been verified by the hydrographic staff of Division 3 that this is caused by ice dams releasing water above the gage, and that this is good record.

Remarks.-- Record is good except for period of estimation, which is poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08250000 CULEBRA CREEK AT SAN LUIS

RATING TABLE-- CULSANCO07 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

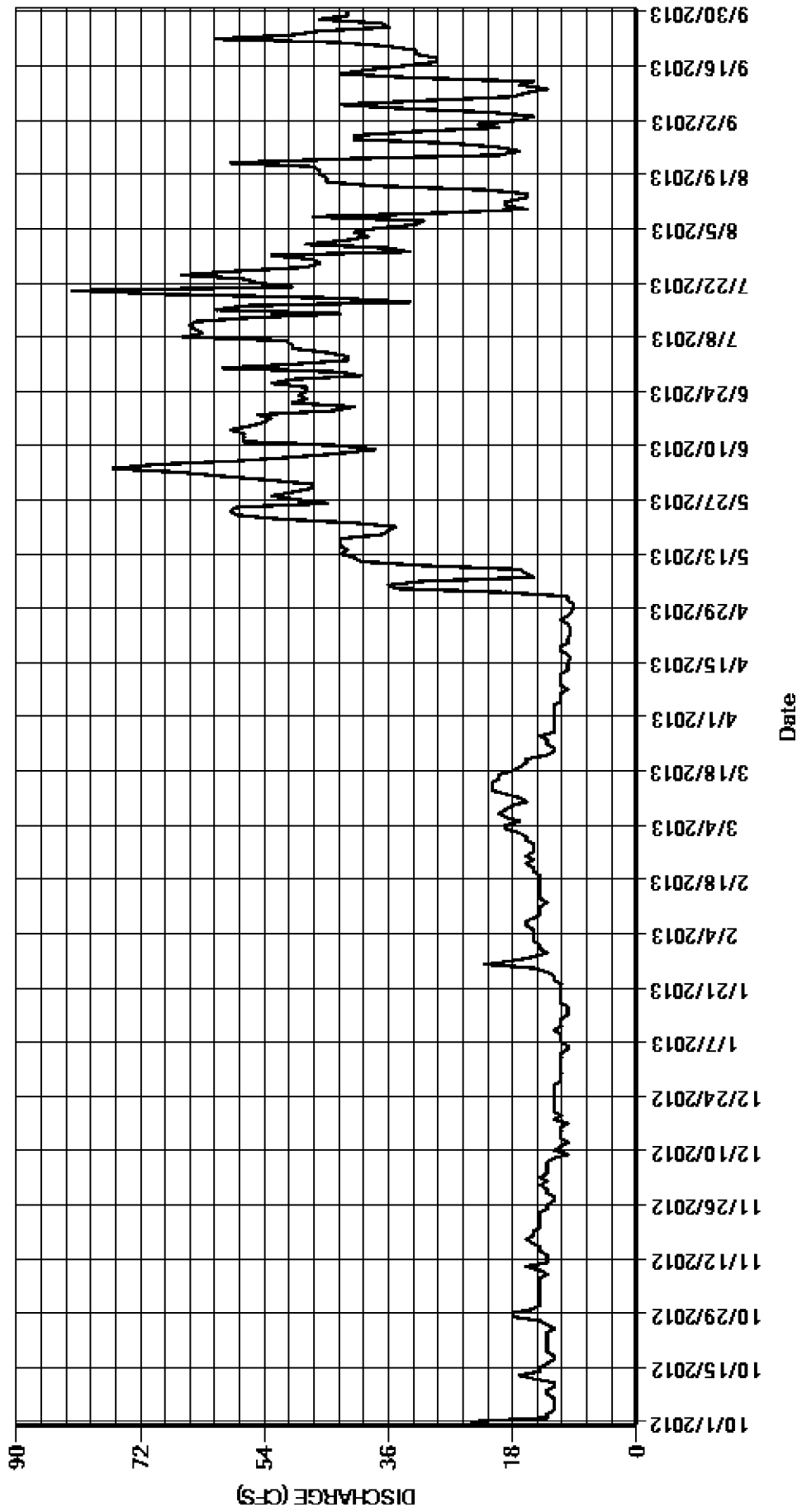
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	24	14	14	11	14	16	12	10	53	50	48	23
2	13	14	13	11	15	17	12	10	60	42	42	17
3	13	14	14	11	15	19	12	19	66	42	39	15
4	12	14	13	11	15	19	12	35	76	45	41	21
5	12	14	13	10	15	17	11	36	70	50	38	34
6	12	14	13	10	16	19	11	31	58	50	32	43
7	12	14	13	11	16	20	11	15	50	51	31	31
8	13	13	12	11	15	19	10	16	43	66	47	18
9	13	14	10	e11	14	18	11	17	38	63	28	16
10	12	16	12	e12	14	16	11	31	43	64	16	13
11	12	13	11	e11	14	17	11	40	57	65	19	17
12	15	13	10	e11	13	19	11	41	57	64	19	15
13	17	13	11	e11	14	21	10	43	57	56	16	33
14	14	14	11	e10	14	21	10	42	59	43	16	43
15	14	14	11	e10	14	21	10	43	56	61	22	39
16	13	15	11	e10	14	20	9.6	43	54	57	38	34
17	12	16	10	e11	14	20	10	43	53	33	45	29
18	12	15	12	e11	14	18	11	37	55	44	45	29
19	13	15	11	11	14	17	11	36	44	68	46	32
20	13	14	12	11	15	16	10	35	41	82	46	32
21	13	14	12	11	15	16	10	41	50	50	47	36
22	13	14	12	11	16	13	9.7	52	48	55	59	43
23	13	14	12	12	15	12	9.7	58	49	57	43	61
24	13	14	12	12	16	12	9.7	59	48	66	20	50
25	12	13	12	13	15	13	10	58	48	58	17	46
26	13	13	12	15	15	13	11	45	53	48	20	36
27	14	12	12	22	15	14	10	49	50	46	27	37
28	18	12	11	18	16	12	9.4	53	40	47	41	46
29	18	13	11	15	---	12	9.3	50	43	53	41	42
30	15	13	11	13	---	12	9.2	47	60	33	32	42
31	14	---	11	14	---	12	---	47	---	36	20	---
TOTAL	427	415	365	372	412	511	314.6	1182	1579	1645	1041	973
MEAN	13.8	13.8	11.8	12.0	14.7	16.5	10.5	38.1	52.6	53.1	33.6	32.4
AC-FT	847	823	724	738	817	1010	624	2340	3130	3260	2060	1930
MAX	24	16	14	22	16	21	12	59	76	82	59	61
MIN	12	12	10	10	13	12	9.2	10	38	33	16	13

CAL YR	2012	TOTAL	9671.0	MEAN	26.4	MAX	75	MIN	10	AC-FT	19180
WTR YR	2013	TOTAL	9236.6	MEAN	25.3	MAX	82	MIN	9.2	AC-FT	18320

MAX DISCH: 128 CFS AT 20:00 ON AUG 22, 2013 GH 1.62 FT SHIFT 0 FT  
 MAX GH: 1.62 FT AT 20:00 ON AUG 22, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08250000 CULEBRA CREEK AT SAN LUIS  
WY2013 HYDROGRAPH





RIO GRANDE RIVER BASIN  
08251500 RIO GRANDE RIVER NEAR LOBATOS

Water Year 2013

Location.-- Lat 37°4'43", long 105°45'25" referenced to North American Datum of 1983 (Kiowa Hill, CO quad, scale 1:24,000), UTM Zone 13 432719 E and 4103861 N, in SE ¼ SE ¼ sec. 27, T.33 N., R.11 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010002, on right bank at highway bridge, 5.7 mi north of Colorado-New Mexico State line, 8 mi downstream from Culebra Creek, 11 mi east of Lobatos, CO, and 14 mi east of Antonito, CO.

Drainage Area and Period of Record.-- 7,700 mi<sup>2</sup> approximately, includes 2,940 mi<sup>2</sup> in Closed Basin in northern part of San Luis Valley, Colo; July 1899 to present.

Equipment.-- Graphic water-stage recorder, data collection platform (Sutron model Satlink 2), a float-operated Sutron SDR shaft-encoder, and a water temperature sensor in a four foot square timber shelter and cobblestone well. SDR float is operated in an oil cylinder during winter months. The primary reference gage is a drop tape from reference point on shelf. Un-readable auxiliary outside slope gage abandoned.

Hydrologic Conditions.-- Natural streamflow is affected by transmountain diversions, storage reservoirs, ground-water withdrawals, diversions for irrigation, and return flows from irrigated areas.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log, SDR log, and chart record as backup. Record is complete and reliable except for Jan 4 - Feb 15 and Mar 9 - 14 while oil cylinder and/or inlets were frozen. One 15-minute unit value was filled on Sep 16 from chart backup without loss of accuracy. A +0.01 ft datum correction was applied from Mar 14, when open-water record began, to Aug 1, when RP elevation was adjusted. One +0.04 ft instrument calibration correction was made on Jul 24 due to oil cylinder leaking, which was manually prorated from Jul 21 based on chart backup. The stage-discharge relation was affected by ice Nov 11 - 17; Nov 25 - Dec 1; Dec 8 - Jan 3; and Feb 16 - Mar 8.

Datum Corrections.-- Levels were last run to the Reference Point (RP) inside the gage on Aug 1, 2013 using BM No. 2 as base. The gage was found to be reading within allowable limits. The RP was adjusted -0.007 ft. Two-peg test was performed on the Lietz level (SN 130869) on July 29, 2013, the instrument was within allowable limits and no correction was made.

Rating.-- The control is composed of boulders and cobbles. Shifting is caused by movement of sand, silt, and gravel in the streambed, and by seasonal heavy weed and moss growth. Rating No. 3, in use since May 1, 1965, was used again this year. This rating is probably not very well defined due to the constant growth and death cycles of weeds and moss as well as heavy silt deposition due to this growth. There is only a brief period of time after ice goes out and scours the channel and before heavy aquatic growth begins that the stage-discharge relation is not influenced by other factors. Twenty-seven measurements (223-249) were made this year ranging in discharge from 11.2 to 363 cfs. They cover the discharge range experienced except for lower daily flows on Jul 22, 23, 25; and higher daily flows on Mar 16-23; and Sep 23-25, 28-30. The peak flow of 615 cfs occurred at 1915 on Sep 30, 2013 at a gage height of 2.17 ft with a shift of -0.02 ft. It exceeded high measurement no. 249 with a gage height of 1.72 ft, made Sep 23 by 0.45 ft in stage. The peak gage-height of 2.37 ft occurred on Feb 26, 2013 at 0315 as a result of backwater from ice.

Discharge.-- Shifting control method was used to compute discharge during all open-water periods. Periods of unreliable and ice-affected stage data were estimated. Variable shift curves (VS13-A, 13-H, 13-I, 13-L, 13-M, and 13-N) were developed and used to define the stage-shift relation except for 0000 to 1045 on Oct 1 when a +0.07 ft shift was applied directly. Open-water measurements show shifts varied from -0.01 to +0.16 feet. All measurements were given full weight and applied except nos. 224, 238, 242, 246, and 248; which were adjusted as much as 5.6% to smooth shift trends.

Special Computations.-- Discharge for periods of ice-affected record was estimated using measurements, weather records, trends, and comparison with the stations Rio Grande near Cerro, New Mexico, and Rio Grande near Taos Junction Bridge, New Mexico minus the Red River near Questa, New Mexico.

Remarks.-- Due to the high frequency of measurements, the record is considered good except for periods of estimation, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Install secondary reference gage. Develop base rating from survey and measurement data.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

08251500 RIO GRANDE RIVER NEAR LOBATOS

RATING TABLE-- RIOLOBCO03 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

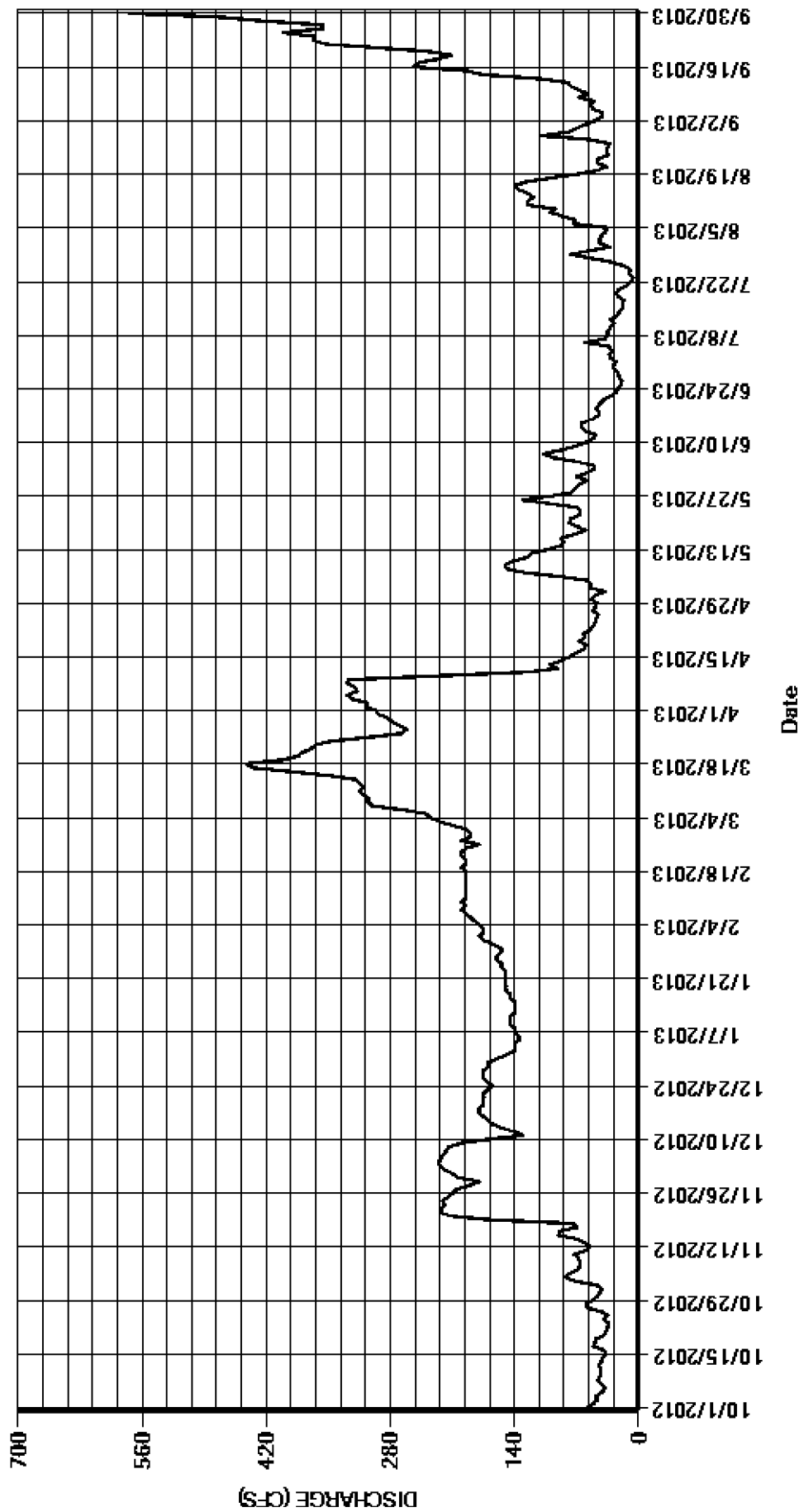
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	58	42	e210	e150	e180	e195	296	49	70	25	44	60
2	51	47	218	e140	e175	e210	308	38	59	32	44	49
3	47	72	223	e140	e175	e225	307	54	50	33	42	42
4	48	82	226	e140	e180	e235	323	54	51	30	37	41
5	41	78	223	e135	e185	e240	329	58	71	34	36	51
6	38	69	221	e135	e190	e265	318	90	95	60	73	55
7	42	66	217	e140	e195	e300	320	129	108	38	71	50
8	46	66	e215	e140	e200	e305	329	149	88	35	86	67
9	44	68	e200	e145	e195	e305	327	151	71	35	100	58
10	43	73	e170	e145	e200	e310	222	141	59	32	94	68
11	43	e60	e130	e145	e195	e315	125	125	51	28	126	77
12	45	e55	e140	e140	e195	e310	91	121	48	32	125	80
13	42	e60	e155	e140	e195	e315	100	102	61	25	119	113
14	41	e70	e165	e140	e195	e320	88	88	65	22	125	176
15	37	e90	e170	e140	e195	350	78	85	64	18	136	194
16	40	e90	e175	e145	e195	392	71	87	53	18	139	254
17	51	e70	e180	e145	e195	435	62	73	45	17	127	249
18	49	74	e180	e150	e195	443	59	60	45	23	98	228
19	48	170	e175	e150	e200	403	67	69	48	26	68	211
20	39	213	e175	e150	e195	384	61	78	44	22	46	237
21	37	224	e175	e150	e195	380	62	77	40	13	36	298
22	35	222	e175	e150	e200	370	55	66	32	8.9	47	354
23	34	219	e170	e150	e200	365	52	66	25	6.4	46	367
24	39	221	e165	e155	e195	347	49	70	23	11	35	366
25	35	e215	e170	e155	e180	304	48	102	20	9.2	36	401
26	42	e210	e175	e160	e200	268	46	131	19	16	35	356
27	58	e205	e175	e160	e190	262	51	99	22	30	33	357
28	59	e190	e175	e155	e190	270	49	75	23	53	56	425
29	51	e180	e170	e155	---	278	47	72	27	77	109	473
30	47	e205	e170	e165	---	284	53	67	29	57	78	576
31	44	---	e160	e175	---	294	---	58	---	33	70	---
TOTAL	1374	3706	5648	4585	5380	9679	4393	2684	1506	899.5	2317	6333
MEAN	44.3	124	182	148	192	312	146	86.6	50.2	29.0	74.7	211
AC-FT	2730	7350	11200	9090	10670	19200	8710	5320	2990	1780	4600	12560
MAX	59	224	226	175	200	443	329	151	108	77	139	576
MIN	34	42	130	135	175	195	46	38	19	6.4	33	41

CAL YR	2012	TOTAL	63777.0	MEAN	174	MAX	1270	MIN	15	AC-FT	126500
WTR YR	2013	TOTAL	48504.5	MEAN	133	MAX	576	MIN	6.4	AC-FT	96210

MAX DISCH: 615 CFS AT 19:15 ON SEP 30, 2013 GH 2.17 FT SHIFT -0.02 FT  
 MAX GH: 2.37 FT AT 03:15 ON FEB 26, 2013 (Backwater from ice)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08251500 RIO GRANDE RIVER NEAR LOBATOS  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
09118200 TARBELL DITCH NEAR COCHETOPA PASS  
Water Year 2013

Location.-- Lat 37°59'33", long 106°47'37" referenced to North American Datum of 1983 (Halfmoon Pass, CO quad, scale 1:24,000), UTM Zone 13 342496 E and 4206511 N, in SE ¼ SE ¼ sec. 7, T.43 N., R.2 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 14020003, on left bank Tarbell ditch diverts water from Lake Fork Cochetopa Creek (tributary to Cochetopa Creek), in NW¼ sec. 18, T.43 N., R.2 E., in Gunnison River basin, to Lake Fork Creek (tributary to Middle Fork Saguache Creek) in NE¼ sec. 18, T.43 N., R.2 E., in Rio Grande basin.

Drainage Area and Period of Record.-- Drainage area not determined.; WY 1949 to present.

Equipment.-- Data collection platform (Sutron Model Satlink2) and a float-operated shaft encoder in a lumber shelter and steel culvert pipe stilling well. A Stevens F-type chart recorder is also occasionally used. One intake pipe attaches well to 2.5 foot Parshall flume.

Hydrologic Conditions.-- This is a trans-mountain diversion gage and all flow is regulated.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log as backup. Record is complete from May 29, 2013 when satellite telemetry was started to Sep 30, 2013. Chart record was used from 1100 May 28, when diversions started, to 1230 May 29. The diversion headgate was closed on Sep 25. There was no flow from Oct 1, 2012 to May 27, 2013 and Sep 26 to Sep 30, 2013.

Datum Corrections.-- No datum corrections since levels have not been run on this flume. The flume is in fair condition. The measured depths on Measurement 40, made Jun. 6, 2011, indicate that flume floor is fairly level laterally. However both flume walls are leaning from left to right. There is also a large flat rock placed at left side of flume entrance to prevent erosion, which affects velocities at left edge of flume.

Rating.-- Rating STD02HFTPF, a standard 2.5 foot Parshall flume rating, was used all year. Sediment and rock above flume cause minor shifting. One discharge measurement (no. 42) was made this year, with a discharge of 1.95 cfs. The peak flow of 7.2 cfs occurred at 2000 on Sep 22, 2013 at a gage height of 0.88 ft with a shift of -0.07 ft. The peak exceeded Measurement No. 42, (GH=0.42 ft) made May 29, 2013, by 0.46 ft in stage.

Discharge.-- Shifting control method was used during all periods of good record. The measured shift (-0.07 feet) was distributed through the entire period of record.

Special Computations.-- No special computations.

Remarks.-- Record is fair. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Cleaning the approach section may reduce shifting.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09118200 TARBELL DITCH NEAR COCHETOPA PASS

RATING TABLE-- STD02HFTPF USED FROM 28-MAY-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

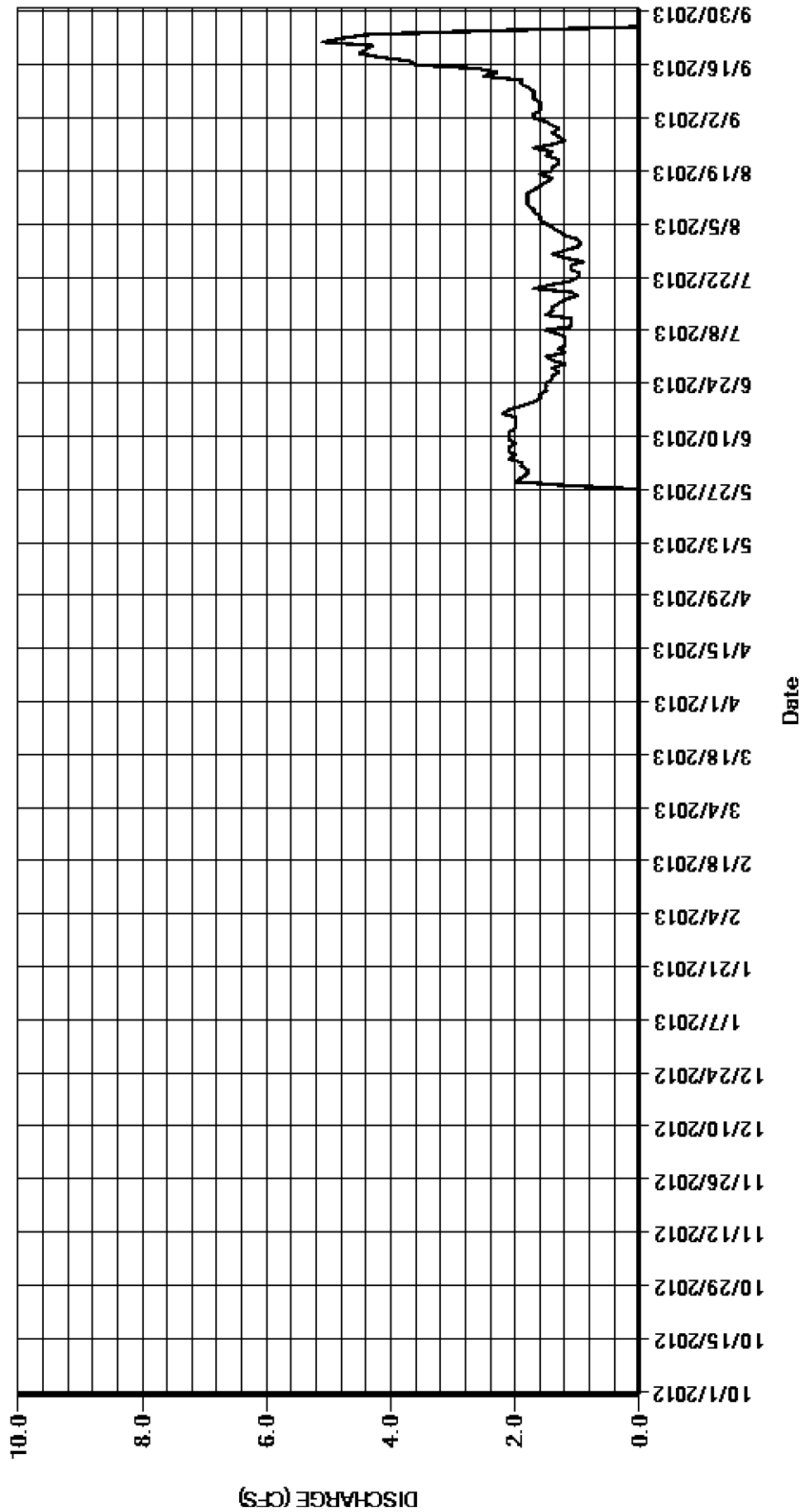
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	1.5	1.0	1.5
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	1.2	1.2	1.7
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	1.3	1.3	1.7
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	1.2	1.4	1.6
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	1.2	1.5	1.6
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	1.2	1.6	1.6
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	1.3	1.6	1.7
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	1.5	1.7	1.7
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	1.1	1.7	1.7
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	1.1	1.8	1.8
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	1.1	1.8	1.9
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	1.5	1.8	1.9
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	1.4	1.8	2.5
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	1.4	1.7	2.3
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	1.3	1.6	2.6
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.2	1.2	1.5	3.6
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	1.0	1.4	3.7
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	1.1	1.6	4.2
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.7	1.7	1.4	4.5
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.6	1.4	1.4	4.4
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.6	1.1	1.3	4.3
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.5	0.99	1.3	5.1
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.5	0.97	1.5	4.8
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.5	1.1	1.4	4.4
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	1.1	1.7	2.4
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.91	1.4	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	1.2	1.2	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e1.2	1.4	1.4	1.3	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	2.0	1.2	1.2	1.4	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	1.9	1.4	1.0	1.3	0.00
31	0.00	---	0.00	0.00	---	0.00	---	1.8	---	0.94	1.4	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.90	53.9	37.61	46.0	69.20
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.22	1.80	1.21	1.48	2.31
AC-FT	0	0	0	0	0	0	0	14	107	75	91	137
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	2.2	1.7	1.8	5.1
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	0.91	1.0	0.00

CAL YR	2012	TOTAL	93.45	MEAN	0.26	MAX	2.9	MIN	0.00	AC-FT	185
WTR YR	2013	TOTAL	213.61	MEAN	0.59	MAX	5.1	MIN	0.00	AC-FT	424

MAX DISCH: 7.20 CFS AT 20:00 ON SEP 22, 2013 GH 0.88 FT SHIFT -0.07 FT  
 MAX GH: 0.88 FT AT 20:00 ON SEP 22, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09118200 TARBELL DITCH NEAR COCHETOPA PASS  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
09121000 TABOR DITCH AT SPRING CREEK PASS, CO  
Water Year 2013

Location.-- Lat 37°56'22", long 107°9'31" referenced to North American Datum of 1983 (Slumgullion Pass, CO quad, scale 1:24,000), UTM Zone 13 310324 E and 4201303 N, in NE ¼ SE ¼ sec. 35, T.43 N., R.3 W., New Mexico Principal Meridian, Hinsdale County, CO, Hydrologic Unit 13010001, on left bank Tabor ditch diverts water from tributaries of Cebolla Creek in secs. 29 and 36, T.43 N., R.3 W., in Gunnison River basin, to Big Spring Creek (tributary to North Clear Creek) in sec. 35, T.43 N., R.3 W., in Rio Grande basin.

Drainage Area and Period of Record.-- Drainage area not determined. ; 1948 to present.

Equipment.-- Data collection platform (Sutron Satlink2), float-operated electronic stage discharge recorder in a new wood shelter with steel stilling well. A non-contact radar sensor was installed over flume on July 26, 2013. One intake pipe attaches well to a new 2.5 foot Parshall flume. Primary reference gage is staff gage in flume. Equipment owned by Colorado Division of Parks and Wildlife.

Hydrologic Conditions.-- This is a trans-mountain diversion and all flow is regulated.

Gage-Height Record.-- Primary record is 15-minute transmitted SDR data with DCP and SDR logs as backup. The period of diversion was May 20 to Sep 30, 2013. During this period, record is complete and reliable. Five missing unit values were estimated on Jul 26, 2013. There were two instrument corrections made, -0.04 and +0.04 ft. These corrections were prorated by time from previous visit. There was no flow from Oct 1, 2012 to approximately May 17, 2013 and no credit was given prior to May 20, 2013 due to inadequate data and documentation.

Datum Corrections.-- Levels were not run this year. Levels have not been run on the new flume.

Rating.-- Rating STD02HFTPF, a standard 2.5 foot Parshall flume rating, was used this year. Eight measurements (nos. 175-182) were made this year ranging in discharge from 0.63 to 2.35 cfs. Measurements cover the range experienced except for higher daily flows on May 22-27, Sep 17-30, 2013. The peak flow of 7.20 cfs occurred at 2015 on May 23, 2013 at a gage height of 0.81 feet with a shift of 0 feet. It exceeded high measurement no. 182 (GH=0.41 ft) made Sep 18, 2013 by 0.40 ft in stage.

Discharge.-- Shifting control method was used during all periods of good record. A variable stage shift relationship (TABDITVS13-A) was developed from WY2013 measurements. The upper end of the shift curve returns to zero, the low end of the curve was left open ended at -0.02 ft based on measurement trend. The shift curve was used for the period May 20, 2013 to the end of the water year. The measured shifts ranged from +0.02 to -0.03 ft. All were given full weight, except nos. 176, 177, 179, 180, and 182; which were adjusted by as much as 10.8% to smooth shift distribution.

Special Computations.-- May 20, 2013 was estimated from average of logged data.

Remarks.-- Record is fair. Record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09121000 TABOR DITCH AT SPRING CREEK PASS, CO

RATING TABLE-- STD02HFTPF USED FROM 01-APR-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.6	0.66	0.70	0.78
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.6	0.65	0.71	1.2
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.5	0.64	0.74	1.2
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.66	0.75	1.2
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.5	0.65	0.80	1.1
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.64	0.86	1.1
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.68	0.97	1.1
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	0.72	1.1	1.1
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	0.62	1.0	1.1
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	0.62	1.2	1.3
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	0.64	1.2	1.2
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	0.92	1.2	1.2
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	0.93	1.2	2.1
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	1.3	1.1	2.0
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	1.1	1.1	2.0
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	1.2	1.0	2.3
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.1	1.1	1.0	2.5
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.98	1.1	0.96	2.5
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	1.2	0.94	2.7
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e2.1	0.81	1.1	0.90	2.6
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.98	0.94	0.88	2.6
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	0.96	0.88	0.82	2.9
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.1	0.90	0.85	0.79	3.0
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	0.84	0.82	0.80	3.1
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.3	0.79	0.79	0.87	3.0
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	0.78	0.74	0.83	3.0
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	0.76	0.75	0.76	3.1
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.75	0.78	0.75	3.1
29	0.00	0.00	0.00	0.00	---	0.00	0.00	2.0	0.71	0.75	0.75	3.1
30	0.00	0.00	0.00	0.00	---	0.00	0.00	1.8	0.70	0.71	0.73	3.1
31	0.00	---	0.00	0.00	---	0.00	---	1.7	---	0.69	0.73	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.60	33.96	25.83	28.14	62.28
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.02	1.13	0.83	0.91	2.08
AC-FT	0	0	0	0	0	0	0	63	67	51	56	124
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.1	1.6	1.3	1.2	3.1
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.62	0.70	0.78

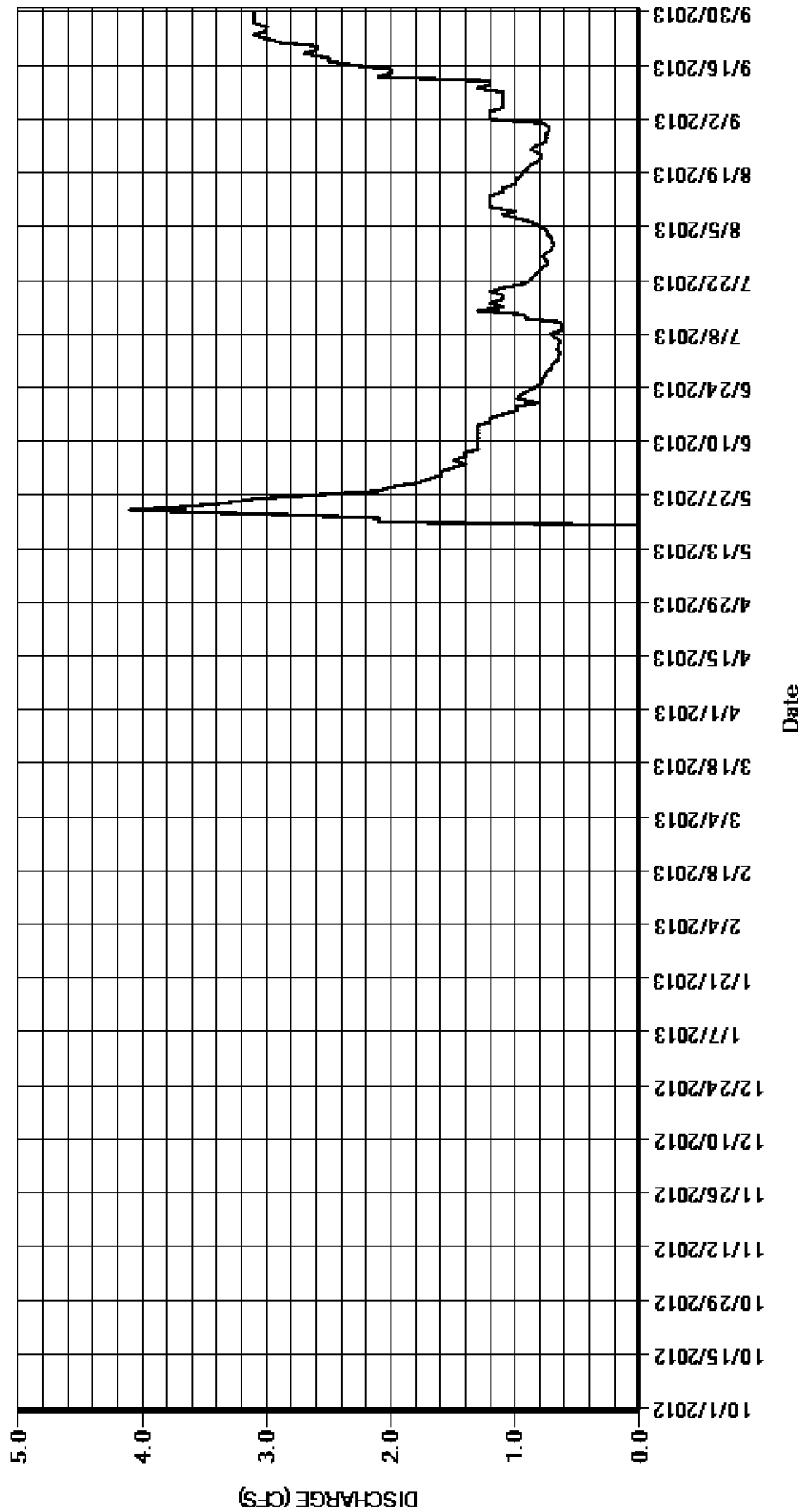
CAL YR	2012	TOTAL	169.01	MEAN	0.46	MAX	5.1	MIN	0.00	AC-FT	335
WTR YR	2013	TOTAL	181.81	MEAN	0.50	MAX	4.1	MIN	0.00	AC-FT	361

MAX DISCH: 7.20 CFS AT 20:15 ON MAY 23, 2013 GH 0.81 FT SHIFT 0 FT  
 MAX GH: 0.81 FT AT 20:15 ON MAY 23, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



09121000 TABOR DITCH AT SPRING CREEK PASS, CO  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
09341000 TREASURE PASS DITCH AT WOLF CREEK PASS  
Water Year 2013

Location.-- Lat 37°28'58", long 106°47'59" referenced to North American Datum of 1983 (Wolf Creek Pass, CO quad, scale 1:24,000), UTM Zone 13 340869 E and 4149940 N, in SW ¼ NW ¼ sec. 5, T.37 N., R.2 E., New Mexico Principal Meridian, Mineral County, CO, Hydrologic Unit 13010001, on right bank. Treasure Pass Ditch diverts water tributary to Wolf Creek and the San Juan River drainage across the Continental Divide to Pass Creek and the South Fork Rio Grande River drainage.

Drainage Area and Period of Record.-- Drainage area not determined.; 1948 to present.

Equipment.-- Float-operated Sutron SDR in small steel shelter and stilling well. One intake pipe attaches well to 2 foot Parshall flume. Primary reference gage is staff gage in flume.

Hydrologic Conditions.-- This is a trans-mountain diversion and all flow is regulated.

Gage-Height Record.-- Primary record is 15-minute SDR log data with no back-up. Record is complete and reliable from May 6 to Sep 30, 2013. One erroneous unit value was corrected on May 23 with no loss in accuracy. A +0.01 ft instrument correction was made to the SDR on May 14 and prorated by time from previous visit. Well isolates from flume at gage-height of 0.04 ft.

Datum Corrections.-- No datum corrections since levels have not been run on this flume. The flume was replaced Sep. 1, 2010 and is in good condition. There is no stilling pool above flume so approach velocity is high.

Rating.-- Rating STD02FTPF, a standard 2 foot Parshall flume rating, was used all year. Changes in approach conditions above flume cause shifting. Three discharge measurements were made this year (nos. 32-34) ranging in discharge from 0.50 to 2.71 cfs. The peak flow of 5.99 cfs occurred at 1630 on May 26, 2013 at a gage height of 0.79 ft with a shift of +0.04 ft. The peak flow exceeded measurement no. 34 made May 31, 2013 (GH = 0.46 ft) by 0.33 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record during all periods of record. Shift curves VS13-4 and VS13-3 were developed and used to apply shifts according to stage. VS13-4 was developed from the change in gage-height due to modifying approach conditions on May 14 and later measured low shift while considering the range in stage during application period. VS13-4 was used May 6-14, 2013. VS13-3 was used for the remainder of the year after the approach conditions were modified. Both shift curves were developed to calculate no flow below the point the well isolates from flume, 0.04 ft. There was no flow Oct 1, 2012 to May 5, May 9-11, Jun 21-30, Jul 1-27, 29-31, Aug 1-6, 8, 9, 12-24, Sep 1, 2, 4-9, 2013.

Special Computations.-- In order to calculate correct daily discharges on days that record started and stopped, 15-minute gage-heights of 0 feet were added before and after the actual start and stop times to the primary stage import file.

Remarks.-- Record is good May 26, 2013 to Jun 15, 2013 and Sep 18-30, 2013 all other periods are poor due to low flows and well isolating. The peak discharge should be considered fair. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09341000 TREASURE PASS DITCH AT WOLF CREEK PASS

RATING TABLE-- STD02FTPF USED FROM 06-MAY-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

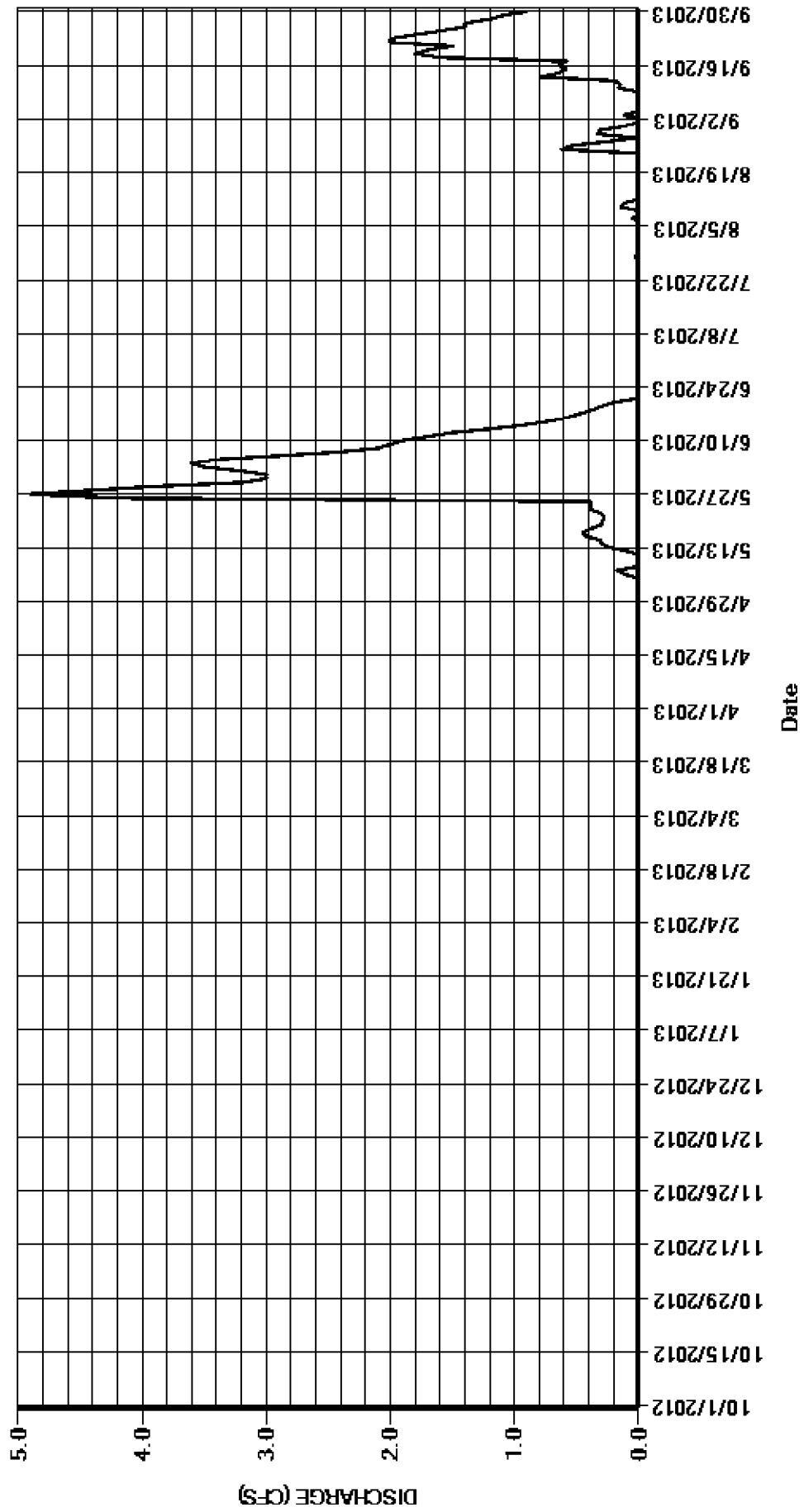
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.2	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.5	0.00	0.00	0.12
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	2.9	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	2.4	0.00	0.05	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	2.1	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	0.00	0.14	0.16
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.7	0.00	0.12	0.15
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	1.5	0.00	0.00	0.19
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	1.2	0.00	0.00	0.79
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.93	0.00	0.00	0.64
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.73	0.00	0.00	0.59
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.57	0.00	0.00	0.64
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.47	0.00	0.00	0.58
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.37	0.00	0.00	1.6
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.29	0.00	0.00	1.8
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.19	0.00	0.00	1.7
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00	0.00	0.00	1.5
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.00	0.00	0.00	2.0
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	2.0
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	1.8
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.62	1.6
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.2	0.00	0.00	0.54	1.4
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.9	0.00	0.00	0.26	1.4
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.4	0.00	0.03	0.02	1.2
29	0.00	0.00	0.00	0.00	---	0.00	0.00	3.9	0.00	0.00	0.33	1.1
30	0.00	0.00	0.00	0.00	---	0.00	0.00	3.2	0.00	0.00	0.32	0.90
31	0.00	---	0.00	0.00	---	0.00	---	3.0	---	0.00	0.13	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.44	35.95	0.03	2.53	23.86
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.92	1.20	0.001	0.082	0.80
AC-FT	0	0	0	0	0	0	0	56	71	.06	5.0	47
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.9	3.6	0.03	0.62	2.0
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CAL YR	2012	TOTAL	107.36	MEAN	0.29	MAX	5.8	MIN	0.00	AC-FT	213
WTR YR	2013	TOTAL	90.81	MEAN	0.25	MAX	4.9	MIN	0.00	AC-FT	180

MAX DISCH: 5.99 CFS AT 16:30 ON MAY 26, 2013 GH 0.79 FT SHIFT 0.04 FT  
 MAX GH: 0.79 FT AT 16:30 ON MAY 26, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09341000 TREASURE PASS DITCH AT WOLF CREEK PASS  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
DON LA FONT DITCH NO. 1 AT PIEDRA PASS  
Water Year 2013

Location.-- Lat 37°34'9", long 107°0'17" referenced to North American Datum of 1983 (Palomino Mountain, CO quad, scale 1:24,000), UTM Zone 13 322967 E and 4159909 N, in SW ¼ SE ¼ sec. 32, T.39 N., R.1 W., New Mexico Principal Meridian, Mineral County, CO, Hydrologic Unit 14080102, on bank 17.8 mi southwest of Wagon Wheel Gap, CO.

Drainage Area and Period of Record.-- Drainage area not determined.; 1951 to present.

Equipment.-- Float-operated Sutron SDR data logger in a CMP shelter and metal pipe stilling well. One intake pipe attaches well to 9 inch Parshall flume. Primary reference gage is a staff gage in Parshall flume. All equipment is owned and maintained by Colorado Division of Parks and Wildlife (CPW).

Hydrologic Conditions.-- This is a trans-mountain diversion and all flow is regulated.

Gage-Height Record.-- Primary record is 15-minute logged SDR data with no backup. Record is complete and reliable May 21 to Jul 21, 2013. One missing unit value was filled from gage readings on Jun 12, 2013 with no loss in accuracy. There was one -0.01 ft instrument correction made to the SDR on Jun 12, 2013. This correction was prorated by time from previous visit.

Datum Corrections.-- No datum corrections. Levels have not been run on this flume.

Rating.-- Rating STD09INPF, a standard 9 inch Parshall flume rating, was used all year. There was one measurement (no. 13) made this year at 0.24 cfs. The peak flow of 3.45 cfs occurred at 1615 on May 24, 2013 at a gage height of 1.11 feet with a shift of -0.03 feet. It exceeded measurement no. 13 (GH = 0.22 ft) made Jun 12, 2013 by 0.89 feet in stage.

Discharge.-- Shifting control method was used to compute the discharge during all periods of record. A shift curve (VSC13-A) was used to apply the -0.03 shift to all gage-heights above the apparent point of isolation and calculate no flow below the point of isolation. There was no flow Oct 1, 2012 to May 20, 2013 and Jun 24 to Sep 30, 2013.

Special Computations.-- In order for correct daily discharge values to be calculated on days that record started and stopped, 15-minute gage heights of 0 feet were added before and after the actual start and stop times to the primary stage import file.

Remarks.-- Record is fair due to limited visitation by DWR personnel. Station maintained cooperatively by Colorado Parks and Wildlife and Div. 3 hydrographic staff. Record developed by Div. 3 hydrographic staff.

Recommendations.-- Install inlet at lower elevation to avoid well isolation during low flows.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

DON LA FONT DITCH NO. 1 AT PIEDRA PASS

RATING TABLE-- STD09INPF USED FROM 21-MAY-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

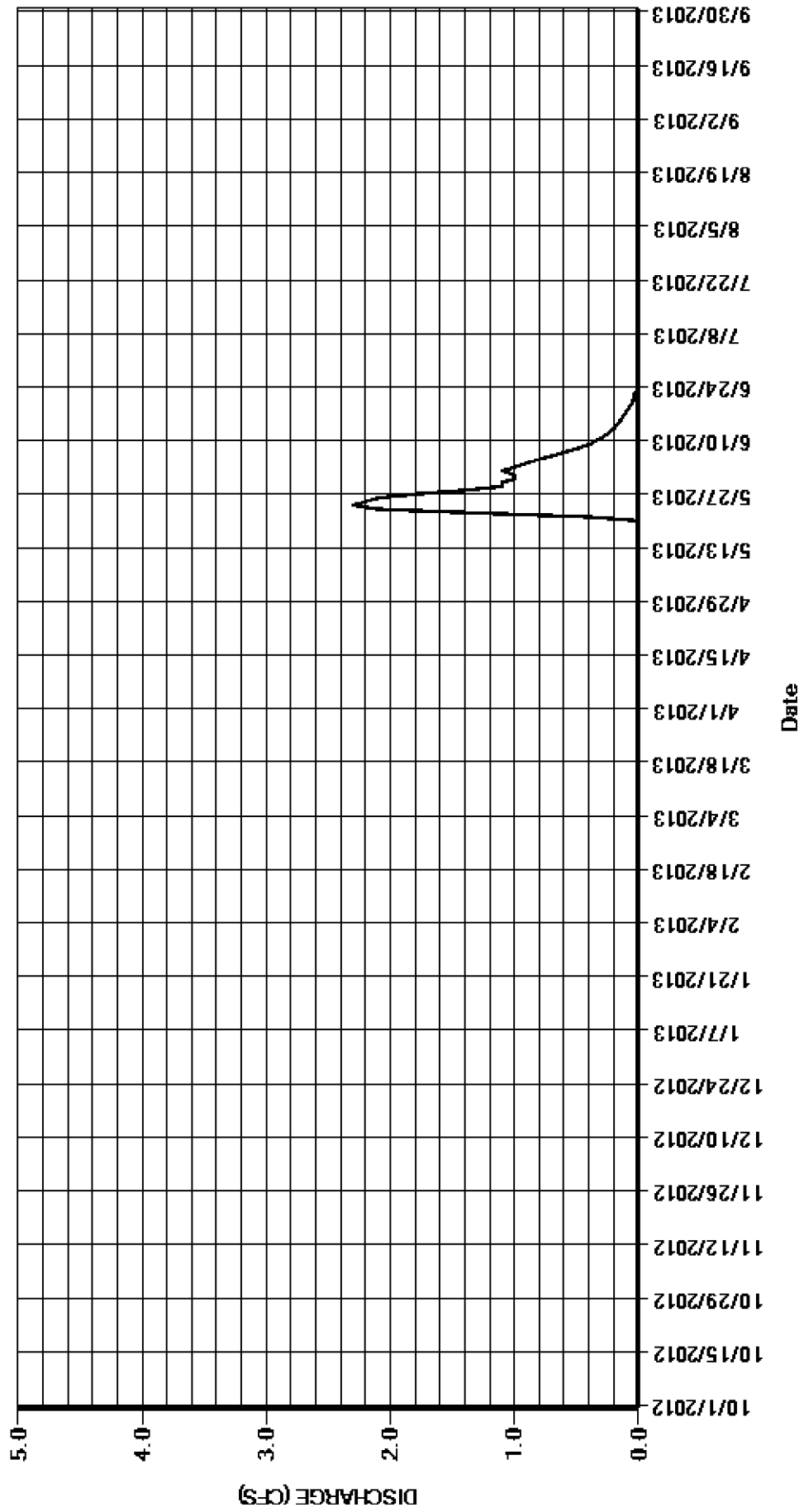
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.1	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.81	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.59	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.04	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	0.04	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.01	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.3	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.2	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	1.1	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	1.1	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	1.0	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.81	8.92	0.00	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.54	0.30	0.000	0.000	0.000
AC-FT	0	0	0	0	0	0	0	33	18	0	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.3	1.1	0.00	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CAL YR	2012	TOTAL	25.45	MEAN	0.070	MAX	2.0	MIN	0.00	AC-FT	50
WTR YR	2013	TOTAL	25.73	MEAN	0.070	MAX	2.3	MIN	0.00	AC-FT	51

MAX DISCH: 3.45 CFS AT 16:15 ON MAY 24, 2013 GH 1.11 FT SHIFT -0.03 FT  
 MAX GH: 1.11 FT AT 16:15 ON MAY 24, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**DON LA FONT DITCH NO. 1 AT PIEDRA PASS  
WY2013 HYDROGRAPH**



RIO GRANDE RIVER BASIN  
09347000 DON LA FONT DITCH NO. 2 AT PIEDRA PASS  
Water Year 2013

Location.-- Lat 37°34'21", long 106°59'57" referenced to North American Datum of 1983 (South River Peak, CO quad, scale 1:24,000), UTM Zone 13 323451 E and 4160264 N, in NE ¼ SE ¼ sec. 32, T.39 N., R.1 W., New Mexico Principal Meridian, Mineral County, CO, Hydrologic Unit 13010001, on right bank 17.5 mi southwest of Wagon Wheel Gap, CO. Diversion is from tributaries of Piedra River in San Juan River Basin to Red Mountain Creek in Rio Grande River Basin.

Drainage Area and Period of Record.-- Drainage area not determined. ; 1963 to present.

Equipment.-- Data collection platform (Sutron Model 8200 DCP with GOES radio) and a float-operated Sutron SDR in a wood shelter and metal pipe stilling well. One intake pipe attaches well to 1.5 foot Parshall flume. The only reference gage is a staff gage in Parshall flume. All equipment is owned and maintained by Colorado Division of Parks and Wildlife (CPW).

Hydrologic Conditions.-- This is a trans-mountain diversion gage and all flow is regulated.

Gage-Height Record.-- The DCP was not used this year to transmit data. Primary record is 15-minute logged SDR data with no backup. Record is complete and reliable from May 21 to Sep 9, 2013. There was one missing unit value on each of three days Jun 12, Jul 22, and Aug 20, 2013. The missing value on Jun 12, 2013 was filled from gage readings and the others were estimated using linear interpolation with no loss in accuracy. A -0.04 feet instrument correction was made to the SDR on Jun 12, 2013. This correction was applied when station was opened on May 21, 2013.

Datum Corrections.-- No datum corrections. Levels have not been run at this flume.

Rating.-- Rating STD01HFTPF, a standard 1.5 foot Parshall flume rating, was used all year. One discharge measurement (no. 19) was made this year at a gage-height of 0.51 ft with a discharge of 2.15 cfs and a computed shift of 0.00 ft. The peak flow of 8.15 cfs occurred at 1800 on May 24, 2013 at a gage-height of 1.22 feet with a shift of 0 feet. The peak exceeded measurement no. 19, made on Jun 12, 2013, by 0.71 feet in stage.

Discharge.-- Shifting control method was used during entire period of record. Two shift curves (VS13-A and VS13-B) apply the 0 ft shift to all gage-heights above the apparent point of well isolation and calculates no flow below the point of isolation. There was no flow Oct 1, 2012 through May 20, Jun 30 - Jul 4, Jul 6-10, 13, 15-17, 19-27, 29-31, and Sep 10-30, 2013.

Special Computations.-- In order for correct daily discharge values to be calculated on days that record started and stopped, 15-minute gage heights of 0 feet were added before and after the actual start and stop times to the primary stage import file.

Remarks.-- Record is fair due to limited visitation by DWR personnel. Station cooperatively maintained by Colorado Division of Parks and Wildlife and Div 3 hydrographic staff. Record developed by Div 3 hydrographic staff.

Recommendations.-- Install inlet at lower elevation to avoid well isolation at low flows.



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09347000 DON LA FONT DITCH NO. 2 AT PIEDRA PASS

RATING TABLE-- STD01HFTPF USED FROM 21-MAY-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

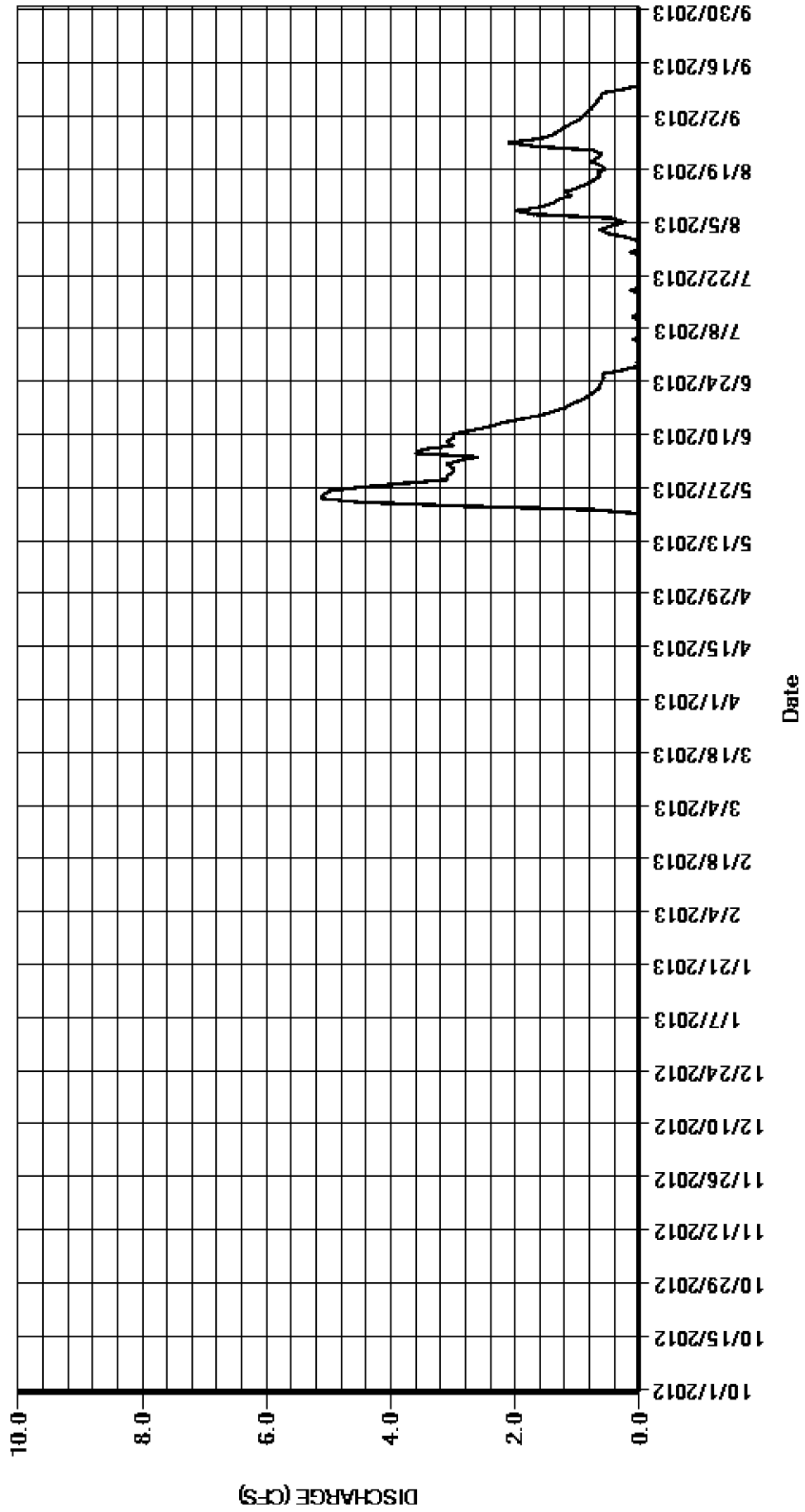
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0	0.00	0.20	0.98
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	0.00	0.51	0.91
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9	0.00	0.64	0.84
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	0.00	0.45	0.77
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	0.09	0.24	0.72
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.5	0.00	0.44	0.68
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0	0.00	1.7	0.61
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	0.00	2.0	0.60
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0	0.00	1.6	0.27
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0	0.00	1.4	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.7	0.10	1.3	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.4	0.03	1.1	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.2	0.00	1.2	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	0.01	1.0	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.6	0.00	0.86	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.00	0.74	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	0.00	0.64	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.1	0.14	0.67	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.00	0.55	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.83	0.00	0.63	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.74	0.00	0.77	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9	0.66	0.00	0.68	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.5	0.63	0.00	0.61	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.1	0.60	0.00	0.74	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.1	0.58	0.00	1.7	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.0	0.58	0.00	2.1	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.5	0.27	0.00	1.6	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	0.02	0.14	1.4	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	3.1	0.04	0.00	1.3	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	3.1	0.00	0.00	1.2	0.00
31	0.00	---	0.00	0.00	---	0.00	---	3.0	---	0.00	1.1	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.84	51.19	0.51	31.07	6.38
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.32	1.71	0.016	1.00	0.21
AC-FT	0	0	0	0	0	0	0	81	102	1.0	62	13
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.1	3.6	0.14	2.1	0.98
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00

CAL YR	2012	TOTAL	67.04	MEAN	0.18	MAX	4.3	MIN	0.00	AC-FT	133
WTR YR	2013	TOTAL	129.99	MEAN	0.36	MAX	5.1	MIN	0.00	AC-FT	258

MAX DISCH: 8.15 CFS AT 18:00 ON MAY 24, 2013 GH 1.22 FT SHIFT 0 FT  
 MAX GH: 1.22 FT AT 18:00 ON MAY 24, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09347000 DON LA FONT DITCH NO. 2 AT PIEDRA PASS  
WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
DON LA FONT DITCH AT PIEDRA PASS (COMBINED)  
Water Year 2013

Location.-- Don La Font Ditches 1 and 2 divert water from tributaries of Piedra River between headgates in NW¼ sec. 4, T.38 N., R.1 W., and SW¼ sec. 33, T.39 N., R.1 W., and Piedra pass, in San Juan River basin, to Red Mountain Creek in sec. 33, T.39 N., R.1 W., in Rio Grande basin.

Drainage Area and Period of Record.-- N/A;

Equipment.-- Combined record is from Don La Font Ditches 1 and 2 gages. See individual station analyses for gage equipment descriptions.

Hydrologic Conditions.-- This is a combined trans-mountain diversion and all flow is regulated. Don La Font Ditches 1 and 2 divert water from tributaries of Piedra River in San Juan River Basin (Division 7) to Red Mountain Creek in Rio Grande River Basin (Division 3).

Gage-Height Record.-- See individual station analyses.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- Daily discharges computed by summing and rounding individual station daily discharges.

Special Computations.-- A day is considered estimated if the estimated portion of a daily sum is greater than 10% of the daily sum.

Remarks.-- Record is fair, except for periods of flow below 1 cfs should be considered poor. Record developed by Div. 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

DON LA FONT DITCH AT PIEDRA PASS (COMBINED)

RATING TABLE.--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

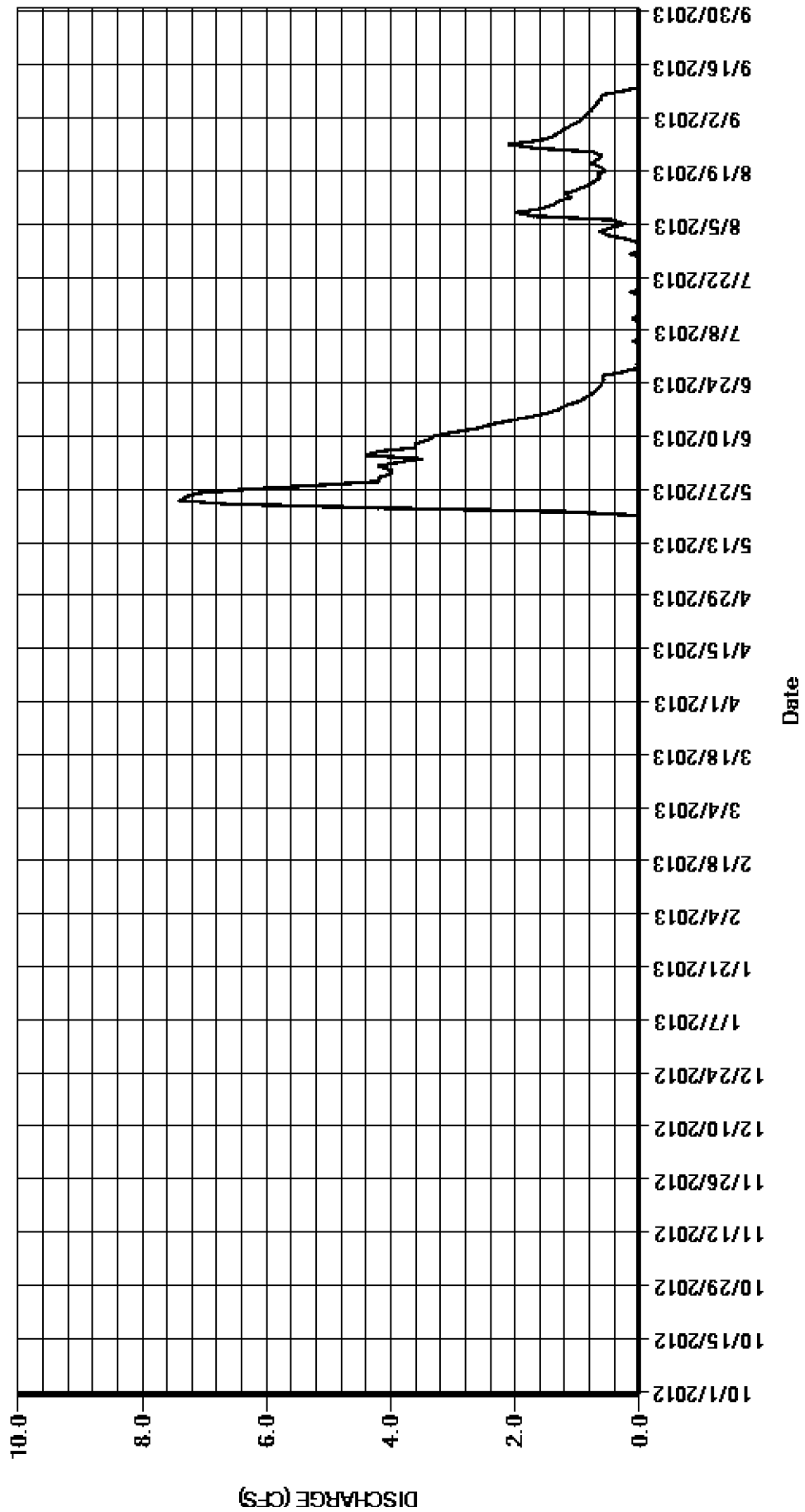
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.0	0.00	0.20	0.98
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.2	0.00	0.51	0.91
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.9	0.00	0.64	0.84
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.5	0.00	0.45	0.77
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.4	0.09	0.24	0.72
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.2	0.00	0.44	0.68
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	0.00	1.7	0.61
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	0.00	2.0	0.60
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	0.00	1.6	0.27
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.3	0.00	1.4	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0	0.10	1.3	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	0.03	1.1	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.4	0.00	1.2	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.01	1.0	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.00	0.86	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.5	0.00	0.74	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	0.00	0.64	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	0.14	0.67	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	0.00	0.55	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.00	0.63	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	0.78	0.00	0.77	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.2	0.70	0.00	0.68	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.6	0.64	0.00	0.61	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.4	0.60	0.00	0.74	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.3	0.58	0.00	1.7	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.1	0.58	0.00	2.1	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.3	0.27	0.00	1.6	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.2	0.02	0.14	1.4	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	4.2	0.04	0.00	1.3	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	4.2	0.00	0.00	1.2	0.00
31	0.00	---	0.00	0.00	---	0.00	---	4.0	---	0.00	1.1	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57.70	60.09	0.51	31.07	6.38
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.86	2.00	0.016	1.00	0.21
AC-FT	0	0	0	0	0	0	0	114	119	1.0	62	13
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.4	4.4	0.14	2.1	0.98
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00

CAL YR	2012	TOTAL	92.62	MEAN	0.25	MAX	6.3	MIN	0.00	AC-FT	184
WTR YR	2013	TOTAL	155.75	MEAN	0.43	MAX	7.4	MIN	0.00	AC-FT	309

MAX DISCH:  
 MAX GH:

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**DON LA FONT DITCH AT PIEDRA PASS (COMBINED)  
WY2013 HYDROGRAPH**



RIO GRANDE RIVER BASIN  
09348000 WILLIAM'S CREEK-SQUAW PASS DITCH AT SQUAW PASS  
Water Year 2013

Location.-- Lat 37°36'0", long 107°13'4" referenced to North American Datum of 1983 (Cimarrona Peak, CO quad, scale 1:24,000), UTM Zone 13 304215 E and 4163748 N, in NE ¼ SE ¼ sec. 20, T.39 N., R.3 W., New Mexico Principal Meridian, Hinsdale County, CO, Hydrologic Unit 14080102, on right bank William's Creek-Squaw Pass ditch diverts water from William's Creek (tributary to Piedra River) in sec. 21, T.39 N., R.3 W., in San Juan River basin, to Squaw Creek in sec. 21, T.39 N., R.3 W., in Rio Grande basin.

Drainage Area and Period of Record.-- Drainage area not determined.; 1948 to present.

Equipment.-- Data collection platform (Satlink2) with satellite telemetry and float-operated SDR Shaft Encoder in a wood shelter with metal pipe stilling well. One intake pipe attaches well to 2 foot Parshall flume. The primary reference gage is the staff gage in flume.

Hydrologic Conditions.-- This is a trans-mountain diversion gage and all flow is regulated.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log and SDR log as backup. Record is complete and reliable from May 27, 2013, when diversion started, to Sep 29, 2013, when station was shut down for the season except for Jul 10-12, 17-19, and 21- 27, 2013; when the well was isolated all or part of each day. There were two instrument corrections. A -0.03 ft instrument correction was made on Jun 5, 2013 and an additional -0.01 ft correction was made Jun 6, 2013 when the stage was lower and the outside painting was reduced. The net -0.04 ft correction was applied straight back to May 27, 2013, when the station was opened. The -0.01 ft correction made on Jun 6, 2013 was ran straight back to Jun 5, 2013, when previous correction was made. Well isolates from flume at gage-height of 0.03 ft.

Datum Corrections.-- No datum corrections since levels have not been run on this flume. The flume is in fair condition and the depths recorded on the WY2012 measurement indicate that it is fairly level laterally.

Rating.-- Rating WCSGITCO03, which is not a standard Parshall Flume rating, was created and used all year. This rating is based on historic measurements taking into account the inherent excessive approach velocities and conditions. Minor shifting is caused by changes in approach conditions above flume and deposition. Two discharge measurements (no. 34, 35) were made this year, with discharges of (M34) 8.45 cfs and (M35) 3.65 cfs. The peak flow of 12.4 cfs occurred at 0100 on Sep 13, 2013 at a gage height of 1.15 ft with a shift of 0.00 ft. It exceeded high measurement no. 34 (GH = 0.89 ft), made Jun 5, 2013 by 0.26 ft in stage.

Discharge.-- One variable shift curve WCSGITVS13-1 was created and used the entire year. It was created to apply the rating directly above the point where the flume isolates and compute no flow below the point of isolation.

Special Computations.--

Remarks.-- Record is fair except for periods of missing and unreliable gage-height, and periods when flow is less than 0.5 cfs, which are poor. The peak should also be considered fair. Station maintained and record developed by Division 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09348000 WILLIAM'S CREEK-SQUAW PASS DITCH AT SQUAW PASS

RATING TABLE-- WCSGITCO03 USED FROM 01-JAN-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

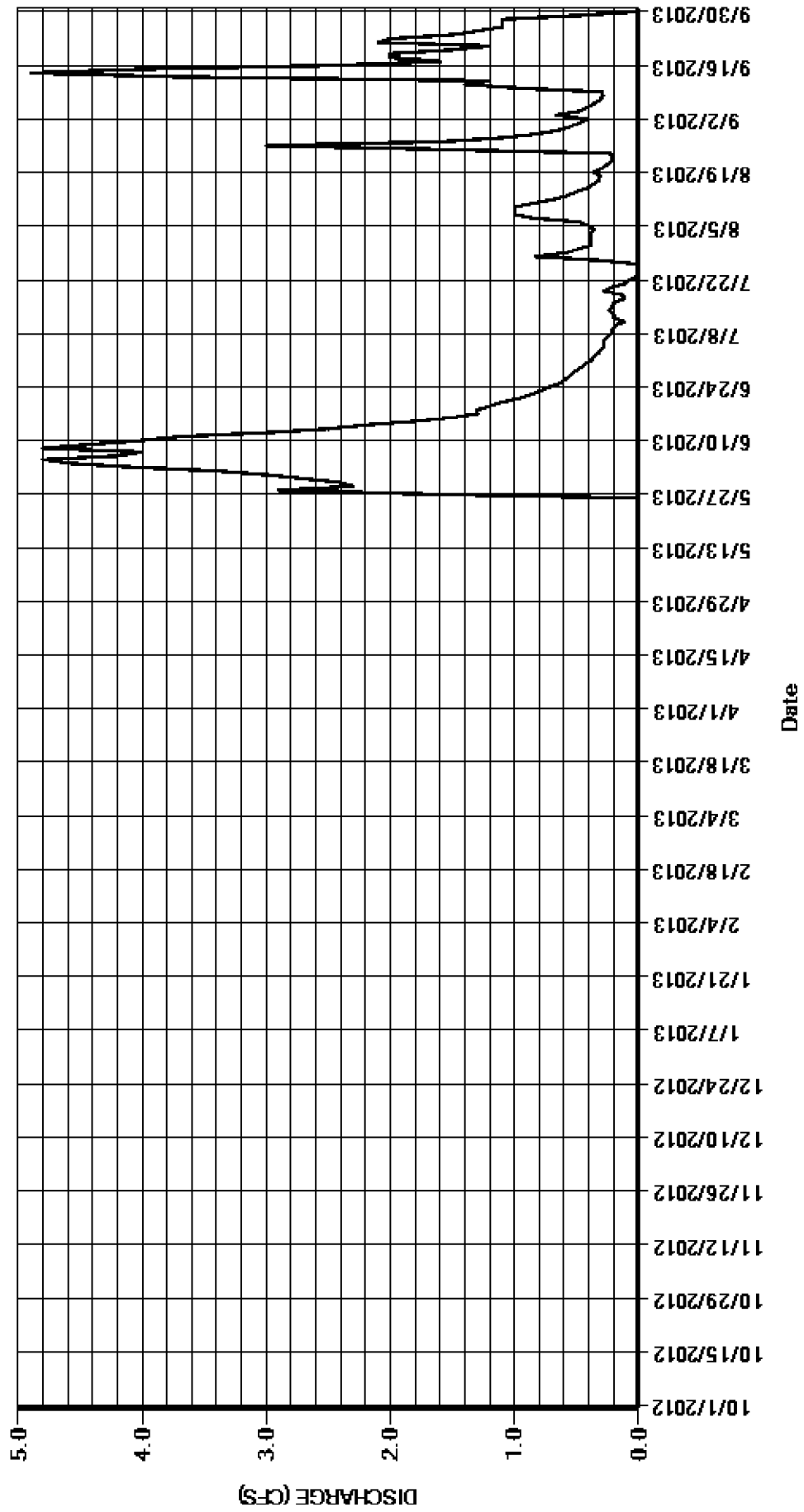
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0	0.38	0.39	0.47
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	0.36	0.38	0.41
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.1	0.32	0.39	0.67
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.6	0.29	0.36	0.48
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.8	0.28	0.40	0.41
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.2	0.28	0.47	0.36
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.0	0.25	0.85	0.31
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.8	0.22	1.0	0.29
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.4	0.21	1.0	0.30
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.0	e0.19	1.0	0.99
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.7	e0.12	0.85	1.4
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0	e0.20	0.68	1.2
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.5	0.20	0.57	3.7
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.2	0.24	0.50	4.9
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.21	0.41	4.0
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.5	0.20	0.36	2.4
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	e0.11	0.32	1.6
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	e0.13	0.31	2.0
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	e0.28	0.36	2.0
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.1	0.22	0.30	1.5
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.96	e0.11	0.26	1.2
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.87	e0.07	0.22	2.1
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.78	e0.00	0.21	2.0
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	e0.00	0.23	1.5
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63	e0.00	1.6	1.3
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.59	e0.00	3.0	1.1
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e1.7	0.55	e0.32	1.6	1.1
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9	0.52	0.83	1.1	1.1
29	0.00	0.00	0.00	0.00	---	0.00	0.00	2.3	0.47	0.58	0.82	e0.47
30	0.00	0.00	0.00	0.00	---	0.00	0.00	2.4	0.43	0.49	0.64	0.00
31	0.00	---	0.00	0.00	---	0.00	---	2.7	---	0.38	0.55	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	67.41	7.47	21.13	41.26
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.39	2.25	0.24	0.68	1.38
AC-FT	0	0	0	0	0	0	0	24	134	15	42	82
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9	4.8	0.83	3.0	4.9
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.00	0.21	0.00

CAL YR	2012	TOTAL	169.89	MEAN	0.46	MAX	6.7	MIN	0.00	AC-FT	337
WTR YR	2013	TOTAL	149.27	MEAN	0.41	MAX	4.9	MIN	0.00	AC-FT	296

MAX DISCH: 12.4 CFS AT 01:00 ON SEP 13, 2013 GH 1.15 FT SHIFT 0 FT  
 MAX GH: 1.15 FT AT 01:00 ON SEP 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09348000 WILLIAM'S CREEK-SQUAWPASS DITCH AT SQUAWPASS  
WY2013 HYDROGRAPH





RIO GRANDE RIVER BASIN  
09351000 PINE RIVER WEMINUCHE PASS DITCH AT WEMINUCHE PASS  
Water Year 2013

Location.-- Lat 37°40'43", long 107°19'4" referenced to North American Datum of 1983 (Weminuche Pass, CO quad, scale 1:24,000), UTM Zone 13 295602 E and 4172671 N, in NW ¼ SW ¼ sec. 33, T.40 N., R.4 W., New Mexico Principal Meridian, Hinsdale County, CO, Hydrologic Unit 14080101, on right bank Pine River-Weminuche Pass ditch diverts water from right bank of north fork of Los Pinos River in sec. 4, T.39 N., R.4 W., in San Juan River basin, to Weminuche Creek in sec. 33, T.40 N., R.4 W., in Rio Grande basin.

Drainage Area and Period of Record.-- Drainage area not determined. ; Water year 1948 to present.

Equipment.-- Data collection platform (Sutron Satlink2) and float-operated SDR in a wood shelter with stilling well. One intake pipe attaches well to 3 foot Parshall flume. Primary reference gage is staff gage in flume.

Hydrologic Conditions.-- This is a trans-mountain diversion and all flow is regulated.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP and SDR logs as backup. Record is complete and reliable May 22 through Jun 7, Aug 27 through Sep 1, and Sep 12-30, 2013. A -0.02 ft instrument correction was made to the SDR on May 30, 2013 and carried straight from station start-up on May 22, 2013. There was also a +0.11 ft correction made Aug 28, 2013 and ran straight back to when the gage started to flow water on Aug 27, 2013.

Datum Corrections.-- No datum corrections since levels have not been run on this flume. The flume is in good condition, but is susceptible to submergence due to sediment deposition in ditch below flume.

Rating.-- Rating PRWDITCO04, a standard 3 foot Parshall flume rating, was used all year. Changes in approach conditions above flume and deposition below flume cause shifting. One discharge measurement (No. 60) of 6.10 cfs was made this year. The peak flow of 11.1 cfs occurred at 04:30 on Sep 15, 2013 at a gage height of 0.96 feet with a shift of -0.01 feet. The peak flow exceeded high measurement No. 60 (GH = 0.66 ft) by 0.30 ft in stage.

Discharge.-- Shifting control method was used during entire period of record. The measured -0.01 ft shift was applied to this year's period of record. There was no flow Oct 1, 2012 through May 21, 2013, Jun 8, 2013 through Aug 26, 2013, and Sep 2, 2013 to Sep 11, 2013..

Special Computations.-- In order to calculate correct daily discharge values on days that record started and stopped, 15-minute gage-heights of 0 feet were added before and after actual start and stop times to the primary stage import file.

Remarks.-- Record is good, except for periods of going into and out of flow which should be considered fair. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- More measurements throughout the flow range would improve the accuracy of this record.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09351000 PINE RIVER WEMINUCHE PASS DITCH AT WEMINUCHE PASS

RATING TABLE-- PRWDITCO04 USED FROM 01-JAN-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

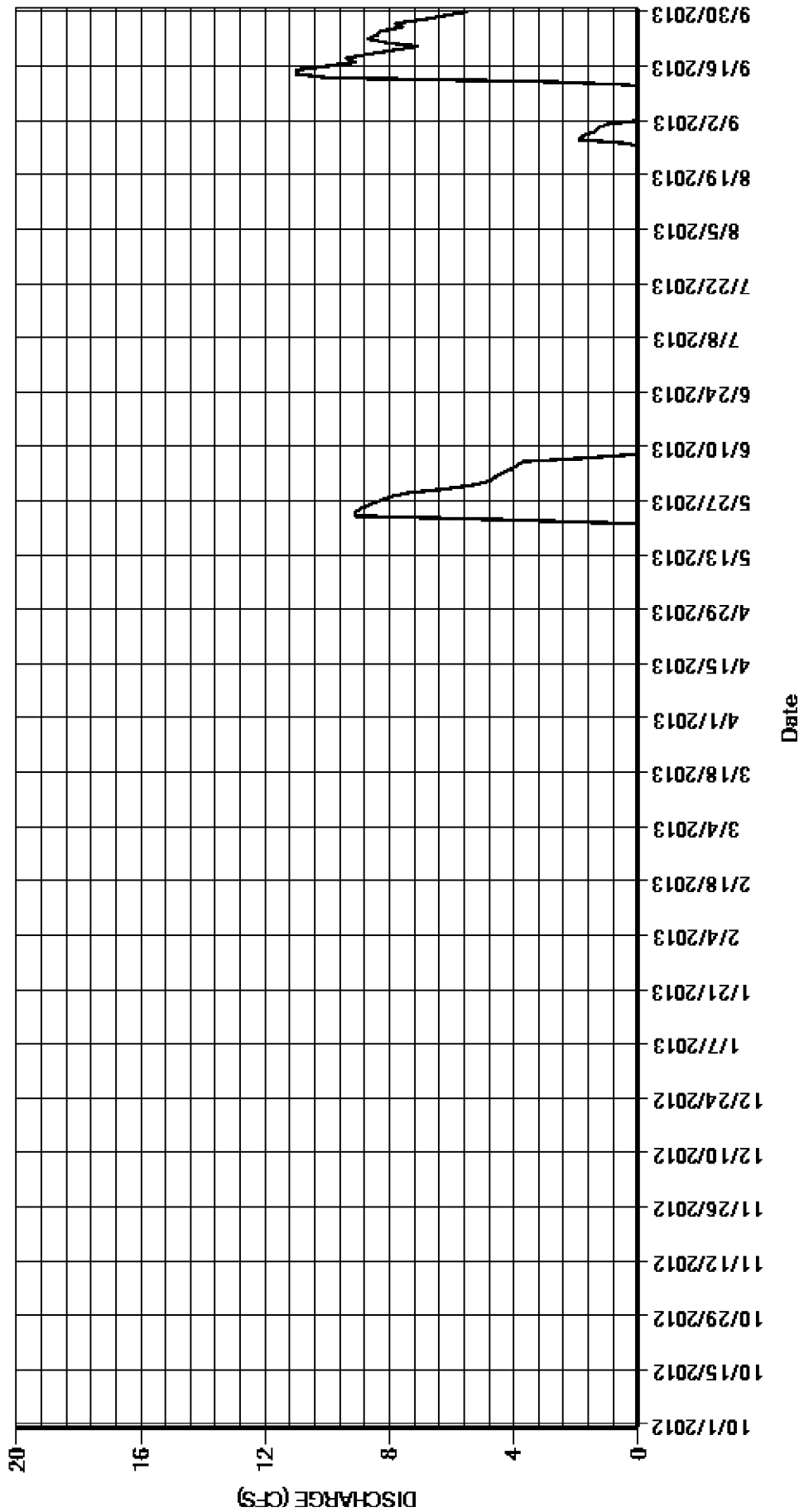
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.8	0.00	0.00	e1.0
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.6	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.4	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.1	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.9	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.7	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e1.7	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e2.9
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.1
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.4
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.7
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.9
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.1
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e4.2	0.00	0.00	0.00	8.1
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.1	0.00	0.00	0.00	8.7
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.1	0.00	0.00	0.00	8.4
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.9	0.00	0.00	0.00	8.3
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.6	0.00	0.00	0.00	7.6
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.3	0.00	0.00	e0.28	7.8
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.0	0.00	0.00	1.9	6.9
29	0.00	0.00	0.00	0.00	---	0.00	0.00	7.4	0.00	0.00	1.8	6.2
30	0.00	0.00	0.00	0.00	---	0.00	0.00	6.2	0.00	0.00	1.4	5.5
31	0.00	---	0.00	0.00	---	0.00	---	5.3	---	0.00	1.3	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	75.10	27.20	0.00	6.68	155.60
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.42	0.91	0.000	0.22	5.19
AC-FT	0	0	0	0	0	0	0	149	54	0	13	309
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.1	4.8	0.00	1.9	11
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CAL YR	2012	TOTAL	122.80	MEAN	0.34	MAX	10	MIN	0.00	AC-FT	244
WTR YR	2013	TOTAL	264.58	MEAN	0.72	MAX	11	MIN	0.00	AC-FT	525

MAX DISCH: 11.1 CFS AT 04:30 ON SEP 15, 2013 GH 0.96 FT SHIFT -0.01 FT  
 MAX GH: 0.96 FT AT 04:30 ON SEP 15, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09351000 PINE RIVER WEMINUCHE PASS DITCH AT WEMINUCHE PASS  
 WY2013 HYDROGRAPH



RIO GRANDE RIVER BASIN  
09351500 WEMINUCHE PASS DITCH AT WEMINUCHE PASS  
Water Year 2013

Location.-- Lat 37°40'45", long 107°19'18" referenced to North American Datum of 1983 (Weminuche Pass, CO quad, scale 1:24,000), UTM Zone 13 295260 E and 4172755 N, in NW ¼ SW ¼ sec. 33, T.40 N., R.4 W., New Mexico Principal Meridian, Hinsdale County, CO, Hydrologic Unit 14080101, on left bank Weminuche Pass ditch diverts water from left bank of Los Pinos River in sec. 5, T.39 N., R.4 W., in San Juan River basin, to Weminuche Creek in sec. 28, T.40 N., R.4 W., in Rio Grande basin.

Drainage Area and Period of Record.-- Drainage area not determined.; 1948 to present.

Equipment.-- Data collection platform and float-operated Sutron SDR in a CMP shelter and stilling well. One intake pipe attaches well to 5 foot Parshall flume. The only reference gage is a staff gage in Parshall flume. All equipment is owned and maintained by Colorado Division of Parks and Wildlife (CPW).

Hydrologic Conditions.-- This is a trans-mountain diversion and all flow is regulated.

Gage-Height Record.-- Primary record is 15-minute satellite transmitted data with DCP log and SDR log as backup. Record is complete and reliable from May 25 to Jun 7, Aug 27 to Sep 30. One missing unit value was estimated by linear interpolation on Sep 24 with no loss in accuracy. There were no corrections made to the SDR, but it read 0.02 ft too high on May 30; therefore a - 0.02 correction was prorated from previous visit on May 25 and then carried straight to Jun 7 when diversion was shut off. The stage-discharge relation was affected by backwater from beaver dam Sep 28-30.

Datum Corrections.-- No datum corrections. Levels have not been run at this flume.

Rating.-- Rating STD05FTPF, a standard 5 foot Parshall flume rating, was used all year. Changes in approach conditions above flume cause minor shifting. One discharge measurement, no. 55, was made this year at gage-height of 0.77 ft with a discharge of 12.7 cfs and a shift of -0.02 ft. Since 1997, nine measurements have been made and the shifts varied from - 0.03 to -0.01 feet. The peak flow of 36.9 cfs occurred at 0315 on Sep 13, 2013 at a gage height of 1.49 feet with a shift of - 0.02 feet. It exceeded measurement no. 55 (GH = 0.77 ft), made May 30, 2013, by 0.72 ft in stage.

Discharge.-- Shifting control method was used to compute the discharge record. The measured shift (-0.02 feet) was applied to all record. Discharge was estimated Sep 28-30 when the stage-discharge relation was affected by backwater from beaver dam. There was no flow from Oct 1 to May 24, Jun 8 to Aug 26, and Aug 31 to Sep 9.

Special Computations.-- In order for correct daily discharge values to be calculated on days that record started and stopped, 15-minute gage heights of 0 feet were added before and after the actual start and stop times to the primary stage import file. Discharge for period of backwater affected record was estimated using hydrographic comparison with Pine River Weminuche Pass Ditch at Weminuche Pass.

Remarks.-- Record is fair due to limited visits by DWR hydrographic staff. Station maintained by CPW and record developed by Div 3 hydrographic staff.

Recommendations.-- More discharge measurements would improve record quality.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09351500 WEMINUCHE PASS DITCH AT WEMINUCHE PASS

RATING TABLE-- STD05FTPF USED FROM 25-MAY-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

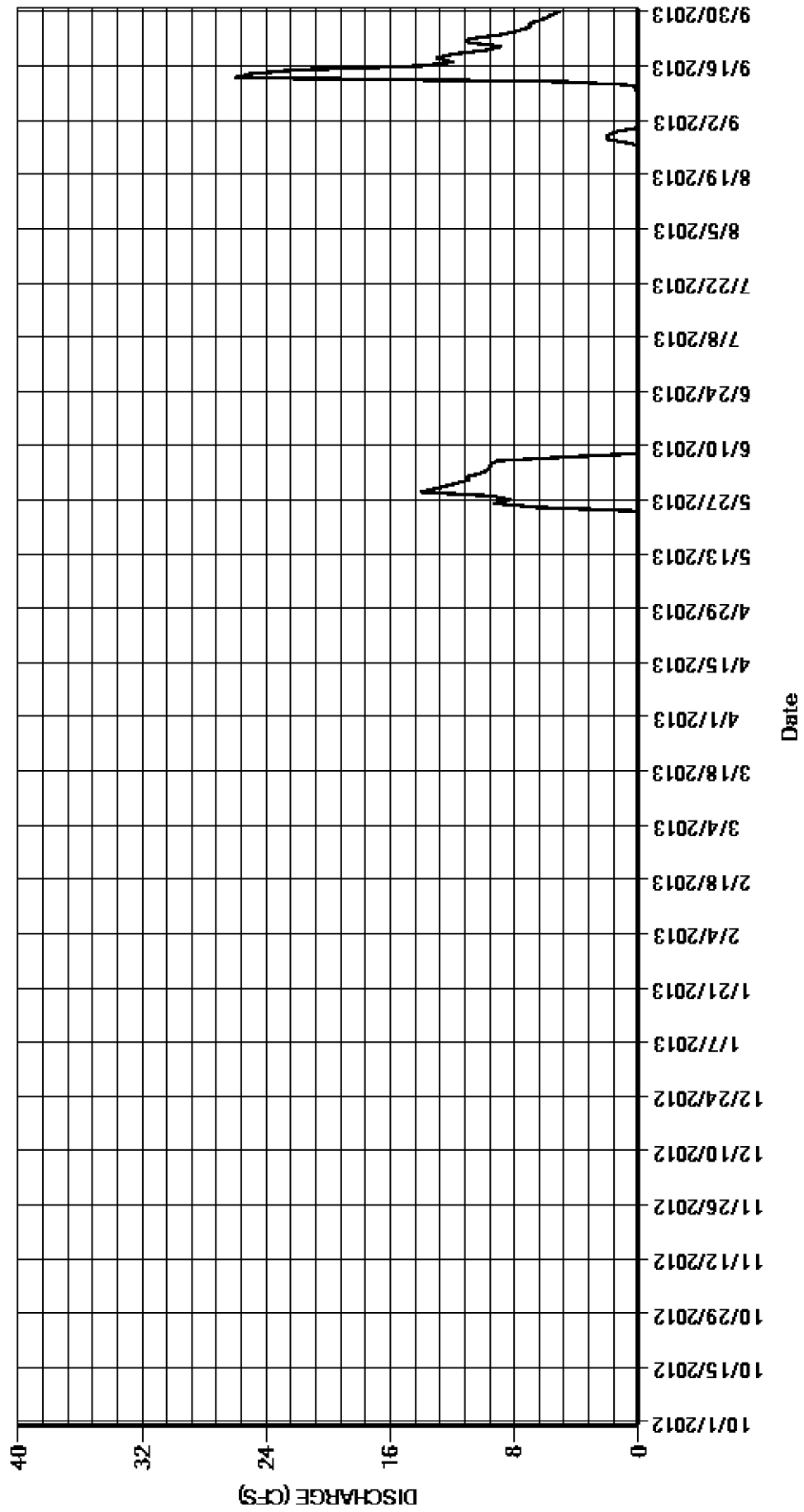
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.7	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.5	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.2	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.9	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.1
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.8
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.9
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.0
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.6	0.00	0.00	0.00	7.9
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.3	0.00	0.00	0.00	7.0
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.3	0.00	0.00	0.52	7.0
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.4	0.00	0.00	2.0	e6.2
29	0.00	0.00	0.00	0.00	---	0.00	0.00	14	0.00	0.00	2.0	e5.7
30	0.00	0.00	0.00	0.00	---	0.00	0.00	13	0.00	0.00	1.4	e5.1
31	0.00	---	0.00	0.00	---	0.00	---	12	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	72.60	65.30	0.00	5.92	218.23
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.34	2.18	0.000	0.19	7.27
AC-FT	0	0	0	0	0	0	0	144	130	0	12	433
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	11	0.00	2.0	26
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CAL YR	2012	TOTAL	110.20	MEAN	0.30	MAX	12	MIN	0.00	AC-FT	219
WTR YR	2013	TOTAL	362.05	MEAN	0.99	MAX	26	MIN	0.00	AC-FT	718

MAX DISCH: 36.9 CFS AT 03:15 ON SEP 13, 2013 GH 1.49 FT SHIFT -0.02 FT  
 MAX GH: 1.49 FT AT 03:15 ON SEP 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09351500 WEMINUCHE PASS DITCH AT WEMINUCHE PASS  
 WY2013 HYDROGRAPH



GUNNISON RIVER BASIN  
09131490 MUDDY CREEK ABOVE PAONIA RESERVOIR  
Water Year 2013

Location.-- Lat. 38°59'15", Long. 107°20'52.8", in the NE¼SW¼NW¼ sec 28, T.12 S., R.89 W. Sixth Principal Meridian, in Gunnison County, Hydrologic Unit 14020004, on the right bank 750 ft. downstream from county bridge and 1,400 ft. upstream from high water line of Paonia Reservoir. (296554 Easting, 4314310 Northing)

Drainage Area and Period of Record.-- 238 square miles. (USGS Stream Stats). ; Published by the Colorado Division of Water Resources, Office of the State Engineer since 1991.

Equipment.-- A Sutron Satlink 2 High Data Rate DCP along with a Sutron Stage Discharge Recorder (SDR) and a Sutron Constant Flow Bubbler (CFB). The SDR and CFB store data and are used for backup purposes. The primary reference gage is a steel drop tape. The station is also equipped with an air temperature sensor. There is a water temperature sensor since Sep 18, 2012.

Hydrologic Conditions.-- The basin is composed of conifer and aspen forest to open sagebrush hillsides. There is about 3,000 acres under irrigation diversion and return flows for mountain grass hay up stream. A very large land slide continues to encroach from the east about four miles upstream. This process is more active in the spring and during high ground water conditions.

Gage-Height Record.-- The primary record is the 15-minute satellite data with SDR download data as backup. The record is complete and reliable, except for periods when ice affected the stage-discharge relationship: Nov 12-14, 27-30; Dec 10-12, 2012; Feb 1-28; and Mar 1-6, 2013. There were four primary sensor calibration corrections and two flush corrections this year. The SDR was corrected -0.02 once on Feb 9, 2013. Then the record while using the CFB was corrected from the beginning of the series on Mar 1 to Mar 2 in the record because the correction was not made in the field. Then this correction of 0.06 was carried to an observed difference between the CFB and the SDR of -0.04 seen in the data. Then the -0.04 was carried to Apr 12, 2013 when a zero correction was observed. Field corrections were made on May 1, 2013 and Jun 4, 2013. They ranged from -0.05 to 0.02.  
The flush corrections were made on Jun 4 and Aug 5, 2013 and these ranged from 0.01 to 0.04 ft.  
The visit log listed a 0.10 SDR correction on Jan 21, 2013. This was not seen in the data and was not implemented in the record.  
The CFB was used during Mar, Apr and May because the trace was more responsive than the SDR. The inlets appeared to be sluggish and slow. This has resulted in fair confidence because the reference is tied to the stilling well and therefore tied the communication between the stream and the well. This is at and immediately after the inlets have been flush and can last for only a short period of time depending on the sediment load being carried at any given time.

Datum Corrections.-- Levels were not run this year. Levels were last run to the adjustable RP, located inside the gage shelter, on August 28, 2007, using the RP as the base.

Rating.-- The stream bed is composed of medium to large sized cobble. During spring runoff the channel is fairly stable at the gage. There is an encroaching shelf of cobble moving downstream from above. The left bank is flat at the gage and then pinches into a steep cliff about 50 feet downstream. The right bank is flat brush and mixed conifer. The channel will overtop the right bank at high water. When this happens, water has been up to a foot deep around the gage house. During low flows in the range of 10 to 20 cfs an irregular medium cobble riffle is a section control about 10 to 20 feet below the gage. During medium flows the channel is the control. During high flows the channel is the control with some influence by the brush on the right side and the constriction of the cliff on the left side. During extremely high flows, the brush on the right, the cliff on the left and a large boulder on the left have a greater influence on the stage-discharge relationship. Heavy sediments are deposited in the gage pool when the velocities drop. The slope of the channel doesn't allow the sediment to completely bury the cobble, but it does significantly smooth the stream bed. Rating MUDAPRC08B was used the entire water year. There were 13 measurements (Nos. 410 – 422) made this year, ranging in discharge from 13.1 to 318 cfs. They cover the range in stage experienced, except the lower daily flows of Oct 1-12, 2-31; Nov 1-9, 20-23; Dec 1-10, 19; Feb 2-5, 13-16, 20 and Jul 23 and 27, 2013; and the higher daily flows of Apr 29, 30; May 1, 12-20, 23 and 24, 2013. The instantaneous peak flow of 560 cfs occurred at 0000 on May 14, 2013 at a gage height of 6.94 ft. with a shift of +0.04 ft. and a gage height correction of +0.01 ft. It exceeded the stage of measurement No. 418 made May 1, 2013 by 0.47 ft.

Discharge.-- Shifting control method was used during the entire water year. Shifting is caused mainly by erosion and deposition of silt in gage pool above and on the control. Shifts were distributed by time with consideration given to changes in stage. Shifts were distributed by time from 0000 on Oct 1, 2012 to the end of the water year at 2345 hrs on Sep 30, 2013. All measurements were given full weight and applied directly except Nos. 413, 417, 421 and 422 which were discounted from -7.95% to 3.57% to smooth shift distribution. Measurements 411, 414 and 415 were not used because the stage-discharge relationship was affected by ice.

Special Computations.-- Discharge during ice-affected periods were estimated using partial day record, adjacent good days, and temperatures data collected at this site. The ice period of Muddy Creek above Paonia Reservoir was compared to the calculated inflow and whenever the raw value was greater than the calculated value, that period was evaluated. A spreadsheet was used to calculate the inflow into Paonia Reservoir and was compared to the flows recorded at the gage. The flows were calculated using the change in storage for Paonia Reservoir minus the outflow released from the reservoir. The outflow released from the reservoir was recorded by the Muddy Creek below Paonia Reservoir (MUDBPRCO). The gage height trace was used as a hydrograph in these comparisons and evaluation. Three ice measurements, 411, 414 and 415 were made during the ice affected period and the flow obtained was used in the estimation. Measurements 412 and 413 were made during the winter and are considered good because an ice bridge or free water surface over the control. This insulated the water from the colder air temperatures.

Remarks.--

The record is rated good, except for the periods when the stage-discharge relationship was affected by ice, which was estimated and should be considered poor and during the spring runoff when the inlets were prone to sluggish reaction to the stage. The Constant Flow Bubbler was used during the three months of March, April and May are fair because the CFB cannot be set to an independent outside reference. The peak instantaneous discharge falls during this time and therefore is fair. Gage maintained and operated by Gerald M. Thrush, Stephen W. Tuck, Paul A. Schmucker. The record was developed by Gerald M. Thrush.

Recommendations.--

A bank operated cableway would produce much higher quality high water measurements than the bridge site. An independent outside gage needs to be established to calibrate the outside bubble sensor.



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09131490 MUDDY CREEK ABOVE PAONIA RESERVOIR

RATING TABLE-- MUDAPRCO08B USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

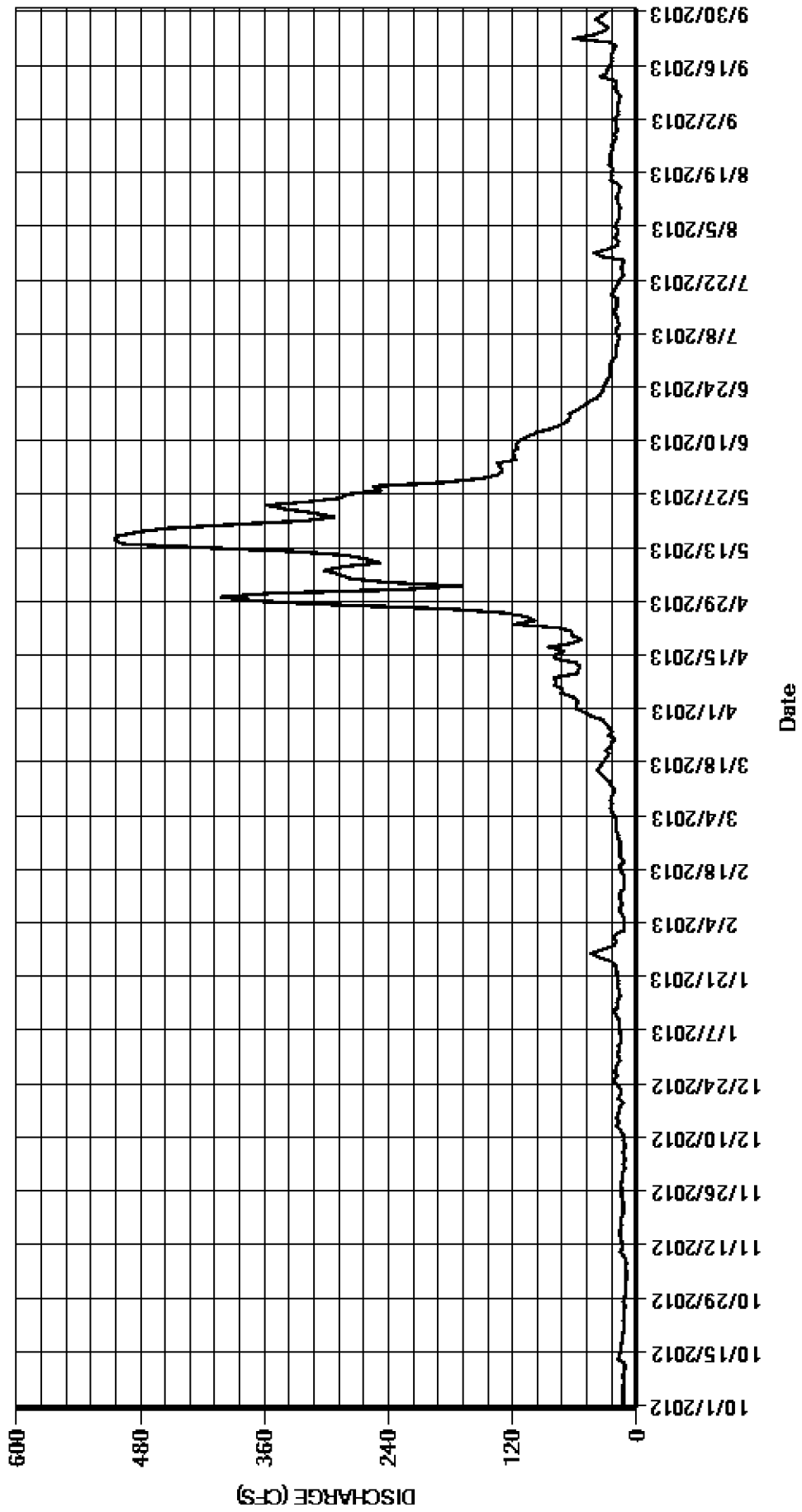
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	11	13	18	e20	e20	59	356	134	23	18	20
2	13	11	11	17	e12	e20	58	225	130	20	21	21
3	13	10	13	18	e12	e20	57	169	132	20	19	18
4	13	9.9	11	15	e12	e22	62	242	135	20	18	18
5	13	10	12	15	e12	e24	73	278	117	19	21	18
6	13	11	13	16	e14	e25	72	287	119	18	19	18
7	12	10	12	16	e16	24	79	302	120	17	17	17
8	13	11	11	17	e16	25	78	286	115	20	17	16
9	13	13	13	17	e14	24	80	249	117	20	17	19
10	12	16	e12	18	e16	22	58	262	113	17	16	21
11	11	14	e14	20	e16	21	57	282	105	18	18	20
12	12	e14	e16	22	e16	25	55	336	97	19	19	20
13	18	e15	20	18	e12	27	59	425	83	21	19	35
14	17	e16	17	19	e12	31	79	497	74	21	17	29
15	15	16	20	18	e12	35	79	505	67	19	16	28
16	15	16	18	16	e12	38	70	503	64	19	18	26
17	15	15	17	17	e14	35	85	485	65	19	25	24
18	14	15	16	18	e16	32	62	456	58	25	24	24
19	14	15	13	18	e16	30	54	391	52	22	24	24
20	13	13	18	18	e12	27	62	320	47	20	23	22
21	12	13	16	19	e16	30	63	293	39	18	27	20
22	12	13	15	19	e16	25	75	312	35	16	26	26
23	13	13	17	20	e16	25	118	340	33	13	26	61
24	12	14	20	21	e16	21	99	357	32	14	25	42
25	12	15	22	25	e16	27	107	317	30	15	23	31
26	12	14	19	e36	e18	24	129	287	28	14	24	28
27	11	e15	21	e44	e18	27	184	279	26	12	22	34
28	13	e15	20	e33	e20	30	287	248	25	34	20	40
29	12	e14	19	e22	---	33	367	255	26	41	22	33
30	11	e14	16	e20	---	45	402	188	26	28	19	29
31	11	---	18	e22	---	51	---	151	---	19	20	---
TOTAL	403	401.9	493	632	418	865	3169	9883	2244	621	640	782
MEAN	13.0	13.4	15.9	20.4	14.9	27.9	106	319	74.8	20.0	20.6	26.1
AC-FT	799	797	978	1250	829	1720	6290	19600	4450	1230	1270	1550
MAX	18	16	22	44	20	51	402	505	135	41	27	61
MIN	11	9.9	11	15	12	20	54	151	25	12	16	16

CAL YR	2012	TOTAL	18067.8	MEAN	49.4	MAX	321	MIN	8.4	AC-FT	35840
WTR YR	2013	TOTAL	20551.9	MEAN	56.3	MAX	505	MIN	9.9	AC-FT	40760

MAX DISCH: 560 CFS AT 00:00 ON MAY 14, 2013 GH 6.95 FT SHIFT 0.04 FT  
 MAX GH: 6.95 FT AT 00:00 ON MAY 14, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09131490 MUDDY CREEK ABOVE PAONIA RESERVOIR  
WY2013 HYDROGRAPH



GUNNISON RIVER BASIN  
09131500 MUDDY CREEK BELOW PAONIA RESERVOIR  
Water Year 2013

Location.-- Lat. 38°56'26", Long. 107°21'24" in the SE¼NW¼NE¼ sec. 8, T.13 S., R. 89 W. (in Gunnison County), Hydrologic Unit 14020004, on the right hand bank, about 100 feet above county bridge and about 1100 feet below Paonia Reservoir outlet.

Drainage Area and Period of Record.-- The drainage area is 257 square miles. ; Preliminary electronic data started on Sep 19, 1985 with data transmitted to Denver. Record published by Colorado Division of Water Resources Oct. 1, 1991 to present.

Equipment.-- Graphic water-stage recorder and Stage Discharge Recorder (SDR) on separate floats in a 42-inch CMP shelter and well. Sutron Satlink 2 DCP satellite telemetry equipment is housed in a NEMA box attached to the outside of the CMP shelter. The primary reference gage is a steel drop tape referenced to an adjustable reference point inside the gage house. The secondary reference gage is a bank-operated cantilever outside chain gage located just upstream of the station. The Satlink 2 DCP was replaced with a Satlink 2 – V2 DCP on Mar. 6, 2013. A direct line of sight radio has been installed to communicate between the gage and the gate house.

Hydrologic Conditions.-- The control is a concrete ramp flume. Flows are completely controlled by Paonia Reservoir until the reservoir spills.

Gage-Height Record.-- The primary record is the 15-minute satellite data from the SDR with the DCP log, chart record and SDR log used for backup purposes. The gage was visited on 19 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. There were five corrections made to the primary gage in water year 2013, -0.01' on Mar. 2, +0.12' on Mar. 7, -0.01' on Apr. 12, -0.01' on Aug. 29, and +0.01' on Sep. 19, 2013, no flush corrections were made. The +0.12' correction on Mar. 7 was due to gage height not set properly when Satlink was replaced previous day. Moss was cleared from the control on Jul. 1, 2013 resulting in a -0.01 GH correction which was prorated by time back to the previous gage visit. The record is complete and reliable.

Datum Corrections.-- No levels were run this water year. Levels were last run on August 28, 2007.

Rating.-- During higher flows approaching 800 cfs the banks neck down and the county road bridge piers act as a compound control. The rating table MUDBPRCO09A in use since Oct. 1, 2005, was used for all of water year 2013. Twelve discharge measurements were made during water year 2013 (Nos. 390 to No. 401). Measurements ranged from 4.37 cfs to 181 cfs. An observation of trickle flow (estimated as 0.10 cfs) was made on Nov. 14, 2012. For record purposes, this flow is negligible and zero flow is assumed. An observation of trickle flow and measurements covered the range in stage experienced in the water year except for higher average daily flows on: May 10 – 22, Aug. 18, 20 – 21, 23, 30 – 31, and Sep. 3 – 5, 2013. The peak discharge of 547 cfs occurred at 1230 on May 14, 2013 at gage height of 5.55 ft with a shift of +0.01 ft. It exceeded high measurement No. 400 made on Aug 29, 2013 by 0.98 ft in stage.

Discharge.-- Shifting section control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed with consideration to both time and stage. Shifts were distributed by time from 0000 on Oct 1, 2012 to 2330 on Mar. 27, 2013. Variable shift curve MUDBPRCOVS13a, based on measurement nos. 397 – 400 was instituted from 2345 on Mar. 27, 2013 to Sep. 6, 2013. Shifts were then distributed by time from Sep. 6, 2013 through the end of the water year. Open water measurements showed unadjusted shifts ranging from +0.01 to +0.04 ft. All measurements were given full weight and applied directly except measurements 390, 394, and 396 which were discounted from -7% and -1% to smooth shift distribution.

Special Computations.-- No special computations were necessary in water year 2013.

Remarks.-- The record is good. The peak instantaneous flow should be considered fair. Gage operated by Stephen Tuck, Paul A. Schmucker and Jerry Thrush. Record developed by Brian Leavesley.

Recommendations.-- Levels should be run in water year 2014.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09131500 MUDDY CREEK BELOW PAONIA RESERVOIR

RATING TABLE-- MUDBPRCO09A USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

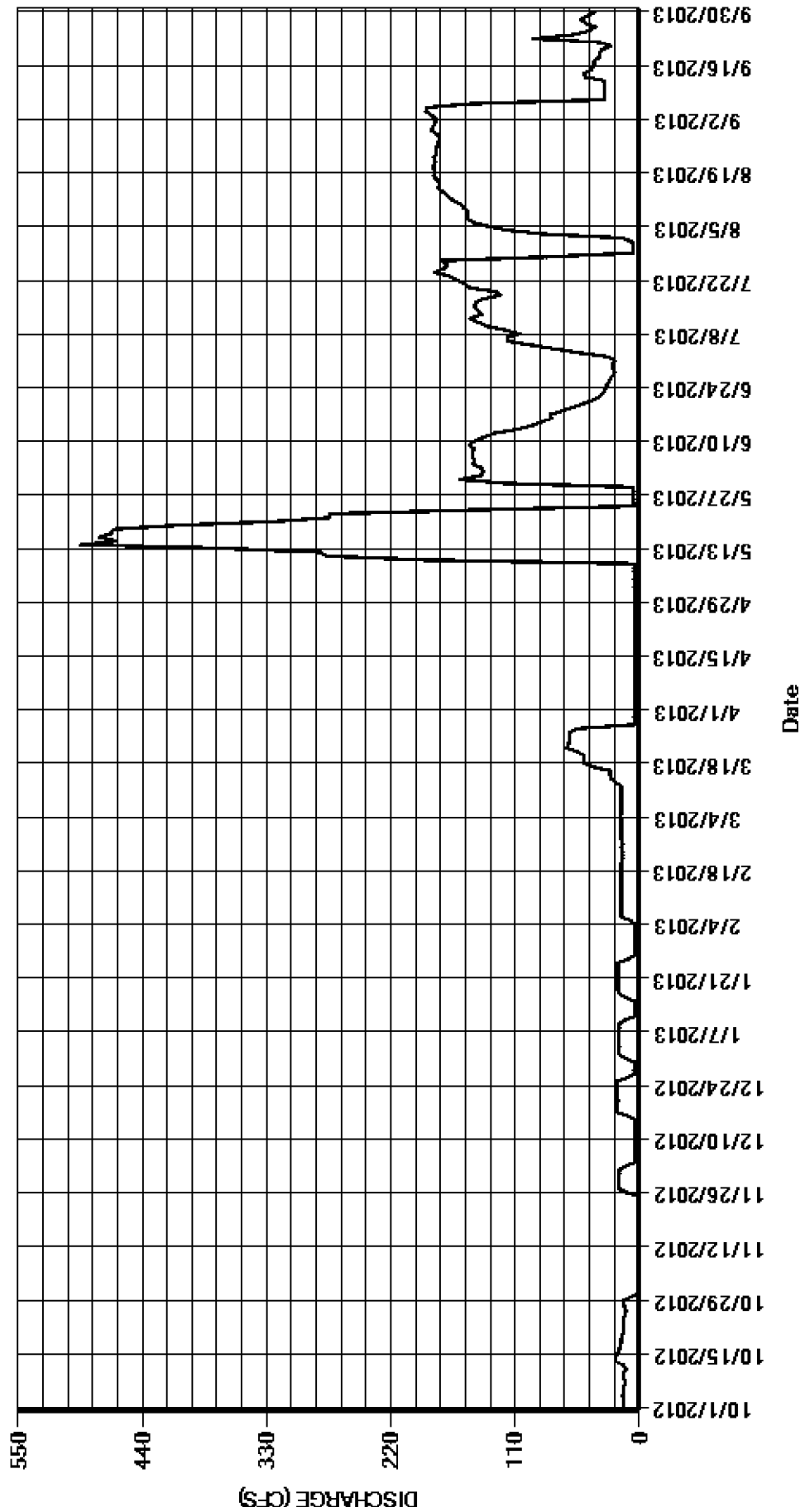
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	0.00	18	18	4.2	16	4.6	4.5	140	22	6.2	181
2	14	0.00	18	18	4.2	16	4.6	4.5	138	28	15	180
3	14	0.00	12	18	4.2	16	4.4	4.7	140	52	83	184
4	15	0.00	3.7	18	4.2	17	4.1	4.7	148	75	117	189
5	14	0.00	3.7	18	8.0	16	4.0	4.6	146	95	134	188
6	14	0.00	3.7	18	16	16	3.8	4.7	148	117	147	148
7	13	0.00	3.7	18	16	16	4.0	4.7	148	117	152	31
8	13	0.00	3.7	18	16	16	4.0	4.7	146	106	152	31
9	14	0.00	3.7	18	16	16	4.2	4.7	151	119	152	31
10	14	0.00	3.9	13	16	16	4.2	191	146	134	156	31
11	12	0.00	3.7	3.2	16	16	4.2	277	138	143	159	31
12	14	0.00	3.7	3.9	16	16	4.1	283	129	150	166	31
13	21	0.00	3.7	4.2	16	21	4.2	371	109	140	170	48
14	21	0.00	3.7	4.2	16	25	4.2	495	95	143	174	49
15	19	0.00	3.7	4.2	16	26	4.2	463	86	146	178	42
16	18	0.00	10	13	16	26	4.2	478	78	145	177	40
17	17	0.00	20	18	16	41	4.2	467	79	139	179	40
18	16	0.00	20	19	16	49	4.2	466	67	123	182	36
19	16	0.00	20	19	16	49	4.2	413	57	127	181	35
20	15	0.00	19	19	16	49	4.2	325	48	150	182	34
21	14	0.00	20	19	15	55	4.2	275	39	154	182	25
22	14	0.00	20	19	15	64	4.2	274	34	161	181	35
23	14	0.00	20	19	15	63	4.2	146	31	168	182	94
24	14	0.00	20	19	16	62	4.2	4.9	30	181	180	59
25	13	0.00	20	19	15	62	4.2	5.1	28	173	180	45
26	12	11	11	9.4	16	62	4.2	5.2	26	170	179	39
27	13	18	4.7	4.2	16	56	4.2	5.2	24	175	178	48
28	14	18	4.7	4.2	16	4.7	4.2	5.2	22	82	177	52
29	14	18	4.5	4.2	---	4.7	4.2	5.2	23	5.9	179	45
30	6.7	18	4.2	4.1	---	4.7	4.3	119	24	5.8	184	39
31	0.00	---	12	4.2	---	4.7	---	159	---	6.1	183	---
TOTAL	436.70	83.00	322.7	408.0	388.8	921.8	125.9	5274.6	2618	3552.8	4847.2	2061
MEAN	14.1	2.77	10.4	13.2	13.9	29.7	4.20	170	87.3	115	156	68.7
AC-FT	866	165	640	809	771	1830	250	10460	5190	7050	9610	4090
MAX	21	18	20	19	16	64	4.6	495	151	181	184	189
MIN	0.00	0.00	3.7	3.2	4.2	4.7	3.8	4.5	22	5.8	6.2	25

CAL YR	2012	TOTAL	18645.40	MEAN	50.9	MAX	297	MIN	0.00	AC-FT	36980
WTR YR	2013	TOTAL	21040.50	MEAN	57.6	MAX	495	MIN	0.00	AC-FT	41730

MAX DISCH: 547 CFS AT 12:30 ON MAY 14, 2013 GH 5.55 FT SHIFT 0.01 FT  
 MAX GH: 5.55 FT AT 12:30 ON MAY 14, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09131500 MUDDY CREEK BELOW PAONIA RESERVOIR  
WY2013 HYDROGRAPH



GUNNISON RIVER BASIN

ABC LATERAL

Water Year 2013

Location.--	Lat. 38°29'06", Long. 107°44'59", in NE¼NE¼ sec. 27, T.49 N., R.8 W., Montrose County, on left bank of canal 270 ft. below takeout from South Canal, such takeout being 1700 ft. below the west portal of the Gunnison Tunnel.
Drainage Area and Period of Record.--	N/A. ; Published by the Colorado Division of Water Resources, Office of the State Engineer from October of 1990 to the present.
Equipment.--	Sutron Satlink 2 HDR data collection platform with Stage Discharge Recorder (SDR) in a 36 in. diameter CMP shelter and a 24 in CMP stilling well. The SDR operates from a float and is set to an inside drop tape referenced to an adjustable RP on the instrument shelf. The control is a broad crested concrete structure about 12 feet below the gage. A wooden bridge at the gage is used to make flow measurements. The station is, also equipped with an air temperature sensor. No changes in this water year.
Hydrologic Conditions.--	The AB and C Drop aka the AB Lateral Canal combined with the South Canal account for the total diversion through the Gunnison Tunnel. Generally there is very little ice effect due to the warm properties of the water. At times snow will blow onto the control and this probably has some effect, but this is barely distinguishable on the GH trace and is generally ignored. The AB Lateral is a man made structure and 100% controlled. The control is a concrete broad crested weir. Two gates are set below the control. One gate dumps into Cedar Creek; the other controls the AB Lateral through a concrete flume. At times these gates can cause the control to become 100% submerged.
Gage-Height Record.--	The primary record is 15-minute satellite data with SDR log and DCP log as backup. The record is complete and reliable except when the stilling well froze during sub zero weather Jan 12-19, 2013. The gage was visited on 16 occasions to verify the instrument remained calibrated to the primary reference. The SDR was adjusted 1 time (Oct. 10, 2012). The correction was -0.02 ft.; the tape was off the wheel sprocket. Rocking the wheel placed the tape back in place and reading correctly. The full -0.02 correction was carried back to the previous change in stage when it was assumed that the event happened on Oct 09, 2012. This same day (Oct 10, 2012) a new (not mossy or stained) chunk of concrete was discovered near the inlet pipe. Removal changed stage -0.01. This has been ignored. Moss was removed from the control on three occasions. The corrections were distributed by time through the shift distribution function. The intake to the stilling well was plugged (slow inlet) Apr. 12-15, 2013. The gage height was manually adjusted on Apr 12, 2013. A flush correction function was distributed manually to correct the record Apr. 13-15, 2013. The rate was not linear so short intervals were calculated to achieve the final corrected value. Gage height record during the plugged intake period should be considered poor.
Datum Corrections.--	Levels were run on Aug. 2, 2013 to the drop tape reference point (RP_DT) using bench mark No. 1 (BM#1) as the base. The RP_DT was found to be reading 0.005 ft. high. The drop tape length (TL_DT) was found to be reading correct. No corrections were made as the RP_DT and TL_DT were found to be within the allowable tolerances. Bench mark no. 4 (BM4) was established on Aug. 2, 2013 at an elevation 8.872 ft. BM4 is a 3/8 inch concrete anchor bolt located on the downstream gate structure.
Rating.--	The canal is concrete lined above and below the control section. The left side is a smooth trapezoidal shape. The right side is a smooth trapezoidal shape with a vertical section and a square step at the bottom. The concrete has been repaired in places and this has broken off and rough in places. The control is a broad crested concrete structure about 12 ft. below the intake. Rating ABCLATCO02 in use since Nov. 1, 2008, was used for the entire Water Year. The rating is well defined to 230 cfs. Nine discharge measurements (Nos. 340-348) were made this year ranging in discharge from 2.95 cfs to 88.9 cfs. These measurements cover the range in stage experienced except higher daily flows seen on Apr 17, 18, 24, 2013 and the lower flows seen on Oct 16-21, 2012; Jan 26-31; Feb 1-3, 5-10; Mar 2-18, 21, 25-31; and Apr 1-11, 2013. The peak instantaneous flow of 136 cfs occurred at 1130 on Apr 16, 2013 with a gage height of 3.18 ft. and a shift of +0.06 ft. It exceeded the stage of Measurement No. 344, made Apr. 25, 2013 by 0.49 ft.
Discharge.--	Shifting control method was used during all periods of record. Shifts were distributed by time between events and measurements from 0000 on Oct. 1, 2012 to 1815 on Mar. 29, 2013. A variable stage-shift relationship: ABCLATCO13vs1 was applied from 1830 on Mar. 29, 2013 to 1600 on Apr 25, 2013. Then shifts were distributed by time as defined by measurements through the end of the Water Year at 2345 on Sep 30, 2013. Measurements showed shifts varying between -0.13 and +0.06 feet. All were given full weight and applied directly.
Special Computations.--	The ice estimated days used adjacent good values smoothed together. A hydrograph was used.
Remarks.--	The record is good, except when the stilling well was frozen from Jan 12-19, 2013 which is poor and for periods when the flow was reduced during the winter which should be rated fair. The period of low flow fair record is Oct 16-21, 2012 and Jan 20-Apr 11, 2013. Apr 12-15, 2013 is rated fair because of a slow inlet. The peak instantaneous flow should be considered good. Station maintained and record developed by Gerald M. Thrush.
Recommendations.--	

A flush riser needs to be installed.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

ABC LATERAL

RATING TABLE-- ABCLATCO02 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	55	11	11	11	2.9	4.0	0.84	73	74	79	78	85
2	55	10	11	9.6	2.9	1.9	0.92	73	74	79	78	85
3	55	7.9	11	8.0	2.9	0.34	0.91	73	74	79	78	85
4	55	7.4	11	6.3	3.0	0.37	0.84	73	73	79	78	86
5	55	7.4	10	6.0	2.9	0.41	2.1	73	74	79	77	87
6	55	7.6	10	6.1	2.9	0.88	2.7	73	73	79	76	87
7	55	7.8	10	5.5	2.9	1.0	2.7	73	73	79	75	87
8	55	8.0	10	6.1	2.9	2.2	2.7	74	73	78	75	87
9	53	7.4	10	5.2	2.9	2.5	2.7	74	73	79	75	87
10	53	6.5	11	5.0	2.9	2.3	2.6	73	70	79	75	64
11	52	6.7	11	4.7	3.1	2.5	2.5	73	70	79	76	48
12	52	7.3	11	e4.7	3.5	2.7	e29	73	76	79	76	48
13	52	8.1	11	e4.7	3.5	2.9	e65	73	77	79	76	48
14	52	11	11	e3.9	3.7	2.0	e65	74	77	79	76	48
15	31	13	11	e3.9	3.7	0.28	e64	74	77	79	77	48
16	1.3	14	11	e3.8	3.7	0.39	84	74	77	79	77	48
17	2.1	13	11	e3.8	4.1	0.63	100	74	77	78	78	48
18	2.7	12	11	e3.0	3.7	2.9	100	74	77	78	78	48
19	2.7	10	11	e3.0	3.3	4.5	69	74	77	81	79	49
20	2.6	12	11	3.0	3.5	4.0	70	74	78	79	79	50
21	2.6	15	11	3.1	3.8	2.9	81	74	78	79	79	50
22	7.9	13	11	3.1	3.9	3.9	85	74	78	79	83	49
23	12	13	11	3.1	4.0	4.3	87	74	78	78	85	50
24	10	13	9.6	3.5	3.7	4.4	89	74	78	80	85	49
25	8.2	13	9.0	3.1	3.9	2.2	88	74	77	80	86	49
26	8.2	13	9.6	2.9	3.9	0.62	78	75	79	80	86	49
27	8.4	13	9.7	2.7	4.0	1.2	69	76	79	80	86	49
28	8.6	13	11	2.7	4.2	1.2	69	75	79	80	86	49
29	8.6	13	13	2.9	---	1.3	71	79	79	80	86	49
30	8.7	12	11	2.7	---	1.1	73	78	79	79	86	49
31	10	---	12	2.8	---	1.0	---	74	---	78	86	---
TOTAL	889.6	319.1	332.9	139.9	96.3	62.82	1457.51	2296	2278	2452	2471	1815
MEAN	28.7	10.6	10.7	4.51	3.44	2.03	48.6	74.1	75.9	79.1	79.7	60.5
AC-FT	1760	633	660	277	191	125	2890	4550	4520	4860	4900	3600
MAX	55	15	13	11	4.2	4.5	100	79	79	81	86	87
MIN	1.3	6.5	9.0	2.7	2.9	0.28	0.84	73	70	78	75	48

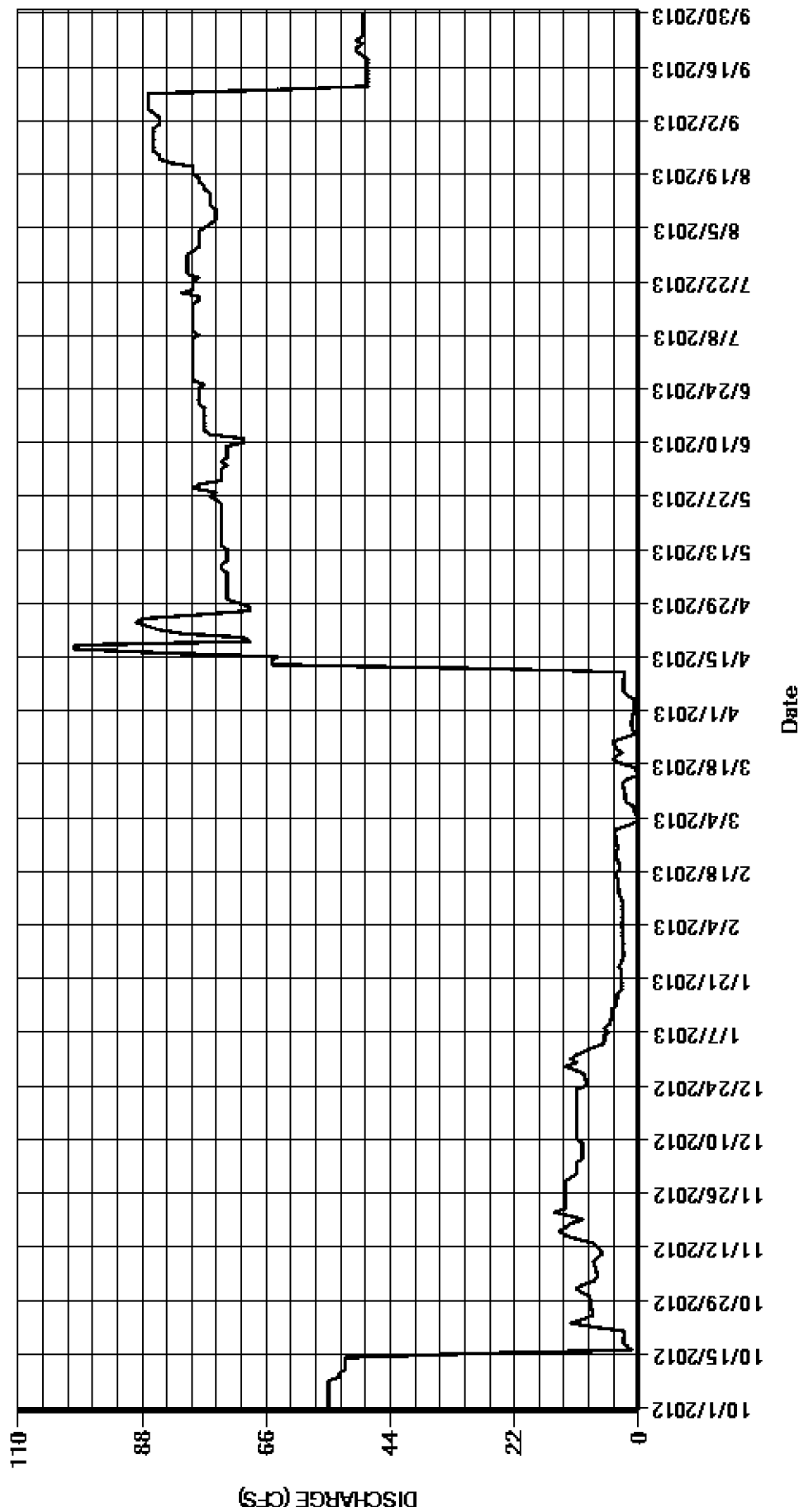
CAL YR	2012	TOTAL	15416.42	MEAN	42.1	MAX	98	MIN	0.00	AC-FT	30580
WTR YR	2013	TOTAL	14610.13	MEAN	40.0	MAX	100	MIN	0.28	AC-FT	28980

MAX DISCH: 136 CFS AT 11:30 ON APR 16, 2013 GH 3.18 FT SHIFT 0.06 FT  
 MAX GH: 3.20 FT AT 19:00 ON JUL 19, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



ABC LATERAL  
WY2013 HYDROGRAPH



GUNNISON RIVER BASIN  
SOUTH CANAL NEAR MONTROSE  
Water Year 2013

Location.-- Lat. 38°28' 58.3", Long. 107°45' 24.3", in SW¼NE¼ sec 27, T.49 N., R.8 W., Montrose County, on right bank of canal approximately 3600 ft. below the west portal of the Gunnison Tunnel.

Drainage Area and Period of Record.-- N/A; Published by the Colorado Division of Water Resources, Office of the State Engineer from October of 1990 to the present.

Equipment.-- Sutron Stage Discharge Recorder (SDR) connected to a Sutron Satlink 2 DCP in a 42-inch diameter CMP shelter and well. The primary reference is a steel drop tape referenced to an adjustable brass nut mounted on the wood instrument shelf. The SDR operates from a float. A Sutron Constant Flow Bubbler was installed and became operational on Nov 7, 2012. No other changes this water year.

Hydrologic Conditions.-- A manmade structure which is a 100% controlled diversion. Winter and spring the natural gravel bar and two step concrete drop structure act as the main control for the gage. As late spring proceeds into summer and fall the willow / salt cedar along the banks and moss growth within the channel drown out the control. Large negative shifts occur as a result of the aquatic and terrestrial growth.

A change in the operation of the South Canal occurred in the Winter of 2012 / 2013; the Gunnison Tunnel remained open to fill Fairview Reservoir. This is normally done by several larger tunnel runs throughout the winter months. The constant lower flow was done to accommodate the construction of two hydro electric plants.

Gage-Height Record.-- The primary record is the 15-minute satellite data with SDR and DCP log data as backup for October 1-14, 2012. Then from Nov 7, 2012 through the end of Water Year 2013 on Sep 30, 2013 the 15-minute satellite data for the Constant Flow bubbler was used. The intervening period was estimated because the stilling well was isolated and the CFB hadn't been actuated. The record is complete and reliable, except the estimated period from Oct 15-Nov 7, 2012. The gage was visited on 24 occasions to verify the instrument / instruments remained calibrated to the primary reference, perform cross section maintenance and check on conditions. The SDR was not adjusted during the time that it was used for record purposes. The CFB was adjusted 10 times from -0.03 to 0.03 ft. during the time that it was used for record purposes.

Datum Corrections.-- Levels were run on Nov 7, 2012 this water year, using BM No.1 as a base. Oct 1, 2012 through Nov 6, 2012. No corrections were necessary as a result of this levels run. The datum was corrected -1.000 ft on Nov. 7, 2012 to prevent negative gage height values with the installation of the new CFB. Primary BM No. 1 elevation was changed from 9.962 ft to 10.962 ft (gage datum). The new datum is 1.000 ft lower than the old one. It has been used since Nov 7, 2012 and uses the new CFB data which is now non negative at the low flows encountered.

Rating.-- Control is a transition above a two step concrete drop structure. The low water control is natural gravel bar about 100 feet below the gage. Intermediate and high water control consists of a concrete transition structure located approximately 4,000 feet below the gage. Rating No. 18 was used from Oct. 1, 2012 through Oct. 31, 2012. Rating No. 20 was used from Nov 1, 2012 through the end of water year 2013. It was developed from measurements 427 – 429 before moss growth on the control affected the gage height. Eighteen discharge measurements (Nos. 428 - 445) were made during the water year ranging in discharge from 4.35 to 1020 cfs. An observation of zero flow was made on Mar 29, 2013. Measurements and an observation of zero flow cover the range in stage experienced. The peak flow of 1050 cfs occurred at 1245 on Jun 10, 2013 at a gage height of 4.46 ft with a shift of -0.02 ft. It exceed the maximum flow of measurement No. 437, made May 20, 2013 by 30 cfs. The highest recorded stage (5.20 ft. at 1315 on Sep 10, 2013) exceeded the highest measured stage of 4.69 (Measurement No. 422, made on Sep 11, 2013) by 0.51 ft. in stage.

Discharge.-- Shifting control method was used during all periods of record. Shifts were distributed by time from 0000 Oct 1, 2012 to 1445 Feb 8, 2013 (using Ratings 18 and 20), and from 1545 May 20, 2013 to the end of Water Year 2013 at 2345 on Sep 30, 2013 using Rating 20. Then a variable stage-shift relationships associated with Rating 20 SOUCANCO13vs4 (applied from 1500 Feb 8, 2013 to 1530 May 20, 2013). It used shift values from measurements 431-437. Measurements show unadjusted shifts varying from -0.94 ft to +0.11 ft. All were given full weight and applied directly except for measurement numbers 428, 434, 435, 437, 442, 443 and 444 which were discounted from -6.32% to 2.31% to smooth shift distribution.

Special Computations.-- The period of no gage height record when the canal shut down isolating the stilling well on Oct 15, 2012 to when the CFB became operational on Nov 7, 2012 was estimated using flow values from the Fairview off the South Canal gage.

Remarks.-- The record is good, except the period when the stilling well was isolated from Oct 15, 2012 to Nov 7, 2012 which is poor and the months of Dec of 2012 and Jan of 2013 which are fair. The peak instantaneous peak flow is rated good. Station maintained and record developed by Gerald M. Thrush.

Recommendations.--

The large gage pool makes the moss growth compound the negative shifts which are seen. The condition of a very large gage pool and a virtual channel control even without the aquatic growth makes the gage height much less sensitive to changes in the flow regimen. The flow meter installed in the penstock should be used for more sensitive readings. The gage at the AB Lateral would still have to be operated.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

SOUTH CANAL NEAR MONTROSE

RATING TABLE-- SOUCANCO18 USED FROM 01-OCT-2012 TO 31-OCT-2012  
 SOUCANCO20 USED FROM 01-NOV-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

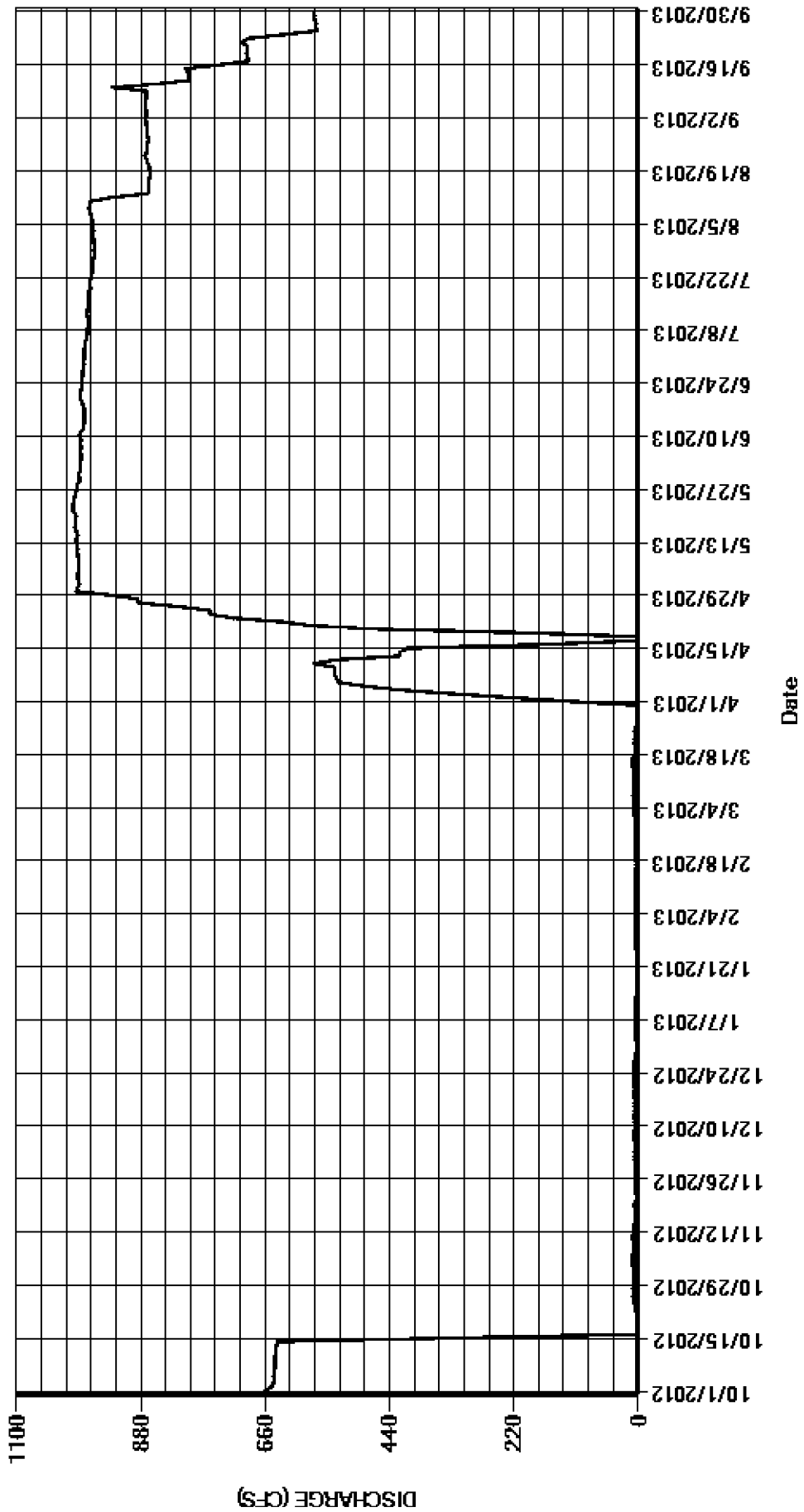
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	662	e7.7	6.5	3.6	4.5	5.0	119	993	987	980	964	871
2	649	e8.2	6.5	4.4	4.4	7.0	224	989	988	981	966	871
3	646	e10	6.5	5.2	4.1	8.4	329	991	988	980	964	870
4	644	e10	6.4	5.6	4.1	8.5	422	992	986	979	965	871
5	645	e9.9	6.5	4.8	4.1	8.5	484	991	986	978	966	872
6	644	e9.6	6.7	4.3	4.0	8.4	531	991	987	976	966	872
7	643	e9.0	7.0	4.4	4.0	9.2	534	990	986	975	968	871
8	643	8.5	6.9	4.6	4.0	8.0	538	991	987	975	970	870
9	643	9.1	6.8	4.9	4.1	7.7	538	991	986	974	972	871
10	643	9.9	6.3	5.0	4.2	8.0	537	992	989	973	971	930
11	642	9.7	6.5	5.2	4.1	8.0	574	992	987	973	969	846
12	641	9.1	6.7	5.0	3.9	8.0	536	993	982	976	931	794
13	640	9.1	6.8	4.1	3.9	8.0	423	995	981	975	868	796
14	639	7.0	6.5	3.5	3.9	9.0	422	994	980	974	866	797
15	e336	4.4	6.5	3.2	4.0	10	408	992	980	974	866	801
16	e0.00	3.8	6.5	2.7	4.0	9.7	163	995	980	974	866	739
17	e0.00	4.8	6.6	2.5	3.8	9.7	1.6	997	980	973	865	689
18	e0.00	5.6	7.1	2.5	4.1	6.3	1.6	996	982	973	864	692
19	e0.00	7.6	7.0	2.5	4.3	5.3	188	996	985	968	865	693
20	e0.00	5.2	6.4	2.6	4.2	6.3	453	995	987	971	865	693
21	e0.00	1.9	7.2	2.7	4.3	6.8	578	1000	988	970	868	693
22	e4.0	4.0	6.9	2.6	4.5	6.6	629	1000	986	968	870	704
23	e6.0	4.0	6.9	2.8	4.3	6.6	716	1000	984	967	873	689
24	e7.0	4.0	8.3	3.0	4.3	6.7	758	999	984	965	870	627
25	e9.4	4.3	8.2	3.6	4.3	4.9	758	997	985	966	869	568
26	e9.5	4.3	7.2	4.3	4.3	1.4	814	996	983	965	869	571
27	e9.4	4.3	7.1	4.9	4.3	0.13	885	993	983	963	867	570
28	e9.2	4.2	5.3	4.5	4.2	0.00	886	993	982	962	868	573
29	e8.9	4.3	4.3	4.8	---	0.00	934	989	981	964	870	573
30	e8.9	5.0	3.5	4.3	---	0.00	994	989	981	962	870	574
31	e8.4	---	3.4	4.4	---	0.00	---	990	---	963	870	---
TOTAL	9440.70	198.5	201.0	122.5	116.2	192.13	15378.2	30802	29531	30117	28061	22451
MEAN	305	6.62	6.48	3.95	4.15	6.20	513	994	984	972	905	748
AC-FT	18730	394	399	243	230	381	30500	61100	58570	59740	55660	44530
MAX	662	10	8.3	5.6	4.5	10	994	1000	989	981	972	930
MIN	0.00	1.9	3.4	2.5	3.8	0.00	1.6	989	980	962	864	568

CAL YR	2012	TOTAL	166098.20	MEAN	454	MAX	1030	MIN	0.00	AC-FT	329500
WTR YR	2013	TOTAL	166611.23	MEAN	456	MAX	1000	MIN	0.00	AC-FT	330500

MAX DISCH: 1050 CFS AT 12:45 ON JUN 10, 2013 GH 4.46 FT SHIFT -0.02 FT  
 MAX GH: 5.20 FT AT 13:15 ON SEP 10, 2013 (Moss on the control)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH CANAL NEAR MONTROSE  
 WY2013 HYDROGRAPH



GUNNISON RIVER BASIN  
UNCOMPAHGRE RIVER UPSTREAM OF SOUTH CANAL  
Water Year 2013

Location.-- Lat 38°21'29", Long 107° 47'32.5", in the SE¼NW¼ of section 6, T.47 N., R.8 W, NMPM, Montrose County, Hydrologic Unit 14020006, on the left bank 1.98 mi. down-stream from the Uncompahgre River at Colona (a USGS stream gage) and about 5,000 feet up-stream of where the South Canal releases into the Uncompahgre River. It is 1.2 mi. down-stream of the confluence with Beaton Creek, on private land, southeast of the end of Vernal Road.

Drainage Area and Period of Record.-- Approximately 479 square miles of drainage (USGS Streamstats); Provisional electronic data began transmitting on May 18th, 2010. Published from October 1, 2010 to the present.

Equipment.-- Sutron SatLink 2 DCP with a Sutron Accubar Constant Flow Bubble Gage (CFB) in a 48" corrugated metal pipe bolted to a 6" thick concrete pad. The primary reference is an outside horizontal cantilever chain gage installed on May 30, 2012. The control is a large boulder drop structure approximately 30 feet down-stream of the gage. The orifice to the CFB was extended on Dec. 17, 2012 so that the top of the brass nut is at a gage height of approximately 1.88.

Hydrologic Conditions.-- The Uncompahgre River begins in high mountain terrain near Hurricane Peak at an elevation of 13,447 feet and drops to 6,220 feet at the gage. The gage is located approximately 8.5 miles downstream of Ridgway Reservoir. Warm water released from reservoir normally minimizes ice at the gage. However, during Water Year 2013, due to low snow pack predictions and low storage in Ridgway Reservoir, flows from the reservoir were reduced to 30 cfs throughout the winter. These lower flows, along with an unusually cold winter caused 27 ice days in Water Year 2013. The amount of flow at this gage is mainly comprised of water released from Ridgway Reservoir; however, there are several small tributaries and diversion structures between the reservoir and the gage.

Gage-Height Record.-- Primary record is 15-minute satellite CFB data with DCP log data used for backup purposes. The record is complete and reliable except for the period Dec. 10, 11, 2012 when the orifice line was exposed or nearly exposed to the atmosphere. The orifice was subsequently extended into deeper water on December 17, 2012. Gage heights were adjusted due to painting caused by silt over the orifice on the following days: May 16-21, 24-25, 28-30, and June 4-8, 2013. These days were also given the "a" day designation. The CFB was set to auto-purge daily on June 7 which seemed to rectify the silt problem. Five instrument corrections were made to the CFB during water year 2013 and were distributed by time back to the date when the sensor matched the primary reference gage. These occurred as follows: -0.01 ft on Oct. 4, 2012; -0.01 ft on Oct. 25, 2012; +0.01 on May 23, 2013; -0.08 on June 7, 2013; +0.07 on June 24, 2013. Two purge corrections were also made on the following dates: -0.13 on June 7, 2013; -0.05 on October 9, 2013 which affected the gage height record back to Sept. 13, 2013. There were 27 ice days in Water Year 2013 due to lower-than-average releases from Ridgway Reservoir. These "b" days occurred on the following dates: December 20-23, 29-31, 2012; January 1-10, 14-23, 2013. The record is complete and reliable except for the "a" days and "b" days described above.

Datum Corrections.-- Levels were run in water year 2013 on August 2, 2013. BM1 was used as the base. There were no datum corrections necessary.

Rating.-- The control is a large boulder drop structure approximately 30 feet downstream of the gage. Rating No. 01 in use since Oct. 1, 2010 was used through the first measurement in water year 2013 (meas. 27 on 10/4/13). Rating No. 02 was developed on 12/17/13 and was used to calculate flow during the remainder of water year 2013. Rating 02 is well defined from 0 to 340 cfs. From 340 cfs to 2140 cfs the rating is based on measurements by the USGS at the UNCCOLCO gage. These measurements were lagged by time and adjusted for known diversions between the two gages. Fifteen measurements were made this water year (Nos. 027 - 041) ranging in discharge from 28 cfs to 238 cfs. They cover the range in stage experienced except for the lower daily flows on February 13, 28, 2013 and the higher daily flows on April 17, 18, May 17, 18, 25-27, June 12, 13, August 23-31 and September 1-30, 2013. The peak instantaneous flow of 575 cfs occurred at 0730 on September 13, 2013 at a gage height of 4.76 ft. with a shift of 0.02 ft. It exceeded the stage of Measurement No. 41, made August 26, 2013 by 0.91 feet in stage.

Discharge.-- Shifting control method was used during all periods of record. Shifts were distributed by stage and by time. Shifts were distributed by stage (UNCUPSCOVS12A) from 0000 on October 1, 2012 to 1230 on October 4, 2012. Shifts were distributed by time from 1245 on Oct. 4, 2012 to the end of the water year. Measurements show unadjusted shifts --ranging from -0.44 to +0.11 ft. All were given full weight and applied directly except for measurements no. 28, 34, 35 and 36 which were discounted from -2.53% to +8.39% to smooth shift distribution.

Special Computations.-- There is no bridge or cableway to make high flow measurements at this gage. Measurements above 400 cfs are not safe to wade. High flows are estimated using the USGS stream gage Uncompahgre at Colona located approximately 2 miles upstream. Measurements of PZF ranged from 0.30 to 0.10, with the majority at 0.10. As 0.10 was used for the Wy2012 record and no changes were observed to the control during Wy2013, a PZF of 0.10 is still being used. Discharge for the 27 days when ice affected the stage (see "Discharge" section of Analysis) was estimated on the basis of partial days of good record, good gage data before and after ice affected data and air temperature data from the ABCLATCO gage. Discharge for the two "a" days in December (see "Discharge" section of Analysis) was estimated using good data before and after. There were 11 "a" days in May and 5 in June (see "Discharge" section of Analysis) due to silt over the orifice. Discharge was estimated by manually smoothing the gage height and further adjustment by mass balance using the UNCCOLCO gage on those days.

Remarks.-- The record is complete, reliable and good except for the days when the orifice line was exposed, the CFB was painting and the days when ice affected the stage discharge relationship which were estimated and should be considered poor. The periods when the average daily flows exceeded 310 cfs should be considered fair. The instantaneous peak flow is rated fair as it is well over 310 cfs. Gage operated and maintained by Luke Reschke and Jerry Thrush. Record developed by Luke Reschke.

Recommendations.--

Some more high water measurements (up to 400 cfs) at UNCUPSCO and some high water measurements at UNCCOLCO (anything about 1070 cfs would be helpful) are needed to further define and confirm the upper end of the rating.

STATE OF COLORADO  
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UNCOMPAHGRE RIVER UPSTREAM OF SOUTH CANAL

RATING TABLE-- UNCUPSCO01 USED FROM 01-OCT-2012 TO 04-OCT-2012  
 UNCUPSCO02 USED FROM 04-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	40	51	40	e30	28	28	55	120	104	188	147	247
2	40	45	40	e30	28	28	59	75	154	187	188	237
3	39	44	37	e30	28	29	47	78	145	184	150	234
4	39	43	31	e30	28	30	45	100	e144	179	149	235
5	39	44	31	e30	28	29	59	91	e171	179	140	257
6	39	44	31	e30	28	31	48	74	e207	177	136	257
7	38	42	31	e30	29	33	54	68	e192	173	157	263
8	38	42	31	e30	28	33	48	62	e208	170	191	256
9	38	42	31	e30	29	31	45	53	214	168	178	260
10	37	43	e30	e30	28	30	37	50	194	168	171	286
11	38	40	e29	e30	28	30	36	47	228	171	194	284
12	41	37	30	e30	28	30	33	55	271	185	170	283
13	41	39	31	e30	27	32	32	93	255	181	175	376
14	41	41	31	e30	28	37	37	171	230	178	168	347
15	41	41	31	e30	28	43	37	207	216	176	165	335
16	42	42	31	e30	28	41	125	e198	208	200	161	329
17	40	43	31	e30	28	37	260	e250	184	191	158	316
18	41	42	31	e30	28	35	246	e282	148	216	158	297
19	42	41	32	e30	28	32	162	e165	140	192	185	309
20	42	40	e31	e30	28	32	35	e93	135	207	220	292
21	43	40	e31	e30	28	32	30	e51	129	180	213	287
22	43	40	e31	e30	28	31	33	51	128	167	220	318
23	44	39	e31	e30	28	31	39	98	127	144	241	362
24	44	38	31	31	28	31	30	e231	122	135	234	328
25	49	38	30	30	28	31	29	e250	129	132	234	318
26	53	40	30	29	28	31	28	275	147	130	238	312
27	57	38	30	30	28	31	31	274	163	130	237	313
28	58	37	30	30	27	35	55	e224	194	152	243	308
29	57	38	e30	29	---	38	97	e159	197	170	241	306
30	57	38	e30	28	---	43	128	e101	194	162	239	283
31	56	---	e30	28	---	42	---	96	---	147	241	---
TOTAL	1357	1232	975	925	784	1027	2000	4142	5278	5319	5942	8835
MEAN	43.8	41.1	31.5	29.8	28.0	33.1	66.7	134	176	172	192	294
AC-FT	2690	2440	1930	1830	1560	2040	3970	8220	10470	10550	11790	17520
MAX	58	51	40	31	29	43	260	282	271	216	243	376
MIN	37	37	29	28	27	28	28	47	104	130	136	234

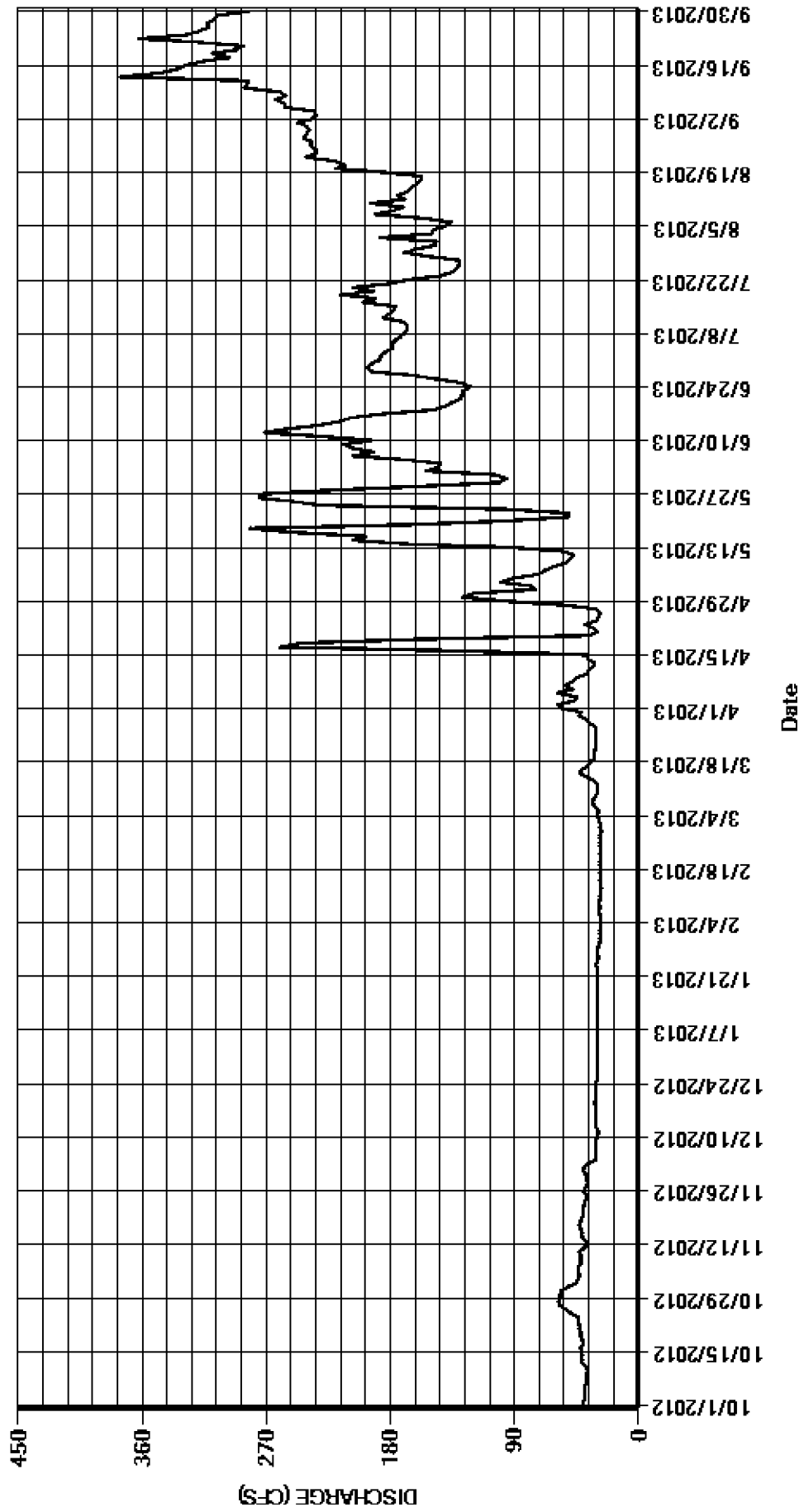
CAL YR	2012	TOTAL	41830	MEAN	114	MAX	332	MIN	29	AC-FT	82970
WTR YR	2013	TOTAL	37816	MEAN	104	MAX	376	MIN	27	AC-FT	75010

MAX DISCH: 575 CFS AT 07:30 ON SEP 13, 2013 GH 4.76 FT SHIFT 0.02 FT  
 MAX GH: 4.76 FT AT 07:30 ON SEP 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



UNCOMPAHGRE RIVER UPSTREAM OF SOUTH CANAL  
WY2013 HYDROGRAPH



GUNNISON RIVER BASIN  
UNCOMPAHGRE RIVER AT UNCOMPAHGRE ROAD BRIDGE  
Water Year 2013

Location.-- Lat. 38°22'40.6"; Long. 107°48'36.5', in the NE¼ NW¼ of section 36, T. 48 N, R. 9 W., NMPM, Montrose Cnty, CO, Hydrologic Unit 14020006, located on the right bank with the sensor on the downstream side of the Uncompahgre Road Bridge about 4,000 ft. downstream of the confluence of South Canal and 7.8 mi. south of Montrose. Elev. about 6,160 ft. from topo map.

Drainage Area and Period of Record.-- Approximately 480 square miles of drainage. ; Record published by Colorado Division of Water Resources, May 25, 2011 through present.

Equipment.-- A Campbell Scientific Radar Water-Level Sensor gage (model CS476-L) mounted on the downstream side of the bridge, near the left bank. The DCP is a Sutron SatLink Logger 2 mounted in a 24" X 18" X 10" (approximately) NEMA box, bolted to a welded steel bracket, which is bolted to two I-beams on the down-stream, right bank wing-wall of the bridge. The primary reference is a wire-weight gage mounted on the downstream side of the bridge, near the radar unit. This wire-weight gage was moved on 8/29/2013 to a location closer to the radar unit. No other changes this water year.

Hydrologic Conditions.-- The control is a cobble riffle approximately 150 feet downstream of the gage. The flows at this gage primarily consist of water released from Ridgway Reservoir and trans-basin water from the Gunnison Tunnel through the South Canal. There are several small tributaries and diversions between the reservoir and the gage.

Gage-Height Record.-- Primary record is 15-minute radar data downloaded from satellite telemetry with DCP download data for backup purposes. The gage was visited on 15 separate occasions to verify the instruments remained calibrated to the primary reference gage. There were no fifteen minute values missing in the primary record in Water Year 2013. Only one instrument correction was made to the radar sensor during 2013 and it was distributed by time. This correction of +0.04 occurred on 10/25/2012 @ 1435. The gage-height record is good except for the days when ice on the control caused backwater on the following days: December 20-23, 29-30, 2012; January 1-10, 12-23; and February 15, 23, & 28, 2013 for a total of 31 days. Also, there were a few days in October where stage was affected by a malfunction in the radar sensor believed to be caused by spider webs in the cone. The malfunction occurred on October 13-14, 2012 and caused more than 4 hours of bad data and those days are labeled "a" days in the record.

Datum Corrections.-- Levels were run this year on 8/2/2013 and on 8/29/2013. BM #3 was established on 8/2/2013. No datum corrections were needed or made in Water Year 2013.

Rating.-- The control during low flow is a cobble riffle located approximately 150-ft. downstream of the gage. The control splits the river into two separate channels separated by a small island. All water is contained in the right channel up to approximate stage of 3.10 ft. when water will begin to fill the left channel. At higher flows (approximately 700 cfs and higher) the control becomes the channel. Rating 02 in use since May 25, 2011 was used until 1030 on October 5, 2012. Rating 03 was developed and used the remainder of the water year. Eleven discharge measurements (Nos. 17-27) were made during the water year ranging in discharge from 48.2 to 911 cfs. Measurements cover the range in stage experienced except for the lower average daily flows of Dec. 10, 24, 2012; Jan. 9-26, 30-31; Feb. 1-6, 8, 10-28; Mar. 1-4, 5, 2013 and the higher average daily flows of May 17, 18, 24-28; Jun. 5-16, 28-30; Jul. 1-24, 28-30; Aug. 2, 8, 9, 11; Sep. 10, 11, 13-15, 2013. The instantaneous peak flow of 1,130 cfs occurred at 0800 on Sep. 13, 2013 at a gage height of 4.51 ft. with a shift of -0.06 ft. It exceeded the stage of measurement no. 24 made on Jun. 10, 2013 by 0.33 feet.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were distributed by stage from October 1, 2012 through October 5, 2012 using UNCBRGCOVS12B. Shifts were then distributed by time from October 5, 2012 through October 15, 2012. Shifts were then distributed by stage from October 15 to the end of the water year using UNCBRGCO13vs1. Open water measurements showed unadjusted shifts varying from -0.16 to +0.10. Shifts were applied directly and given full weight except measurement Nos. 18, 19, and 22-27 which were discounted from -8.74% to 8.40% to smooth distribution.

Special Computations.-- Discharge for periods of ice-affected record was estimated on the basis of good record before and after ice, water temperature records from UNCCOLCO, and partial days of good record.

Remarks.-- This record is good, complete, and reliable except for periods when ice affected the stage-discharge relationship and when the radar sensor malfunctioned which were estimated and should be considered poor. The peak instantaneous flow should be considered good. Station maintained and record developed by Gerald M. Thrush and Luke Reschke.

Recommendations.-- More measurements should be made in Water Year 2014.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

UNCOMPAHGRE RIVER AT UNCOMPAHGRE ROAD BRIDGE

RATING TABLE-- UNCBRGCO2 USED FROM 01-OCT-2012 TO 05-OCT-2012  
 UNCBRGCO03 USED FROM 05-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

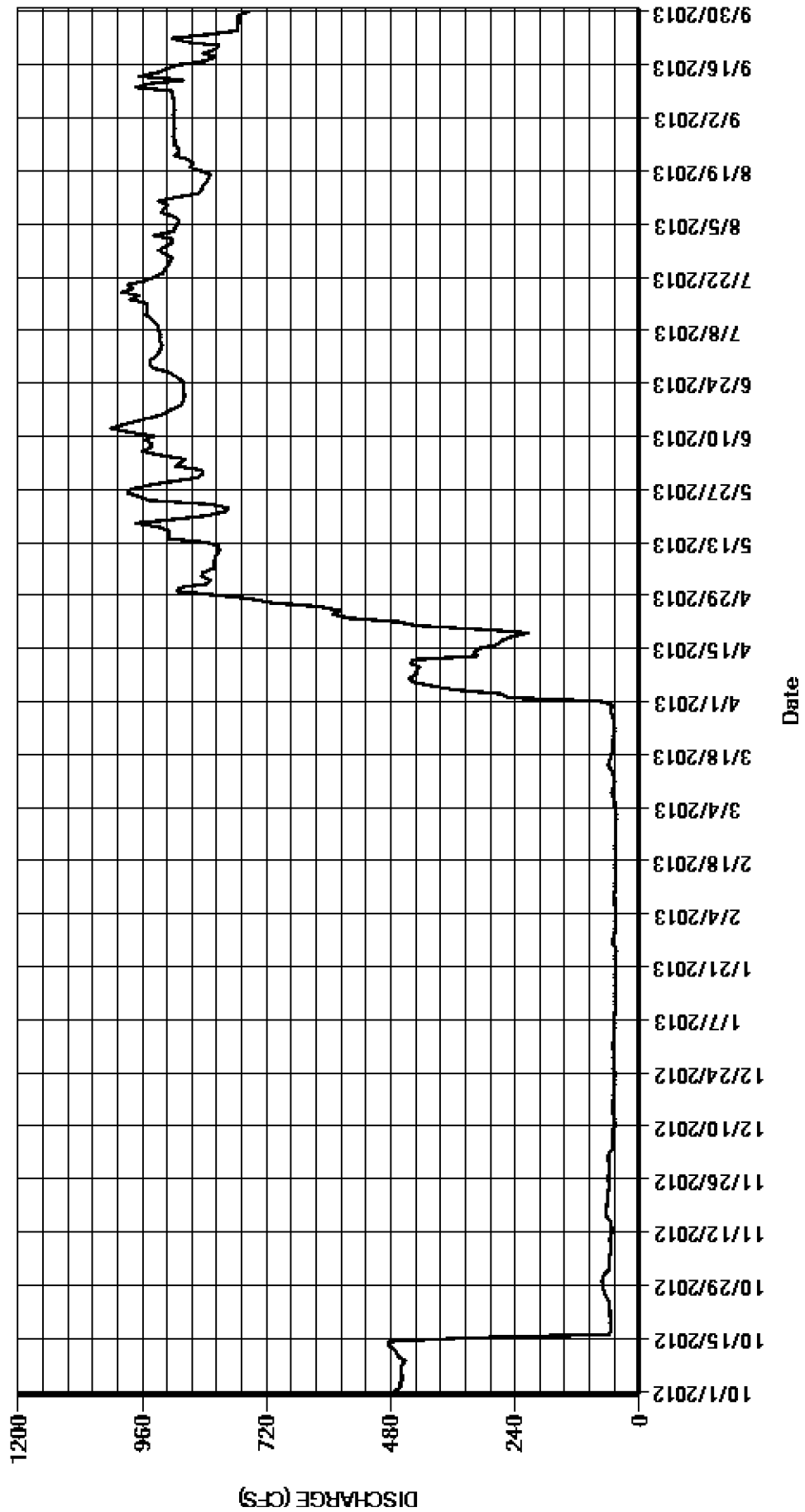
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	473	66	60	e50	46	45	74	889	846	935	902	900
2	462	59	60	e49	47	45	253	838	896	929	938	900
3	462	58	58	e49	47	46	270	828	886	925	900	900
4	458	58	51	e49	47	48	354	846	878	923	897	898
5	459	58	50	e48	46	47	399	843	926	926	891	899
6	460	57	52	e48	47	49	436	824	959	926	890	900
7	461	56	52	e48	48	51	444	822	944	926	901	900
8	458	56	51	e48	47	53	432	821	943	929	924	903
9	453	56	51	e47	49	51	431	819	954	930	919	903
10	465	57	47	e47	47	49	425	815	939	936	911	973
11	469	56	48	47	47	48	441	811	985	943	928	946
12	475	53	48	e47	47	49	438	814	1020	954	898	882
13	e484	54	50	e47	46	52	313	837	997	951	852	966
14	e483	55	51	e47	46	55	320	909	969	951	846	929
15	343	57	52	e47	e46	60	308	910	941	951	843	914
16	58	64	51	e47	47	59	273	908	916	983	836	888
17	55	65	50	e47	47	56	265	929	906	967	832	838
18	56	64	50	e47	47	54	248	973	887	1000	830	819
19	56	63	50	e47	46	52	216	899	882	979	848	843
20	56	62	e49	e47	46	51	310	835	880	989	869	819
21	57	61	e48	e47	47	51	431	801	879	956	863	813
22	57	61	e48	e47	47	50	466	794	881	937	871	875
23	58	60	e48	e47	e46	50	561	831	881	921	898	902
24	58	59	47	47	46	48	591	945	880	917	889	835
25	61	59	50	45	46	48	580	965	888	911	892	777
26	65	61	50	46	46	49	618	988	899	907	899	776
27	68	59	50	52	46	49	711	982	911	902	897	775
28	70	58	50	51	e46	52	750	949	940	917	900	775
29	71	58	e50	49	---	55	819	904	946	929	899	775
30	72	59	e50	47	---	56	892	855	945	917	898	753
31	71	---	51	47	---	51	---	844	---	903	900	---
TOTAL	7854	1769	1573	1478	1306	1579	13069	27028	27604	29070	27461	25976
MEAN	253	59.0	50.7	47.7	46.6	50.9	436	872	920	938	886	866
AC-FT	15580	3510	3120	2930	2590	3130	25920	53610	54750	57660	54470	51520
MAX	484	66	60	52	49	60	892	988	1020	1000	938	973
MIN	55	53	47	45	46	45	74	794	846	902	830	753

CAL YR	2012	TOTAL	164341	MEAN	449	MAX	980	MIN	47	AC-FT	326000
WTR YR	2013	TOTAL	165767	MEAN	454	MAX	1020	MIN	45	AC-FT	328800

MAX DISCH: 1130 CFS AT 08:00 ON SEP 13, 2013 GH 4.51 FT SHIFT -0.06 FT  
 MAX GH: 4.51 FT AT 08:00 ON SEP 13, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

UNCOMPAHGRE RIVER AT UNCOMPAHGRE ROAD BRIDGE  
 WY2013 HYDROGRAPH



GUNNISON RIVER BASIN  
UNCOMPAGHGRE RIVER NEAR OLATHE  
Water Year 2013

Location.-- Lat. 38°35'58.37", Long. 107°58'57.45", SE¼SW¼ of NW¼ sec. 15, T.50 N., R. 10W, NMPM, and about 3,100 ft. above the S. H. 348 bridge and about 5,100 ft below the East Canal head gate and diversion structure, both stream distance. The gage is on the right bank and in Montrose County.

Drainage Area and Period of Record.-- Approximately 817 square miles or 522,880 acres in the drainage area from a project and calculations supplied from Division VII. Published by the Colorado Division of Water Resources, Office of the State Engineer since 1993.; Preliminary data is available from the gage installation March of 1991. Published data is available since WY 1993.

Equipment.-- A Sutron SatLink Logger 2 with a stage discharge recorder (SDR) in a 48-in spiral corrugated metal shelter and stilling well. The SDR is activated by a float in the stilling well. The primary reference gage is a steel drop tape referenced to an adjustable RP located in the gage on the instrument shelf. An air temperature sensor was installed on Jul 11, 2012. No other changes this water year.

Hydrologic Conditions.-- The control is the natural streambed with a somewhat stable cobble channel. There is very little ice in winter except when extended and, or extreme sub zero conditions occur as the releases from Ridgway Reservoir and the geothermal water from the upper Uncompahgre River in the Ouray area, help to keep the River at this point virtually free of ice. The Uncompahgre River is controlled by releases from Ridgway Reservoir and imported water through the Gunnison Tunnel during periods of low flow. The canals of the Uncompahgre Project affect the amount of discharge at this gage. The East Canal is immediately upstream, and the Ironstone Canal is above that. The automatic gates on the Ironstone cause the gage height to be very uneven as the gates seek their set level. Moss growth at low flows can change the control in just a few days.

Gage-Height Record.-- The primary record is the 15 minute electronic SDR data from satellite telemetry with the SDR logger data as backup. This record is complete and reliable except when the stilling well was frozen on Dec 21, 2012; the float was suspended above the oil by ice and or frost on Jan 10, 11, 21-24, 2013. The stage-discharge relationship was affected by ice on the control on Dec 22, 23, 30, 31, 2012; Jan 2-9, 12-20 2013. Three minor instrument corrections in the range of -0.01 ft to +0.02 ft. resulting from calibration of the SDR to the inside drop tape were distributed by time. One flush correction was observed on May 2, 2013.

Datum Corrections.-- Levels were not run this water year. Levels were last run on August 29, 2007, using BM No. 1 as base.

Rating.-- The control is a natural cobble channel. Rating UNCOLACO8 was developed and put into use February 14, 2010. The highest measurement at that time in the range of 1200 cfs was used to help better define the higher range of the rating. The mid range is similar to previous ratings, 8A and 8B. Nine discharge measurements Nos. 259-267 were made during water year 2013. Measurements ranged from 0.62 cfs to 815 cfs, which covered the range in stage, except the lower daily flows of May 21, 22, 30, 31; Jun 18-27; Jul 3-5, 2013, and the higher daily flow of Sep 23, 2013. The instantaneous peak flow of 1130 cfs occurred at 0315 on Sep 23, 2013, at a gage height of 5.26 ft with a shift of 0.14 ft. The peak exceeded the stage of the high measurement No. 267 made Sep 23, 2013 by 0.64 ft.

Discharge.-- A shifting control method was used throughout the year. Shifts were distributed by time with consideration of stage. Variable shift curve UNCOLAVs13a was carried over from last water year was used until Oct. 23, 2012. Shifts were distributed by time from Oct. 23, 2012 until Apr. 23, 2013. Four variable shifts curves (13b, 13c, 13d and 13e) were developed and used during the remainder of the water year to distribute shifts by stage. Open water measurements made in water year 2013 showed shifts ranged from -0.49 ft to 0.14 ft. All measurements were given full weight and applied directly except Nos. 260 and 262 which were discounted from -6.79% to 1.86% for smoothing purposes.

Special Computations.-- Discharge for periods when the stage-discharge relation was affected by ice were estimated using good adjacent days and comparing the pattern on the electronically generated chart. Evaluation also included temperature data obtained from the gage temperature sensor. The periods when the stilling well froze and the float was suspended were estimated using the values from partial good days and the trend from the gage height trace.

Remarks.-- The record is rated good, except periods when the stage-discharge relation was affected by ice on the control, when the well was frozen and when the float was suspended by ice / frost which were estimated and should be considered poor. The instantaneous peak flow is considered good. Station maintained by Luke Reschke and Gerald Thrush. Record developed by Gerald M. Thrush.

Recommendations.-- The installation of an outside gage would help determine if and when there was drawdown. The rating curve needs to be evaluated at the lower end; there appears to have been fill in the low water control. Meter notes and gage visits need to note more detail about control / moss conditions. Levels need to be run in WY 2014.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

UNCOMPAGRE RIVER NEAR OLATHE

RATING TABLE-- UNCOLACO8 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

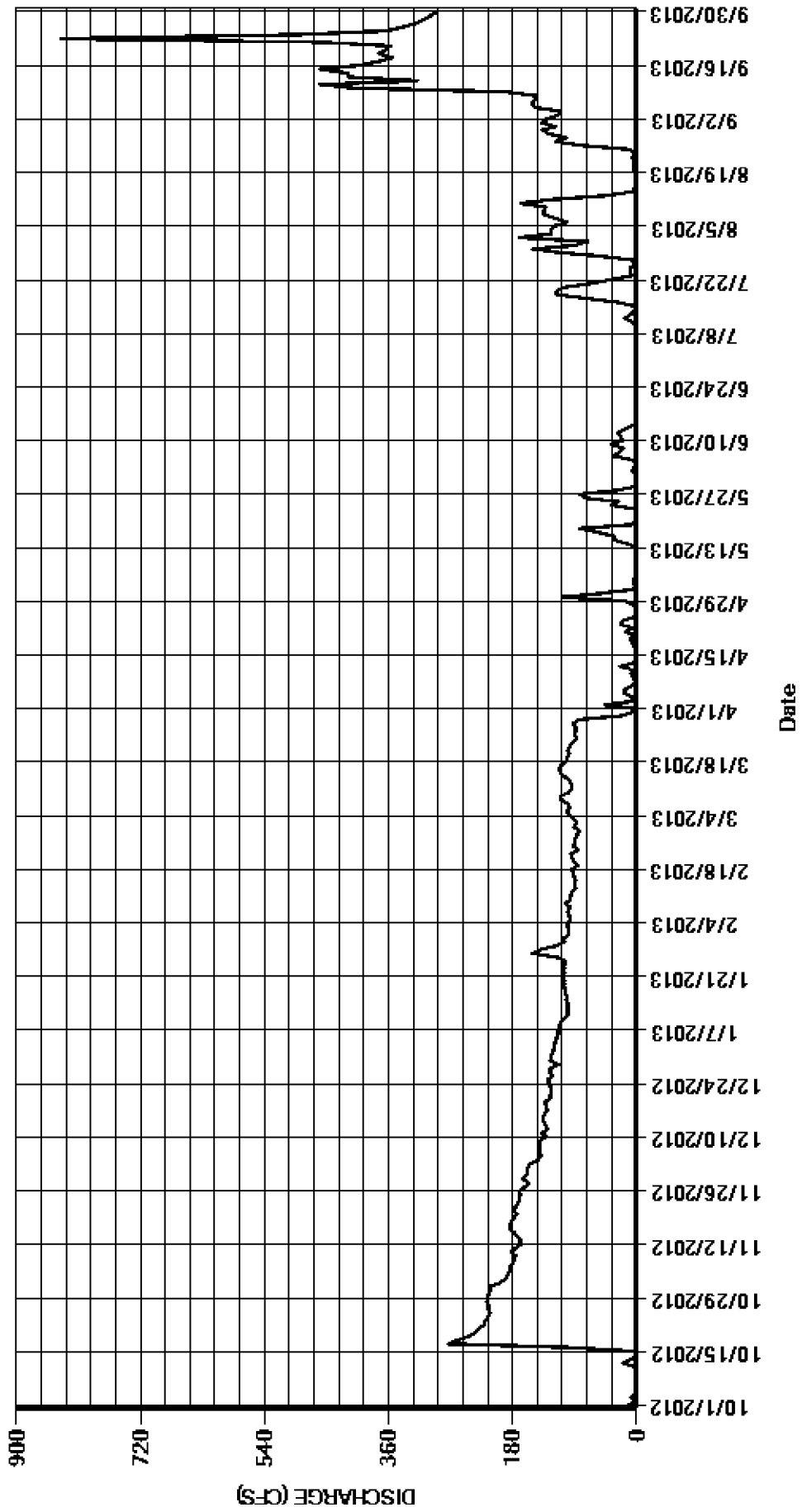
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	212	159	122	99	91	5.3	53	0.71	1.0	71	138
2	3.9	198	158	e120	99	87	46	6.0	7.8	0.87	171	131
3	7.8	191	156	e120	100	91	2.0	1.3	3.4	0.44	124	115
4	1.2	187	144	e118	100	98	7.7	5.5	1.4	0.46	125	110
5	1.0	184	139	e116	96	101	19	4.0	8.5	0.47	119	148
6	0.95	184	140	e114	98	97	17	0.70	33	1.1	101	152
7	0.92	180	140	e114	100	100	5.3	0.85	25	1.1	119	147
8	1.0	178	140	e112	96	109	2.5	1.0	20	0.62	135	147
9	0.85	176	140	e110	103	111	5.4	1.3	37	0.64	135	188
10	0.86	182	132	e105	97	99	7.8	0.72	21	0.67	132	413
11	0.83	177	137	e100	96	94	6.0	0.83	23	7.1	169	461
12	20	169	130	e100	94	94	24	0.96	27	17	121	319
13	7.5	169	131	e100	89	97	2.2	1.8	16	7.8	42	418
14	2.7	173	135	e100	90	103	1.8	14	3.6	2.2	5.7	420
15	2.2	178	136	e102	89	110	1.8	32	2.2	1.3	3.0	459
16	93	183	134	e102	91	113	2.0	34	1.3	26	2.8	402
17	273	184	130	e104	92	110	2.8	55	2.2	71	2.7	374
18	259	182	131	e105	95	103	6.1	82	0.44	116	2.7	355
19	244	178	134	e105	86	101	9.8	7.7	0.45	116	2.8	374
20	235	174	126	e105	91	98	2.8	0.83	0.48	106	5.3	364
21	229	180	e125	e105	95	100	16	0.52	0.45	68	5.1	358
22	221	175	e125	e105	95	97	4.8	0.48	0.43	38	2.7	452
23	220	172	e125	e105	85	94	24	0.80	0.43	7.8	6.0	836
24	216	170	127	e105	92	87	20	36	0.42	9.3	2.8	495
25	213	169	129	104	90	90	1.3	27	0.40	9.3	9.0	362
26	216	170	123	115	89	89	1.4	76	0.39	3.2	77	340
27	215	162	126	151	87	88	2.9	82	0.36	3.5	118	319
28	217	157	125	140	83	92	3.1	29	0.91	48	102	308
29	217	165	114	117	---	85	17	1.9	1.2	111	127	299
30	215	160	e125	105	---	22	107	0.42	1.4	151	137	290
31	213	---	e125	105	---	5.9	---	0.44	---	90	118	---
TOTAL	3559.71	5319	4141	3431	2617	2856.9	374.8	558.05	240.87	1016.87	2293.6	9694
MEAN	115	177	134	111	93.5	92.2	12.5	18.0	8.03	32.8	74.0	323
AC-FT	7060	10550	8210	6810	5190	5670	743	1110	478	2020	4550	19230
MAX	273	212	159	151	103	113	107	82	37	151	171	836
MIN	0.83	157	114	100	83	5.9	1.3	0.42	0.36	0.44	2.7	110

CAL YR	2012	TOTAL	29392.66	MEAN	80.3	MAX	287	MIN	0.48	AC-FT	58300
WTR YR	2013	TOTAL	36102.80	MEAN	98.9	MAX	836	MIN	0.36	AC-FT	71610

MAX DISCH: 1130 CFS AT 03:15 ON SEP 23, 2013 GH 5.26 FT SHIFT 0.14 FT  
 MAX GH: 5.26 FT AT 03:15 ON SEP 23, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

UNCOMPAHGRE RIVER NEAR OLATHE  
WY2013 HYDROGRAPH



GUNNISON RIVER BASIN  
REDLANDS CANAL NEAR GRAND JUNCTION

Water Year 2013

Location.-- Lat. 39°02'52.93", Long. 108°34'33.16", in the NE¼ NW¼NE¼ Sec 27, T1S, R1W, Ute Meridian, Mesa County, Hydrologic Unit 14020005, on the right bank just downstream of and attached to an old bridge. The canal distance to the head gate is about 1.76 miles and the distance to the power plant is about 1.74 miles.

Drainage Area and Period of Record.-- N/A. ; Published stream flow record by the Colorado Division of Water Resources, Office of the State Engineer since 1991. The 50 years of record used to calculate the mean daily flow seen on the web site were hand entered into the satellite monitoring system from old hand worked flow sheets. Some of these were derived from a correlation from power generation data / records.

Equipment.-- A Sutron SatLink 2 DCP, Acoustic Doppler Velocity Meter (ADVM) in a cooperative agreement with the USBR and a Sutron Constant Flow Bubbler (CFB) set to an outside staff gage. The Channel Master (CM) ADVM has the ability to give instantaneous flow readings. It produces the primary discharge record. The Channel Master and AccuBubble are connected to the DCP via SDI-12 with a terminal block. The following data is transmitted to the GOES satellite: GAGE\_HT (CFB), DISCHRG2 (ADVM), and GAGE\_HT2 [ADVM Vertical Beam (VB)]. Discharge reported on the DWR website is calculated from a conventional rating table. This value is less accurate than the onsite flow data because there is no unique stage-discharge relationship. In absence of ADVM, discharge is estimated using the stage-discharge relationship from the bubbler.

Hydrologic Conditions.-- The Redlands Canal is a channel carved into the sandstone cliffs with a hard sedimentary bed rock bottom. The channel bottom is relatively flat with vertical walls along the side. Water in the canal is for power generation and irrigation. Penstock gates and the turbine at the Redlands Water and Power Canal Company downstream of the gage control the flow in the canal and thus there is no unique stage-discharge relationship.

Gage-Height Record.-- ADVM COMPUTED RECORD: Discharge calculated from data provided by the ADVM was used from Oct 1, 2012 to Sep 30, 2013. The record is complete and reliable except for the period Dec 1-31, 2012; Jan 1-5, 2013 when the freeze-thaw of the canal caused irregular low flows. Jan 6-31, 2013 when large amount of ice in the canal caused the instrumentat to malfunction. Feb 5-8, 11-14, 17-19, 21, 25, 2013 when the sensor was working, but ice in the canal affected the sensor readings. Jul 15, 19-21 and Sep 20, 23, 2013 when more than 16 unit values (15 min.) were found to be out of reasonable range, reading high.

Datum Corrections.-- Levels were not run during Water Year 2012. New bench marks were established and staff gages set at this site on Mar. 24, 2005 in and with cooperation from the USGS. Levels were last run on Mar. 24, 2006 by the USBR in cooperation with the development of the index velocity rating for the CM.

Rating.-- The rectangular channel was carved into the sandstone cliffs with a hard sedimentary bed rock bottom. The channel bottom is relatively flat with vertical walls along the side. No control exists at the gage. A conventional stage-discharge rating is used for the auxiliary CFB, but this is only used in cases of malfunction or for backup. The conventional stage-discharge rating was not used this water year. An ADVM rated to an index velocity is used to determine the discharge at the gage. An index velocity coefficient 0.84 was applied to the record from Oct. 1, 2012 until the end of the ice period on Feb 25, 2013. Then an adjustment was applied which yielded a coefficient of 0.80 through the end of the water year. The coefficient was derived from measurement No 334. Three discharge measurements of 0 flow (Nos. 331-333) were made this year. The peak instantaneous flow of 948 cfs occurred at 1530 on May 14, 2013 at a gage height (vertical beam) of 7.37 ft. (CFB 7.35). The peak instantaneous gage height (VB) occurred at 1300 on May 14, 2013 with a reading of 7.52 ft. The peak instantaneous gage height (CFB) occurred at 1315 on May 14, 2013 with a reading of 7.51 ft.

Discharge.-- The discharge record for WY13 has been developed from the on-site computed flow from the Channel Master ADVM. Stage-discharge values using the CFB and shifts derived from measurements were not used.

Special Computations.-- At 09:00 on May 25, 2012, a new index velocity coefficient of 0.84 was entered into the Channel Master. The 0.84 index velocity coefficient was applied to the discharge record from Oct 1, 2012 to 2345 on Feb. 26, 2013. A correction factor of 0.95 ( $0.80/0.84 = 0.95$ ) was applied to the discharge record for the period 0000 on Feb 27, 2013 until the end of the water year. The fall maintenance in Nov 2013, showed a large amount of material in the undershot at Monument Road. This was caused by the extreme ice seen in Jan and Feb, 2013. The calculated coefficient was derived from measurement No 334 made on Oct 18, 2013.

Remarks.-- The record is rated good except for the period Dec. 1-31, 2012 and Jan. 1-5, 2013, which is considered fair. Jan 6-31, 2013 is rated poor. Feb. 5-8, 11-14, 17-19, 21, 25, 2013 should be considered poor. Jul 15, 19-21 and Sep 20, 23, 2013 should be considered poor. The peak instantaneous flow should be considered fair because a correction factor was applied. The station maintained and record developed by Gerald M. Thrush.

Recommendations.--



The data needs to be downloaded frequently because the number of logged parameters has increased and several of them are being logged on a 5 minute interval.

STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

REDLANDS CANAL NEAR GRAND JUNCTION

RATING TABLE-- STCONVERT USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

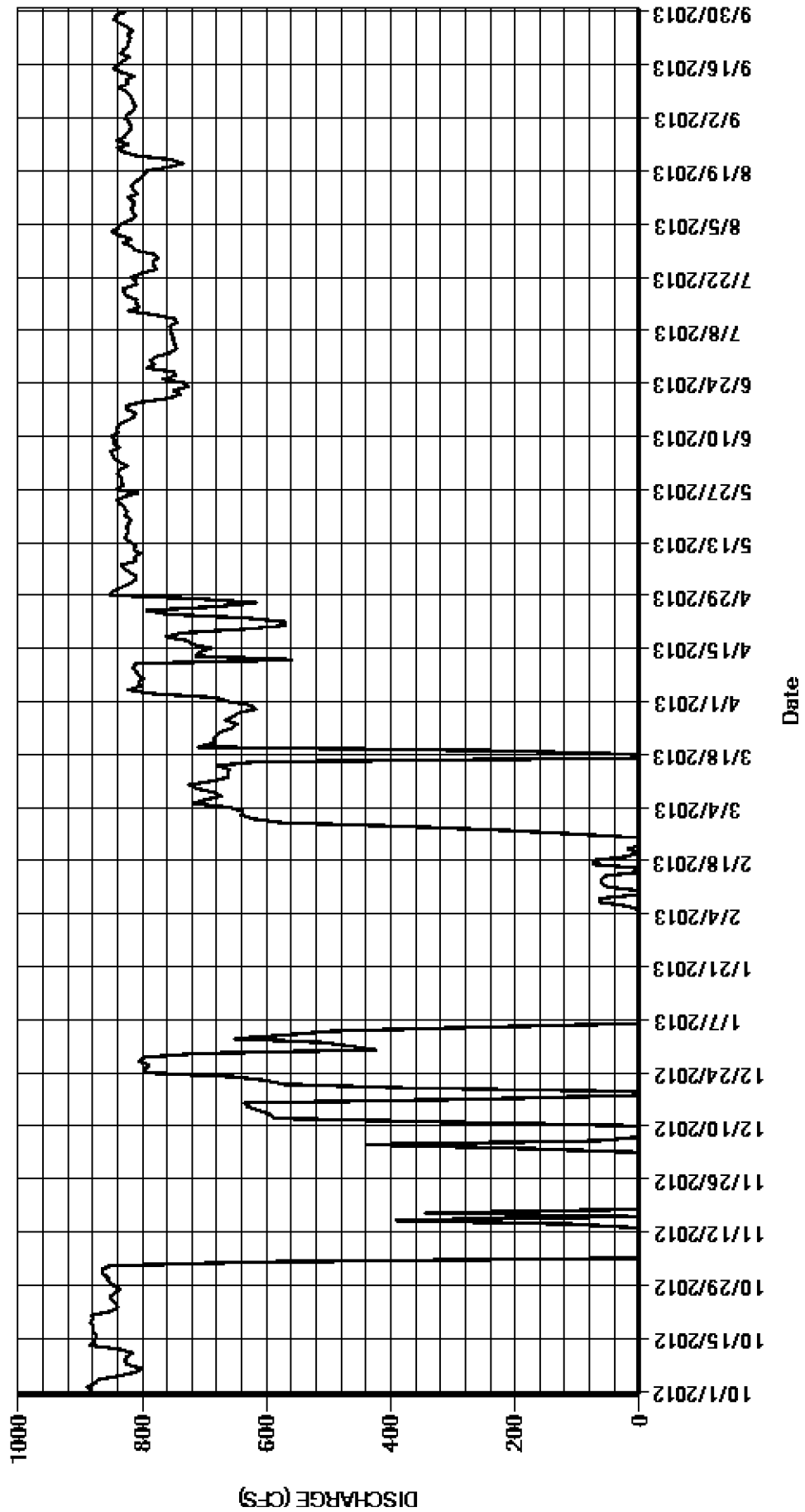
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	882	864	0.00	506	0.00	621	662	835	837	777	818	822
2	889	865	0.00	651	0.00	641	682	823	825	755	837	828
3	876	853	0.00	569	0.00	639	781	812	836	746	850	823
4	872	618	191	495	0.00	661	823	810	844	748	839	815
5	840	0.00	438	252	0.00	718	803	820	848	750	834	811
6	810	0.00	67	e0.00	e21	699	806	829	851	751	819	815
7	801	0.00	0.00	e0.00	e64	672	799	834	837	753	811	817
8	825	0.00	0.00	e0.00	e63	685	807	810	845	754	816	820
9	828	0.00	0.00	e0.00	0.00	713	811	813	845	756	818	827
10	825	0.00	0.00	e0.00	0.00	725	815	804	849	744	814	838
11	816	0.00	309	e0.00	e52	686	811	814	840	749	815	824
12	837	0.00	588	e0.00	e61	662	561	811	841	780	823	826
13	885	0.00	595	e0.00	e61	662	714	819	838	822	808	814
14	878	109	612	e0.00	e55	661	707	828	825	806	815	833
15	875	392	631	e0.00	0.00	679	690	826	815	e810	818	847
16	875	0.00	635	e0.00	0.00	618	719	823	810	810	812	839
17	880	344	255	e0.00	e75	0.00	729	826	824	827	803	831
18	879	0.00	0.00	e0.00	e75	0.00	762	822	827	830	798	821
19	883	0.00	0.00	e0.00	e23	212	736	819	801	e830	793	835
20	880	0.00	375	e0.00	0.00	710	639	828	757	e810	759	e830
21	881	0.00	571	e0.00	e18	685	571	825	740	e811	735	823
22	850	0.00	602	e0.00	0.00	686	572	829	750	818	753	823
23	840	0.00	657	e0.00	0.00	680	630	835	727	800	810	e820
24	842	0.00	796	e0.00	0.00	673	760	841	733	778	831	824
25	850	0.00	796	e0.00	e100	655	793	830	767	782	840	816
26	852	0.00	790	e0.00	216	648	680	808	747	783	823	825
27	844	0.00	805	e0.00	376	666	618	842	749	775	841	837
28	836	0.00	798	e0.00	576	654	707	832	793	782	829	846
29	847	0.00	714	e0.00	---	644	853	834	781	812	824	842
30	855	0.00	425	e0.00	---	618	848	834	787	817	819	827
31	856	---	463	e0.00	---	626	---	840	---	831	819	---
TOTAL	26489	4045.00	12113.00	2473.00	1836.00	18899.00	21889	25556	24169	24397	25224	24799
MEAN	854	135	391	79.8	65.6	610	730	824	806	787	814	827
AC-FT	52540	8020	24030	4910	3640	37490	43420	50690	47940	48390	50030	49190
MAX	889	865	805	651	576	725	853	842	851	831	850	847
MIN	801	0.00	0.00	0.00	0.00	0.00	561	804	727	744	735	811

CAL YR	2012	TOTAL	262873.00	MEAN	718	MAX	918	MIN	0.00	AC-FT	521400
WTR YR	2013	TOTAL	211889.00	MEAN	581	MAX	889	MIN	0.00	AC-FT	420300

MAX DISCH: 948 CFS AT 15:30 ON MAY 14, 2013 GH 7.37 FT  
MAX GH: 7.52 FT AT 13:00 ON MAY 14, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

REDLANDS CANAL NEAR GRAND JUNCTION  
 WY2013 HYDROGRAPH



GUNNISON RIVER BASIN  
GUNNISON RIVER BELOW REDLANDS DIVERSION DAM  
Water Year 2013

Location.-- Lat. 39°02'17 " , Long. 108°34'13", in SW¼SW¼ sec 26, T.1 S., R.1 W., Ute Meridian, Mesa County, Hydrologic Unit 14020005, on the right bank of the Gunnison River just upstream of the Department of Energy Compound, about 1.6 miles above the mouth and the Colorado River, and about 0.78 miles below the Redlands Canal Diversion Dam.

Drainage Area and Period of Record.-- The drainage area is approximately 8,020 square miles.; Published by the Colorado Division of Water Resources, Office of the State Engineer since 2003. Preliminary data starts in 1995. Published data from 2003 to present.

Equipment.-- A Sutron Satlink 2 Logger high data rate DCP and a Sutron Constant Flow Bubbler (CFB). The shelter is a 48-inch CMP culvert on a concrete pad. The primary reference is an outside cantilever chain gage which can be used at low gage readings if the bank is trenched. It is used up to gage height 13.00 ft. The secondary reference gage is a section of staff gage that is carried to and placed at the top of the brass nut at the end of the orifice line. Gage height of the brass nut is 0.46 ft. This is used to calibrate the CFB at extremely low flows and is more accurate under these circumstances than the cantilever because the cantilever is 60+ ft. downstream. There is an air temperature sensor. No other changes this water year.

Hydrologic Conditions.-- The control is the natural streambed with a somewhat stable cobble channel. There is very little ice in winter except for the coldest times in the year and this is not as apparent especially during higher flows around 1000 cfs. The Redlands Canal Diversion Dam is 0.78 miles upstream and diverts water in the range of 700 to 800 cfs all year for power generation, and during irrigation season it diverts an additional 60 cfs. Reservoirs upstream include Taylor Park Reservoir, Blue Mesa Reservoir, Morrow Point Reservoir, Crystal Reservoir, Paonia Reservoir, Silver Jack Reservoir, Crawford Reservoir and Ridgway Reservoir. The higher discharges probably starting around 10,000 cfs and flood flows around the range of 18,000 cfs may experience back water from the Colorado River.

Gage-Height Record.-- The primary record is the 15-minute bubbler data from satellite telemetry with DCP download data used for backup purposes. The record is complete and reliable except for the following days when ice affected the stage discharge relationship: Dec. 21-23, 26, 28-31 2012; Jan. 1-31; Feb 1-18, 2013. The gage was visited on 19 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The bubbler was adjusted 9 times this water year. The instrument corrections ranged from -0.02 ft. to +0.03 ft. All corrections made were distributed by time back to the last known correct reading.

Datum Corrections.-- Levels were run on Aug 5, 2013 to the horizontal cantilever gage (CANT) using BM No. 2 as the base. The cantilever gage was found to be reading 0.005 ft. high. No correction was made since the gage was found to be reading within the allowable error tolerances. Levels were also run to the two other bench marks (BM1 and BM3). BM1 was found to be reading 0.009 feet high and BM3 was found to be reading 0.001 feet low.

Rating.-- The control is the natural streambed with a somewhat stable cobble channel. At high flows in the range of 18,000 cfs and above, backwater from the Colorado River may affect the control. Rating GUNREDCO04 in use since October 1, 2004, was used to Nov 1, 2012; rating GUNREDCO05 was used from Nov 1, 2012 through the end of Water Year 2013. Nine discharge measurements (Nos. 155-163) were made during water year 2013, ranging in discharge from 17.6 cfs to 1050 cfs. Measurements cover the range in stage experienced, except the lower mean daily flow on Apr 27, 28 2013; and the higher mean daily flows on May 1, 13-21 ,25-29; Jun 7, 10; Jul 19 and Sep 15-17, 19-30, 2013. The peak instantaneous flow of 3110 cfs occurred at 1345 on Sep 23, 2013 at a gage height of 4.48 ft. with a shift of-0.04 ft. It exceeded measurement No. 163, made Sep 17, 2013 by 1.90 feet in stage.

Discharge.-- Shifting control method was used during all periods of record. Shifts were distributed by stage from the beginning of Water Year 2013 starting at 0000 on Oct 01, 2012 to 1315 on Nov 01, 2012 using variable shift curve GUNRECvs13aa. This bridged the gap from Water Year 2012 up to measurement No 155. Shifts were distributed by time between measurements from 1330 on Nov 01,2012 through the end of Water Year 2013 at 2345 on Sep 30, 2013. Measurements show unadjusted shifts of 0.26 ft. for Rating 04 and from -0.08 ft. to 0.03 ft. for Rating 05. All were given full weight and applied directly.

Special Computations.-- The ice effect this year was more severe compared to a normal year when only intermittent, sporadic anchor ice is typically present. During the lower flows and sub zero temperatures the river was frozen over. The ice periods were estimated using adjacent good record days, the hydrograph and data from recorded temperatures taken at the gage.

Remarks.-- The record is rated as good except when the stage-discharge relationship was affected by ice which should be considered poor. The peak instantaneous flow should be considered good. Station maintained and record developed by Gerald M. Thrush.

Recommendations.-- There are no recommendations for future operations.

STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

GUNNISON RIVER BELOW REDLANDS DIVERSION DAM

RATING TABLE-- GUNREDCO04 USED FROM 01-OCT-2012 TO 01-NOV-2012  
GUNREDCO05 USED FROM 01-NOV-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

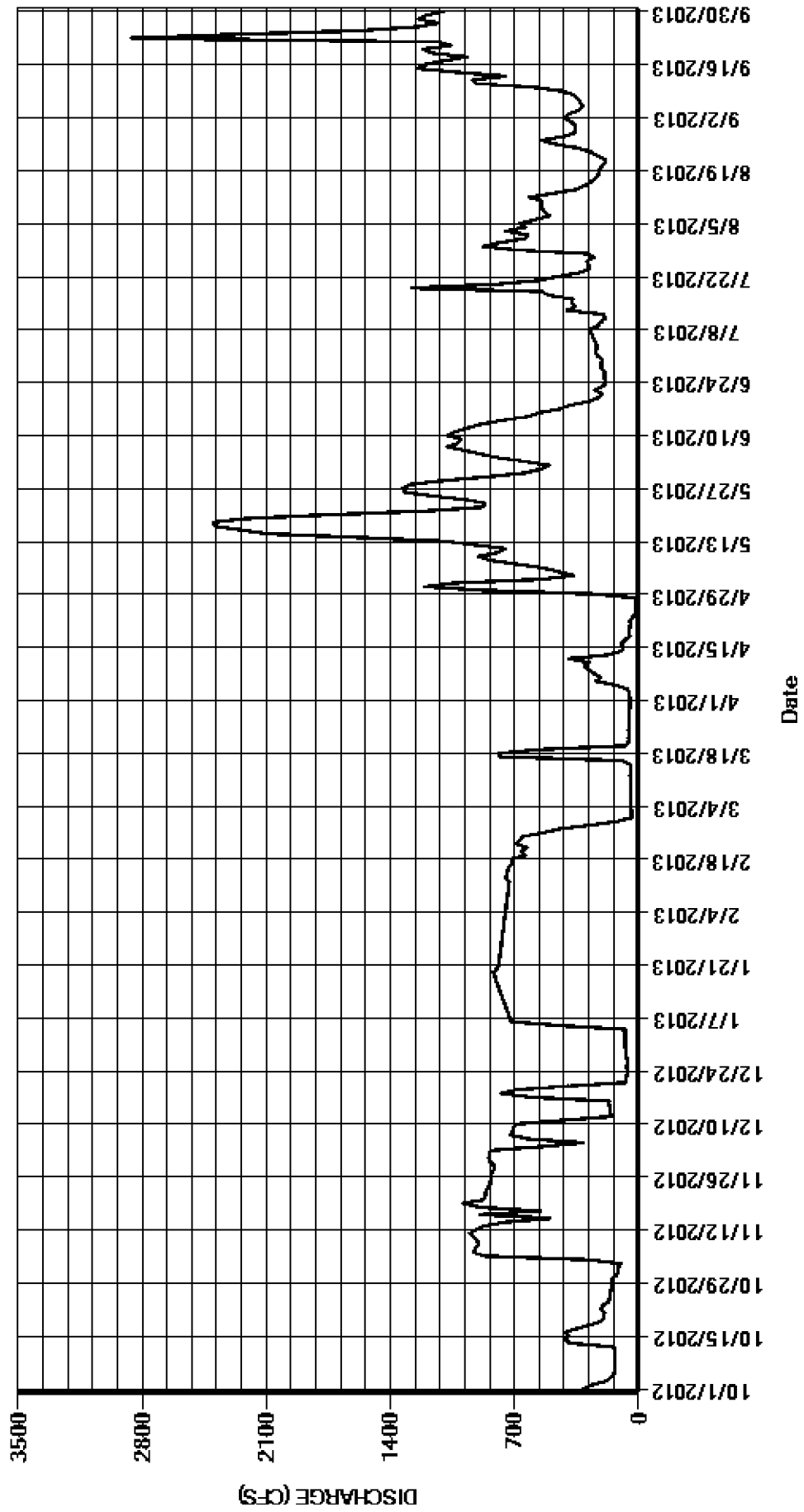
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	312	114	844	e75	e760	41	50	1210	556	232	643	382
2	263	115	842	e75	e757	41	51	1050	507	241	626	419
3	178	101	835	e75	e755	41	54	550	628	235	750	394
4	156	270	540	e75	e752	44	64	365	776	239	639	336
5	140	864	314	e450	e749	45	135	450	883	250	673	318
6	134	930	623	e720	e746	46	241	541	976	258	580	330
7	134	924	721	e728	e744	45	216	696	1080	266	504	346
8	136	907	713	e735	e741	43	250	845	1020	278	531	366
9	133	908	706	e743	e738	46	282	902	1000	230	545	438
10	134	927	693	e751	e735	47	307	797	1080	212	552	597
11	133	953	422	e758	e733	46	278	750	1030	190	545	915
12	138	917	151	e766	e730	48	397	924	958	196	615	936
13	391	879	162	e774	e750	47	175	1080	883	405	477	749
14	411	749	163	e782	e745	46	96	1540	758	357	355	1020
15	398	502	167	e789	e740	47	89	2090	628	376	302	1250
16	408	896	167	e797	e730	95	98	2240	560	373	271	1210
17	347	554	597	e805	e715	782	73	2390	447	512	244	1100
18	262	894	776	e812	e720	785	51	2400	386	540	227	970
19	207	989	688	e820	639	569	52	2220	281	1280	220	1160
20	195	877	399	e800	660	74	50	1740	228	798	211	1220
21	194	865	e75	e790	631	57	48	1180	206	558	191	1060
22	212	864	e72	e787	688	57	49	878	245	457	188	1120
23	201	851	e65	e785	670	57	32	868	196	335	235	2860
24	170	839	64	e782	654	57	18	968	188	276	274	2290
25	163	835	68	e779	539	55	19	1160	193	284	349	1570
26	161	832	e65	e776	448	54	18	1320	192	292	473	1250
27	158	829	65	e774	275	54	17	1330	192	250	550	1130
28	154	816	e70	e771	116	53	17	1290	211	294	419	1240
29	154	814	e70	e768	---	52	242	1110	211	693	358	1200
30	149	837	e75	e765	---	50	878	861	207	876	359	1100
31	125	---	e75	e763	---	49	---	647	---	788	361	---
TOTAL	6451	22652	11287	20870	18660	3573	4347	36392	16706	12571	13267	29276
MEAN	208	755	364	673	666	115	145	1174	557	406	428	976
AC-FT	12800	44930	22390	41400	37010	7090	8620	72180	33140	24930	26320	58070
MAX	411	989	844	820	760	785	878	2400	1080	1280	750	2860
MIN	125	101	64	75	116	41	17	365	188	190	188	318

CAL YR	2012	TOTAL	161773	MEAN	442	MAX	1790	MIN	64	AC-FT	320900
WTR YR	2013	TOTAL	196052	MEAN	537	MAX	2860	MIN	17	AC-FT	388900

MAX DISCH: 3110 CFS AT 13:45 ON SEP 23, 2013 GH 4.48 FT SHIFT -0.04 FT  
MAX GH: 4.48 FT AT 13:45 ON SEP 23, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**GUNNISON RIVER BELOW REDLANDS DIVERSION DAM  
WY2013 HYDROGRAPH**



BLUE RIVER BASIN  
BLUE RIVER AT HIGHWAY 9 BRIDGE BELOW BRECKENRIDGE  
Water Year 2013

Location.-- Lat 39° 32' 21.6", long 106° 02' 32.0" NAD83 in SE¼ of SW¼ of sec 7, T6S, R77W, Hydrologic Unit 14010004, in Summit County. Located on right bank 25 ft. above Highway 9 Bridge, 3 1/2 miles north of Breckenridge and 2 1/4 miles south of Dillon Reservoir(Blue River Arm).

Drainage Area and Period of Record.-- 80.8 sq mi; Satellite telemetry began Nov 25, 1996. Published streamflow record Oct 1, 1996 to present.

Equipment.-- A Sutron constant flow bubbler (CFB) and shaft encoder (SE) and Sutron SatLink2 data collection platform (DCP) in precast concrete building. The CFB is backup sensor for the SE. The SE and CFB are set by drop tape to an adjustable reference point (RP) in edge of equipment shelf. Outside staff gage, near right bank adjacent to intake pipes, serves as a backup RP. Station has AC power that allows use of a stock tank heater and space heater to prevent water from freezing in stilling well and intake pipes. The SatLink2 was replaced on Jan 25, 2012. No other changes this year.

Hydrologic Conditions.-- Transmountain diversions above the station occur through the Continental-Hoosier Tunnel and the Boreas Pass Ditch.

Gage-Height Record.-- The primary record is 15-minute satellite-transmitted SE gage height data with a CFB backup from October 1, 2012 through September 30, 2013. The record is complete and reliable, except for July 16 and September 17 when CDOT was in the river installing and removing a dam placed for road construction. Several instrument corrections were applied during the period of record.

Datum Corrections.-- Levels were last run on Sep 24, 2012 using RM 1 as base. The channel was excavated on September 15, 2011, which lowered the control. The lower control caused negative gage heights at low flows. The datum of the gage was lowered by 1.00 feet (in the published record only) on Oct 6, 2011 to correct this issue. The inside gage tape was permanently lowered by 1.00 ft on Oct 3, 2012 with the rating, shaft encoder and CFB lowered on May 2, 2013. The gage was otherwise found to read correct and no additional adjustments were made to the inside RP.

Rating.-- Low water control is rock and cobble riffle at the gage house. High water control is three 8 ft diameter culverts 25 ft below gage house under Highway 9. Channel is often mossy during the winter. Rating No. 12 was used for the entire 2013 water year. Nineteen discharge measurements (Nos. 162–180) made during WY2013 and Measurement 181 made subsequently were used for analysis. The measurements ranged from 10.3 to 214 cfs, which covers the range of stage experienced except for the higher daily flows of June 7-17 and September 14, 2013 and lower daily flows February 22-28 and March 1-5, 2013. The peak discharge of 473 cfs occurred at 0200 on June 12, 2013 at a gage height of 3.25 ft with a shift of -0.14 ft. It exceeded the stage of high Measurement No. 174 made June 17, 2013 by 0.74 ft. The peak gage height occurred at 0000 on September 14, 2013 and was 3.66 ft.

Discharge.-- Shifting control method was used the entire water year. Shifts were applied as defined by measurements distributed by time from Oct. 1-3, 2012, a variable shift curve, BLUNINCO2013WYa, from Oct. 3, 2012 through Jun. 17, 2013 and again by time from Jun. 17, 2013 to end of water year. Measurements made during the period of record indicate raw shifts ranging from -1.12 ft to +0.01 ft. Shifts were applied directly and given full weight except for measurements 162, 163, 165 and 168 which were discounted from -2.83% to +5.23% to smooth the shift distribution.

Special Computations.-- Average daily discharge was compared with downstream BLUNDICO gage operated by USGS for trend comparison.

Remarks.-- Record is rated good except for the days where CDOT was working in the river. They installed a rock dam on Jul. 16, 2013 and removed the dam, mostly, on Sep. 17, 2013. Record from Jul. 16, 2013 through Sep. 17, 2013 is considered poor. The road work, and therefore the river alterations should be finalized summer of 2014. The peak instantaneous flow is rated good. Station was maintained by and record was developed by Jana Miller.

Recommendations.-- Rating will need to be developed when CDOT road/bridge work is complete.

STATE OF COLORADO  
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BLUE RIVER AT HIGHWAY 9 BRIDGE BELOW BRECKENRIDGE

RATING TABLE-- BLUNINCO12 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	29	34	17	15	11	10	13	51	139	98	54	134
2	29	33	17	15	11	10	13	55	140	91	49	112
3	28	32	18	15	11	10	13	47	158	87	44	95
4	27	31	18	15	11	10	13	39	176	84	41	85
5	27	30	17	15	11	10	14	36	195	80	42	85
6	27	31	16	15	11	10	14	35	213	78	42	87
7	27	31	16	15	11	10	15	37	246	88	44	92
8	27	30	16	15	11	10	14	40	254	103	49	84
9	29	29	16	15	11	10	14	41	273	106	56	61
10	34	29	15	15	11	10	14	41	349	98	72	72
11	35	28	15	15	11	10	14	42	441	86	61	90
12	35	24	15	15	11	10	14	48	428	80	55	142
13	37	22	15	15	11	10	14	54	380	92	51	200
14	39	20	15	14	11	10	15	72	334	105	52	238
15	39	18	15	14	11	10	15	109	275	105	46	151
16	38	17	16	14	11	11	15	125	248	e105	40	105
17	40	17	16	13	11	11	15	141	216	e105	35	e137
18	41	17	15	13	11	11	15	147	193	e105	34	118
19	37	18	16	13	11	10	15	142	183	106	36	112
20	37	20	16	13	11	11	15	121	174	89	33	102
21	38	21	16	12	11	11	15	104	160	69	31	89
22	37	22	16	12	10	11	16	103	150	59	33	88
23	36	23	16	12	10	11	16	118	141	54	61	116
24	36	23	17	12	10	11	15	156	132	56	60	104
25	36	21	16	12	10	11	15	183	123	65	65	95
26	32	21	16	12	10	11	16	184	113	73	63	91
27	29	20	16	12	10	11	19	187	108	73	61	82
28	27	18	16	12	10	11	24	184	103	84	56	72
29	31	17	16	12	---	11	30	182	99	118	59	69
30	34	17	15	12	---	12	39	171	98	111	71	67
31	35	---	15	12	---	12	---	151	---	73	122	---
TOTAL	1033	714	495	421	301	327	489	3146	6242	2726	1618	3175
MEAN	33.3	23.8	16.0	13.6	10.8	10.5	16.3	101	208	87.9	52.2	106
AC-FT	2050	1420	982	835	597	649	970	6240	12380	5410	3210	6300
MAX	41	34	18	15	11	12	39	187	441	118	122	238
MIN	27	17	15	12	10	10	13	35	98	54	31	61

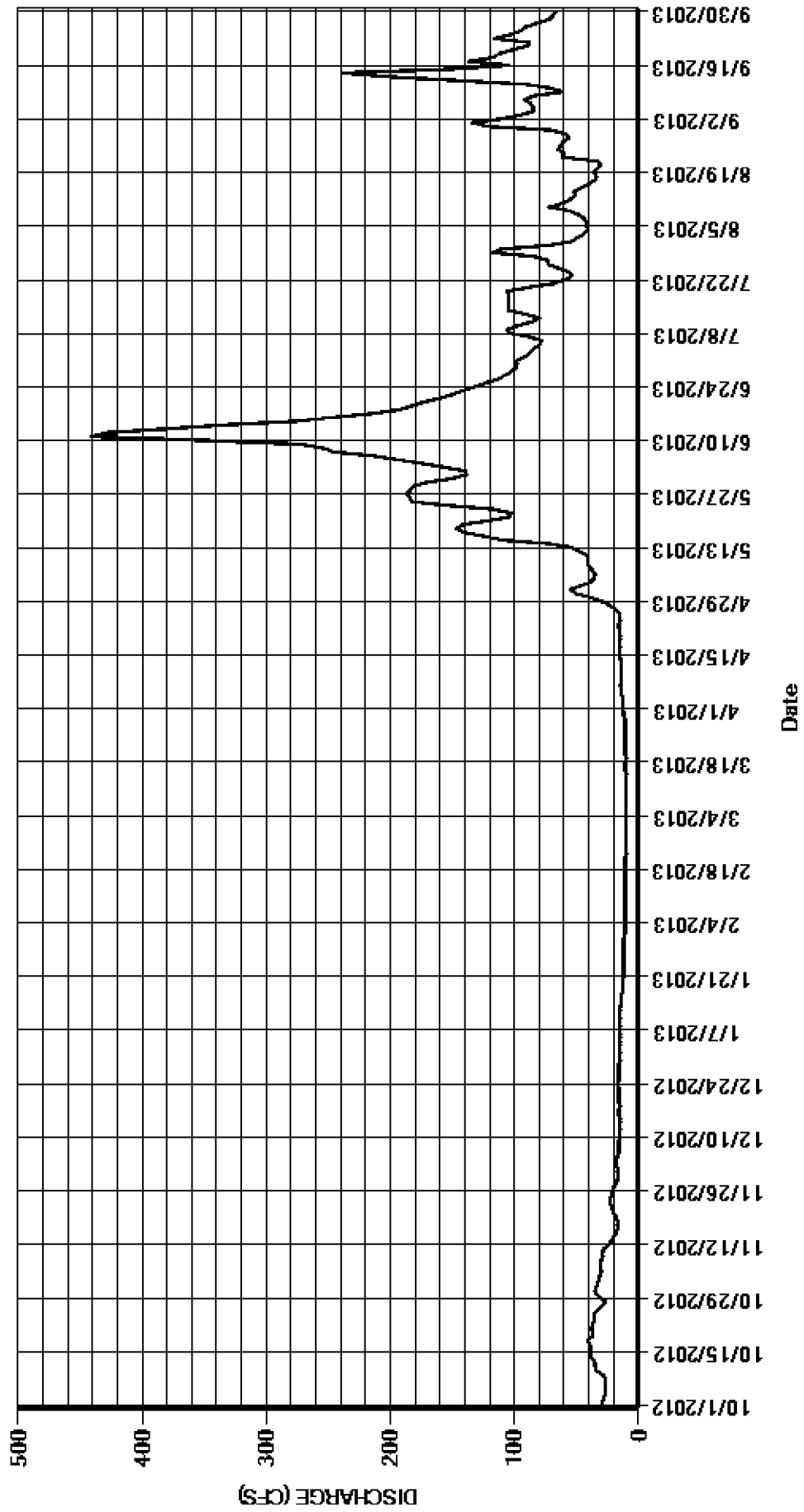
CAL YR	2012	TOTAL	12047	MEAN	32.9	MAX	83	MIN	15	AC-FT	23900
WTR YR	2013	TOTAL	20687	MEAN	56.7	MAX	441	MIN	10	AC-FT	41030

MAX DISCH: 473 CFS AT 02:00 ON JUN 12, 2013 GH 3.25 FT SHIFT -0.14 FT  
 MAX GH: 3.66 FT AT 00:00 ON SEP 14, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



BLUE RIVER AT HIGHWAY 9 BRIDGE BELOW BRECKENRIDGE  
WY2013 HYDROGRAPH



BLUE RIVER BASIN  
SNAKE RIVER AT KEYSTONE SKI AREA  
Water Year 2013

Location.-- Lat 39°36'24", long 105°57'06", in NE1/4 NE1/4 Sec. 24, T5S, R77W in Summit County. Located on left bank of Snake River just below Keystone Ski Area snowmaking diversion, 0.5 mi below confluence with North Fork of Snake River, 1.5 mi above confluence with Keystone Gulch, and 3.2 mi upstream of Snake River Arm of Dillon Reservoir.

Drainage Area and Period of Record.-- The drainage area above the gage is 59.5 square miles. ; Partial year (winter) record published with data from Oct 1, 2005 to present.

Equipment.-- Sutron constant flow bubbler (CFB) sensor and Sutron SatLink 2 data collection platform (DCP) housed in the Keystone Ski Area snowmaking pumphouse. The CFB is calibrated to a staff gage located above rock weir control and below Keystone diversion dam.

Hydrologic Conditions.-- Drainage basin is the Snake River and North Fork of the Snake River. Record includes water pumped from Montezuma shaft of Roberts Tunnel that is not always diverted for snowmaking at Keystone Ski Area. Banks between the dam and control are steep and velocity is generally slow in the reach below the diversion. Channel below the control is composed of cobble and is relatively straight to the measurement section. There is one channel at all stages.

Gage-Height Record.-- The primary record is 15-minute satellite-transmitted data. The DCP log is used as a backup. The record is complete and reliable for the six month period of operation (Oct 1, 2012 – Mar 31, 2013) except for Nov 7-8, Dec 21-24, 26, 2012, and January 4-6, 9, 11-13, 18-20, 2013, when the CFB was either fully or partially blocked and record was estimated. During the period of Nov 19, 2012 and Dec 14, 2012 the CFB was very unstable and large gage height corrections were made. Several other minor instrument calibration corrections were made to the CFB sensor during the period of record.

Datum Corrections.-- Levels were run on September 24, 2012 to the outside staff gage using RM3 as the base. The outside staff gage was found to be reading 0.009 ft. low.. No datum corrections were made since the outside staff gage was within the allowable error tolerances. The existing staff gage was removed and a new staff gage as installed on the same date.

Rating.-- Control is a W-weir rock structure approximately 70 ft downstream of the Keystone snowmaking diversion point and 20 ft downstream of AccuBubble orifice pipe. Rating No. 12 was used until 15:15 on Oct 8, 2012 when a rock was replaced in the control. Rating No. 13 was used from 15:30 on Oct 8, 2012 through the end of the water year. Ten measurements (Nos 43-52), made during the period of record, were used for analysis. Measurements range in discharge from 8.11 to 25.7 cfs, which covered the range of flows experienced during the period of record except for the higher daily flows of Oct 14-16, 2012 and the lower daily flows of Dec 9-10, 2012 and Mar 10-13, 2013. The peak discharge of 47.2 cfs occurred at 13:30 on January 22, 2013 at a gage height of 2.07 ft with a shift of -0.01 ft. The peak gage height exceeded high measurement 45 by 0.23 ft in stage.

Discharge.-- Measurements 47-49 did not fall nicely on the rating, and it is assumed that it was either ice effected, or the measurement section used, downstream of the beaver dam, was somehow effected by the beaver dam.

Discharge.-- A shifting control method was used for WY2013. Shifts were applied by time for the entire period of record due to the fact that a rating was developed specifically using these measurements. Measurements 47 and 49 were discounted between -8% and -6% to smooth application of shifts. Raw shifts ranged from -0.03 (Rating No. 13) to +0.25 (Rating No 12) ft.

Special Computations.-- Discharge during periods of bad gage height record were estimated from good data before and after bad record.

Remarks.-- Record is rated as good, except for days of estimated daily discharge which are considered poor. The peak instantaneous flow should be considered good. Gage operated and record developed by Jana Miller.

Recommendations.-- Consider construction of a cantilever gage to replace staff gage. Also, if extreme cold temperatures continue to affect the gage, then the possibility of installing a radar stage sensor should be considered.

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SNAKE RIVER AT KEYSTONE SKI AREA

RATING TABLE-- SNAKEYCO12 USED FROM 01-OCT-2012 TO 08-OCT-2012  
 SNAKEYCO13 USED FROM 08-OCT-2012 TO 14-MAY-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

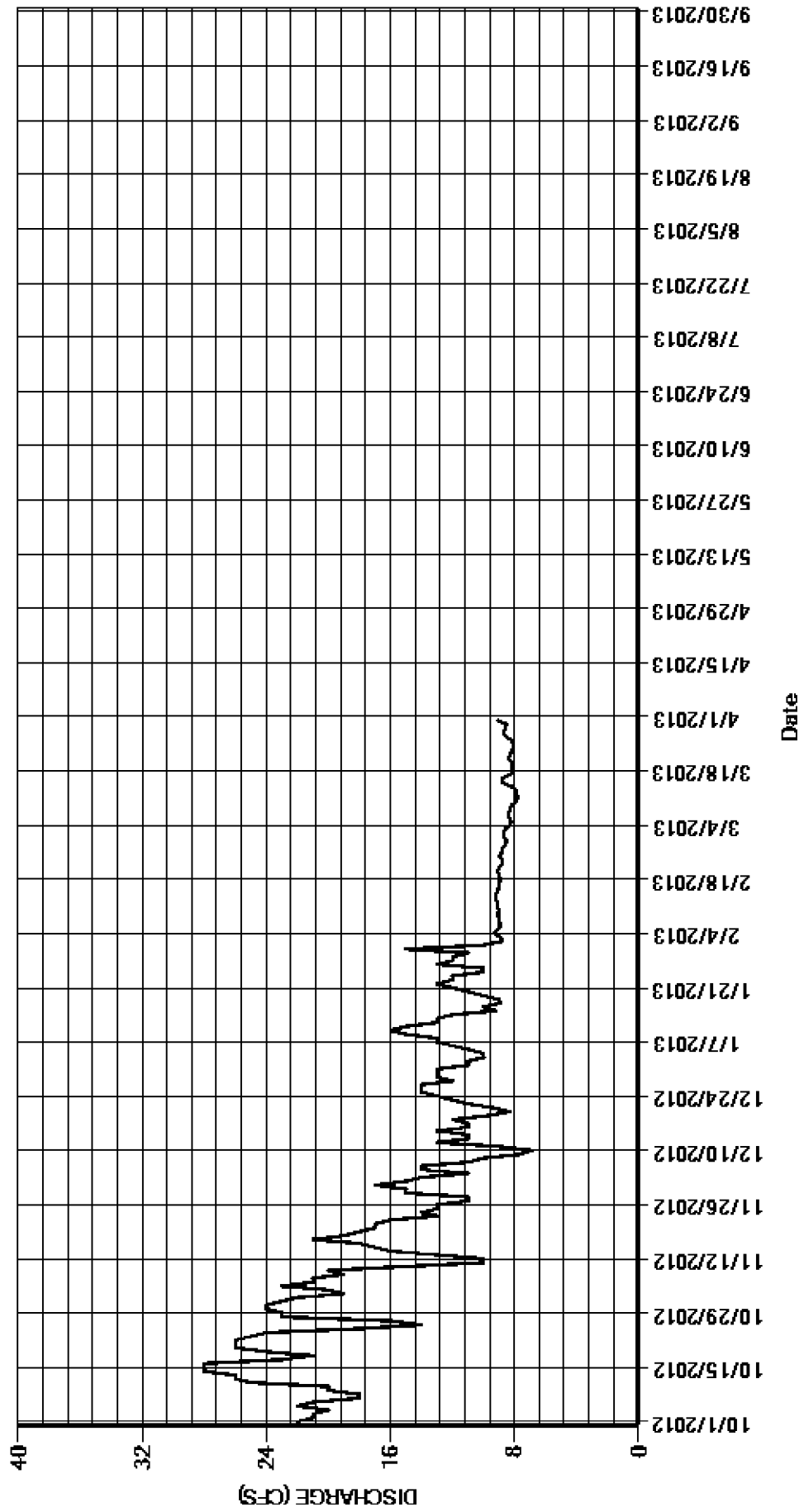
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	23	17	11	10	8.7	---	---	---	---	---	---
2	21	22	15	11	8.8	8.7	---	---	---	---	---	---
3	21	19	14	10	8.9	8.6	---	---	---	---	---	---
4	20	20	11	e10	9.3	8.3	---	---	---	---	---	---
5	22	23	14	e11	9.1	8.2	---	---	---	---	---	---
6	21	21	14	e12	8.9	8.4	---	---	---	---	---	---
7	18	e21	11	13	9.0	8.4	---	---	---	---	---	---
8	18	e19	10	13	9.0	8.3	---	---	---	---	---	---
9	20	20	7.7	e15	9.1	8.2	---	---	---	---	---	---
10	20	15	6.9	16	9.0	7.9	---	---	---	---	---	---
11	25	10	9.0	e15	9.1	7.8	---	---	---	---	---	---
12	26	10	13	e13	9.1	7.9	---	---	---	---	---	---
13	26	13	11	e13	9.2	7.9	---	---	---	---	---	---
14	28	16	11	12	9.2	8.2	---	---	---	---	---	---
15	28	17	13	9.2	9.1	8.8	---	---	---	---	---	---
16	28	18	11	10	9.0	8.8	---	---	---	---	---	---
17	23	21	11	8.9	9.0	8.3	---	---	---	---	---	---
18	21	19	12	e9.0	8.9	8.1	---	---	---	---	---	---
19	24	18	9.7	e10	9.0	8.2	---	---	---	---	---	---
20	26	17	8.3	e11	9.1	8.1	---	---	---	---	---	---
21	26	17	e9.4	12	9.0	8.4	---	---	---	---	---	---
22	26	16	e11	13	8.8	8.3	---	---	---	---	---	---
23	25	13	e12	12	8.8	8.2	---	---	---	---	---	---
24	24	14	e13	12	9.0	8.1	---	---	---	---	---	---
25	18	13	14	10	8.8	8.1	---	---	---	---	---	---
26	14	13	e14	10	8.8	8.2	---	---	---	---	---	---
27	16	11	14	13	8.6	8.6	---	---	---	---	---	---
28	23	11	12	12	8.5	8.7	---	---	---	---	---	---
29	23	15	13	12	---	8.6	---	---	---	---	---	---
30	24	15	13	11	---	8.5	---	---	---	---	---	---
31	24	---	13	15	---	9.1	---	---	---	---	---	---
TOTAL	701	500	368.0	365.1	252.1	258.6	---	---	---	---	---	---
MEAN	22.6	16.7	11.9	11.8	9.00	8.34	---	---	---	---	---	---
AC-FT	1390	992	730	724	500	513	---	---	---	---	---	---
MAX	28	23	17	16	10	9.1	---	---	---	---	---	---
MIN	14	10	6.9	8.9	8.5	7.8	---	---	---	---	---	---

CAL YR	2012	TOTAL	2842.6	MEAN	15.5	MAX	37	MIN	6.9	AC-FT	5640 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	2444.8	MEAN	13.4	MAX	28	MIN	6.9	AC-FT	4850 (PARTIAL YEAR RECORD)

MAX DISCH: 47.2 CFS AT 13:30 ON JAN 22, 2013 GH 2.07 FT SHIFT -0.01 FT  
 MAX GH: 2.07 FT AT 13:30 ON JAN 22, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**SNAKE RIVER AT KEYSTONE SKI AREA  
WY2013 HYDROGRAPH**



ROARING FORK RIVER BASIN  
ROARING FORK RIVER BELOW MAROON CREEK NEAR ASPEN

Water Year 2013

Location.-- Lat. 39°13'30", Long. 106°51'20", NW ¼ of SW¼ of Sec. 35, T.9 S., R.85 W. in Pitkin County, Hydrologic Unit 14010004, CO. Gage located on left bank at Aspen Consolidated Sanitation Plant, 0.8 mi downstream from confluence with Maroon Creek.

Drainage Area and Period of Record.-- 289 sq. mi.; Published record November 1988 to present.

Equipment.-- Gage is equipped with a Sutron shaft encoder and Sutron SatLink2 data collection platform (DCP) housed in precast concrete building with floor dimensions of about 4.5 ft by 6.5 ft. Building is constructed over a 12 ft deep well constructed with 4 ft diameter precast concrete rings. A Sutron Stage Discharge Recorder (SDR) was installed on July 5, 2012 to replace the Stevens A-71 graphic water-stage. The SDR and shaft encoder have separate floats and are set by drop tape from an adjustable reference point in edge of equipment shelf. Well is connected to stream by two 2" intake pipes with outside risers for flushing. An A-frame cableway with sit-down cable car is located 500 ft. upstream of the gage. No other changes this water year.

Hydrologic Conditions.-- Upstream transmountain diversions occur through Hunter Tunnel (part of Frypan-Arkansas system) and Twin Lakes Tunnel. Building is equipped with AC power that allows use of a space heater and a stock tank heater, which help keep the well and intakes from freezing. Anchor ice often forms in the riffle control during cold weather and causes a backwater effect.

Gage-Height Record.-- Primary record is 15-minute satellite-transmitted shaft encoder data with SDR log used for backup. The record is complete and reliable for Water Year 2013, except for December 10, 2012 through January 26, 2013 when the stage-discharge relationship was affected by anchor and surface ice in the riffle control. Two instrument corrections of +/- 0.03 and no flush corrections were made during Water Year 2013.

Datum Corrections.-- Levels were run on Aug. 1, 2012 using RM2 as a base. The gage was found to read correct and the R.P. was not adjusted.

Rating.-- Channel is composed of cobble throughout and is straight from 400 ft above to 100 ft below the gage. Banks are steep on right bank and medium on left bank. The low flow control is a rock and cobble riffle about 80 ft below the gage. High flow control is 15 ft diameter boulder about 100 ft downstream of gage. Rating Number 7 was used the entire 2013 Water Year. Seventeen measurements (Nos. 241-257) were made during WY2013. Measurements ranged from 69.1 to 1210 cfs, which covered the range in stage experienced during the year except for the lower daily flows on February 14-15, 2013 and the higher daily flows of June 6-13, 2013. The peak discharge of 2010 cfs occurred at 0030 on June 11, 2013 at a gage height of 5.43 ft with a shift of 0.0 ft. The peak gage height exceeded high measurement No. 251 by 0.69 ft in stage.

Discharge.-- Shifting control method used for WY2013. Shifts were distributed by time from Oct 1, 2012 through Sep 30, 2013. Discharge measurements made this water year resulted in shifts ranging from -0.34 to +0.04 ft. Measurements 241,243,245-46,248-50,252-54 were discounted between -7.7% and +2.9% to smooth the shift distribution.

Special Computations.-- Discharge estimates for ice-affected days were based on straight-line pro-ration from adjacent days with good electronic gage height data in addition to one ice measurement, No 244.

Remarks.-- Record is good, except during periods of ice-affected control when record is rated as fair. The peak instantaneous peak discharge is considered good. Gage operated and maintained by Jana Miller and record developed by Jana Miller.

Recommendations.-- Cableway is due for inspection.

STATE OF COLORADO  
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ROARING FORK RIVER BELOW MAROON CREEK NEAR ASPEN

RATING TABLE-- ROABMCCO07 USED FROM 01-OCT-2012 TO 02-OCT-2012  
 ROABMCCO07ext USED FROM 02-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

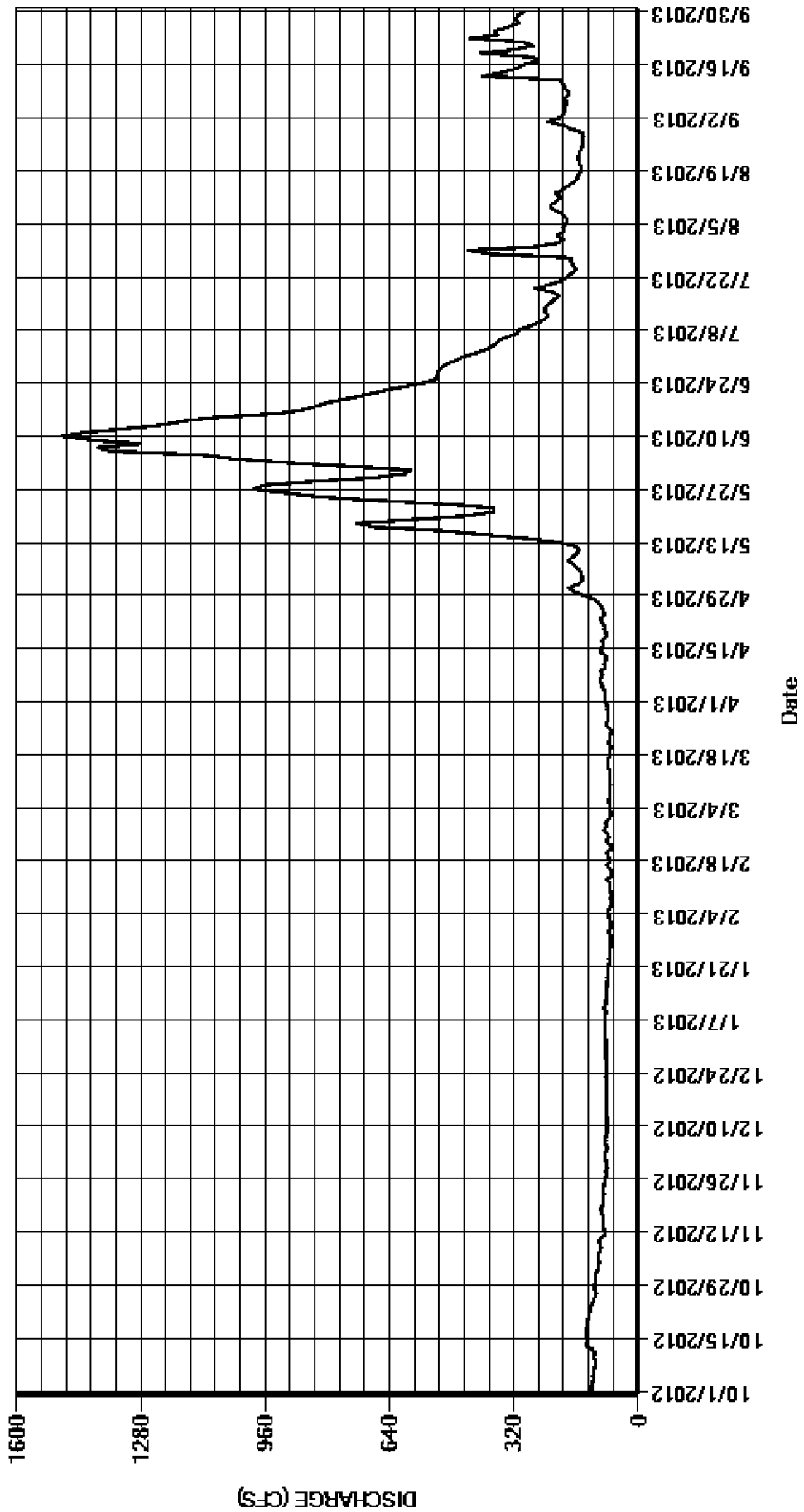
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	120	110	85	e84	71	75	85	180	586	448	194	233
2	122	104	85	e85	72	72	85	154	754	415	209	205
3	118	102	86	e85	76	72	86	144	910	389	192	192
4	115	100	79	e85	76	74	88	146	1040	372	194	189
5	116	103	84	e85	77	75	93	148	1110	361	187	188
6	115	102	85	e86	71	77	97	154	1360	340	183	185
7	113	99	85	e86	69	73	97	166	1390	313	192	188
8	109	97	81	e86	71	74	92	179	1280	310	203	181
9	111	100	80	e83	70	75	97	169	1410	281	223	181
10	115	100	e80	e88	73	72	86	158	1480	256	226	190
11	110	88	e80	e84	73	73	87	151	1420	238	211	195
12	120	85	e80	e84	74	73	84	166	1310	232	199	200
13	136	90	e81	e83	81	74	85	206	1220	241	214	399
14	131	90	e81	e82	68	75	98	287	1170	239	195	352
15	133	90	e81	e81	68	78	95	396	1080	227	183	316
16	134	89	e81	e80	76	78	90	498	922	217	166	294
17	136	94	e81	e80	79	76	92	678	861	203	158	258
18	132	96	e82	e79	72	73	83	724	826	221	153	271
19	131	92	e82	e78	77	74	84	573	794	264	147	405
20	129	91	e82	e77	80	70	87	436	741	227	147	317
21	127	90	e82	e76	71	78	88	372	694	199	152	271
22	125	89	e82	e75	71	73	94	373	652	183	153	294
23	123	89	e83	e75	82	74	97	494	603	172	154	432
24	118	89	e83	e74	75	69	86	669	552	159	151	363
25	115	87	e83	e73	79	77	90	821	519	168	146	367
26	111	85	e83	e72	87	83	95	906	517	175	144	334
27	109	81	e83	71	83	77	102	989	516	173	143	309
28	113	85	e84	72	84	77	115	966	508	378	142	316
29	113	81	e84	71	---	77	142	840	493	439	143	310
30	111	82	e84	78	---	79	167	681	470	264	174	294
31	111	---	e84	72	---	80	---	600	---	207	193	---
TOTAL	3722	2780	2556	2470	2106	2327	2867	13424	27188	8311	5471	8229
MEAN	120	92.7	82.5	79.7	75.2	75.1	95.6	433	906	268	176	274
AC-FT	7380	5510	5070	4900	4180	4620	5690	26630	53930	16480	10850	16320
MAX	136	110	86	88	87	83	167	989	1480	448	226	432
MIN	109	81	79	71	68	69	83	144	470	159	142	181

CAL YR	2012	TOTAL	60295	MEAN	165	MAX	626	MIN	79	AC-FT	119600
WTR YR	2013	TOTAL	81451	MEAN	223	MAX	1480	MIN	68	AC-FT	161600

MAX DISCH: 2010 CFS AT 00:30 ON JUN 11, 2013 GH 5.43 FT SHIFT 0.00 FT  
 MAX GH: 5.43 FT AT 00:30 ON JUN 11, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ROARING FORK RIVER BELOW MAROON CREEK NEAR ASPEN  
WY2013 HYDROGRAPH



ROARING FORK RIVER BASIN  
09077200 FRYINGPAN RIVER NEAR IVANHOE LAKE

Water Year 2013

Location.-- Lat. 39° 14' 42", Long. 106° 31' 50", unsurveyed in Pitkin County, Hydrologic Unit 14010004. Located on left bank 100 ft downstream from diversion dam, 2 mi southwest of Ivanhoe Lake, and 9.1 mi southeast of Norrie, CO.

Drainage Area and Period of Record.-- 18.7 sq mi. from topographic map.;

Equipment.-- Sutron Model SDR-0001-4 stage discharge recorder in 3'-0" square doghouse style metal-clad shelter on 24-inch diameter corrugated metal stilling well located directly in stream. SDR is set by drop tape to an inside reference point on edge of equipment shelf. The SDR is hardwired to Chapman control house where a SatLink2 data collection platform (DCP) provides satellite transmission. No changes this water year.

Hydrologic Conditions.-- Drainage basin is National Forest land, primarily wilderness area. Diversion dam is just upstream of gage. Diverted water and discharge from Fryingpan-Arkansas collection tunnels (north and south tunnels converge above station) flow into Charles H. Boustead Tunnel, which carries water transmountain to the Arkansas River basin (since May 16, 1972). Well and control freeze during winter months.

Gage-Height Record.-- The primary record is 15-minute data downloaded from the SDR. Satellite transmitted data is used as backup when available. The record is complete and reliable for water year 2013, except for periods when stilling well and control were frozen (October 24-31, 2012 and Nov 10, 2012- May 5, 2013), and period of inaccurate GH data (Nov 4-5). No instrument correction were applied during WY13.

Datum Corrections.-- levels were not run in WY13. Levels were last run on Jul. 12, 2012. No corrections were made since the RP\_DT index and TL\_DT were found to be within the accepted error tolerance.

Rating.-- Channel is composed of boulders and cobbles. Control is a 9.8 ft wide rectangular concrete weir. Rating No. 9, developed in water year 2011, was used throughout all of water year 2012. Six discharge measurements (Nos. 396-401) made during water year 2013, and No. 402 made subsequently, were used for analysis. Measurements ranged from 6.21 cfs to 77.7 cfs which covered the range in stage experienced during the year except for the lower daily flows on Nov 11-12, 20-30, Dec 1-31, 2012; Jan 1-31; Feb 1-28; Mar 1-14, 18-24, 27-29, Apr 25, and May 2-10 2013; and higher daily flows of Jun 28, 29, 2013. The peak discharge of 88.4 cfs occurred at 2115 on Jun. 28, 2013 at a gage height of 1.94 ft with a shift of 0.12 ft. The peak gage height exceeded high Measurement No. 399 by 0.11 ft. in stage.

Discharge.-- Shifting control method was used during the entire water year. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were distributed by time from the beginning of the water year until the consistent period of frozen well on Nov. 10, 2012. Shifts were distributed by time from May 6 through May 11, 2013. Shifts were distributed by stage utilizing variable shift curve FRYIVLCOVS13a from May 12, 2013 through the end of the water year. Measurements showed unadjusted shifts ranged from +0.01ft to +0.12 ft. Measurements Nos. 398, 400 and 401 were discounted from -3% to +5% to smooth shift distribution.

Special Computations.-- Average daily discharges for periods of frozen well (Oct 24-31, 2012 and Nov 10, 2012 through May 5, 2013) and inaccurate GH (Nov 4-5, 2012) were estimated from hydrographic comparison with the downstream gage on the Fryingpan River near Thomasville gage (FRYTHOCO). Diversions associated with the Fryingpan-Arkansas project were not occurring during the estimated periods of record, which allows reasonable estimates of discharge using this method.

Remarks.-- Record is good, except for periods of frozen well and bad GH data should are rated poor. The peak instantaneous flow should be considered good. Gaging station operated, maintained and record developed by Craig Bruner.

Recommendations.-- Gage requires independent data collection platform and transmission equipment due to unreliable transmissions common to all index gages associated with the upper Fryingpan-Arkansas collection system.



STATE OF COLORADO  
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09077200 FRYINGPAN RIVER NEAR IVANHOE LAKE

RATING TABLE-- FRYIVLCO09 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

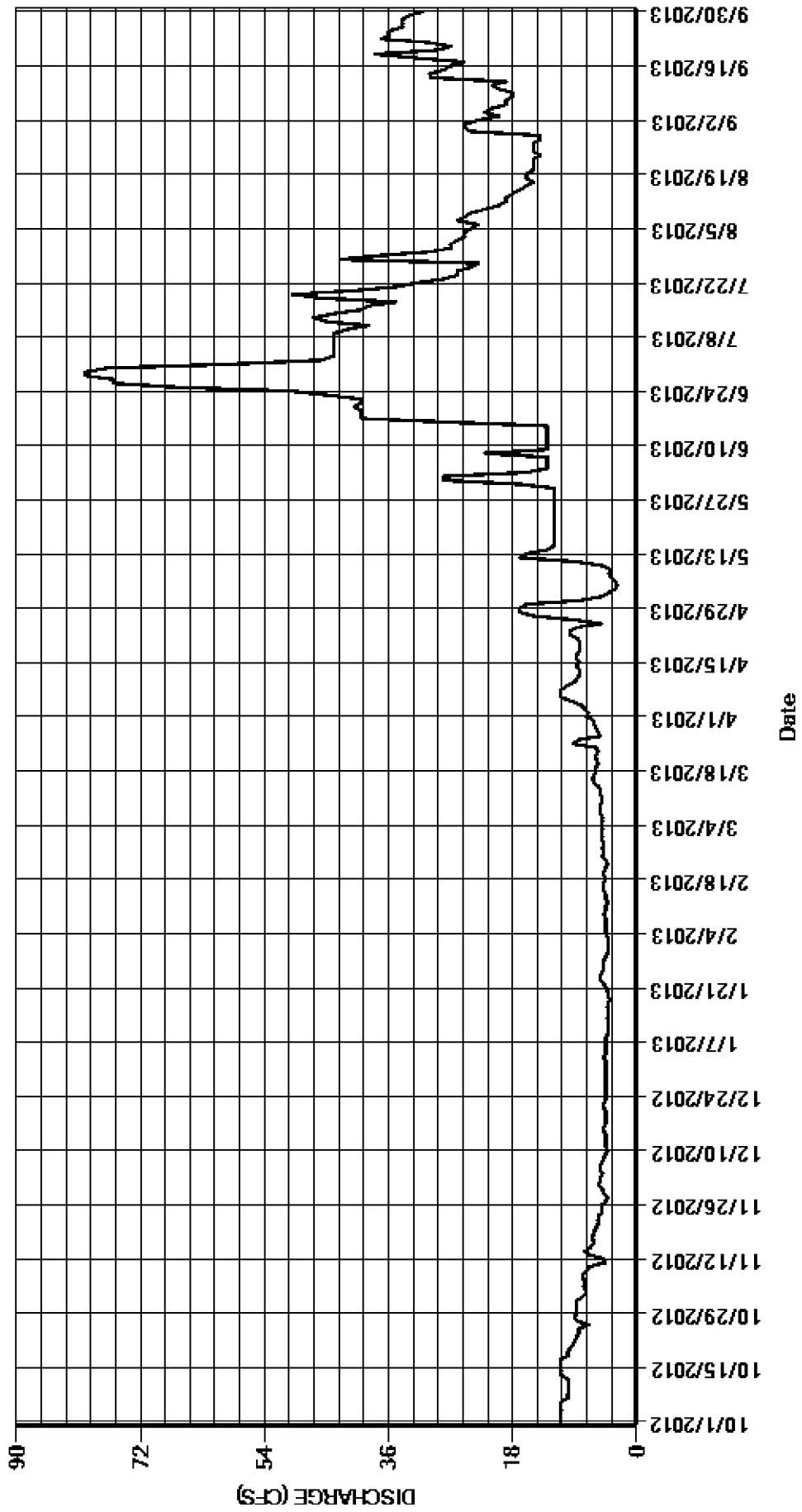
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	8.8	e5.6	e4.5	e4.2	e5.0	e7.3	e8.0	28	59	27	25
2	11	8.0	e5.3	e4.5	e4.2	e5.0	e7.0	e5.0	28	46	26	23
3	11	7.4	e5.3	e4.8	e4.2	e5.0	e7.5	e4.0	16	44	25	20
4	11	e7.4	e5.0	e4.5	e4.5	e5.0	e8.1	e3.0	13	44	25	22
5	11	e7.7	e5.3	e4.5	e4.5	e5.0	e9.4	e2.9	13	44	24	21
6	11	7.4	e5.3	e4.5	e4.5	e5.0	e11	3.1	13	44	23	19
7	10	7.8	e5.0	e4.5	e4.5	e5.3	e11	3.7	13	44	26	19
8	10	7.8	e4.8	e4.5	e4.5	e5.3	e11	4.0	22	44	25	18
9	9.9	7.2	e4.5	e4.2	e4.8	e5.3	e10	3.8	13	44	24	18
10	9.9	e6.8	e4.2	e4.2	e4.5	e5.0	e9.0	5.1	13	42	22	20
11	9.9	e4.6	e4.5	e4.2	e4.5	e5.0	e8.5	8.9	13	39	20	21
12	10	e4.9	e4.5	e4.2	e4.2	e5.3	e8.3	17	13	45	19	19
13	11	e6.9	e4.5	e4.2	e4.5	e5.3	e8.3	16	13	47	19	30
14	11	e7.5	e4.5	e4.2	e4.5	e5.6	e8.8	13	13	44	18	30
15	11	e6.7	e4.8	e4.2	e4.8	e6.2	e8.3	12	13	40	17	28
16	11	e6.2	e4.8	e4.2	e4.8	e6.4	e8.8	12	28	39	16	27
17	11	e6.4	e4.5	e4.2	e4.8	e6.2	e8.7	12	40	35	15	25
18	10	e6.4	e4.5	e3.9	e4.5	e5.9	e8.3	12	40	46	16	32
19	10	e6.2	e4.5	e4.2	e4.8	e5.9	e8.3	12	40	50	16	38
20	9.6	e5.9	e4.5	e4.2	e4.8	e5.6	e8.3	12	41	41	15	29
21	9.2	e5.6	e4.8	e4.5	e4.5	e5.9	e8.5	12	40	35	15	27
22	8.9	e5.6	e4.8	e4.8	e4.2	e5.9	e9.7	12	40	32	15	30
23	8.7	e5.6	e4.5	e5.3	e4.5	e5.6	e9.7	12	45	28	15	37
24	e8.4	e5.0	e4.5	e5.3	e5.0	e5.9	e8.7	12	50	26	14	36
25	e8.4	e5.0	e4.5	e5.0	e4.8	e9.2	e5.1	12	67	26	15	36
26	e7.0	e5.0	e4.5	e4.8	e5.0	e8.4	e9.0	12	76	24	15	34
27	e8.7	e4.5	e4.5	e4.8	e4.8	e5.3	e15	12	76	23	15	34
28	e9.0	e4.2	e4.5	e4.8	e5.0	e5.6	e17	12	80	43	14	34
29	e8.7	e4.8	e4.5	e4.5	---	e5.9	e17	12	80	37	14	33
30	e8.7	e5.0	e4.5	e4.2	---	e6.2	e16	12	77	30	24	31
31	e8.7	---	e4.5	e4.2	---	e6.3	---	17	---	27	25	---
TOTAL	304.7	188.3	146.0	138.6	128.4	178.5	291.6	306.5	1057	1212	599	816
MEAN	9.83	6.28	4.71	4.47	4.59	5.76	9.72	9.89	35.2	39.1	19.3	27.2
AC-FT	604	373	290	275	255	354	578	608	2100	2400	1190	1620
MAX	11	8.8	5.6	5.3	5.0	9.2	17	17	80	59	27	38
MIN	7.0	4.2	4.2	3.9	4.2	5.0	5.1	2.9	13	23	14	18

CAL YR	2012	TOTAL	5286.1	MEAN	14.4	MAX	53	MIN	2.7	AC-FT	10480
WTR YR	2013	TOTAL	5366.6	MEAN	14.7	MAX	80	MIN	2.9	AC-FT	10640

MAX DISCH: 88.4 CFS AT 21:15 ON JUN 28, 2013 GH 1.94 FT SHIFT 0.12 FT  
 MAX GH: 1.94 FT AT 21:15 ON JUN 28, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077200 FRYINGPAN RIVER NEAR IVANHOE LAKE  
WY2013 HYDROGRAPH



ROARING FORK RIVER BASIN  
09077610 IVANHOE CREEK NEAR NAST  
Water Year 2013

Location.-- Lat. 39°17'13", Long. 106°33'31", unsurveyed, Pitkin County, Hydrologic Unit 14010004, on left bank 60 ft upstream from culvert under Nast Tunnel, 300 ft downstream from diversion dam, 2.3 mi east of Nast, and 5.8 mi southeast of Norrie, CO.

Drainage Area and Period of Record.-- Drainage area is 9.43 mi<sup>2</sup>. ;

Equipment.-- Sutron Model SDR-001-4 stage discharge recorder (SDR) housed in a 3'-0" square metal-clad shelter on 24" diameter corrugated metal well located directly in stream. The SDR is hard-wired to Chapman Control House and configured to transmit gage height via 4-20 mA output. SDR is set by drop tape to inside reference point. The SDR was replaced by the USBR with an equivalent Sutron Model SDR-0001-4 on May 21, 2012. No changes this water year.

Hydrologic Conditions.-- Basin is USFS land with several seasonal roads. Transmountain diversions occur just upstream of station and are diverted to Arkansas River Basin through Charles H. Boustead Tunnel.

Gage-Height Record.-- The primary record is 15-minute data downloaded from the SDR. Satellite transmitted data is used for comparison/verification when available. Intermittent missing 15-min stage values were prorated between adjacent good gage height data. The record is complete and reliable for Water Year 2013, except periods where SDR float was beached on sediment accumulation in the well (Oct 10-12, 2012); stilling well was frozen (Oct 26-29, 2012, and Nov 9, 2012 - May 15, 2013), and the float tape was broken (Jun 11-13, 2013). Two minor instrument corrections were made during water year 2013.

Datum Corrections.-- Levels were not run in Water Year 2013. Levels were last run Jul 12, 2012 when the RP index and drop tape length were found to be within the allowable error tolerances.

Rating.-- Low water control is 120 degree v-notch weir approximately 30 ft below gage. Rating No. 4, in use since October 1, 1996, was used for the entire water year. Five discharge measurements (Nos. 253-257) made during Water Year 2013, and No. 258 made subsequently, were used for analysis. Measurements ranged from 0.78 to 4.19 cfs, which covered the range experienced during the year except for lower daily flows on Oct 6-12, Nov 11, 12, 20-30; Dec 1-31; Jan 1-31; Feb 1-28, 2013; Mar 1-6, 10, 11; and higher daily flows on Jun 9-13, 18-19, 30; Jul 18, 19, 28, 29 Aug 31; and Sep 25-30, 2013. The peak discharge of 91.3 cfs occurred at 2230 on Jun 10, 2013 at a gage height of 2.77 ft with a shift of 0.01 ft. The peak gage height exceeded high Measurement 255 by 1.76 feet in stage.

Discharge.-- Shifting control method was used during the entire water year. Shifts were applied as defined by measurements and were distributed by stage. Shifts were distributed by stage utilizing variable shift curve IVCRNACOV513A from 1415 on Oct. 1, 2012 until 1330 on Oct. 28, 2013. Measurements showed shifts ranged from -0.06 ft to 0.00 ft. Shifts were applied directly and given full weight except for Measurement Nos. 255 and 257 which were discounted -9% and 4% respectively to develop the stage-shift relationship. The shift for Measurement No. 254 was not used because the well was frozen.

Special Computations.-- Average daily discharge for periods of beached SDR float (Oct 10-12, 2012), frozen well (Oct 26-29, 2012, Nov 9, 2012 through May 15, 2013), and broken float tape (Jun 11-13, 2013) were estimated from adjacent days of good record and GH, point in time measurements and hydrographic comparison with the downstream gage on the Fryngpan River near Thomasville (FRYTHOCO). Diversions associated with the Fryngpan-Arkansas project were not occurring during the beached SDR float and frozen well estimated periods of record, which allows reasonable estimates of discharge using this method.

Remarks.-- Record is good except for periods of beached SDR float, frozen well, and broken float tape, which are estimated and should be considered poor. The peak instantaneous flow likely occurred on June 11, 2013 (period of broken float tape), in conjunction with surrounding gage peak flows, and is therefore considered poor. Station maintained and record developed by Craig Bruner.

Recommendations.-- Gage requires independent data collection platform and transmission equipment due to unreliable transmissions common to all index gages associated with the Fryngpan-Arkansas collection system. An adjustable R.P. needs to be installed in the equipment shelter. Coordination with the USBR to obtain measurements in the 5 - 50 range (during maximum collection system operation) to verify the stage-discharge relationship.

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09077610 IVANHOE CREEK NEAR NAST

RATING TABLE-- IVCRNACO04 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

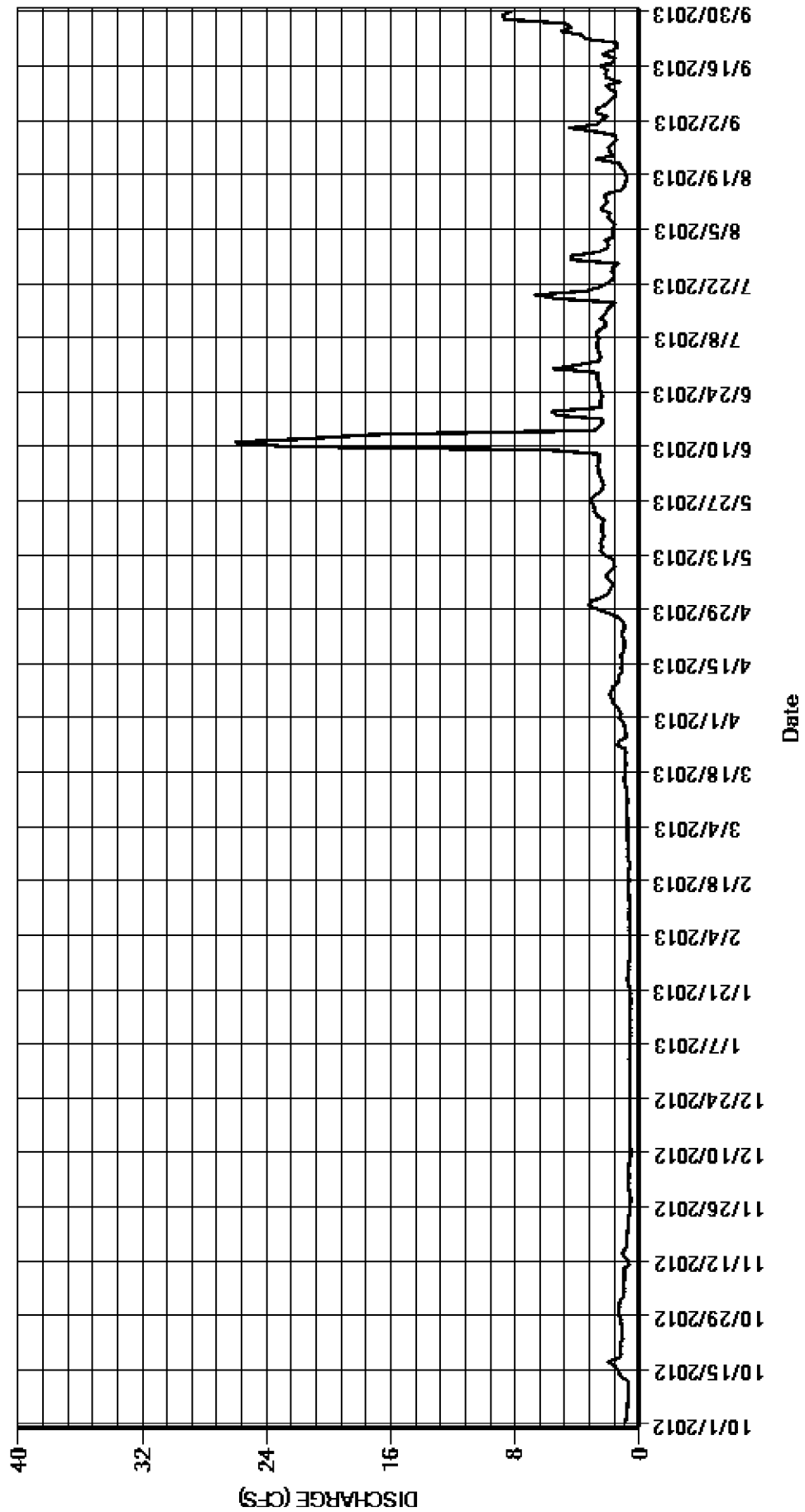
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.98	1.3	e0.73	e0.61	e0.60	e0.76	e1.3	e3.1	2.4	3.9	2.0	2.7
2	0.88	1.2	e0.69	e0.61	e0.61	e0.76	e1.2	e2.4	2.5	2.6	2.2	2.5
3	0.84	1.0	e0.69	e0.65	e0.61	e0.76	e1.3	e2.0	2.6	2.5	1.7	2.1
4	0.80	0.99	e0.66	e0.62	e0.65	e0.76	e1.5	e1.9	2.6	2.6	1.7	2.8
5	0.78	1.0	e0.70	e0.62	e0.65	e0.76	e1.7	e1.7	2.7	2.7	1.7	2.7
6	0.77	1.0	e0.70	e0.62	e0.65	e0.76	e1.8	e1.8	2.6	2.7	1.6	2.2
7	0.73	0.99	e0.66	e0.62	e0.65	e0.81	e1.9	e2.1	2.6	2.7	1.8	1.9
8	0.71	0.97	e0.63	e0.62	e0.65	e0.81	e1.8	e2.1	2.6	2.6	2.0	1.6
9	0.73	0.98	e0.59	e0.58	e0.69	e0.81	e1.7	e1.8	5.6	2.8	1.9	1.5
10	e0.72	e1.0	e0.55	e0.58	e0.65	e0.77	e1.4	e1.6	23	2.6	2.5	1.9
11	e0.72	e0.68	e0.59	e0.58	e0.65	e0.77	e1.3	e1.6	e26	2.2	2.3	2.1
12	e0.73	e0.72	e0.59	e0.59	e0.61	e0.81	e1.3	e1.8	e21	2.2	2.1	1.3
13	1.1	e1.0	e0.59	e0.59	e0.66	e0.81	e1.1	e2.3	e17	2.5	2.2	2.1
14	1.3	e1.1	e0.60	e0.59	e0.66	e0.86	e1.2	e2.5	2.9	2.2	2.2	2.2
15	1.4	e0.96	e0.63	e0.59	e0.70	e0.94	e1.1	2.4	2.6	2.1	1.2	2.1
16	1.6	e0.78	e0.63	e0.59	e0.70	e0.99	e1.1	2.5	2.4	1.9	0.97	2.5
17	2.0	e0.82	e0.60	e0.59	e0.70	e0.95	e1.2	2.4	2.4	1.6	0.89	1.6
18	1.3	e0.82	e0.60	e0.55	e0.66	e0.91	e1.0	2.3	5.3	5.4	0.84	1.6
19	1.2	e0.78	e0.60	e0.59	e0.70	e0.91	e0.98	2.4	5.6	6.7	0.89	2.4
20	1.2	e0.75	e0.60	e0.59	e0.71	e0.87	e0.95	2.4	2.5	3.5	1.0	1.7
21	1.2	e0.72	e0.64	e0.63	e0.67	e0.91	e1.0	2.4	2.5	2.6	1.2	1.4
22	1.2	e0.72	e0.64	e0.67	e0.62	e0.91	e1.1	2.3	2.5	2.1	1.3	1.5
23	1.1	e0.72	e0.60	e0.76	e0.67	e0.87	e1.1	2.7	2.4	1.7	2.8	3.4
24	1.1	e0.65	e0.61	e0.76	e0.75	e0.91	e0.97	2.9	2.5	1.6	1.7	3.7
25	1.1	e0.65	e0.61	e0.72	e0.71	e1.4	e1.0	2.9	2.6	1.8	1.9	5.0
26	e1.1	e0.65	e0.61	e0.68	e0.75	e1.3	e1.1	3.0	2.6	1.7	2.0	4.4
27	e1.2	e0.58	e0.61	e0.68	e0.71	e0.83	e1.4	3.2	2.7	1.4	1.7	4.8
28	e1.2	e0.54	e0.61	e0.68	e0.76	e0.88	e2.0	3.0	2.7	4.4	1.5	8.7
29	e1.3	e0.62	e0.61	e0.64	---	e0.92	e2.7	2.6	2.7	4.4	1.5	8.8
30	1.3	e0.65	e0.61	e0.60	---	e0.97	e3.3	2.4	5.5	2.7	2.8	8.3
31	1.3	---	e0.61	e0.60	---	e1.1	---	2.3	---	2.1	4.5	---
TOTAL	33.59	25.34	19.39	19.40	18.80	27.58	42.50	72.8	165.6	84.5	56.59	91.5
MEAN	1.08	0.84	0.63	0.63	0.67	0.89	1.42	2.35	5.52	2.73	1.83	3.05
AC-FT	67	50	38	38	37	55	84	144	328	168	112	181
MAX	2.0	1.3	0.73	0.76	0.76	1.4	3.3	3.2	26	6.7	4.5	8.8
MIN	0.71	0.54	0.55	0.55	0.60	0.76	0.95	1.6	2.4	1.4	0.84	1.3

CAL YR	2012	TOTAL	803.47	MEAN	2.20	MAX	15	MIN	0.31	AC-FT	1590
WTR YR	2013	TOTAL	657.59	MEAN	1.80	MAX	26	MIN	0.54	AC-FT	1300

MAX DISCH: 91.3 CFS AT 22:30 ON JUN 10, 2013 GH 2.77 FT SHIFT 0.01 FT  
MAX GH: 2.72 FT AT 23:30 ON JUN 10, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077610 IVANHOE CREEK NEAR NAST  
WY2013 HYDROGRAPH



## ROARING FORK RIVER BASIN

09077800 SOUTH FORK FRYINGPAN RIVER AT UPPER STATION NEAR NORRIE

Water Year 2013

Location.-- Lat. 39°14'20", Long. 106°35'24", unsurveyed, Pitkin County, Hydrologic Unit 14010004, on right bank 300 ft downstream from diversion dam, 5.2 mi upstream from mouth, and 7.2 mi southeast of Norrie, CO.

Drainage Area and Period of Record.-- 11.5 mi<sup>2</sup>; Oct. 1, 1963 to present.

Equipment.-- Sutron Model SDR-0001-4 stage discharge recorder (SDR) on rectangular platform with removable steel cover on 12-in diameter corrugated metal well located directly in stream. The SDR is hard-wired to Chapman Control House and configured to transmit 4-20 mA gage height via satellite. SDR is set by drop tape to a reference point (1/4 in brass bolt) on outside of downstream side of shelter previously used for a graphic recorder. No other changes this water year.

Hydrologic Conditions.-- Drainage Basin is National Forest land, primarily wilderness area. Transmountain diversions occur just upstream of station and are diverted to Arkansas River Basin through Charles H. Boustead Tunnel.

Gage-Height Record.-- The primary record is 15-minute logged gage height data downloaded from the SDR. SDR GH record for the entire year was corrected in accordance with a sensor programming error. The sensor was programmed with an 18 inch wheel size with an actual 12 inch wheel size attached to the SDR. Satellite transmitted data (when available) was used to verify daily gage height trend only. The record is complete and reliable for the water year, except for the periods where well ice affected sensor readings (Oct 18-21, 25-28; Nov 7, 2012 and Apr 9-11, 14-21, 23-28, 2013), and frozen well (Nov 10, 2012 through Mar 31, 2013). All instrument corrections were accounted for in correction of the GH stage data.

Datum Corrections.-- Levels were not run during water year 2013. Levels were last run on Jul. 19, 2012 when the RP index elevation and tape length were found to be within the allowable error tolerances.

Rating.-- Control is 6.2 ft wide concrete weir with a 6 ft concrete apron above the crest. Rating No. 9 was used for the entire water year. The rating is reasonably well-defined from 5 to 115 cfs. Six discharge measurements (Nos. 360-365) made during water year 2013, and No. 366 made subsequently, were used for analysis. Measurements ranged from 2.08 to 43.5 cfs which covered the range in stage experienced during the year except for lower daily flows on Mar 23, 27-31 and Apr 2, 3, 10 -16, 18-26; and the higher daily flows of Jun 22, 23, 29 and 30, 2013. The peak discharge of 103 cfs occurred at 1900 on Jun 10, 2013 at a gage height of 4.03 ft. and a shift of +0.10 ft. It exceeded the stage of Measurement No. 363 by 0.99 ft in stage.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by stage. Shifts distribution by time at the end of the water year 2012 continued until October 17, 2012. New variable shift curve FRYSFUCO\_VS13a was developed based on water year 2013 measurements, and applied from October 18, 2012 through the end of the water year. Measurements showed unadjusted shifts varying from 0.00 ft to +0.10 ft. Shifts were applied directly and given full weight except for measurements 362 and 364 which were discounted +6% and +4% respectively. The shift for measurement no. 360 was not used because of ice-affected well.

Special Computations.-- Erroneous primary stage data was adjusted with algorithms using time-stamped GH calibrations down-loaded from the SDR events log. Average daily discharge for periods where well ice affected sensor readings (Oct 18-21, 25-28; Nov 7, 2012 and Apr 9-11, 14-21, and 23-28, 2013), and frozen well (Nov 10, 2012 - Mar 31, 2013) were estimated from adjacent periods of good GH, point in time measurements, and hydrographic comparison with downstream gage on Fryingpan River near Thomasville (FRYTHOCO). Diversions associated with the Fryingpan-Arkansas Project were not occurring during the estimated periods of record, which allows reasonable estimates of discharge using this method.

Remarks.-- Record is rated fair due to corrected stage record and lack of backup stage data. Periods when the well was ice affected and frozen were estimated and should be considered considered poor. The instantaneous peak discharge should be considered fair. Gage is operated and record developed by Craig Bruner.

Recommendations.-- Gage requires independent data collection platform and transmission equipment due to unreliable transmissions common to all index gages associated with the Fryingpan-Arkansas collection system. Gage requires secondary sensor for backup data. Avalanche danger typically limits vehicle access until late May.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09077800 SOUTH FORK FRYINGPAN RIVER AT UPPER STATION NEAR NORRIE

RATING TABLE-- FRYSFUCO09 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

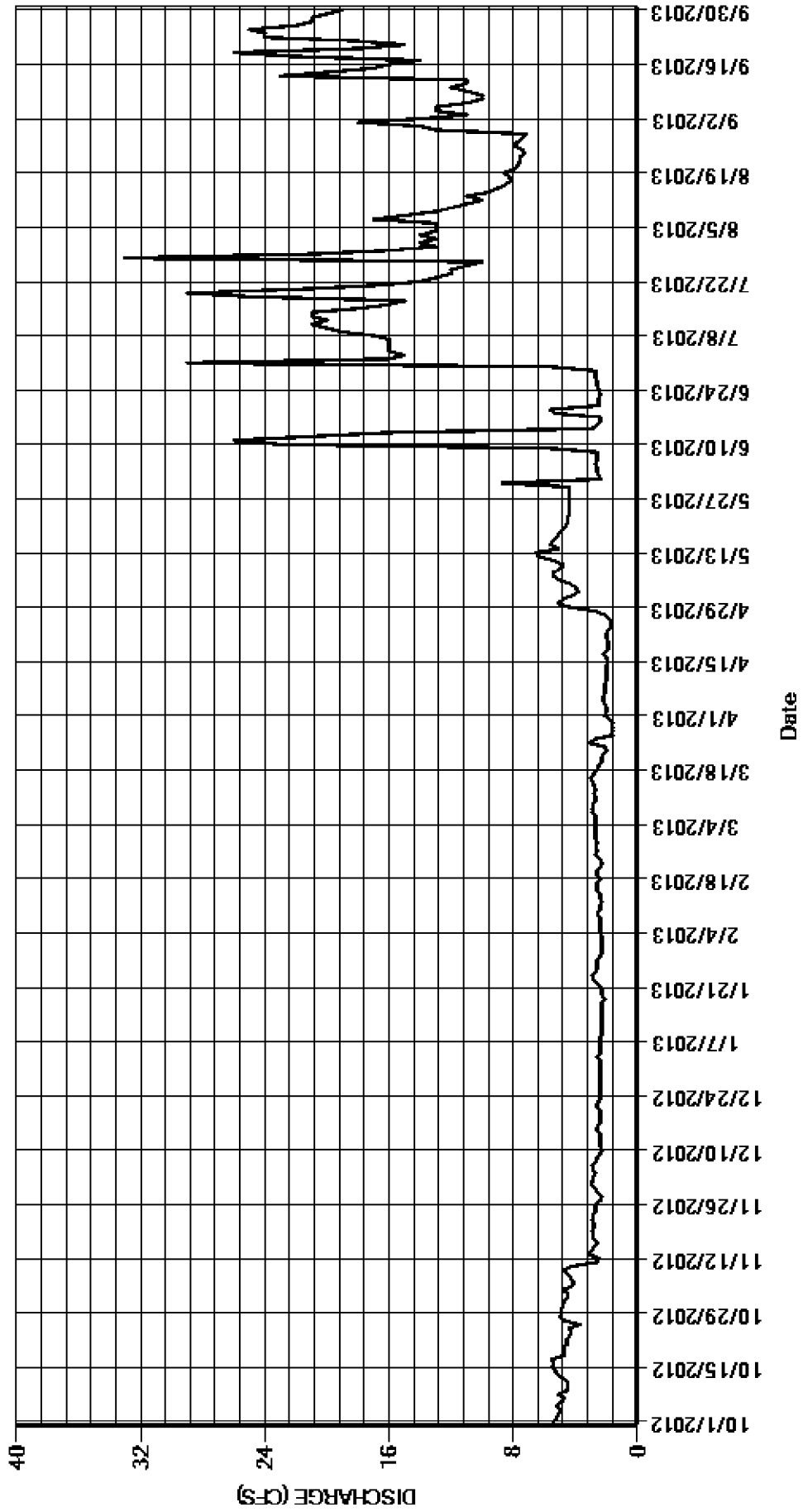
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.4	4.7	e3.0	e2.4	e2.3	e2.7	2.1	4.8	2.4	29	14	18
2	5.2	4.5	e2.9	e2.4	e2.3	e2.7	2.0	4.2	2.5	16	13	14
3	5.1	4.5	e2.9	e2.6	e2.3	e2.7	2.0	3.8	2.6	15	14	11
4	5.0	4.8	e2.7	e2.4	e2.4	e2.7	2.1	4.0	2.6	16	13	13
5	5.2	4.2	e2.9	e2.4	e2.4	e2.7	2.2	4.3	2.7	16	13	13
6	4.9	4.1	e2.9	e2.4	e2.4	e2.7	2.2	5.0	2.6	16	13	11
7	4.7	e4.3	e2.7	e2.4	e2.4	e2.9	2.1	5.4	2.6	16	17	10
8	5.1	4.5	e2.6	e2.4	e2.4	e2.9	2.1	5.4	2.6	17	15	10
9	4.5	4.7	e2.4	e2.3	e2.6	e2.9	e2.1	4.9	5.6	19	13	11
10	4.5	e4.2	e2.3	e2.3	e2.4	e2.7	e2.0	4.8	23	20	12	12
11	4.5	e2.6	e2.4	e2.3	e2.4	e2.7	e2.0	5.4	e26	21	11	11
12	4.8	e2.5	e2.4	e2.3	e2.3	e2.8	2.0	6.4	e21	20	10	11
13	5.1	e3.1	e2.4	e2.3	e2.4	e2.7	2.0	6.5	e16	21	11	23
14	5.3	e3.0	e2.4	e2.3	e2.4	e2.8	e2.0	5.1	2.9	21	9.6	20
15	5.5	e2.8	e2.6	e2.3	e2.6	e2.9	e1.9	5.6	2.6	18	9.0	17
16	5.4	e2.6	e2.6	e2.3	e2.6	e3.0	e2.0	5.5	2.4	16	8.5	16
17	5.5	e2.8	e2.4	e2.3	e2.6	e2.8	e2.2	5.2	2.4	15	8.1	14
18	e4.7	e2.9	e2.4	e2.1	e2.4	e2.6	e1.9	5.1	5.3	25	8.3	22
19	e4.7	e2.9	e2.4	e2.3	e2.6	e2.5	e1.9	4.8	5.6	29	8.6	26
20	e4.8	e2.8	e2.4	e2.3	e2.6	e2.3	e1.9	4.6	2.5	22	7.9	18
21	e4.5	e2.8	e2.6	e2.4	e2.4	e2.3	e2.0	4.5	2.5	17	7.7	15
22	4.6	e2.9	e2.6	e2.6	e2.3	e2.2	2.0	4.5	2.5	14	7.6	18
23	4.4	e2.9	e2.4	e2.9	e2.4	e2.0	e1.9	4.4	2.4	13	7.6	24
24	4.3	e2.7	e2.4	e2.9	e2.7	e2.1	e1.7	4.4	2.5	12	7.3	24
25	e4.4	e2.7	e2.4	e2.7	e2.6	e3.1	e1.7	4.4	2.6	12	7.4	25
26	e3.7	e2.7	e2.4	e2.6	e2.7	e2.7	e1.8	4.4	2.6	11	8.0	22
27	e4.7	e2.4	e2.4	e2.6	e2.6	e1.6	e2.1	4.4	2.7	10	7.7	21
28	e5.0	e2.3	e2.4	e2.6	e2.7	e1.6	e2.7	4.4	2.7	33	7.4	21
29	4.9	e2.6	e2.4	e2.4	---	e1.6	4.4	4.4	2.7	21	7.2	20
30	4.9	e2.7	e2.4	e2.3	---	e1.6	5.1	4.4	5.5	16	13	19
31	4.8	---	e2.4	e2.3	---	e1.8	---	8.7	---	13	14	---
TOTAL	150.1	99.2	78.5	75.1	69.2	77.3	66.1	153.7	164.6	560	323.9	510
MEAN	4.84	3.31	2.53	2.42	2.47	2.49	2.20	4.96	5.49	18.1	10.4	17.0
AC-FT	298	197	156	149	137	153	131	305	326	1110	642	1010
MAX	5.5	4.8	3.0	2.9	2.7	3.1	5.1	8.7	26	33	17	26
MIN	3.7	2.3	2.3	2.1	2.3	1.6	1.7	3.8	2.4	10	7.2	10

CAL YR	2012	TOTAL	3258.9	MEAN	8.90	MAX	41	MIN	2.2	AC-FT	6460
WTR YR	2013	TOTAL	2327.7	MEAN	6.38	MAX	33	MIN	1.6	AC-FT	4620

MAX DISCH: 103 CFS AT 19:00 ON JUN 10, 2013 GH 4.03 FT SHIFT 0.10 FT  
 MAX GH: 4.03 FT AT 19:00 ON JUN 10, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077800 SOUTH FORK FRYINGPAN RIVER AT UPPER STATION NEAR NORRIE  
WY2013 HYDROGRAPH





ROARING FORK RIVER BASIN  
09077945 CHAPMAN GULCH NEAR NAST  
Water Year 2013

Location.-- Lat. 39°15'51", long. 106°37'54", in NW 1/4 of SE 1/4 of Sec. 14, T8S, R83W in Pitkin County, on right bank 700 ft downstream from Chapman diversion tunnel, 3.3 mi upstream from confluence with Fryingpan River, and 4.3 mi southeast of Norrie, CO.

Drainage Area and Period of Record.-- Approximately 6 mi<sup>2</sup> from topographic map. ;

Equipment.-- Sutron model SDR-0001-4 stage discharge recorder in 3 ft. square metal-clad shelter on a 24 inch diameter corrugated metal well located directly in stream. SDR is set by drop tape to an adjustable reference point on edge of equipment shelf opening to the well. SDR is hard-wired to Chapman Control House and configured to transmit gage height via 4-20 mA output. No changes this water year.

Hydrologic Conditions.-- Basin is almost entirely roadless National Forest land. Chapman Diversion for Fryingpan-Arkansas Project is just upstream of gaging station. Hunter Tunnel discharges above the diversion. During winter, ground water seepage from the tunnel flows into the stream and keeps control and gaging station free of ice.

Gage-Height Record.-- The primary record is 15-minute SDR Log data with SDR satellite-transmitted stage data used for backup. Satellite transmitted data was very limited throughout WY2013, but used for comparison when available. The record is complete and reliable for Water Year 2013 except for Jan 16-18, 2013 when the well was frozen. Two minor instrument corrections were applied during the period of record.

Datum Corrections.-- Levels were not run in WY2013. Levels were last run on Jul 12, 2012. No corrections were made since the RP\_DT was found to be within the allowable error tolerance.

Rating.-- Low water control is 120-degree (v-notch) weir approximately 12 ft below gage. High water control is the channel banks. Rating No. 8 was used for the entire water year 2013. Nine discharge measurements (Nos. 400-408) made during WY 2013, and No. 409 made subsequently were used for analysis. Measurements ranged from 1.03 to 24.0 cfs and cover the range of flow experienced during the year except for higher daily flows on Jun 9-11, 24-30 2013. The peak instantaneous flow of 112 cfs occurred at 1945 on Jun 10, 2013 at a gage height of 3.88 ft with a shift of 0.00 ft. Peak gage height exceeded high flow Measurement 406 by 1.13 ft in stage.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were distributed by time from the beginning of water year through Jan. 18, 2013. Shifts were distributed by stage utilizing variable shift curve CHAGULCOVS13 from Jan. 18, 2013 through the end of the water year. Measurement shifts ranged from -0.01 ft to +0.03 ft. Shifts were applied directly and given full weight except measurement Nos.401, 404, 405, 406 and 408 which were discounted -5% to +6% to smooth shift distribution.

Special Computations.-- Daily discharge for Jan 16-18 were estimated by detailed analysis of GH data and mean daily GH values. Intermittent discharge of water diverted from other stream basins in the collection system makes it difficult to estimate gage height from comparison with FRYTHOCO when the Fry-Ark system is operating.

Remarks.-- Record is rated good, except estimated period of frozen well which was estimated and should be considered poor. The peak instantaneous flow should be considered good. Gaging station operated and record developed by Craig Bruner.

Recommendations.-- Station requires upgrade with independent DCP/transmission equipment as soon as possible.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09077945 CHAPMAN GULCH NEAR NAST

RATING TABLE-- CHAGULCO08 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

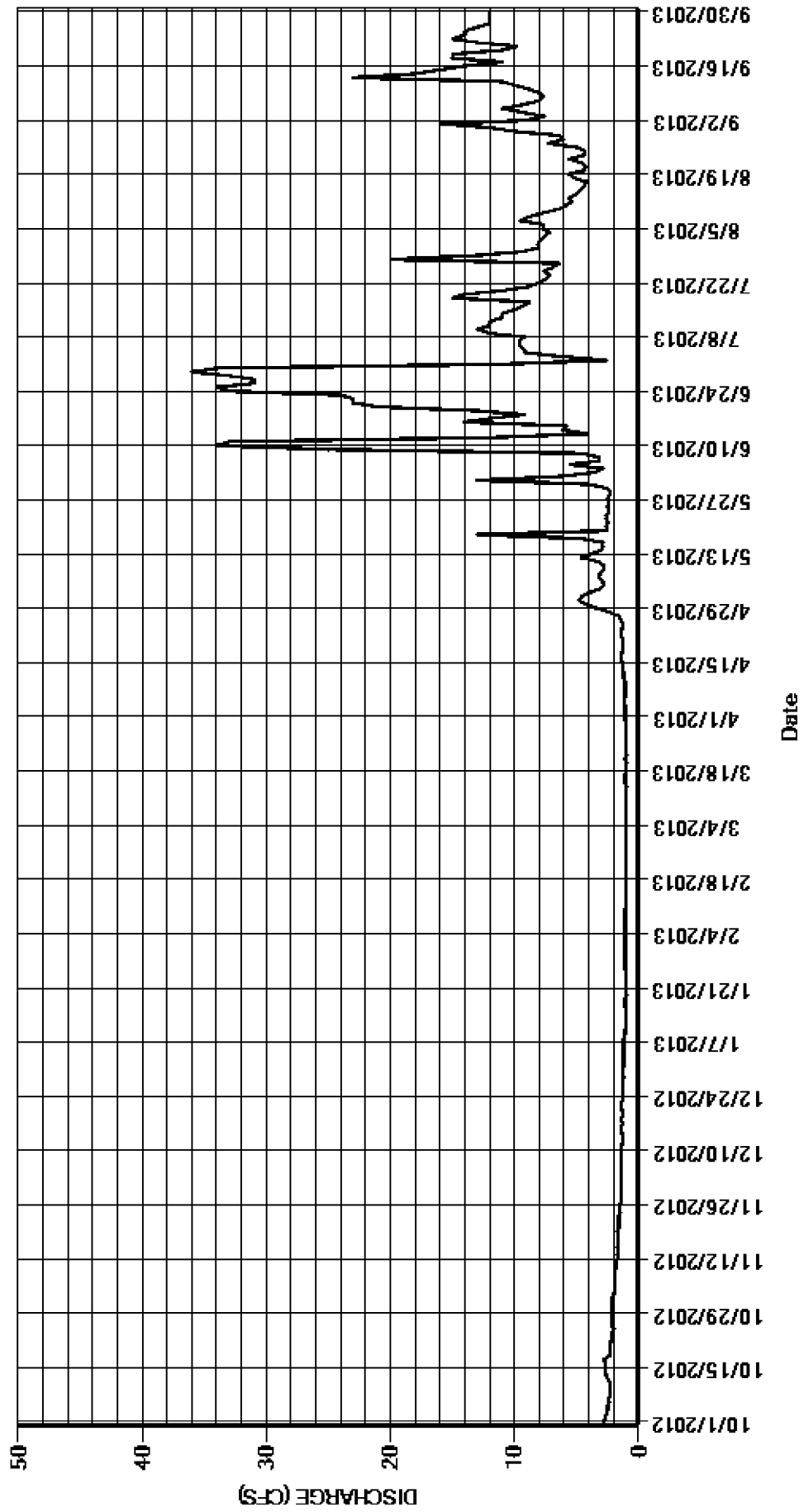
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.8	2.2	1.4	1.2	1.1	1.0	1.1	4.8	13	11	8.1	16
2	2.7	2.1	1.4	1.2	1.1	1.0	1.1	4.6	6.2	2.6	7.9	9.1
3	2.6	2.0	1.4	1.2	1.1	1.0	1.1	3.9	3.6	6.3	7.6	7.6
4	2.5	1.9	1.4	1.2	1.1	1.0	1.1	3.1	2.9	9.2	7.2	9.3
5	2.5	1.9	1.4	1.2	1.1	1.0	1.2	2.8	5.5	9.3	7.7	11
6	2.4	1.9	1.4	1.2	1.1	1.0	1.1	2.9	3.2	9.6	7.7	9.3
7	2.4	1.9	1.4	1.2	1.1	1.0	1.1	3.2	3.2	9.6	9.5	8.0
8	2.3	1.9	1.4	1.2	1.1	1.0	1.1	3.1	4.6	9.2	8.8	7.7
9	2.3	1.9	1.4	1.1	1.1	1.0	1.1	2.8	25	12	7.7	8.0
10	2.3	1.8	1.4	1.1	1.1	1.0	1.1	2.8	34	13	6.5	8.9
11	2.3	1.8	1.4	1.0	1.0	1.0	1.2	3.3	33	12	5.9	10
12	2.5	1.7	1.3	1.0	1.0	1.0	1.2	4.6	12	12	5.4	11
13	2.6	1.7	1.3	1.0	1.0	1.0	1.3	3.8	4.2	11	5.6	23
14	2.7	1.7	1.3	1.0	1.0	1.0	1.3	3.0	6.1	11	5.0	18
15	2.7	1.7	1.4	1.0	1.0	1.1	1.3	2.9	5.8	10	4.7	16
16	2.7	1.7	1.4	e1.1	1.0	1.1	1.4	2.9	14	9.3	4.4	14
17	2.8	1.7	1.3	e1.1	1.0	1.1	1.4	4.6	12	8.8	4.2	11
18	2.3	1.7	1.4	e1.1	1.0	1.0	1.3	13	9.2	15	5.2	15
19	2.3	1.7	1.3	1.0	1.0	1.0	1.3	2.6	13	14	5.6	15
20	2.3	1.6	1.3	1.0	1.0	1.0	1.3	2.6	21	11	4.4	11
21	2.3	1.6	1.4	1.0	1.0	1.1	1.3	2.5	23	8.9	4.2	9.8
22	2.2	1.6	1.4	1.0	1.0	1.0	1.4	2.6	23	8.1	4.6	13
23	2.2	1.6	1.3	1.0	1.0	1.0	1.4	2.6	24	7.5	5.6	15
24	2.1	1.5	1.3	1.0	1.0	1.0	1.3	2.4	33	7.2	4.4	14
25	2.0	1.5	1.3	1.0	1.0	1.0	1.3	2.5	34	7.6	4.3	14
26	2.2	1.5	1.3	1.1	1.0	1.0	1.4	2.4	31	6.9	5.0	13
27	2.2	1.4	1.3	1.1	1.0	1.0	1.6	2.5	31	6.4	7.3	12
28	2.2	1.4	1.3	1.1	1.0	1.0	2.4	2.4	33	20	6.1	12
29	2.2	1.4	1.2	1.1	---	1.0	3.4	2.3	36	13	6.4	12
30	2.2	1.4	1.3	1.1	---	1.0	4.3	2.6	34	9.4	10	12
31	2.2	---	1.3	1.1	---	1.1	---	4.1	---	8.1	12	---
TOTAL	74.0	51.4	41.8	33.7	29.0	31.5	43.9	106.2	533.5	309.0	199.0	365.7
MEAN	2.39	1.71	1.35	1.09	1.04	1.02	1.46	3.43	17.8	9.97	6.42	12.2
AC-FT	147	102	83	67	58	62	87	211	1060	613	395	725
MAX	2.8	2.2	1.4	1.2	1.1	1.1	4.3	13	36	20	12	23
MIN	2.0	1.4	1.2	1.0	1.0	1.0	1.1	2.3	2.9	2.6	4.2	7.6

CAL YR	2012	TOTAL	2013.4	MEAN	5.50	MAX	36	MIN	1.2	AC-FT	3990
WTR YR	2013	TOTAL	1818.7	MEAN	4.98	MAX	36	MIN	1.0	AC-FT	3610

MAX DISCH: 112 CFS AT 19:45 ON JUN 10, 2013 GH 3.88 FT SHIFT 0.00 FT  
 MAX GH: 3.88 FT AT 19:45 ON JUN 10, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077945 CHAPMAN GULCH NEAR NAST  
WY2013 HYDROGRAPH



ROARING FORK RIVER BASIN  
09078500 NORTH FORK FRYINGPAN RIVER NEAR NORRIE  
Water Year 2013

Location.-- Lat. 39°20'34", Long. 106°39'55", in SE¼ of NW¼ of Sec. 21, T8S, R83W in Pitkin County (Hydrologic Unit 14010004). Located on left bank of North Fork of Fryingpan River, 800 ft upstream from bridge on county road, 0.4 mi upstream of confluence with Fryingpan River, 0.5 mi downstream from Last Chance Creek, and 1.3 mi northwest of Norrie, CO.

Drainage Area and Period of Record.-- 42 mi<sup>2</sup>.; Record published by USGS Oct. 1, 1910 to Mar. 31, 1917 and Oct. 1, 1947 to Sep. 30, 1982. Record published Oct. 1, 1982 to present by Colorado Division of Water Resources.

Equipment.-- Sutron Model 56-0540 shaft encoder (SE) and Sutron SatLink2 data collection platform housed in a 42-in diameter corrugated metal shelter and stilling well. An air temperature sensor is mounted on exterior of the shelter. Shaft encoder and Sutron SDR-0001-01 stage discharge recorder (SDR) on separate floats. Recorders set by drop tape to an adjustable reference point on edge of recorder shelf. No changes this water year.

Hydrologic Conditions.-- Basin is primarily USFS land. Diversions for the Fryingpan-Arkansas Project occur in several tributaries upstream of the station. Well and intakes are frozen in winter.

Gage-Height Record.-- The primary record is 15-minute satellite-transmitted shaft encoder data with DCP log data used to fill in missing data due to DCP/transmission errors. The record is complete and reliable for Water Year 2013, except for the periods of Nov. 11 to Nov. 13, 2012 when ice formed on the control and Nov 14, 2012 through May 6, 2013 when the well was frozen. The SDR backup record was not used due to multiple instrument corrections required due to discrepancy with the primary sensor. The discrepancy was caused by the wheel size of the SDR being incorrectly programmed (18-inch programmed with an actual size of 12-inch). A single instrument correction was made during the period of record, +0.03' to the shaft encoder (primary recorder) on May 14, 2013.

Datum Corrections.-- Levels were not run in water year 2013. Levels were last run Jul 19, 2012. The RP\_DT was found to be within the allowable error tolerance.

Rating.-- Control is a boulder riffle approximately 35 ft downstream at lower stages and a large boulder 50 feet downstream of gage at higher stages. Rating 11 in use since May 16, 2010, was used for the entire period of record. The rating is well defined from 1 to 1000 cfs. Seven discharge measurements (Nos.833-839) made during water year 2013, and No. 840 made subsequently, was used for analysis. Measurements ranged in discharge from 2.49 to 117 cfs, which covered the range in stage experienced during the water year except for the lower average daily flows on Jan 9-20, 30, 31, Feb 1-3, 12, 22, 2013, and the higher average daily flows of May 14-18, 24-28, and Jun 3-15, 2013. The peak discharge of 312 cfs occurred at 0200 on Jun 11, 2013 at a gage height of 4.43 ft and a shift of 0.01 ft. The peak gage height exceeded high Measurement No. 836 by 0.71 ft in stage.

Discharge.-- Shifting control method was used for the entire water year. New variable shift curve FRYNFNCOVS13 was developed from FRYNFNCOVS12 and water year 2013 measurements. Shifts were applied as defined by measurements and were distributed by stage for the entire water year using variable shift curve FRYNFNCOVS13. Measurements showed unadjusted shifts ranging from -0.06 to +0.08 ft. All were given full weight and applied directly except for measurements 833 and 839 which were discounted from -2% to -6% to smooth the shift distribution. The shifts for Measurements 834 and 835 were not used because the stage was affected by ice.

Special Computations.-- Average daily discharges for periods of ice-affected gage height and frozen well were estimated by point in time measurements, and hydrographic comparison with average daily discharge from the Fryingpan River near Thomasville (FRYTHOCO) gage. Average daily discharge for the short period of missing GH data was estimated by proration between adjacent days of good record.

Remarks.-- Record is rated good, except for periods of ice affected stage, frozen stilling well, and missing GH data which are estimated and rated poor. The peak instantaneous flow should be considered good. Station maintained and record developed by Craig Bruner.

Recommendations.-- The DCP and transmission equipment will be inspected and repaired/replaced in spring 2014 to correct the transmission errors. The secondary SDR sensor will also be replaced. Levels should be run in water year 2014.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09078500 NORTH FORK FRYINGPAN RIVER NEAR NORRIE

RATING TABLE-- FRYNFNCO11 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

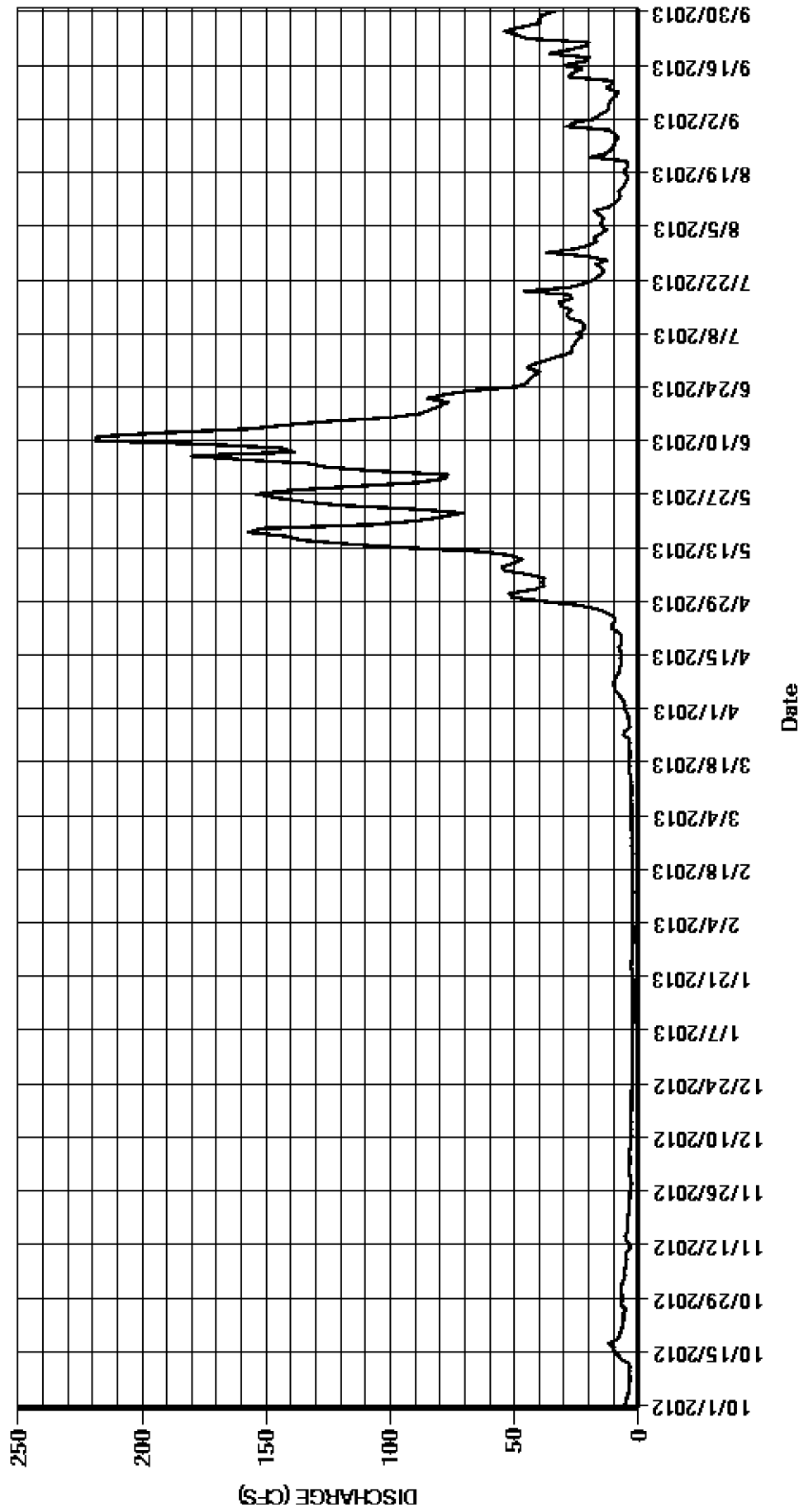
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.7	7.0	e3.9	e2.5	e2.3	e2.8	e5.7	e52	77	37	17	26
2	5.1	6.6	e3.7	e2.5	e2.3	e2.8	e5.6	e42	106	32	18	18
3	4.7	5.7	e3.7	e2.7	e2.3	e2.8	e6.2	e38	126	27	15	16
4	4.2	5.6	e3.5	e2.5	e2.5	e2.8	e7.3	e39	134	27	13	13
5	3.9	5.7	e3.7	e2.5	e2.5	e2.8	e8.5	e38	160	26	15	12
6	3.7	5.4	e3.7	e2.5	e2.5	e2.8	e9.6	e44	180	25	15	12
7	3.6	5.0	e3.5	e2.5	e2.5	e3.0	e10	54	139	23	14	11
8	3.5	4.9	e3.3	e2.5	e2.5	e3.0	e9.8	55	144	25	16	9.1
9	3.7	5.2	e3.1	e2.3	e2.7	e3.0	e9.2	50	174	22	18	8.4
10	3.6	5.0	e2.9	e2.3	e2.5	e2.8	e8.1	47	219	22	12	13
11	3.6	e3.4	e3.1	e2.3	e2.5	e2.8	e7.7	52	218	23	9.6	11
12	4.0	e3.6	e3.0	e2.3	e2.3	e3.0	e7.5	65	191	28	8.0	11
13	7.2	e5.0	e3.0	e2.3	e2.5	e3.0	e6.9	97	156	29	7.4	28
14	8.2	e5.4	e3.0	e2.3	e2.5	e3.2	e7.3	118	142	27	7.9	27
15	10	e4.8	e3.1	e2.3	e2.7	e3.6	e6.9	136	124	31	6.6	23
16	10	e4.4	e3.1	e2.3	e2.7	e3.8	e7.3	142	100	32	5.5	30
17	12	e4.6	e2.9	e2.3	e2.7	e3.7	e7.9	157	88	27	4.7	22
18	9.0	e4.6	e2.9	e2.2	e2.5	e3.6	e6.9	152	84	28	4.4	20
19	7.7	e4.4	e2.8	e2.3	e2.7	e3.6	e6.9	107	80	46	6.2	36
20	7.4	e4.1	e2.8	e2.3	e2.7	e3.5	e6.9	89	77	28	5.0	28
21	6.9	e3.9	e3.0	e2.5	e2.5	e3.7	e8.7	79	85	22	4.5	21
22	6.5	e3.9	e2.9	e2.7	e2.3	e3.7	e11	71	78	18	4.9	20
23	6.2	e3.9	e2.7	e3.0	e2.5	e3.6	e11	90	67	16	19	45
24	6.0	e3.5	e2.7	e3.0	e2.8	e3.8	e9.5	121	49	14	13	49
25	6.1	e3.5	e2.7	e2.8	e2.7	e6.1	e10	135	45	15	11	54
26	5.2	e3.5	e2.7	e2.7	e2.8	e5.6	e13	145	44	17	10	47
27	6.8	e3.1	e2.6	e2.7	e2.7	e3.6	e17	154	42	13	9.5	40
28	6.8	e2.9	e2.6	e2.7	e2.8	e3.8	e25	140	40	20	8.3	40
29	6.6	e3.3	e2.6	e2.5	---	e4.0	e39	114	45	37	9.5	39
30	6.9	e3.5	e2.6	e2.3	---	e4.3	e51	89	42	26	12	34
31	7.0	---	e2.5	e2.3	---	e4.9	---	78	---	20	29	---
TOTAL	191.8	135.4	94.3	76.9	71.5	109.5	347.4	2790	3256	783	349.0	763.5
MEAN	6.19	4.51	3.04	2.48	2.55	3.53	11.6	90.0	109	25.3	11.3	25.4
AC-FT	380	269	187	153	142	217	689	5530	6460	1550	692	1510
MAX	12	7.0	3.9	3.0	2.8	6.1	51	157	219	46	29	54
MIN	3.5	2.9	2.5	2.2	2.3	2.8	5.6	38	40	13	4.4	8.4

CAL YR	2012	TOTAL	5871.6	MEAN	16.0	MAX	97	MIN	2.0	AC-FT	11650
WTR YR	2013	TOTAL	8968.3	MEAN	24.6	MAX	219	MIN	2.2	AC-FT	17790

MAX DISCH: 312 CFS AT 02:00 ON JUN 11, 2013 GH 4.43 FT SHIFT 0.01 FT  
 MAX GH: 4.43 FT AT 02:00 ON JUN 11, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09078500 NORTH FORK FRYING PAN RIVER NEAR NORRIE  
WY2013 HYDROGRAPH



ROARING FORK RIVER BASIN  
09078600 FRYINGPAN RIVER NEAR THOMASVILLE  
Water Year 2013

Location.-- Lat. 39°20'41", Long. 106°40'23", in NW¼NW¼ sec. 21, T.8 S., R.83 W., Pitkin County, Hydrologic Unit 14010004, on right bank 400 ft upstream from private bridge, 400 ft downstream from mouth of North Fork Fryingpan River, 1.6 mi southeast of Thomasville, CO, and 1.7 mi northwest of Norrie, CO.

Drainage Area and Period of Record.-- 134 mi<sup>2</sup>. ; Gage established Oct 1, 1975. Colorado Division of Water Resources began operation of the gage in water year 1977. Published streamflow record from Oct 1, 1975 to present.

Equipment.-- Sutron Stage Discharge Recorder (SDR) and Sutron Constant Flow Bubbler (CFB) in 42" diameter corrugated metal shelter and stilling well. A Sutron SatLink2 data collection platform (DCP) is installed in box mounted on exterior of shelter. The SDR (and CFB) are set by drop tape to an adjustable reference point on edge of equipment shelf in shelter. Stilling well is connected to stream by two, 2-in diameter intake pipes with a standard outside flush tank. On November 28, 2012, the CFB line was extended an addition 20 ft. into the channel. No other changes this water year.

Hydrologic Conditions.-- Drainage basin is almost entirely National Forest land. Transmountain diversions above gage occur through Boustead Tunnel and through Busk-Ivanhoe Tunnel.

Gage-Height Record.-- The primary record is 15-minute satellite-transmitted CFB GH data from Oct. 6, 2012 through Apr. 01, 2013 with stage discharge recorder GH data used for backup. SDR GH data was used from Oct. 1 through Oct. 5, 2012 and Apr. 02, 2013 through the end of WY 2013 with CFB data as backup. The record is complete and reliable, except for the periods Dec. 10-29, 2012 and Jan. 4-12, 2013 when the control was ice affected, Jan 13-18 (erroneous GH data), and Jun. 7-13, 2013 (missing GH data - low battery). Data downloaded from the SDR log was used to fill in most of the missing data when the battery was low. Jun. 8, 9, 2013 remained incomplete. Checks between the primary and backup records generally agreed to within +/- 0.02 ft. A few minor instrument corrections and one flush correction were applied during the period of record. The control was ice affected Dec. 10 through 29, 2012 and Jan. 4 through 12, 2013.

Datum Corrections.-- Levels were not run this water year. Levels were last run on Aug 15, 2012. No corrections were made since the RP elevation and tape length were found to be within the allowable error tolerances.

Rating.-- Control is a 100 ft long concrete weir. Rating No. 3 (developed Nov 18, 2008) was used for the entire water year. The rating is well defined from 20 to 1000 cfs. Nine discharge measurements (Nos. 432-440) made during WY 2013, and No. 441 made subsequently, were used for analysis. Measurements ranged from 13.4 to 272 cfs, which covered the range experienced during the year except for the higher daily flows on May 15-18, 24-28, and Jun 4-15, 2013. The peak discharge of 895 cfs occurred at 0030 on Jun 11, 2013 at a gage height of 3.81 ft with a shift of 0.00 ft. The peak gage height exceeded high Measurement No. 437 by 0.98 ft in stage.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were distributed by stage from beginning of the water year until 1245 on Oct. 05, 2012 utilizing variable shift curve FRYTHOCOVS2012a, and from 0000 on Apr. 1, 2013 until 1345 on Sep. 23, 2013 utilizing variable shift curve FRYTHOCOVS2013b. Shifts were distributed by time from 1300 on Oct. 5, 2012 through 2345 on Mar 31, 2013, and from 1400 on Sep. 23, 2013 through the end of the water year. Measurements showed shifts ranged from -0.05 to +0.01 ft. Measurements 433, and 439 were discounted from -3% to +2% to smooth shift distribution. Measurements 434 and 435 were not used in the shift analysis due to ice-affected control.

Special Computations.-- Discharge for the periods of ice-affected record was estimated by consideration of good record before and after ice, temperature records from the North Fork Fryingpan near Norrie gaging station (FRYNFNCO), and hydrographic comparison with discharge record from the Chapman Gulch near Nast gaging station (CHAGULCO). Daily discharge for Jan 13-18 (bad GH data) was estimated by hydrographic comparison with average daily discharge from the Chapman Gulch near Nast (CHAGULCO) gage and point-in-time flow measurements. Daily discharge for Jun 8, 9 (missing GH data) was estimated by hydrographic comparison with average daily discharge from the downstream gage Fryingpan River at Meredith (FRYMERCO).

Remarks.-- Record is rated good, except for periods when ice affected the stage-discharge relationship and bad/missing GH data, which are rated poor. The peak instantaneous flow should be considered good. Gage operated and record developed by Craig Bruner.

Recommendations.-- Levels should be run again in water year 2014.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09078600 FRYINGPAN RIVER NEAR THOMASVILLE

RATING TABLE-- FRYTHOCO03 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	34	31	20	16	15	18	29	156	216	173	78	106
2	32	29	19	16	15	18	28	125	249	122	82	82
3	31	26	19	17	15	18	30	110	271	110	74	71
4	30	26	18	e16	16	18	35	109	290	115	74	65
5	29	27	19	e16	16	18	41	104	324	114	74	77
6	28	26	19	e16	16	18	46	116	407	115	74	73
7	27	25	18	e16	16	19	48	138	322	108	76	66
8	27	24	17	e16	16	19	47	144	e319	111	81	61
9	29	27	16	e15	17	19	44	132	e417	109	80	57
10	28	25	e15	e15	16	18	39	128	542	110	69	72
11	28	17	e16	e15	16	18	37	135	607	113	61	71
12	29	18	e16	e15	15	19	36	167	490	118	56	73
13	37	25	e16	e15	16	19	33	228	385	126	55	127
14	37	27	e16	e15	16	20	35	270	322	121	54	120
15	40	24	e17	e15	17	22	33	302	284	118	50	109
16	39	22	e17	e15	17	23	35	322	221	115	45	113
17	42	23	e16	e15	17	22	38	344	223	102	43	93
18	35	23	e16	e14	16	21	33	346	208	117	42	89
19	34	22	e16	15	17	21	33	255	216	189	49	147
20	34	21	e16	15	17	20	33	209	212	129	43	109
21	32	20	e17	16	16	21	37	191	227	101	44	90
22	32	20	e17	17	15	21	42	178	224	87	43	91
23	31	20	e16	19	16	20	42	215	212	78	65	158
24	30	18	e16	19	18	21	38	274	198	74	52	148
25	30	18	e16	18	17	33	41	300	200	76	49	157
26	25	18	e16	17	18	30	47	316	203	75	50	144
27	31	16	e16	17	17	19	61	333	200	68	53	132
28	32	15	e16	17	18	20	87	312	202	119	47	136
29	31	17	e16	16	---	21	127	268	221	144	48	135
30	31	18	16	15	---	22	160	215	213	104	65	124
31	31	---	16	15	---	25	---	189	---	84	103	---
TOTAL	986	668	520	494	457	641	1415	6631	8625	3445	1879	3096
MEAN	31.8	22.3	16.8	15.9	16.3	20.7	47.2	214	288	111	60.6	103
AC-FT	1960	1320	1030	980	906	1270	2810	13150	17110	6830	3730	6140
MAX	42	31	20	19	18	33	160	346	607	189	103	158
MIN	25	15	15	14	15	18	28	104	198	68	42	57

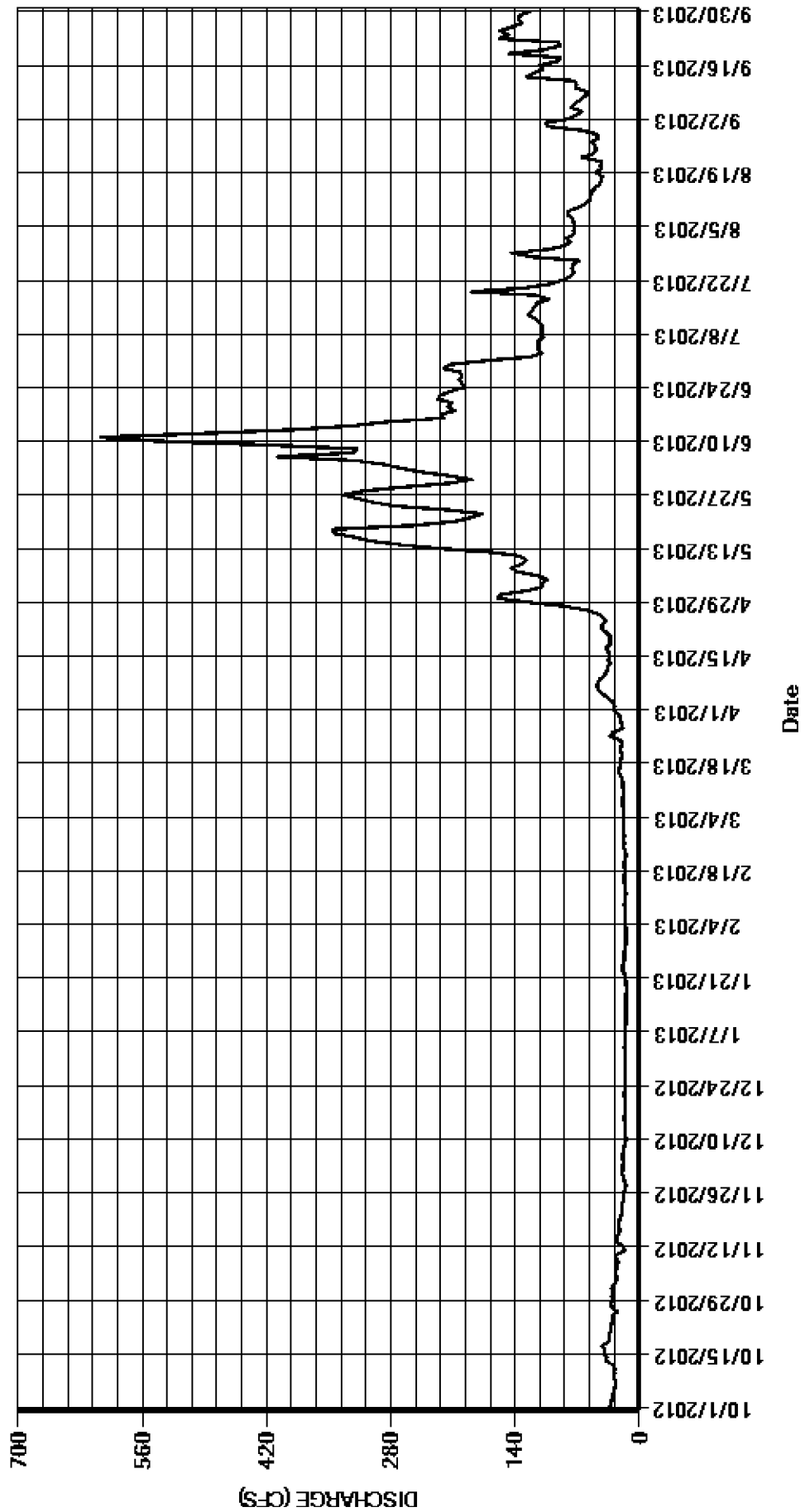
CAL YR	2012	TOTAL	21840	MEAN	59.7	MAX	235	MIN	15	AC-FT	43320
WTR YR	2013	TOTAL	28857	MEAN	79.1	MAX	607	MIN	14	AC-FT	57240

MAX DISCH: 895 CFS AT 00:30 ON JUN 11, 2013 GH 3.81 FT SHIFT 0 FT  
 MAX GH: 3.81 FT AT 00:30 ON JUN 11, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



09078600 FRYINGPAN RIVER NEAR THOMASVILLE  
WY2013 HYDROGRAPH



ROARING FORK RIVER BASIN  
09080100 FRYINGPAN RIVER AT MEREDITH  
Water Year 2013

Location.-- Lat. 39°21'45", Long. 106°43'55", in SE¼SE¼ sec. 11, T.8 S., R.84 W., Eagle County, Hydrologic Unit 14010004, on left bank at Meredith, CO, 0.1 mi downstream from Waterbury Creek, 0.7 mi downstream from Jakeman Gulch.

Drainage Area and Period of Record.-- 191 mi<sup>2</sup>; Record available from Oct. 1, 1910 – Jan. 31, 1915; Oct. 1, 1966 – present.

Equipment.-- Sutron Model 56-0540 shaft encoder and Sutron Stage Discharge Recorder (SDR) housed in a standard 42" diameter corrugated metal shelter and stilling well. A Sutron SatLink2 data collection platform (DCP) is also installed in the shelter. Well is connected to stream by two 2-inch intake pipes with an outside standard flushing tank. An air temperature sensor is mounted on the antennae mast. Shaft encoder and SDR are equipped with separate floats, and referenced by drop tape to an adjustable reference point mounted on the edge of the equipment shelf. On May 14, 2013, the SatLink2 DCP was replaced. No other changes this water year.

Hydrologic Conditions.-- Transmountain diversions above station occur through the Boustead and Busk-Ivanhoe Tunnels.

Gage-Height Record.-- The primary record is logged 15 minute shaft encoder data down-loaded from the DCP, with SDR log used for backup purposes. The record is complete and reliable for Water Year 2013, except for Nov. 11-16 and Nov 25 - Dec 1, 2012, when the stage was affected by ice; and Dec 9, 2012 through May 21, 2013 when the well was frozen. Checks between the primary and backup records generally agreed to within +/- 0.02 ft. Two minor shaft encoder corrections and three flush corrections were applied during the period of record.

Datum Corrections.-- Levels were not run during Water Year 2013. Levels were last run on July 12, 2012.

Rating.-- Low water control is a riffle approximately 80 ft. below the gage house. High water control is the bank of the channel. Rating 4 (in use since October 1, 1984), was used for the entire water year. The rating is well defined from 25 to 1,700 cfs. Five discharge measurements (Nos. 450-454) made during water year 2013, and No. 455 made subsequently were used for analysis. Measurements ranged from 26.9 to 441 cfs, which covered the range experienced during the year except for the lower daily flows of Nov 11, 12, 27-30, Dec 2, 7, 9-31, Jan 1-31, Feb 1-28, and Mar 1-13, 27; and the higher daily flows of May 27-28, and Jun 5-14, 2013. The peak discharge of 1150 cfs occurred at 0145 on Jun 11, 2013 at a gage height of 4.23 ft with a shift of 0.14 ft. The peak gage height exceeded high Measurement No. 453 by 1.06 ft. in stage.

Discharge.-- Shifting control method was used during the entire water year. Shifts were applied as defined by measurements and were distributed by stage. A new stage-shift relationship was developed based on previous variable shift curve FRYMERCOS11A and water year 2013 measurements. New variable shift curve FRYMERCOS13 was applied for the entire water year. Measurements showed shifts ranging from -0.01 to +0.04 ft. Measurement no. 450 was discounted 3% to smooth shift distribution. The shift for measurement 452 was not used due to inaccurate gage height from frozen intake pipes.

Special Computations.-- Daily discharge for periods of ice-affected stage and frozen well was estimated by hydrographic comparison with average daily discharge from the Fryingpan River near Thomasville gage (FRYTHOCO), and a single point-in-time flow measurement.

Remarks.-- Record is rated fair except for periods of ice-affected stage and frozen well which are estimated and considered poor. Station maintained and record developed by Craig Bruner

Recommendations.-- Measurements at stages above 3.50 ft. including at least one measurement at a GH above 4.30 are needed to verify stage-discharge relationship. Heavy ice formation at this gage during the winter makes measurement prohibitive and extremely time-consuming. Gage operation and record development over the 8 month period Apr. 1 through Nov. 30 should be considered.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09080100 FRYINGPAN RIVER AT MEREDITH

RATING TABLE-- FRYMERCO04 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

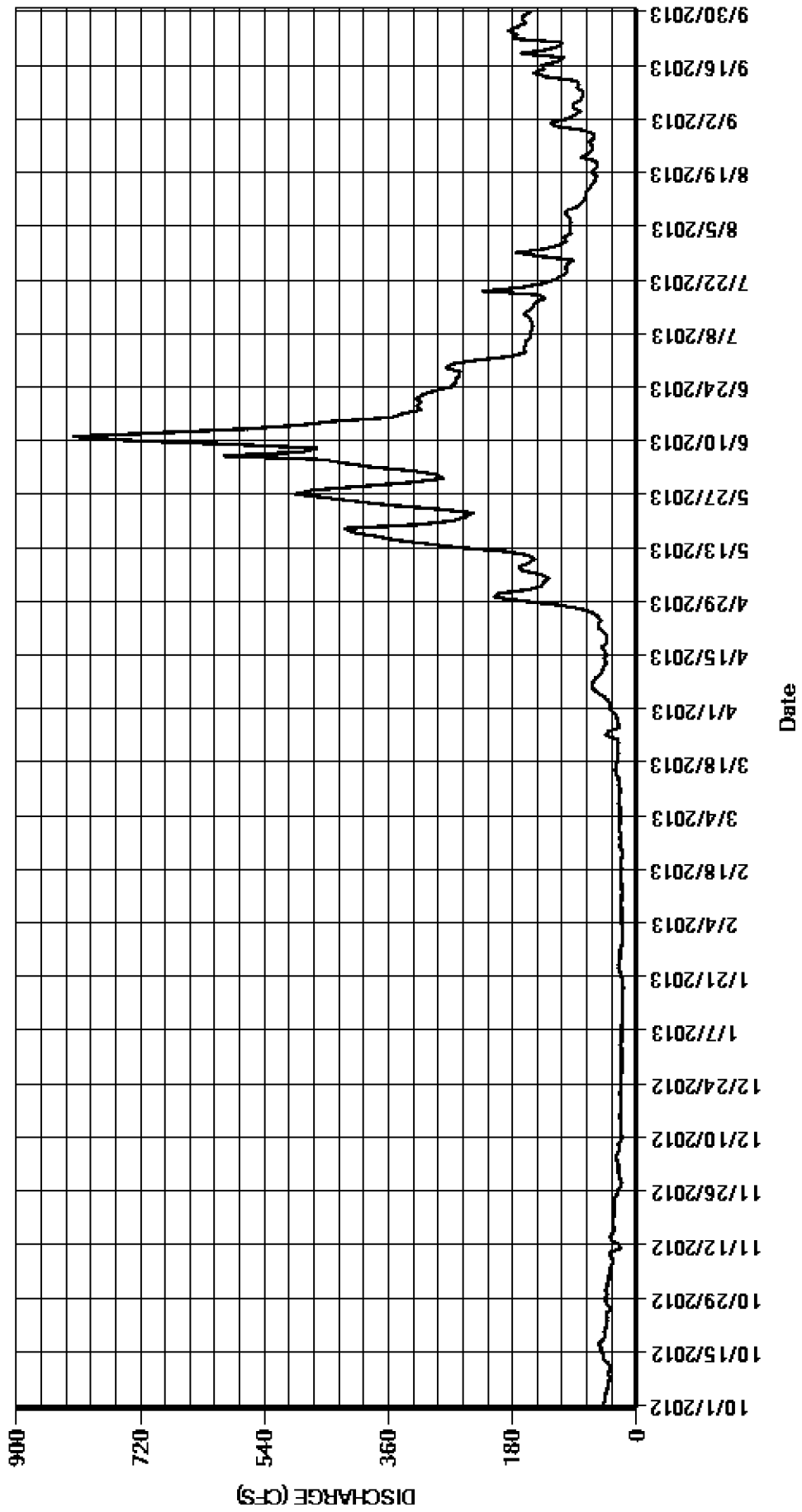
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	50	43	e27	e22	e21	e25	e39	e200	290	232	102	125
2	46	42	26	e22	e21	e24	e38	e156	324	180	106	103
3	46	40	27	e24	e21	e24	e41	e138	385	162	96	90
4	45	40	29	e22	e22	e24	e47	e135	424	164	97	82
5	43	39	30	e22	e22	e24	e56	e128	454	161	96	93
6	42	38	27	e22	e22	e24	e63	e140	598	160	96	91
7	41	35	25	e22	e22	e26	e64	e166	486	154	96	81
8	39	35	27	e22	e22	e26	e63	e171	465	155	103	78
9	41	39	e23	e21	e23	e26	e59	e156	588	152	102	78
10	40	39	e21	e21	e22	e24	e52	e149	738	151	88	86
11	39	e24	e23	e21	e22	e24	e50	e157	817	153	80	84
12	41	e26	e23	e21	e21	e26	e48	e192	687	155	75	88
13	49	e36	e23	e21	e22	e26	e44	e260	565	163	74	131
14	48	e39	e23	e21	e22	e27	e47	e305	486	156	73	149
15	52	e35	e24	e21	e23	e30	e44	e349	438	150	68	135
16	52	e32	e24	e21	e23	e31	e47	e379	355	147	64	137
17	55	35	e23	e21	e23	e30	e51	e413	341	133	60	114
18	49	35	e23	e19	e22	e29	e44	e424	313	142	58	106
19	46	34	e23	e21	e23	e28	e44	e318	319	224	66	167
20	47	32	e23	e21	e23	e27	e44	e266	313	168	59	131
21	45	33	e24	e22	e22	e28	e49	e248	320	137	58	111
22	44	34	e24	e24	e21	e28	e56	238	310	119	59	109
23	43	32	e23	e26	e22	e27	e56	288	291	109	80	180
24	43	32	e23	e26	e25	e28	e52	357	269	101	69	174
25	44	e29	e23	e25	e23	e45	e56	405	263	103	64	186
26	38	e28	e23	e24	e25	e41	e64	448	262	101	65	174
27	42	e24	e22	e24	e23	e26	e81	494	257	92	68	162
28	45	e22	e22	e24	e25	e27	e114	472	257	137	62	166
29	45	e24	e22	e22	---	e28	e164	401	277	175	62	164
30	43	e25	e22	e21	---	e30	e206	329	267	136	79	154
31	45	---	e22	e21	---	e34	---	281	---	113	118	---
TOTAL	1388	1001	744	687	628	867	1883	8563	12159	4585	2443	3729
MEAN	44.8	33.4	24.0	22.2	22.4	28.0	62.8	276	405	148	78.8	124
AC-FT	2750	1990	1480	1360	1250	1720	3730	16980	24120	9090	4850	7400
MAX	55	43	30	26	25	45	206	494	817	232	118	186
MIN	38	22	21	19	21	24	38	128	257	92	58	78

CAL YR	2012	TOTAL	29892	MEAN	81.7	MAX	272	MIN	21	AC-FT	59290
WTR YR	2013	TOTAL	38677	MEAN	106	MAX	817	MIN	19	AC-FT	76720

MAX DISCH: 1150 CFS AT 01:45 ON JUN 11, 2013 GH 4.23 FT SHIFT 0.14 FT  
 MAX GH: 4.23 FT AT 01:45 ON JUN 11, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09080100 FRYINGPAN RIVER AT MEREDITH  
WY2013 HYDROGRAPH



ROARING FORK RIVER BASIN  
09080300 ROCKY FORK CREEK NEAR MEREDITH  
Water Year 2013

Location.-- Lat. 39°21'42", Long. 106°49'14", in NW¼NW¼ Sec. 18, T.8 S., R.84 W., Pitkin County, Hydrologic Unit 14010004 on right bank at upstream end of flume constructed to carry Rocky Fork Creek across spillway to auxiliary outlet of Ruedi Dam on Fryingpan River and 4.6 mi west of Meredith, CO.

Drainage Area and Period of Record.-- 12.3 mi<sup>2</sup>. ; Published streamflow record Oct. 1, 1968 to present.

Equipment.-- A Sutron Stage Discharge Recorder (SDR) and Constant Flow Bubbler (CFB) housed in a 42-in diameter corrugated metal shelter and stilling well in stream on right bank upstream of concrete weir control. The SDR and CFB are hard-wired to data collection platform (DCP) located in control house on top of Ruedi Reservoir Dam. The SDR and CFB are set by drop tape to an adjustable reference point on edge of equipment shelf. Shelter is equipped with an outside staff gage that is used as a secondary reference. The CFB is used as a secondary sensor when the stilling well is frozen or becomes clogged. No other changes this water year.

Hydrologic Conditions.-- Basin is entirely USFS land and there is no development or roads except for trailhead parking ¼ mile above station. There are no diversions above station. Discharge from gage is subtracted from downstream USGS gage FRYRUDCO to calculate Ruedi Reservoir releases.

Gage-Height Record.-- The primary record is 15-minute satellite-transmitted SDR and CFB data. The SDR was the primary record from beginning of the water year until Dec. 5, 2012 and May 15, 2013 until the end of the water year. CFB was used to develop record from Dec. 6, 2012 until May 14, 2013. The record is complete and reliable, except for Oct 8-11, 13-30, Nov 1-7, 9-30, and Dec 1-5, 28-31, 2012 and Feb 10-14, Aug 22, 25-31, Sep 1-4, 6-13, 17 and 23-30, 2013 when the control was affected from beaver dams; and Jan 1-14, 2013 when the CFB sensor data was erroneous. Checks between the primary and backup sensor generally agreed within +/- 0.02 ft.

Datum Corrections.-- Levels were not run during water year 2013. Levels were last run on Aug 15, 2012 when the RP elevation and tape length were found to be within the allowable error tolerances.

Rating.-- Control is a 38 ft. wide v-notch, sharp crested weir adjacent to gage house. Rating 2 was used for the entire period of record and has been in place since Nov 11, 2004. Seven discharge measurements (Nos. 111 - 116) made during WY 2013, and No. 117 made subsequently, were used for analysis. Measurements ranged from 1.27 to 29.5 cfs and covered the range in stage experienced during the year except for the lower daily flows on Jan 9-15, 29-31, Feb 1-28, and Mar 1, 20-21, 23-24, 2013; and the higher daily flows on Jun 6-13, 2013. The peak discharge of 35.7 cfs occurred at 2145 on Jun 10, 2013 at a gage height of 1.13 ft with a shift of 0.03 ft. The peak flow exceeded high Measurement No. 114 by 0.08 ft in stage. The peak stage of 1.89 ft occurred at 0700 on Oct. 24, 2012 was caused by backwater from beaver dam on the control.

Discharge.-- Shifting section control method was used. Shifts were applied as defined by measurements and were distributed by time and stage. Shift distribution by time at the end of water year 2012 continued until Jan 29, 2013. New variable shift curve RFCMERCOS\_VS13a was developed based on water year 2013 measurements, and applied from 1230 on Jan 29, 2013 until the end of the water year. Measurements showed unadjusted shift variation from -0.02 ft. to +0.03 ft. Shifts were applied directly and given full weight, except for measurement 115 which was discounted -1%.

Special Computations.-- Daily discharge for periods of backwater from beaver dams (Oct 8-11, 13-30, Nov 1-7, 9-30, and Dec 1-5, 28-31, 2012 and Feb 10-14, Aug 25-31, Sep 1-4, 6-13, 23-30, 2013) and erroneous GH data (Jan 1-14, 2012) were estimated using straight line interpolation of adjacent good average daily flows.

Remarks.-- Record is rated as good, except for estimated periods which are poor. Station maintained and record developed by Craig Bruner.

Recommendations.-- Beaver population requires control at this location due to substantial effect on transmitted real-time data and subsequent annual streamflow record.

STATE OF COLORADO  
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09080300 ROCKY FORK CREEK NEAR MEREDITH

RATING TABLE-- RFCMERC002 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

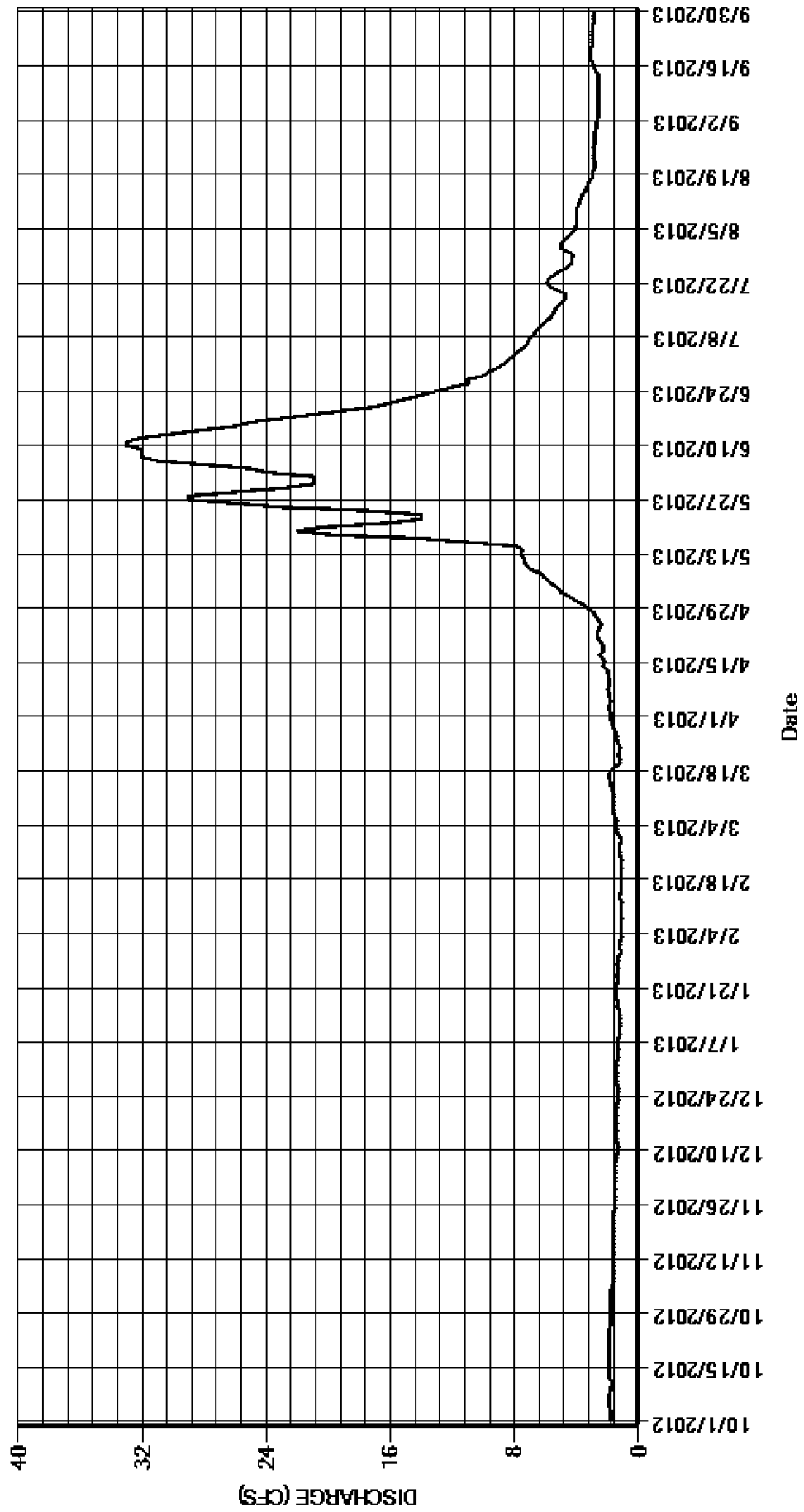
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.8	e1.8	e1.5	e1.4	1.2	1.2	1.8	4.1	21	8.7	5.0	e2.7
2	1.8	e1.8	e1.5	e1.4	1.2	1.4	1.8	4.5	21	8.4	4.8	e2.7
3	1.8	e1.8	e1.5	e1.3	1.1	1.4	1.9	5.0	24	8.1	4.5	e2.6
4	1.8	e1.8	e1.5	e1.3	1.1	1.4	1.9	5.2	25	7.8	4.3	e2.6
5	1.9	e1.7	e1.5	e1.3	1.1	1.4	1.8	5.5	28	7.5	4.1	2.6
6	1.9	e1.6	1.5	e1.3	1.1	1.5	1.9	5.8	31	7.2	4.0	e2.6
7	1.9	e1.6	1.5	e1.3	1.1	1.6	1.9	6.1	32	7.1	4.0	e2.6
8	e1.9	1.6	1.4	e1.3	1.1	1.6	2.0	6.3	32	6.9	4.0	e2.6
9	e1.8	e1.6	1.4	e1.2	1.1	1.6	1.9	7.0	32	6.7	4.0	e2.6
10	e1.8	e1.6	1.3	e1.2	e1.1	1.6	1.9	7.2	33	6.5	4.0	e2.6
11	e1.7	e1.6	1.3	e1.2	e1.1	1.6	1.9	7.4	33	6.3	3.9	e2.6
12	1.9	e1.6	1.4	e1.2	e1.1	1.6	2.0	7.4	32	6.0	3.8	e2.6
13	e1.9	e1.6	1.4	e1.2	e1.2	1.7	2.0	7.6	30	5.7	3.7	e2.6
14	e1.9	e1.6	1.4	e1.2	e1.2	1.8	2.3	7.5	28	5.5	3.6	2.6
15	e1.9	e1.6	1.4	1.2	1.1	1.8	2.2	7.9	26	5.4	3.4	2.8
16	e1.9	e1.6	1.4	1.4	1.1	1.9	2.3	11	25	5.2	3.3	2.9
17	e1.9	e1.6	1.4	1.3	1.1	1.9	2.5	14	23	4.9	3.2	e3.0
18	e1.9	e1.6	1.4	1.4	1.1	1.8	2.3	20	21	4.7	3.0	3.1
19	e1.9	e1.6	1.4	1.4	1.1	1.5	2.3	22	19	4.7	3.0	3.1
20	e1.9	e1.6	1.4	1.5	1.1	1.2	2.4	20	17	5.2	2.9	3.1
21	e1.9	e1.6	1.4	1.4	1.1	1.2	2.6	16	16	5.7	2.8	3.0
22	e1.9	e1.6	1.4	1.4	1.1	1.3	2.7	14	15	5.9	e2.8	3.0
23	e1.9	e1.6	1.3	1.3	1.1	1.2	2.6	14	14	5.8	2.9	e3.0
24	e1.9	e1.6	1.3	1.4	1.2	1.2	2.5	17	13	5.4	2.9	e3.0
25	e1.9	e1.5	1.3	1.3	1.2	1.3	2.4	23	12	5.1	e2.9	e3.0
26	e1.8	e1.5	1.3	1.3	1.2	1.4	2.6	26	11	4.6	e2.9	e3.0
27	e1.8	e1.5	1.4	1.4	1.2	1.4	2.8	29	11	4.3	e2.8	e2.9
28	e1.8	e1.5	e1.4	1.3	1.1	1.5	2.9	29	10	4.3	e2.8	e2.9
29	e1.8	e1.5	e1.4	1.3	---	1.6	3.3	26	9.7	4.2	e2.8	e2.9
30	e1.8	e1.5	e1.4	1.1	---	1.7	3.6	23	9.1	4.6	e2.8	e2.9
31	e1.8	---	e1.4	1.2	---	1.8	---	21	---	5.0	e2.7	---
TOTAL	57.5	48.3	43.5	40.4	31.6	47.1	69.0	419.5	653.8	183.4	107.6	84.2
MEAN	1.85	1.61	1.40	1.30	1.13	1.52	2.30	13.5	21.8	5.92	3.47	2.81
AC-FT	114	96	86	80	63	93	137	832	1300	364	213	167
MAX	1.9	1.8	1.5	1.5	1.2	1.9	3.6	29	33	8.7	5.0	3.1
MIN	1.7	1.5	1.3	1.1	1.1	1.2	1.8	4.1	9.1	4.2	2.7	2.6

CAL YR	2012	TOTAL	1223.7	MEAN	3.34	MAX	12	MIN	1.3	AC-FT	2430
WTR YR	2013	TOTAL	1785.9	MEAN	4.89	MAX	33	MIN	1.1	AC-FT	3540

MAX DISCH: 35.7 CFS AT 21:45 ON JUN 10, 2013 GH 1.13 FT SHIFT 0.03 FT  
 MAX GH: 1.89 FT AT 07:00 ON OCT 24, 2012 (Backwater from beaver dam)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09080300 ROCKY FORK CREEK NEAR MEREDITH  
WY2013 HYDROGRAPH



ROARING FORK RIVER BASIN  
CRYSTAL RIVER AT DOW FISH HATCHERY AB CARBONDALE  
Water Year 2013

Location.-- Lat 39°22'38", Long 107°12'17" in SW 1/4 of NE 1/4 of Sec. 10, T8S, R88W in Garfield County. Located on right bank of Crystal River, at upstream side of County Road 118 Bridge, and 0.75 mi. below confluence with Prince Creek.

Drainage Area and Period of Record.-- The drainage area above the gage is 340 sq. mi. ; Oct 2006 to present. Published by Colorado Division of Water Resources. Seasonal operation April-September only.

Equipment.-- Sutron Constant Flow Bubbler (CFB) sensor and Sutron SatLink 2 data collection platform (DCP) housed in 2 ft rectangular steel shelter. The CFB orifice pipe is below the upstream side of County Road 118 bridge. Primary reference gage is a wire weight gage on the upstream side of the bridge. No changes this water year.

Hydrologic Conditions.-- Drainage basin is the Crystal River basin. The stream banks are moderate to steep sloping with exposed boulders along the lower portions. Control is rock and cobble channel at all stages, with bridge abutment walls becoming part of the control at higher stages. Seasonal diversions occur upstream and downstream of station.

Gage-Height Record.-- The primary record is 15-minute CFB data downloaded from satellite telemetry with DCP downloaded data used as backup. The partial year record is complete and reliable for the 6-month period of operation from April 1, 2013 to September 30, 2013. The gage was visited on 12 separate occasions this water year to verify the instrument remained calibrated to the primary reference gage. The constant flow bubbler was adjusted 4 times during the period of record.

Datum Corrections.-- Levels were not run in water year 2013. Levels were last run on August 1, 2012 using RM 2 as a base. The wire weight gage was found to read within allowable tolerances and no adjustments were made.

Rating.-- Rating No. 7, in use since April 1, 2013, was used for the entire period of record (Apr 1 – Sep 30). Eleven discharge measurements (Nos. 48-58) made during WY 2013, and No. 59 made after the period of record, were used for analysis. The measurements ranged in discharge from 5.30 cfs to 1640 cfs and cover the range of stage experienced during the period of record, except for the higher daily flows on June 9-13. The peak instantaneous flow of 2230 cfs occurred at 02:45 Jun. 11, 2013 at a gage height of 7.01 ft with a shift of +0.05 ft. It exceeded the stage of measurement No. 53 made June 10, 2013 by 0.55 feet in stage.

Discharge.-- Shifting control method was used for WY 2013. Shifts were distributed by time for the 2013 period of record as defined by measurement nos. 49-59.. Open water measurements show shifts varying from +0.00 to +0.22 ft. Shifts were applied directly and given full weight except for measurement Nos. 50, 54, 56 and 59 which were discounted from -4% to +8% to smooth shift distribution.

Special Computations.-- No special computations were done this water year.

Remarks.-- Record is rated good for the period of record, Instantaneous peak flow is rated good. Gaging station operated and maintained by Jana Miller and record developed by Jana Miller.

Recommendations.-- Use Total Station to survey cross-section of channel at gage and better define potential break-points in stage-discharge rating. A new rating was developed for WY 2013, although the outside gage wire developed a number of kinks that is possibly affecting the wire weight gage reading. A new wire weight gage is to be installed before the gage is opened in WY 2014. Installing a radar gage for back up record at this location would also be ideal.



STATE OF COLORADO  
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CRYSTAL RIVER AT DOW FISH HATCHERY AB CARBONDALE

RATING TABLE-- CRYDOWCO06 USED FROM 01-OCT-2012 TO 25-OCT-2012  
 CRYDOWCO07 USED FROM 01-APR-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

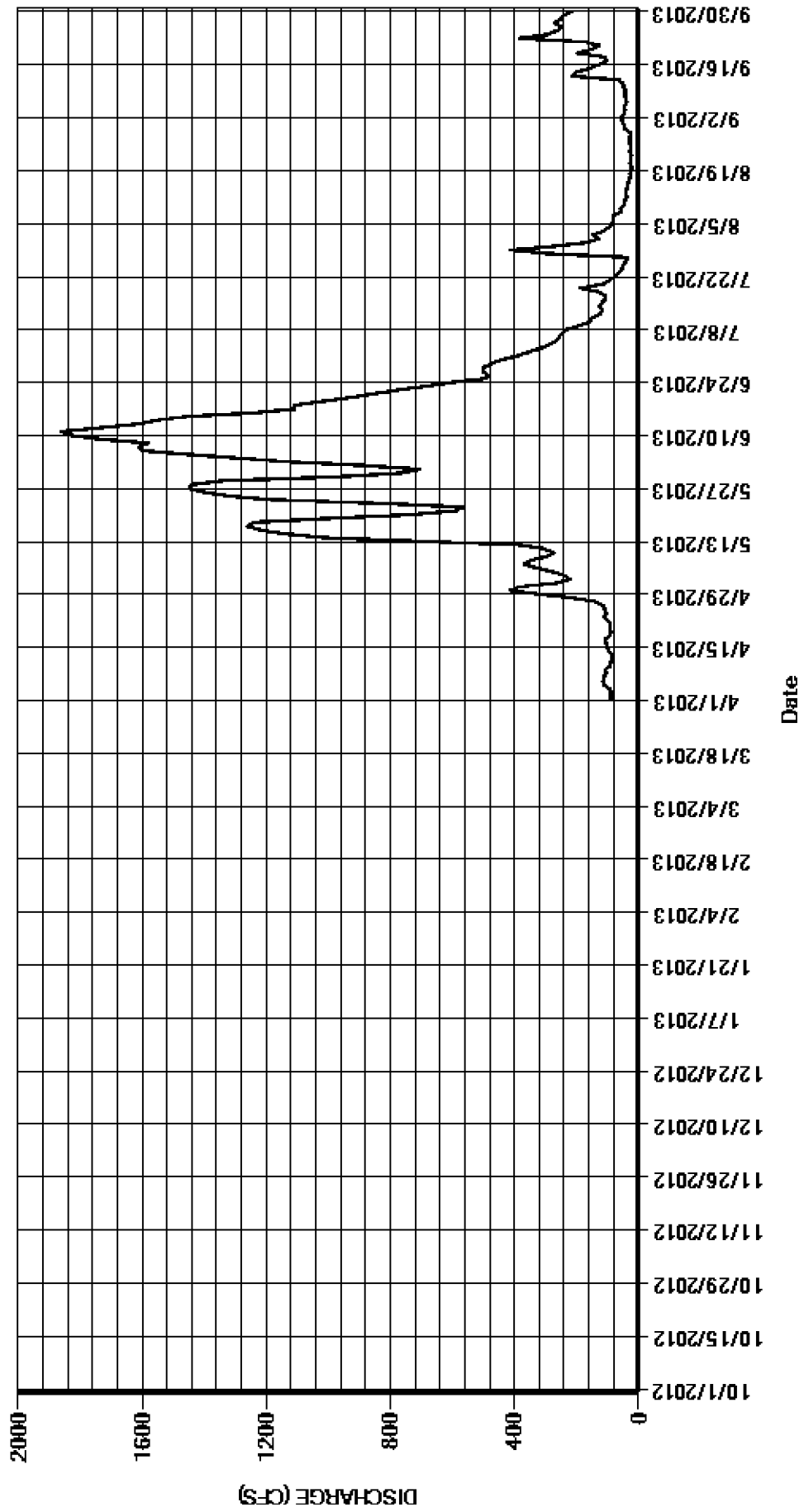
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	88	382	704	391	130	52
2	---	---	---	---	---	---	91	267	886	356	148	57
3	---	---	---	---	---	---	88	222	1130	316	114	47
4	---	---	---	---	---	---	94	240	1290	288	96	44
5	---	---	---	---	---	---	111	280	1450	265	84	47
6	---	---	---	---	---	---	114	332	1600	256	82	39
7	---	---	---	---	---	---	113	369	1610	247	80	41
8	---	---	---	---	---	---	105	346	1580	232	56	45
9	---	---	---	---	---	---	107	294	1740	194	58	42
10	---	---	---	---	---	---	93	274	1830	159	46	48
11	---	---	---	---	---	---	90	307	1860	151	46	50
12	---	---	---	---	---	---	88	385	1730	124	36	63
13	---	---	---	---	---	---	86	695	1610	117	42	216
14	---	---	---	---	---	---	98	1010	1550	126	39	204
15	---	---	---	---	---	---	102	1140	1460	119	37	159
16	---	---	---	---	---	---	105	1220	1240	108	32	128
17	---	---	---	---	---	---	109	1260	1110	110	28	104
18	---	---	---	---	---	---	93	1240	1110	131	27	110
19	---	---	---	---	---	---	88	1010	1020	187	25	196
20	---	---	---	---	---	---	93	737	930	114	22	152
21	---	---	---	---	---	---	91	590	850	95	27	128
22	---	---	---	---	---	---	98	566	774	77	24	172
23	---	---	---	---	---	---	110	836	680	64	24	383
24	---	---	---	---	---	---	105	1180	598	54	28	296
25	---	---	---	---	---	---	109	1320	490	50	27	264
26	---	---	---	---	---	---	113	1400	487	41	27	246
27	---	---	---	---	---	---	139	1450	502	36	30	272
28	---	---	---	---	---	---	211	1440	499	296	27	252
29	---	---	---	---	---	---	322	1340	475	413	27	242
30	---	---	---	---	---	---	415	977	442	277	47	213
31	---	---	---	---	---	---	---	770	---	168	47	---
TOTAL	---	---	---	---	---	---	3669	23879	33237	5562	1563	4312
MEAN	---	---	---	---	---	---	122	770	1108	179	50.4	144
AC-FT	---	---	---	---	---	---	7280	47360	65930	11030	3100	8550
MAX	---	---	---	---	---	---	415	1450	1860	413	148	383
MIN	---	---	---	---	---	---	86	222	442	36	22	39

CAL YR	2012	TOTAL	44638	MEAN	244	MAX	913	MIN	7.1	AC-FT	88540 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	72222	MEAN	395	MAX	1860	MIN	22	AC-FT	143300 (PARTIAL YEAR RECORD)

MAX DISCH: 2230 CFS AT 02:45 ON JUN 11, 2013 GH 7.01 FT SHIFT 0.05 FT  
 MAX GH: 7.01 FT AT 02:45 ON JUN 11, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CRYSTAL RIVER AT DOWFISH HATCHERY AB CARBONDALE  
WY2013 HYDROGRAPH



## 09089500 WEST DIVIDE CREEK NEAR RAVEN

Water Year 2013

Location.-- Lat 39°19'52", Long 107°34'46" in NE1/4 SW1/4 Sec. 29, T8S, R91W, Hydrologic Unit 14010004 in Mesa County. Station is on left bank about 5 ft downstream of private road bridge, 0.8 mi upstream of Brook Creek, 8 mi south of Raven, and 16 mi south of Silt.

Drainage Area and Period of Record.-- Approximately 64.6 sq mi. ; Published by the USGS Oct. 1, 1954 to Oct. 1999. Partial year (Apr - Sep) record published by the USGS Apr 2000 to Oct. 2005. Partial year (Apr - Sep) record published by Colorado Division of Water Resources Apr. 1, 2006 to present.

Equipment.-- Sutron constant flow bubbler (CFB) sensor in corrugated metal shelter on 42-in diameter stilling well. Data collection platform (DCP) is a Sutron SatLink 2 in external box. The CFB is referenced to an outside cantilever chain gage. A Sutron Model 0001-1 stage discharge recorder (SDR) provides backup data when the well intake pipes are not isolated from the stream during low stages. The SDR is set by drop tape from an inside reference point on the equipment shelf.

Hydrologic Conditions.-- Streambed is composed of boulders, cobble, and gravel. Banks are moderately steep and not usually subject to overflow. The left abutment of bridge adjacent to gage constricts flow into the right side of the channel immediately above gage. Record includes water imported from Thompson Creek (Roaring Fork Basin), Clear Fork Creek (Muddy Creek Basin), and Owens Creek (Plateau Creek Basin).

Gage-Height Record.-- The primary record is 15-minute satellite telemetry data from the CFB with SDR data used as backup. Data from the constant flow bubbler was used for the entire partial year record. Checks between the primary and backup record generally agreed with less pronounced variation of the backup record from slower stage change well response. Three instrument calibration corrections were applied during the period of record.

Datum Corrections.-- Levels were last run to the inside and outside reference points (RPs) on Apr 21, 2010 using RM 4 as a base. The inside RP was found to read correct and no adjustments were made. The outside RP was found to read 0.02 ft. high and was corrected.

Rating.-- The control for low and medium stages is a boulder and cobble riffle 15 ft downstream. Control for higher stages is the channel with boulders having some effect. Rating No. 16 was used for the entire period of record (Apr 1-Sep 30). Five discharge measurements (Nos. 43 -47) made during water year 2013, and No. 48 made subsequently, were used for analysis. Measurements ranged from 1.16 to 127 cfs and cover the range of stage experienced except for the lower daily flows on July 10-17, 19-28, 31, Aug 1-31, and Sep 1-12, 17, 18, and 21, 2013; and higher daily flows of May 14-19, 24, 26, and 27, 2013. The peak discharge of 172 cfs occurred at 2315 on May 15, 2013 at a gage height of 3.20 ft. with a shift of +0.12 ft. The peak exceeded Measurement No. 45 by 0.24 feet in stage.

Discharge.-- Shifting control method was used during water year 2013. The shifts were applied as defined by measurements and were distributed by stage using variable shift curve WSDRAVCO\_VS13A for the entire six month period. Measurements showed shifts ranging from -0.24 ft to +0.12 ft. Measurements were applied directly and given full weight except for Measurement no. 44 which was discounted -3 percent.

Special Computations.-- None.

Remarks.-- Record is rated as good. The peak instantaneous flow should be considered good. Station maintained and record developed by Craig Bruner.

Recommendations.-- Construct new cantilever gage, install new secondary (radar) sensor and run levels.

STATE OF COLORADO  
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09089500 WEST DIVIDE CREEK NEAR RAVEN

RATING TABLE-- WSDRAVCO16 USED FROM 01-APR-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

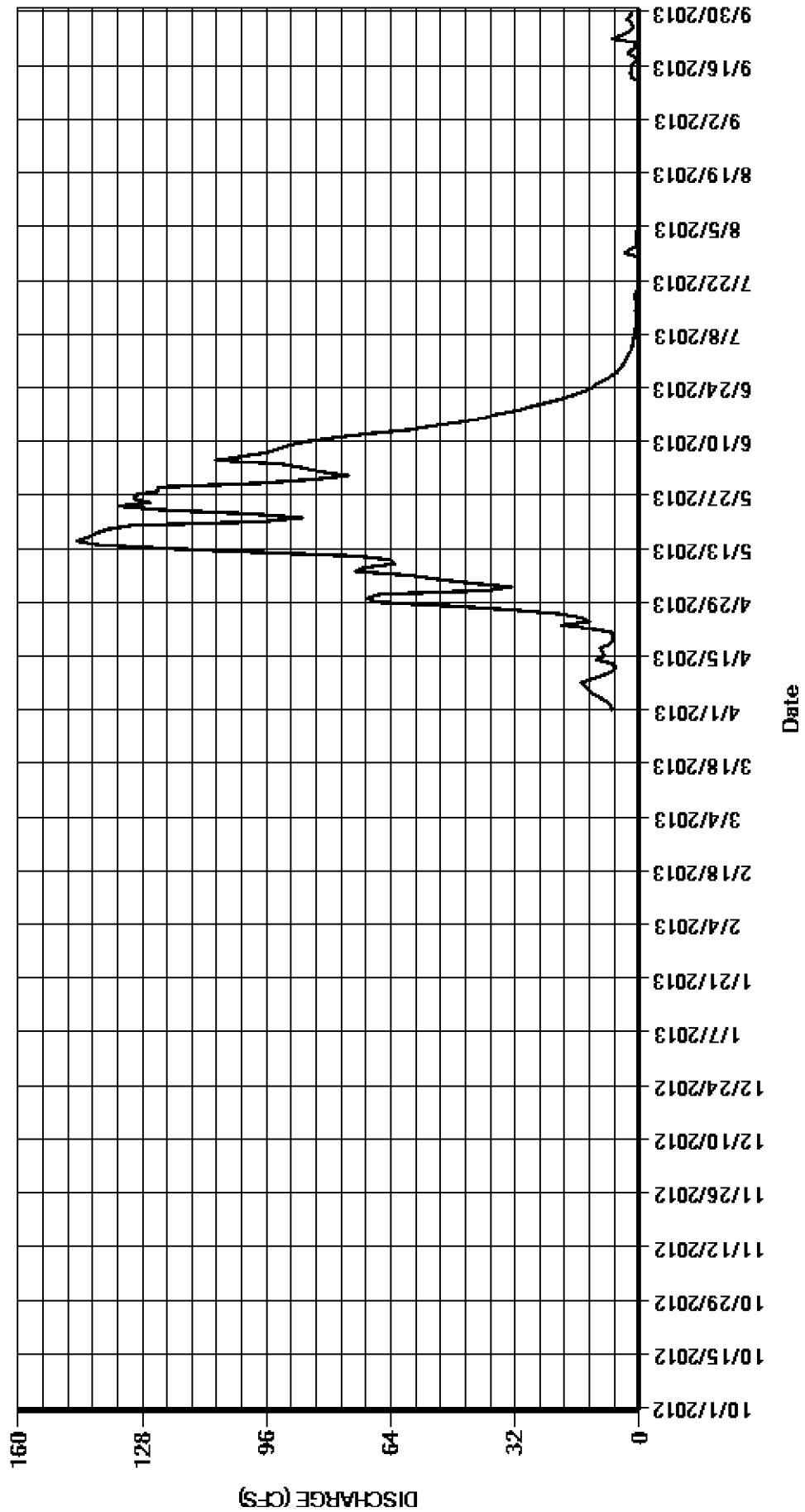
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	7.0	67	75	3.7	0.53	0.00
2	---	---	---	---	---	---	7.4	39	82	3.1	0.91	0.00
3	---	---	---	---	---	---	8.2	33	87	2.6	0.77	0.00
4	---	---	---	---	---	---	9.9	43	92	2.0	0.50	0.00
5	---	---	---	---	---	---	12	52	109	1.8	0.55	0.00
6	---	---	---	---	---	---	13	59	103	1.6	0.39	0.00
7	---	---	---	---	---	---	14	73	96	1.4	0.38	0.00
8	---	---	---	---	---	---	15	71	93	1.2	0.33	0.00
9	---	---	---	---	---	---	12	63	90	1.2	0.20	0.00
10	---	---	---	---	---	---	9.2	64	85	0.79	0.15	0.00
11	---	---	---	---	---	---	7.0	73	78	0.58	0.13	0.08
12	---	---	---	---	---	---	6.1	99	69	0.63	0.07	0.26
13	---	---	---	---	---	---	7.0	123	59	0.87	0.11	2.1
14	---	---	---	---	---	---	11	140	53	1.0	0.03	2.2
15	---	---	---	---	---	---	9.1	145	46	0.86	0.00	2.1
16	---	---	---	---	---	---	9.5	142	40	0.57	0.00	1.9
17	---	---	---	---	---	---	10	140	37	1.1	0.00	0.98
18	---	---	---	---	---	---	7.8	137	31	1.2	0.00	0.68
19	---	---	---	---	---	---	6.7	131	28	0.69	0.00	2.9
20	---	---	---	---	---	---	6.7	97	24	0.46	0.00	2.0
21	---	---	---	---	---	---	6.9	87	20	0.23	0.00	0.82
22	---	---	---	---	---	---	12	100	17	0.08	0.00	1.3
23	---	---	---	---	---	---	20	123	14	0.02	0.00	6.9
24	---	---	---	---	---	---	13	134	12	0.00	0.00	4.4
25	---	---	---	---	---	---	15	126	11	0.00	0.00	2.5
26	---	---	---	---	---	---	21	130	8.7	0.00	0.00	1.6
27	---	---	---	---	---	---	33	130	7.3	0.00	0.00	2.0
28	---	---	---	---	---	---	49	124	5.8	0.37	0.00	3.1
29	---	---	---	---	---	---	68	124	4.9	3.8	0.00	2.3
30	---	---	---	---	---	---	70	98	4.2	2.5	0.00	1.9
31	---	---	---	---	---	---	---	84	---	0.83	0.00	---
TOTAL	---	---	---	---	---	---	496.5	3051	1481.9	35.18	5.05	42.02
MEAN	---	---	---	---	---	---	16.6	98.4	49.4	1.13	0.16	1.40
AC-FT	---	---	---	---	---	---	985	6050	2940	70	10	83
MAX	---	---	---	---	---	---	70	145	109	3.8	0.91	6.9
MIN	---	---	---	---	---	---	6.1	33	4.2	0.00	0.00	0.00

CAL YR	2012	TOTAL	4252.65	MEAN	23.2	MAX	134	MIN	0.00	AC-FT	8440 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	5111.65	MEAN	27.9	MAX	145	MIN	0.00	AC-FT	10140 (PARTIAL YEAR RECORD)

MAX DISCH: 172 CFS AT 23:15 ON MAY 15, 2013 GH 3.20 FT SHIFT 0.12 FT  
 MAX GH: 3.20 FT AT 23:15 ON MAY 15, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09089500 WEST DIVIDE CREEK NEAR RAVEN  
WY2013 HYDROGRAPH



NORTH PLATTE RIVER BASIN  
MICHIGAN RIVER NEAR MEADOW CREEK RESERVOIR

Water Year 2013

Location.-- Lat. 40°36'48", Long. 106°05'05", (Gould, Colorado Quadrangle, 1955), SE1/4 of the SE1/4 in Section 36 T8N, R78W in Jackson County. Under bridge on County Road 30 about 700 feet upstream of its confluence with Peterson Creek.

Drainage Area and Period of Record.-- Approximately 99 sq. mi.; Record kept from 1999 to present.

Equipment.-- Sutron shaft encoder (SDI12) housed in 18-inch diameter corrugated metal pipe stilling well with two 2-inch intakes. The shaft encoder is connected via cable to a Sutron high data rate (HDR) data collection platform (DCP) with satellite telemetry. The DCP is located in a gray NEMA box on the same side of the river but on the upstream side of the bridge. The outside staff, with a range of 0.00 to 6.66 feet, is the primary reference gage. It is located on the right bridge abutment just to the left of the stilling well. No other changes this water year.

Hydrologic Conditions.-- The basin consists of moderate terrain near the gage station, but originates in steep mountainous terrain on the Continental Divide near Thunder Mountain. In the vicinity of the gage station, the channel slope is moderate and has moderate sinuosity. The bed material ranges from silt up to small rock approximately 6-inches in diameter. Several major diversions, located upstream of the gage, can impact flow at the gage.

Gage-Height Record.-- Primary record is 15-minute shaft encoder data from satellite telemetry with the DCP log as backup. Continuous gage height records were kept from October 1 to October 29, 2012 and April 24 to September 30, 2013. Record was not kept during the winter period. The record is complete and reliable except for the following dates: October 29, 2012 (shut-down), April 24, 2013 (start-up), and August 23-30, 2013 (backwater from beaver dam). Five gage height calibration corrections ranging from -0.03 ft to +0.13 ft were made during WY 2013.

Datum Corrections.-- Levels were not run this water year. Levels were last run on August 25, 2010 using RM1 as base.

Rating.-- Rating No. 07A, was used during WY 2013. It is well defined to 1,060 cfs, 142% of the historical highest measurement made in water year 2011. Nine measurements (numbers 106 through 114), ranging in discharge from 6.97 cfs to 407 cfs, were made this water year. Measurements covered the range in stage, except for the lower mean daily flows on October 22-24, 27, 2012; and higher daily flows on May 15-18, 25, 2013. The instantaneous peak flow of 512 cfs occurred at 0530 on May 18, 2013 at a gage height of 3.61 feet and a shift of -0.26 feet. It exceeded the stage of measurement No. 109, made on May 16, 2013 by 0.32 ft. in stage. The minimum daily flow of 6.8 cfs occurred on October 22-24, 2012.

Discharge.-- Shifting control method was applied throughout water year 2013. Open-water measurements showed shifts varying between -0.12 and -0.31 feet. All measurements were discounted between -6% to +6% except for measurement 107 and 113 which were given full weight. Shifts were distributed by time and stage during water year 2013. Variable shift curve MICMERCOSC2A was applied from station opening (4/24/2013) to the peak gage height at 0530 on May 18, 2013. Variable shift curve MICMERCOSC2B was applied from the peak gage height to measurement 112 on July 17, 2013. Shifts were applied by time from July 17, 2013 through September 30, 2013. Beaver activity contributed to the shift calculated from measurement 113. That shift was applied back to Aug. 23, 2013. The gage height dropped -0.12 ft following clearing of the beaver dam.

Special Computations.-- Discharge was estimated for shut-down and start-up days based on actual partial day record, discharge measurements, and record from adjacent days. Discharge for the periods when a beaver dam caused backwater at the gage was estimated using the calculated mean daily discharge with consideration of precipitation during the period of backwater effect.

Remarks.-- The record is good, except for the partial days of record when the gage was shut-down and started up which is considered fair to poor and the period when beavers built a dam on the control, which is considered poor. The peak instantaneous flow is rated good. Station maintained and record developed by Dan Meyer.

Recommendations.-- The rating curve should be revised during water year 2014. Levels should be run in WY2014.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

MICHIGAN RIVER NEAR MEADOW CREEK RESERVOIR

RATING TABLE-- MICMERCO07A USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

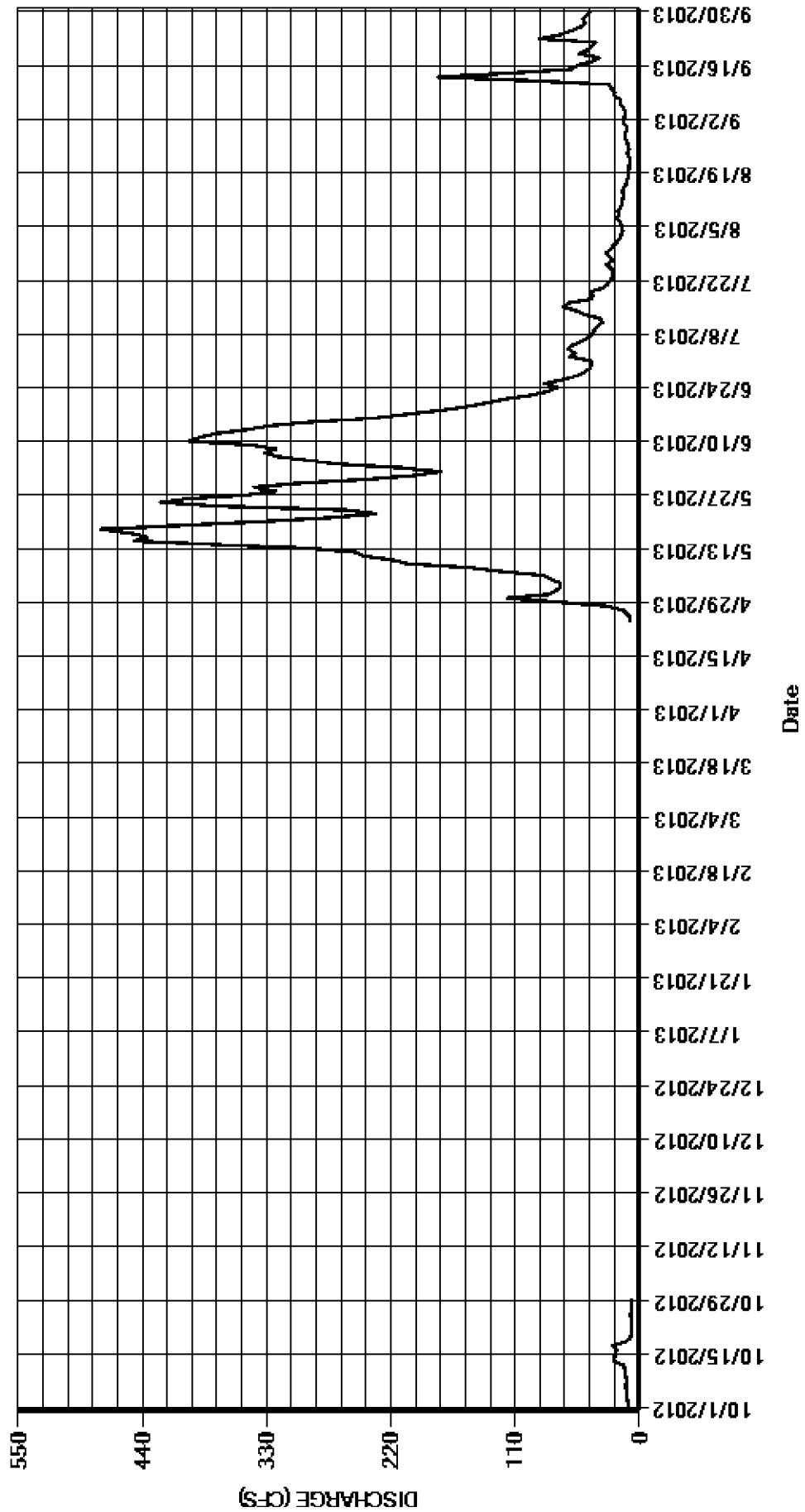
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.8	---	---	---	---	---	---	81	200	43	20	14
2	10	---	---	---	---	---	---	74	176	62	17	14
3	11	---	---	---	---	---	---	70	210	57	16	13
4	11	---	---	---	---	---	---	70	267	63	15	13
5	11	---	---	---	---	---	---	78	294	59	16	14
6	12	---	---	---	---	---	---	85	320	51	17	17
7	12	---	---	---	---	---	---	122	332	45	20	17
8	11	---	---	---	---	---	---	150	322	42	18	22
9	12	---	---	---	---	---	---	205	344	40	19	22
10	13	---	---	---	---	---	---	218	399	37	17	25
11	13	---	---	---	---	---	---	245	389	33	15	27
12	14	---	---	---	---	---	---	251	374	35	15	91
13	22	---	---	---	---	---	---	293	347	48	14	178
14	22	---	---	---	---	---	---	373	327	56	15	115
15	21	---	---	---	---	---	---	447	290	68	14	60
16	20	---	---	---	---	---	---	436	235	62	12	55
17	24	---	---	---	---	---	---	450	207	43	11	42
18	13	---	---	---	---	---	---	477	177	41	10	36
19	8.1	---	---	---	---	---	---	407	153	44	10	53
20	7.4	---	---	---	---	---	---	336	135	32	9.2	46
21	7.3	---	---	---	---	---	---	274	118	28	9.0	42
22	6.8	---	---	---	---	---	---	233	95	25	8.7	39
23	6.8	---	---	---	---	---	---	260	80	24	e9.0	88
24	6.8	---	---	---	---	---	e8.0	374	73	23	e11	71
25	8.2	---	---	---	---	---	8.0	424	84	25	e9.5	61
26	7.0	---	---	---	---	---	11	402	68	29	e10	52
27	6.9	---	---	---	---	---	15	348	56	24	e11	48
28	7.3	---	---	---	---	---	30	322	49	26	e13	50
29	e7.0	---	---	---	---	---	72	341	44	30	e13	47
30	---	---	---	---	---	---	117	303	43	26	e11	43
31	---	---	---	---	---	---	---	242	---	23	11	---
TOTAL	341.4	---	---	---	---	---	261.0	8391	6208	1244	416.4	1415
MEAN	11.8	---	---	---	---	---	37.3	271	207	40.1	13.4	47.2
AC-FT	677	---	---	---	---	---	518	16640	12310	2470	826	2810
MAX	24	---	---	---	---	---	117	477	399	68	20	178
MIN	6.8	---	---	---	---	---	8.0	70	43	23	8.7	13

CAL YR	2012	TOTAL	5425.0	MEAN	27.1	MAX	149	MIN	6.1	AC-FT	10760 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	18276.8	MEAN	96.7	MAX	477	MIN	6.8	AC-FT	36250 (PARTIAL YEAR RECORD)

MAX DISCH: 512 CFS AT 05:30 ON MAY 18, 2013 GH 3.61 FT SHIFT -0.26 FT  
 MAX GH: 3.61 FT AT 05:30 ON MAY 18, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**MICHIGAN RIVER NEAR MEADOW CREEK RESERVOIR  
WY2013 HYDROGRAPH**





NORTH PLATTE RIVER BASIN  
06617100 MICHIGAN RIVER AT WALDEN, CO.

Water Year 2013

Location.-- Lat. 40°44'27", Long. 106°16'54", (Walden, Colorado Quadrangle, 1955), NE1/4 of the NE1/4 in Section 21 T9N, R79W in Jackson County, Hydrologic Unit 10180001, on the left bank just upstream of the Highway 125 Bridge on Jackson County property at Town of Walden Water Treatment Facility and 2.1 miles upstream of the confluence of Illinois River.

Drainage Area and Period of Record.-- Approximately 182 sq. mi.; Records kept by USGS from May 1904 to October 1905 and May 1923 to October 1947. Records kept by the Town of Walden from 1916 to 2002. Record kept by State Engineer's Office from May 2002 to present.

Equipment.-- The equipment at this site consists of a Sutron Constant Flow Bubbler (CFB) and high data rate Satlink 2 Data Collection Platform (DCP) with satellite telemetry housed in a NEMA box mounted on two posts. The CFB was installed approximately 100 feet upstream of the previous gage as a temporary gage to be used during bridge replacement construction and then until a radar gage is installed, spring 2014. An instream staff gage was installed as the primary reference gage on July 16, 2012.

Hydrologic Conditions.-- The basin consists of moderate terrain near the gage station, but originates in steep mountainous terrain on the Continental Divide near Thunder Mountain. In the vicinity of the gage station, the channel slope is mild and has moderate sinuosity. The channel is composed of small rock, gravel, and sand. Flow is affected by upstream reservoir releases, diversions, and the Walden Water Treatment Plant.

Gage-Height Record.-- Primary record is 15-minute CFB data from satellite telemetry with the DCP data log as backup. Continuous gage height records were kept from October 1, 2012 to October 29, 2012 and April 24, 2013 through September 30, 2013. The gage was visited on 10 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. Five instrument calibrations were necessary this water year; -0.11 on May 3, 2013, +0.25 ft on May 16, 2013, -0.07 ft on June 13, 2013, -0.18 ft on June 24, 2013, and -0.01 on August 30, 2013. The record is complete and reliable except for the following dates: October 1-29, 2013 (backwater effect from in-stream construction activities related to bridge replacement and gage closing Oct. 29) and April 24, 2013 (gage opening).

Datum Corrections.-- A staff gage was installed in-stream on July 16, 2012. The staff gage was set using the water surface elevation at the abandoned gage plus 0.50 ft. Levels were run on July 19 and July 27, 2012 to tie-in the temporary staff gage to an existing BM1.

Rating.-- The control at flows higher than 30 cfs is the new triple box culvert under State Highway 125. For lower flows, the control is a rock riffle created by construction activity located just downstream of the temporary staff gage. Rating No. 13, dated November 25, 2009, was used the entire period of record for water year 2013. It is well defined to flows of 273 cfs, 150% of the historical highest discharge measurement made in water year 2005. Eight measurements (number 4 through 11 associated with the temporary gage) were made this water year, ranging in discharge from 11.2 cfs to 117 cfs. These measurements covered the range in stage except for lower daily flows on October 2-3, 10, 21-29, 2012, June 24, August 18-23, and September 2-7, 2013 and higher daily flows on April 30, May 1, 4-31, and June 1, 6-16, 2013. The instantaneous peak flow of 540 cfs occurred at 1515 on May 19, 2013 at a gage height of 3.27 feet and a shift of 0.04 ft. It exceeded Measurement No. 6, made on May 3, 2013 by approximately 1.70 ft. in stage. The instantaneous maximum gage height of 3.27 ft occurred at 1515 on May 19, 2013. The minimum daily flow of 5.7 cfs was estimated and occurred on October 24, 2012.

Discharge.-- Shifting control method was applied throughout the record period. Shifts were applied directly and were distributed by time from October 1 to October 29, 2012 and April 24 to September 30, 2013. Open-water measurements showed unadjusted shifts ranging between -0.26 and 0.13 ft. The shift from Measurement 5 was discounted 5.75%, Measurement 6 was discounted 5.41%, Measurement 7 was adjusted -8.94%, Measurement 8 was adjusted -4.34%, Measurement 9 was adjusted -2.02% and the shift from Measurement 10 was discounted 4.26% to smooth shift distribution. .

Special Computations.-- Discharge was estimated October 1-29, 2012 by comparing the hydrograph from the upstream station MICMERC0 and adjusting the daily calculated discharge accordingly. Discharge was estimated April 24, 2013 from the discharge on subsequent days of good data. .

Remarks.-- The record should be considered fair except for the period when backwater from construction activities which was estimated should be considered poor. The partial record day when the station was opened should be considered poor. Station maintained and record developed by Dan Meyer.

Recommendations.-- A permanent gage should be completed as soon as possible in April 2014 and a new rating developed.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06617100 MICHIGAN RIVER AT WALDEN, CO.

RATING TABLE-- MICWLDCO13 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

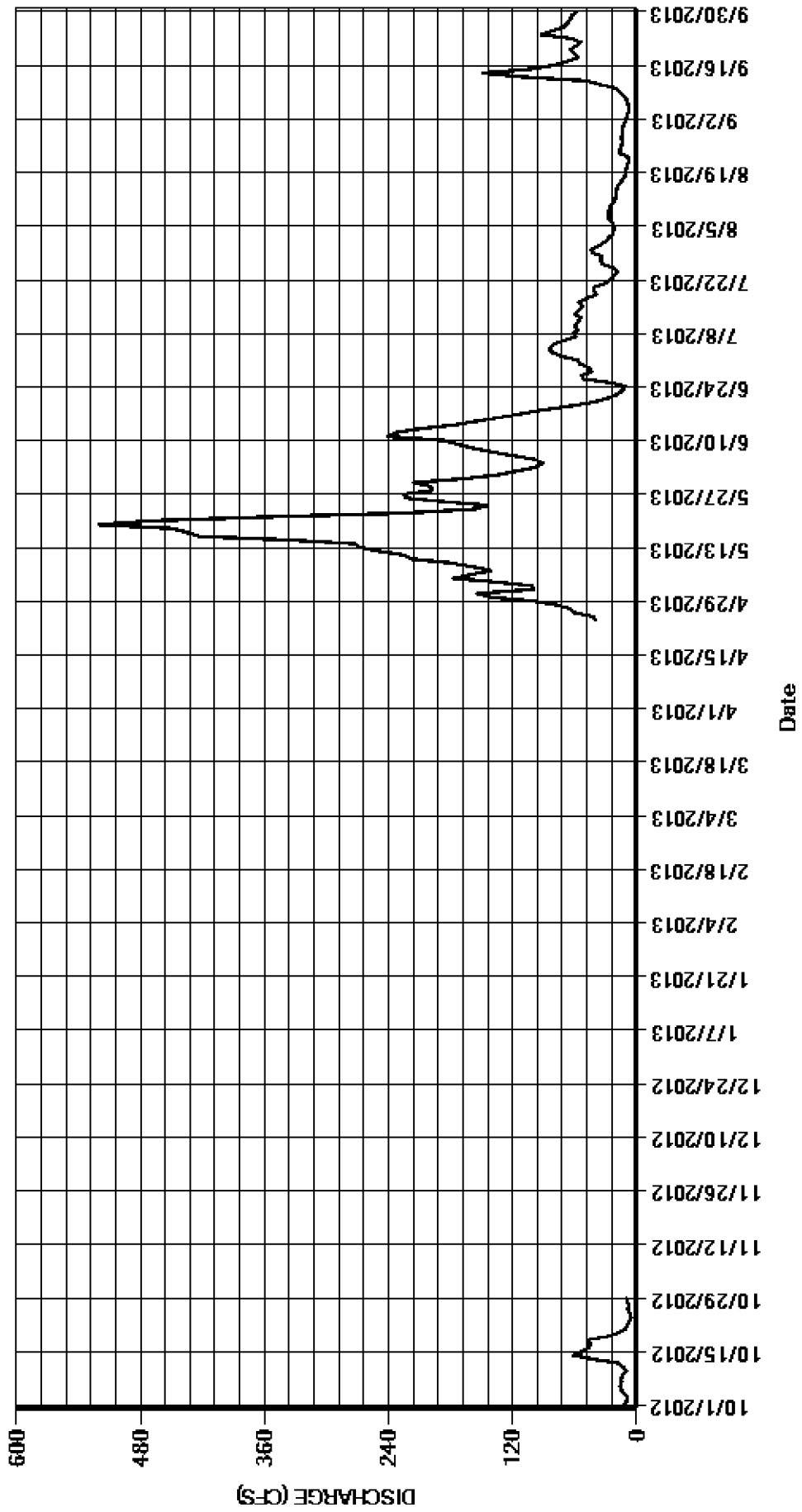
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e12	---	---	---	---	---	---	154	134	57	30	12
2	e10	---	---	---	---	---	---	100	115	74	27	10
3	e9.0	---	---	---	---	---	---	101	97	82	23	9.4
4	e12	---	---	---	---	---	---	133	91	85	22	7.8
5	e15	---	---	---	---	---	---	177	97	81	22	7.8
6	e16	---	---	---	---	---	---	160	118	71	24	8.7
7	e15	---	---	---	---	---	---	141	140	59	27	10
8	e15	---	---	---	---	---	---	158	158	61	27	13
9	e14	---	---	---	---	---	---	181	173	57	27	17
10	e10	---	---	---	---	---	---	217	187	60	26	21
11	e13	---	---	---	---	---	---	225	241	57	23	36
12	e18	---	---	---	---	---	---	249	233	54	21	49
13	e42	---	---	---	---	---	---	268	211	60	20	111
14	e61	---	---	---	---	---	---	273	176	56	20	149
15	e53	---	---	---	---	---	---	332	155	53	19	103
16	e46	---	---	---	---	---	---	424	133	56	17	81
17	e45	---	---	---	---	---	---	435	112	49	14	67
18	e48	---	---	---	---	---	---	449	90	39	11	57
19	e28	---	---	---	---	---	---	520	64	41	11	60
20	e17	---	---	---	---	---	---	469	42	42	10	64
21	e11	---	---	---	---	---	---	357	28	31	9.3	59
22	e9.2	---	---	---	---	---	---	224	19	25	7.8	54
23	e6.9	---	---	---	---	---	---	156	14	22	8.5	62
24	e5.7	---	---	---	---	---	e40	144	11	18	16	92
25	e6.6	---	---	---	---	---	42	187	24	22	16	82
26	e9.0	---	---	---	---	---	60	224	52	33	15	71
27	e7.8	---	---	---	---	---	64	225	53	35	14	67
28	e9.0	---	---	---	---	---	77	198	44	34	15	64
29	e10	---	---	---	---	---	100	199	46	43	14	63
30	---	---	---	---	---	---	142	216	55	44	14	58
31	---	---	---	---	---	---	---	166	---	36	13	---
TOTAL	574.2	---	---	---	---	---	525	7462	3113	1537	563.6	1565.7
MEAN	19.8	---	---	---	---	---	75.0	241	104	49.6	18.2	52.2
AC-FT	1140	---	---	---	---	---	1040	14800	6170	3050	1120	3110
MAX	61	---	---	---	---	---	142	520	241	85	30	149
MIN	5.7	---	---	---	---	---	40	100	11	18	7.8	7.8

CAL YR	2012	TOTAL	4508.2	MEAN	22.5	MAX	98	MIN	0.00	AC-FT	8940 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	15340.5	MEAN	81.2	MAX	520	MIN	5.7	AC-FT	30430 (PARTIAL YEAR RECORD)

MAX DISCH: 540 CFS AT 15:15 ON MAY 19, 2013 GH 3.27 FT SHIFT 0.04 FT  
 MAX GH: 3.27 FT AT 15:15 ON MAY 19, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06617100 MICHIGAN RIVER AT WALDEN, CO.  
WY2013 HYDROGRAPH



NORTH PLATTE RIVER BASIN  
06617500 ILLINOIS RIVER NEAR RAND

Water Year 2013

Location.-- Lat. 40°27'46.17", Long. 106°10'36.18" (NAD83), (Rand Quadrangle, 1956), in SW1/4 of the NE1/4 of Section 29, T6N, R78W in Jackson County, Hydrologic Unit 10180001, on right upstream bridge abutment on Jackson County Road 27.

Drainage Area and Period of Record.-- Approximately 70.6 sq. mi. (from topographic maps); Hydrographic measurements taken in 1981 and 1985, but no records were kept. Records kept from 1987 to present. Records published in 1995 and 2002 through the present by Colorado Division of Water Resources.

Equipment.-- Sutron shaft encoder (SDI12) housed in 18-inch diameter corrugated metal pipe stilling well with two 2-inch intakes located on the upstream side of the right bridge abutment. The shaft encoder is connected via cable to a Sutron high data rate (HDR) data collection platform (DCP) with satellite telemetry. The DCP is located 30 feet north of the stilling well in a NEMA box. Primary reference is an outside staff gage, with a range of 0.00 to 4.33 feet, located on the bridge abutment just to the left of the well.

Hydrologic Conditions.-- The basin consists of moderate terrain near the gage station, but originates in steep mountainous terrain up at the Continental Divide. In the vicinity of the gage station, the channel slope is moderate, but has a high sinuosity. The bed material ranges from silt up to small rock approximately 4-inches in diameter.

Gage-Height Record.-- Primary record is 15-minute shaft encoder data from satellite telemetry with the DCP log as backup. Continuous record was kept from October 1 to October 29, 2012 and April 24 to September 30, 2013. The gage station is closed during the winter months, typically November through mid-April. The station was visited nine times during water year 2013 to ensure instruments remained calibrated to the primary reference gage. There were two corrections made to the shaft encoder this water year (+0.02 on August 30, 2013 and -0.02 on September 27, 2013). Record is complete and reliable except for the following: October 29, 2012 (partial day record - station shut down for season), April 24, 2013 (partial day record - station opened for season) and May 2-3, 2013 (float hung up on ice in well).

Datum Corrections.-- Levels were not run during water year 2013. Levels were last run on August 25, 2010.

Rating.-- The stilling well is located upstream of the bridge at the right abutment. The channel is straight for at least 100-feet upstream to 50-feet downstream of the bridge. A small tributary joins the Illinois River just upstream of the gage station. The bridge at higher flows acts as the control. Otherwise, the natural channel acts as the control. Rating No. 9 in use since April 13, 2012 was applied during water year 2013. Nine measurements (numbered 131 through 139), ranging in discharge from 8.38 cfs to 397 cfs, were made this water year. These measurements covered the range in stage except for lower daily flows on October 1-12, 20-24, 26-28, 2012, August 17-18, 20-25, and September 3-6, 2013 and higher daily flows on May 16-19, 2013. The instantaneous peak flow of 544 cfs occurred at 0815 on May 18, 2013 at a gage height of 4.49 feet with a shift of -0.07 ft. It exceeded the stage of Measurement No. 134, made on May 16, 2013 by 0.35 ft. in stage.

Discharge.-- Shifting control method was applied throughout the period of record. Shifts were applied as defined by measurements and distributed by time and stage. Open-water measurements showed shifts ranging between -0.18 and +0.07 feet. All shifts except for measurement 137 were discounted from -7% to 6% to smooth shift distribution. Shifts were applied by time from October 1-29, 2012. Variable shift curve (ILLRANCOSC06A) was used April 24, 2013 to the peak gage height on May 18, 2013 at 0815. Variable shift curve (ILLRANCOSC06C) was then used until the end of the water year.

Special Computations.-- Discharge values were estimated for October 29, 2012 (station shut-down), April 24, 2013 (station opening) and May 2-3, 2013 (float hung up on ice in well) from the partial day record and consideration of previous or subsequent days of good record.

Remarks.-- The record should be considered good. The days the station was closed and opened along with the days the float was stuck in ice were partial day record. Flow was estimated those days and should be considered poor. The peak instantaneous discharge is rated as good. Station maintained and record developed by Dan Meyer.

Recommendations.-- Levels should be run during water year 2014. When levels run, an electric drop tape should be installed.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

06617500 ILLINOIS RIVER NEAR RAND

RATING TABLE-- ILLRANCO09 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

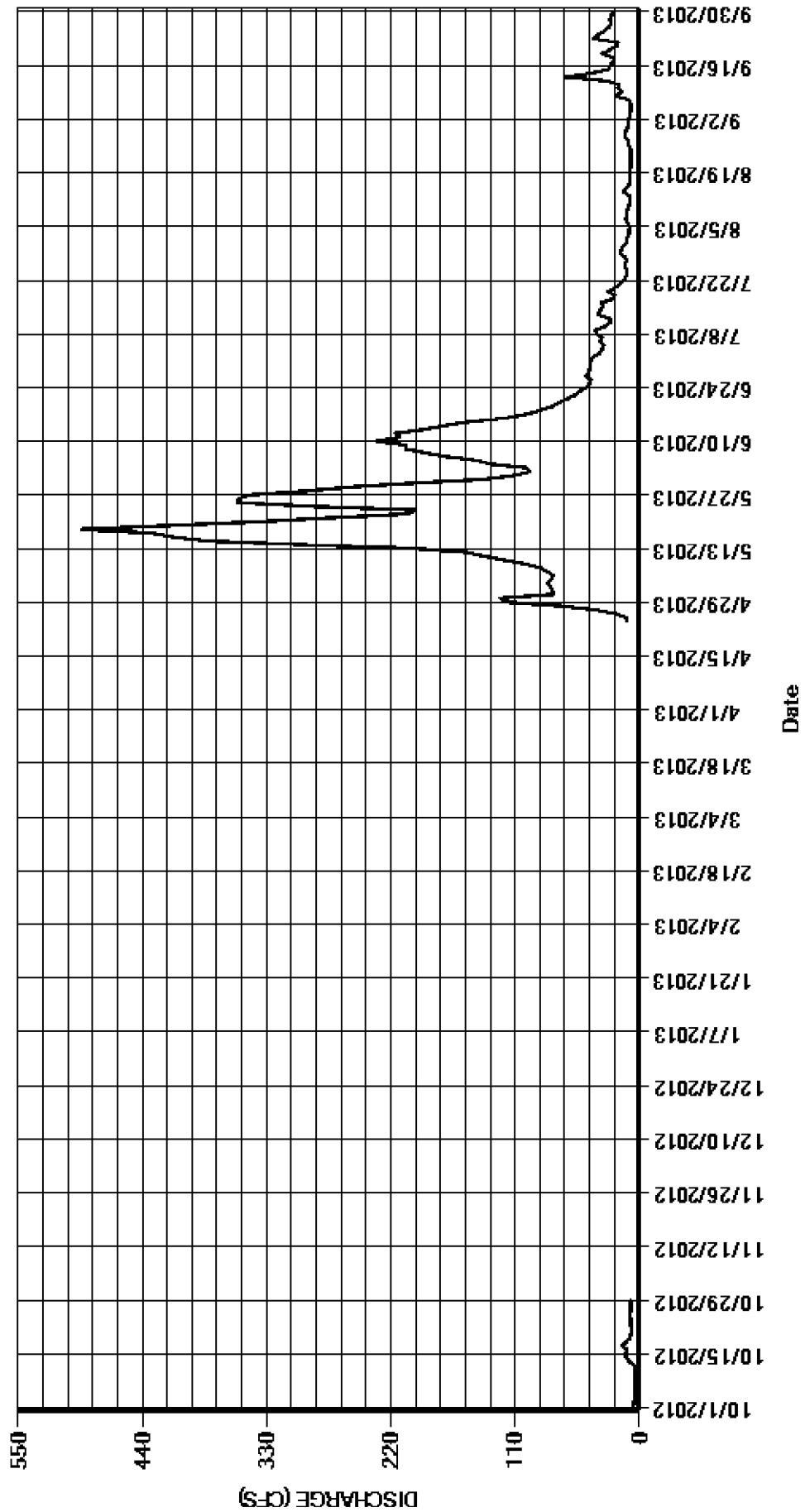
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.6	---	---	---	---	---	---	76	111	43	11	10
2	5.1	---	---	---	---	---	---	e77	97	41	11	10
3	4.5	---	---	---	---	---	---	e79	100	35	9.4	8.3
4	3.8	---	---	---	---	---	---	81	132	33	9.1	8.0
5	3.7	---	---	---	---	---	---	78	144	32	8.9	7.7
6	3.6	---	---	---	---	---	---	76	171	35	11	7.7
7	3.7	---	---	---	---	---	---	82	190	33	12	10
8	3.7	---	---	---	---	---	---	88	207	38	11	21
9	3.6	---	---	---	---	---	---	102	207	39	11	16
10	3.8	---	---	---	---	---	---	121	233	30	10	19
11	4.0	---	---	---	---	---	---	138	212	26	8.7	18
12	4.7	---	---	---	---	---	---	154	216	26	8.4	29
13	9.4	---	---	---	---	---	---	202	191	37	8.9	65
14	12	---	---	---	---	---	---	299	173	35	14	42
15	12	---	---	---	---	---	---	382	151	32	12	27
16	11	---	---	---	---	---	---	413	119	34	9.0	26
17	15	---	---	---	---	---	---	431	101	24	8.3	23
18	12	---	---	---	---	---	---	494	88	22	8.2	23
19	8.6	---	---	---	---	---	---	416	78	28	8.8	33
20	7.9	---	---	---	---	---	---	334	71	22	8.1	26
21	7.1	---	---	---	---	---	---	272	64	17	7.7	20
22	7.4	---	---	---	---	---	---	204	57	14	7.6	19
23	8.0	---	---	---	---	---	---	199	53	12	7.6	41
24	7.5	---	---	---	---	---	e11	296	47	11	8.0	37
25	8.8	---	---	---	---	---	11	356	44	12	7.7	31
26	7.9	---	---	---	---	---	21	355	43	13	9.4	27
27	7.9	---	---	---	---	---	39	345	48	11	9.4	25
28	7.8	---	---	---	---	---	70	295	45	13	12	26
29	e7.8	---	---	---	---	---	118	258	44	17	13	25
30	---	---	---	---	---	---	123	203	44	16	12	23
31	---	---	---	---	---	---	---	139	---	14	9.8	---
TOTAL	207.9	---	---	---	---	---	393	7045	3481	795	303.0	703.7
MEAN	7.17	---	---	---	---	---	56.1	227	116	25.6	9.77	23.5
AC-FT	412	---	---	---	---	---	780	13970	6900	1580	601	1400
MAX	15	---	---	---	---	---	123	494	233	43	14	65
MIN	3.6	---	---	---	---	---	11	76	43	11	7.6	7.7

CAL YR	2012	TOTAL	3345.2	MEAN	16.7	MAX	56	MIN	2.7	AC-FT	6640 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	12928.6	MEAN	68.4	MAX	494	MIN	3.6	AC-FT	25640 (PARTIAL YEAR RECORD)

MAX DISCH: 544 CFS AT 08:15 ON MAY 18, 2013 GH 4.49 FT SHIFT -0.07 FT  
 MAX GH: 4.49 FT AT 08:15 ON MAY 18, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06617500 ILLINOIS RIVER NEAR RAND  
WY2013 HYDROGRAPH



YAMPA RIVER BASIN  
MORRISON CREEK BELOW SILVER CREEK

Water Year 2013

Location.-- Lat. 40°14'44", Long. 106°47'12", (Green Ridge, Colorado Quadrangle), SE1/4 of the NE1/4 in Section 10, T3N, R84W of the Sixth Principal Meridian in Routt County, approximately 200 ft. below the confluence Silver Creek.

Drainage Area and Period of Record.-- 71.9 sq. mi. (from topographic maps). ; October 2008 to present.

Equipment.-- Sutron shaft encoder connected to a Sutron high data rate (HDR) data collection platform (DCP) with satellite telemetry housed in an 18-inch diameter corrugated metal pipe stilling well with two 2-inch intakes with cleanouts. Primary reference is an electric drop tape inside the well. An old staff gage remains in the creek but should not be used as a reference since its datum does not match the primary reference. No changes made this water year.

Hydrologic Conditions.-- Moderate terrain near the gage station, originates in steep mountainous terrain of the Silver Creek and Morrison Creek drainages in the Routt National Forest south of the Service Creek Wilderness Area. The channel slope is moderate and consists of gravel and small to medium size cobbles ranging from 4 to 12 inches in diameter. Some large boulders are located along the banks and in the vicinity of the bridge. Gage location is immediately downstream of the Morrison Creek bridge crossing just downstream of the confluence of Morrison Creek and Silver Creek. The channel is straight for at least 100 feet downstream of the gage. The right and left banks are subject to overflow. Altitude of gage is approximately 7880 ft (from topographic map).

Gage-Height Record.-- Primary record is 15-minute shaft encoder data from satellite telemetry with the DCP log as backup. Continuous record kept from October 1- October 31, 2012 and April 30 - September 30, 2013. The gage station is closed during the winter months. The gage station was visited eight times during water year 2013 to ensure the instruments remained calibrated to the primary reference. Two calibration corrections were made to the shaft encoder during water year 2013. The first correction occurred on October 2, 2012 (+0.01) and the second was on May 22, 2013 (+0.02). Record is complete and reliable except for October 31, 2012 (partial day record due to gage station closure for the winter); April 30, 2013 (partial day record due to gage opening); May 20, 2013 and September 18, 2013 (four hours or more of missing data values).

Datum Corrections.-- Levels were not run during water year 2013. Levels were last run on August 2, 2012.

Rating.-- At low flows the control is a natural small cobble riffle downstream of the gage. At medium flows the small cobble riffle is drowned out as the channel controls. At higher flows the channel will overbank on the right and left side of the channel which consist of willows, small shrubs and grass. The PZF in the channel is approximately 1.00 ft and should be verified during next levels circuit. Rating No. 3 was used for water year 2013. Rating definition is fair to 1,160 cfs (150% of the highest discharge measurement made at the gage). Seven measurements (Nos. 32- 38) were made this year, ranging in discharge from 3.89 cfs to 322 cfs. These measurements covered the range in stage except for lower daily flow on October 4-5 and 7-8, 2012; and higher daily flow May 13-29, 2013. The instantaneous peak flow of 597 cfs occurred at 2245 on May 17, 2013 at a gage height of 4.80 feet and a shift of 0.15 ft. It exceeded the stage of Measurement No. 34, made on May 22, 2013 by 1.08 feet in stage.

Discharge.-- Shifting control method was used during the entire water year. Shifts were transitioned (prorated by time) from water year 2012 through to the first measurement of water year 2013 and then distributed by stage using variable shift curve MORBSCCOVSC01 from October 2, 2012 until October 31, 2012 and then April 30, 2013 through the end of the water year. Measurements show unadjusted shifts varying from +0.07 feet to +0.15 feet. Shifts were applied directly and given full weight except Measurement Nos. 37-38, which were discounted 5% to smooth shift distribution.

Special Computations.-- Discharge was estimated on October 31, 2012 (partial day record due to gage station closure for the winter); April 30, 2013 (partial day record due to gage station opening) and May 20 and September 18, 2013 (four hours or more of missing data values). Estimates for opening and closing day were made using adjacent periods of record and the corresponding discharge measurement. Estimates of discharge for days with missing data were done by interpolating between good data previous to and following the missing period.

Remarks.-- The record is considered good, except for days with estimated discharge which should be considered as fair. Days with estimated discharge include: October 31, 2012, April 30, May 20 and September 18, 2013. Station maintained and record developed by Dan Meyer.

Recommendations.-- Levels should be run in WY2014 to verify new reference marks (RM2 and RM3), check the PZF, and obtain channel cross section at the control. Continue to evaluate factors (moss, irrigation pumping, upstream diversion structures, gravel operations, sand bar, beaver dams, etc.) that are potentially contributing to shift variations. Evaluate Rating No.3 at both extremes of the 2014 hydrograph and revise accordingly.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

MORRISON CREEK BELOW SILVER CREEK

RATING TABLE-- MORBSCCO03 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.0	---	---	---	---	---	---	225	226	22	9.7	9.5
2	4.0	---	---	---	---	---	---	156	220	21	9.1	8.9
3	4.2	---	---	---	---	---	---	140	229	21	8.1	8.0
4	3.7	---	---	---	---	---	---	147	226	22	8.3	7.7
5	3.8	---	---	---	---	---	---	156	218	21	8.6	6.6
6	3.9	---	---	---	---	---	---	169	201	29	8.4	6.1
7	3.4	---	---	---	---	---	---	205	190	25	8.8	11
8	3.6	---	---	---	---	---	---	204	184	20	8.5	12
9	4.3	---	---	---	---	---	---	217	171	18	14	14
10	4.5	---	---	---	---	---	---	220	158	17	13	17
11	4.8	---	---	---	---	---	---	239	143	15	9.4	29
12	5.3	---	---	---	---	---	---	273	127	14	8.0	24
13	8.9	---	---	---	---	---	---	346	113	17	7.7	45
14	9.8	---	---	---	---	---	---	426	101	17	8.3	28
15	9.0	---	---	---	---	---	---	456	90	14	7.1	20
16	7.9	---	---	---	---	---	---	512	82	13	6.1	27
17	9.3	---	---	---	---	---	---	535	77	11	5.5	18
18	7.3	---	---	---	---	---	---	528	67	15	5.4	e17
19	6.5	---	---	---	---	---	---	461	60	17	5.4	21
20	6.8	---	---	---	---	---	---	e414	51	13	5.4	17
21	6.7	---	---	---	---	---	---	366	46	9.9	5.4	14
22	6.6	---	---	---	---	---	---	348	42	8.7	5.2	13
23	6.7	---	---	---	---	---	---	398	39	8.0	5.2	35
24	6.9	---	---	---	---	---	---	462	36	7.9	9.4	28
25	6.6	---	---	---	---	---	---	480	33	8.1	8.6	27
26	6.1	---	---	---	---	---	---	471	31	8.8	7.1	19
27	7.3	---	---	---	---	---	---	438	29	7.7	6.6	18
28	7.9	---	---	---	---	---	---	387	25	9.6	7.2	21
29	8.1	---	---	---	---	---	---	355	24	13	11	21
30	8.1	---	---	---	---	---	e245	307	24	16	9.2	18
31	e8.0	---	---	---	---	---	---	257	---	11	9.2	---
TOTAL	194.0	---	---	---	---	---	245	10298	3263	470.7	248.9	560.8
MEAN	6.26	---	---	---	---	---	245	332	109	15.2	8.03	18.7
AC-FT	385	---	---	---	---	---	486	20430	6470	934	494	1110
MAX	9.8	---	---	---	---	---	245	535	229	29	14	45
MIN	3.4	---	---	---	---	---	245	140	24	7.7	5.2	6.1

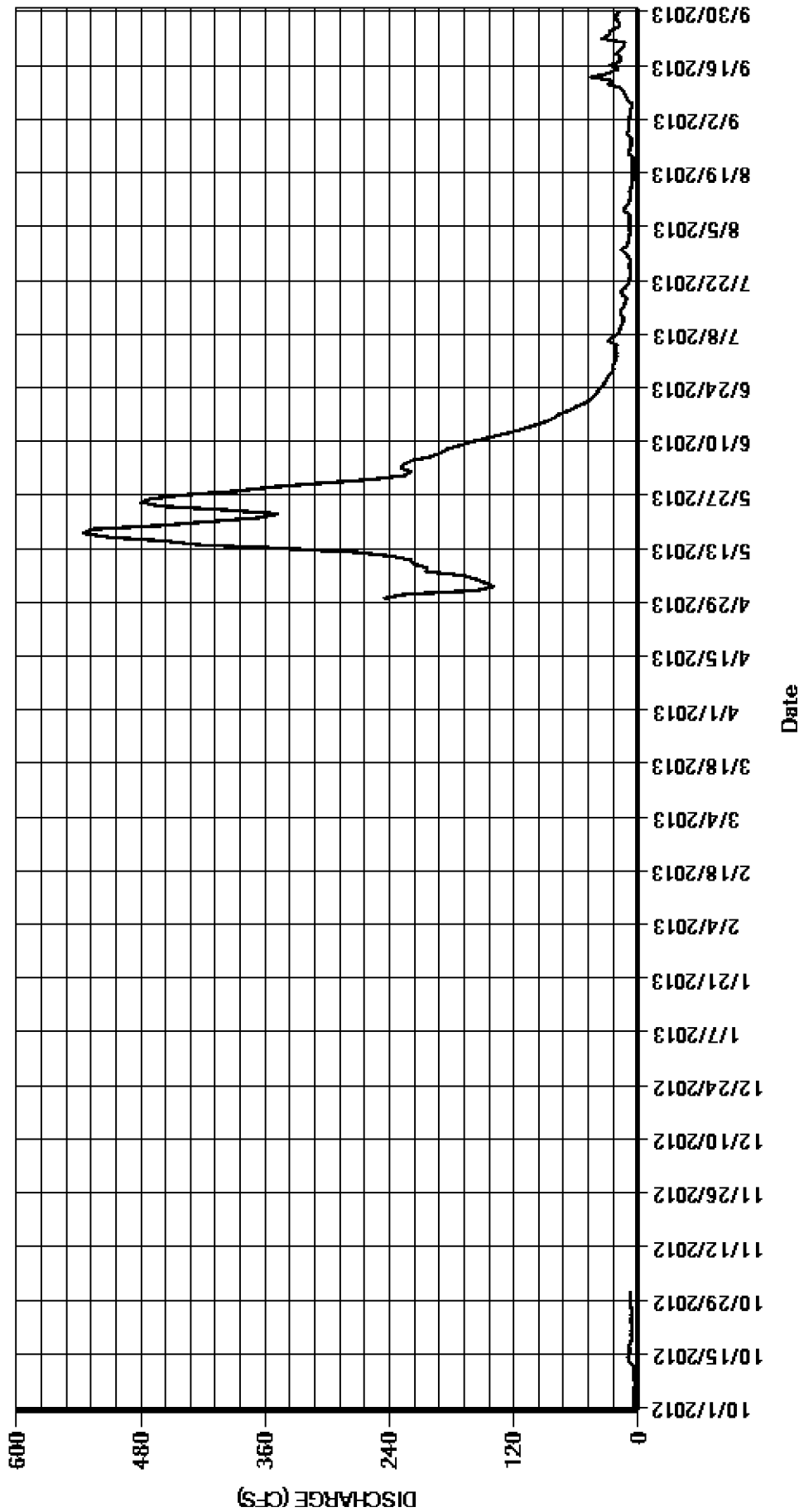
CAL YR	2012	TOTAL	4955.0	MEAN	25.9	MAX	183	MIN	2.4	AC-FT	9830 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	15280.4	MEAN	82.6	MAX	535	MIN	3.4	AC-FT	30310 (PARTIAL YEAR RECORD)

MAX DISCH: 597 CFS AT 22:45 ON MAY 17, 2013 GH 4.80 FT SHIFT 0.15 FT  
 MAX GH: 4.80 FT AT 22:45 ON MAY 17, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



MORRISON CREEK BELOW SILVER CREEK  
WY2013 HYDROGRAPH



YAMPA RIVER BASIN  
YAMPA R ABOVE LAKE CATAMOUNT NR STREAMBOAT SPRINGS  
Water Year 2013

Location.-- Lat. 40°20'27", Long. 106°48'29", (Blacktail Mountain, Colorado Quadrangle), SE1/4 of the SE1/4 in Section 33, T5N, R84W of the Sixth Principal Meridian in Routt County, Hydrologic Unit 14050001, at County Road 18C bridge.

Drainage Area and Period of Record.-- 361 sq mi (from topographic maps). ; October 2003 to present.

Equipment.-- Sutron shaft encoder Model 5600-0531 housed in a 42-inch diameter corrugated metal pipe shelter and well. The shaft encoder is connected to a high data rate Sutron Satlink data collection platform (DCP) with satellite telemetry. Stilling well equipped with two 1.5-inch intakes connected to flush risers. The inside staff, with a range of approximately 0.00 to 6.66 feet, is the primary reference gage and is located on the inside wall of the pipe. The station has a Sutron air-temperature sensor. The station is also equipped with a stock tank heater which is used to keep the well from freezing in the winter.

Hydrologic Conditions.-- The basin consists of moderate terrain near the gage station, but originates in steep mountainous terrain in the Flattops Wilderness Area. Discharge affected by storage and subsequent releases of Yampa River flows from Stagecoach Reservoir approximately 5 miles upstream. The channel slope is moderate and consists of small gravel and rock. Channel is straight for approximately 100 feet upstream and 500 feet downstream with a slight bend as the river passes under the bridge. Altitude of gage is approximately 6880 ft (from topographic map).

Gage-Height Record.-- Primary record is 15-minute shaft encoder data from satellite telemetry with the DCP data log as backup. Continuous record kept from October 1, 2012 to September 30, 2013. Shaft encoder corrections were made at the time of site visits and ranged in value from -0.03 ft to 0.02 ft. Gage heights are recorded throughout the winter months; however, the river can be partially frozen, which in turn may result in the record being affected by ice conditions or the intakes frozen. The stilling well is generally kept ice free through use of a stock tank heater. The record is complete and reliable, except for the following days when the intakes were frozen and the stilling well was disconnected from the river: December 9, 2012 - March 6, 2013 and when beavers constructed a dam on the control: Oct. 1-10, 12-31, Nov. 1-30, Dec. 1-8, 2012, Aug. 9-26, 2013.

Datum Corrections.-- Levels were not run during water year 2013. Levels were last run on August 2, 2012. The closure error was within the acceptable range and no adjustments were made to RP1.

Rating.-- Rating No. 14 was used for water year 2013. It is well defined to a flow of 3,200 cfs, 150% of the historical highest discharge measurement made in water year 2011. Eleven measurements (numbers 201 through 211), ranging in discharge from 30.2 to 1,040 cfs, were made this water year. These measurements covered the range in stage except for higher daily flow on May 17-18, 2013 and lower daily flow on October 1 and 3-11, 2012. The peak instantaneous flow of 1,200 cfs occurred at 2315 on May 17, 2013 at a gage height of 5.04 ft, with a shift of 0.00 ft. This peak exceeded the stage of Measurement 207 made on May 17, 2013 by 0.21 ft. Minimum daily flow of 25 cfs occurred on October 7-8, 2012.

Discharge.-- Shifting control method was applied throughout the record period. Shifts were applied as defined by measurements and were distributed by time. Open-water measurements showed shifts varying between -0.32 ft. to 0.03 ft. Shifts were applied directly and given full weight, except for measurement nos. 208-211 which were discounted from -6% to +2% to smooth shift distribution. Shifts from measurement nos. 202 and 210 were calculated and applied before a beaver dam was cleared and then recalculated and applied after the beaver dam was removed.

Special Computations.-- Discharge values were estimated for those days affected by backwater from beaver dams and days when the intakes were frozen disconnecting the well from the river. Discharge values were estimated by consideration of temperature data (YAMABVCO temperature data) and precipitation data from the Colorado Climate Center (Steamboat Springs, CO weather station), and by comparison to the discharge record from the USGS operated and maintained gage station located upstream approximately 5 miles on the Yampa River below Stagecoach Reservoir. Calculated values were also used for estimating discharge on days when gage height was affected by beaver dams.

Remarks.-- The record is good, except for the period affected when the well was disconnected from the river due to frozen intakes and beaver dams were causing backwater effects. Discharge for days when the well was disconnected from the river was estimated and are considered poor. Discharge for days when backwater effect was affecting the gage height was both estimated and computed and should be considered fair. The peak instantaneous flow is rated as good. Station maintained and record developed by Dan Meyer.

Recommendations.-- Beaver activity on the control should be monitored during WY 2014. The station equipment shelf should be replaced and the exterior of the shelter painted.

STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

YAMPA R ABOVE LAKE CATAMOUNT NR STREAMBOAT SPRINGS

RATING TABLE-- YAMABVCO14 USED FROM 01-OCT-2012 TO 22-MAR-2013  
YAMABVCO14A USED FROM 22-MAR-2013 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

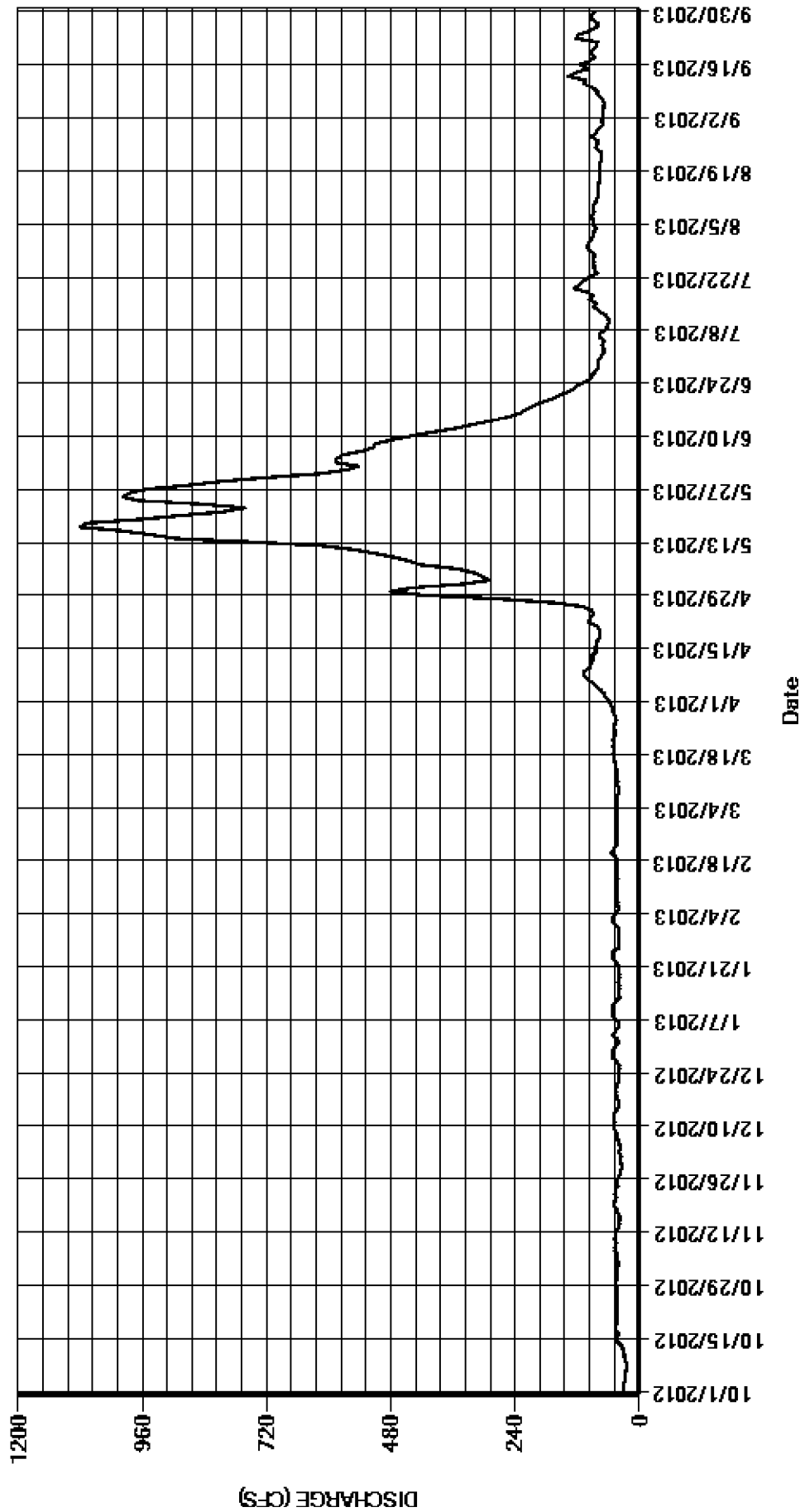
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e30	e43	e37	e40	e47	e43	59	439	566	74	93	72
2	e31	e43	e36	e44	e53	e43	65	342	543	69	89	72
3	e30	e42	e40	e52	e53	e43	68	291	587	69	88	70
4	e28	e41	e37	e46	e47	e43	75	304	586	72	84	70
5	e28	e43	e39	e40	e40	e43	84	321	575	68	90	69
6	e27	e42	e41	e40	e42	e43	92	353	538	76	90	68
7	e25	e47	e44	e45	e42	43	102	421	514	77	92	72
8	e25	e47	e44	e52	e43	40	108	445	510	66	88	81
9	e27	e45	e48	e51	e43	40	106	475	478	62	e89	82
10	e29	e48	e50	e50	e43	43	96	510	442	59	e90	91
11	30	e46	e48	e51	e43	42	94	553	401	60	e84	107
12	e32	e45	e49	e45	e43	43	90	611	356	66	e81	105
13	e35	e41	e49	e38	e42	43	92	739	323	78	e80	137
14	e43	e39	e45	e40	e43	45	84	894	288	88	e80	122
15	e43	e39	e40	e39	e43	46	85	943	256	83	e80	97
16	e40	e38	e40	e39	e43	48	83	1000	231	97	e78	115
17	e46	e42	e42	e41	e43	49	81	1080	219	90	e77	95
18	e46	e44	e45	e39	e42	51	77	1070	205	100	e77	87
19	e43	e49	e45	e39	e47	49	76	966	187	127	e76	95
20	e44	e48	e45	e40	e54	51	78	886	165	116	e77	90
21	e45	e45	e43	e39	e49	49	82	802	150	108	e77	83
22	e44	e47	e40	e44	e44	51	99	763	132	96	e74	81
23	e43	e47	e40	e51	e44	48	95	843	123	82	e74	122
24	e43	e42	e39	e51	e44	47	89	968	110	87	e74	118
25	e44	e42	e39	e51	e44	49	92	997	95	88	e84	96
26	e43	e42	e39	e40	e44	48	110	985	92	88	e82	82
27	e43	e38	e44	e40	e44	45	165	953	86	88	81	81
28	e44	e37	e52	e40	e44	47	271	872	80	87	92	92
29	e45	e34	e51	e40	---	50	419	811	80	97	83	92
30	e45	e35	e51	e40	---	52	480	724	80	101	80	87
31	e43	---	e46	e40	---	55	---	622	---	98	71	---
TOTAL	1164	1281	1348	1347	1253	1432	3597	21983	8998	2617	2555	2731
MEAN	37.5	42.7	43.5	43.5	44.8	46.2	120	709	300	84.4	82.4	91.0
AC-FT	2310	2540	2670	2670	2490	2840	7130	43600	17850	5190	5070	5420
MAX	46	49	52	52	54	55	480	1080	587	127	93	137
MIN	25	34	36	38	40	40	59	291	80	59	71	68

CAL YR	2012	TOTAL	35536	MEAN	97.1	MAX	553	MIN	21	AC-FT	70490
WTR YR	2013	TOTAL	50306	MEAN	138	MAX	1080	MIN	25	AC-FT	99780

MAX DISCH: 1200 CFS AT 23:15 ON MAY 17, 2013 GH 5.04 FT SHIFT 0.00 FT  
MAX GH: 5.04 FT AT 23:15 ON MAY 17, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**YAMPA R ABOVE LAKE CATAMOUNT NR STREAMBOAT SPRINGS  
WY2013 HYDROGRAPH**



YAMPA RIVER BASIN  
09238500 WALTON CREEK NEAR STEAMBOAT SPRINGS, CO.  
Water Year 2013

Location.-- Lat. 40 24'29", Long. 106 47'11", (Steamboat Springs, Colorado, Quad., scale, 1:24,000), in SW1/4 of the NW1/4, in Section 11, T5N, R84W, (projected), Routt County, Hydrologic Unit 14050001, on left bank 0.4 miles downstream from Beaver Creek, 0.6 miles downstream from Storm King Creek, 4.5 miles upstream from its confluence with the Yampa River, and 6.0 miles southeast of Steamboat Springs.

Drainage Area and Period of Record.-- 42.4 sq mi (from topographic maps). ; Record kept from October 1965 to September 1973; May 1982 to September 1987; and October 2001 to present.

Equipment.-- Sutron shaft encoder connected to a Sutron HDR data collection platform (DCP) with satellite telemetry. The encoder and DCP are housed in a 42-inch diameter corrugated metal shelter and well. The station is equipped with two 2-inch intakes equipped with flush risers and valves. Primary reference gage is an inside staff (range of 0.00 to 6.6 ft.) located on inner wall of 42-inch diameter corrugated metal well. An adjustable brass screw/nut on the edge of the equipment shelf is the secondary reference gage but was not used this water year. The control is a broad-crested concrete weir 50-foot long with a low flow section on the left side.

Hydrologic Conditions.-- The basin above the gage consists of steep mountainous terrain originating at the top of Mount Werner and Walton Peak. Channel slope is steep at gage location and consists of large boulders (up to approximately 3-4 feet in diameter) typical of mountainous streams. The channel is straight for 200-feet upstream to 200-feet downstream of the gage, which is located immediately upstream of the weir. The right bank is high and less subject to overflow than the left bank. Some development has occurred in the vicinity of the gage, and a large home is located above the gage location.

Gage-Height Record.-- Primary record is 15-minute satellite telemetry data with the DCP log as backup. Continuous gage height records were kept from October 1 to October 31, 2012 and April 30 to September 30, 2013. Records were not kept during the winter period (November 1, 2012 to April 29, 2013), due to site accessibility and frozen channel issues. The record is complete and reliable except for the following dates: October 31, 2012 and April 30, 2013, which were partial records due to the shut down and start-up of the station in the Fall and Spring, respectively. The shaft encoder was adjusted two times this water year (+0.02 on Aug. 26 and +0.02 on Sept. 23, 2013).

Datum Corrections.-- Levels were not run during water year 2013.

Rating.-- The control is a 50-foot long broad-crested concrete weir with a low flow section on the left side. This section is 9-feet wide at the downstream edge and 19-feet wide at the upstream edge. Rating No. 8, developed in November 2003, and extended in June 2007, was used in water year 2013. Seven measurements (numbers 80 through 86) were made during the current water year, ranging in discharge from 4.60 to 71.8 cfs. They cover the range in stage experienced except for higher daily flows April 30 to June 26, 2013. The instantaneous peak flow of 614 cfs occurred at 1930 on May 26, 2013 at a gage height of 2.09 feet, with a shift of 0.06 feet. It exceeded Measurement No. 86, made on September 23, 2013 by 1.03 ft. in stage. Minimum daily flows of 4.7 cfs occurred on October 4-5 and 8, 2012.

Discharge.-- Shifting section control method was used throughout the period of record. Shifts were applied as defined by measurements and were distributed by time. Measurement 84 was a check measurement and the calculated shift was not used in record development. This year's measurements had unadjusted shifts ranging between 0.11 to -0.09 feet. Shifts from Measurements 80 (-6.31%), 81(-5.89%), 82(+7.76%), 83(+5.04%), 85(+6.76%) and 86(+3.31%) were adjusted to smooth shift distribution.

Special Computations.-- The station is closed during the winter months and no discharges are estimated during this period. Discharge data for October 31, 2012 (shut-down) and April 30, 2013 (start-up) were estimated using flow measurement data, partial day DCP data, and consideration of adjacent good data.

Remarks.-- The record is good, except as follows: October 31, 2012 and April 30, 2013, which were estimated and should be considered fair and May 10 - June 20, 2013, which should be considered fair to poor because the flow exceeded twice the highest water year 2013 measurement. The peak flow for the year is considered poor because it exceeded 200% of the highest discharge measurement ever made at this gage of 106 cfs. This gage station is used for water administration purposes only, the rating is considered more critical during low flow periods. Station maintained and record developed by Dan Meyer.

Recommendations.-- A drop tape should be installed during water year 2014. An outside staff gage should be installed on left weir wing wall near terminus of stilling well intakes.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09238500 WALTON CREEK NEAR STEAMBOAT SPRINGS, CO.

RATING TABLE-- WLTNCKCO08 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

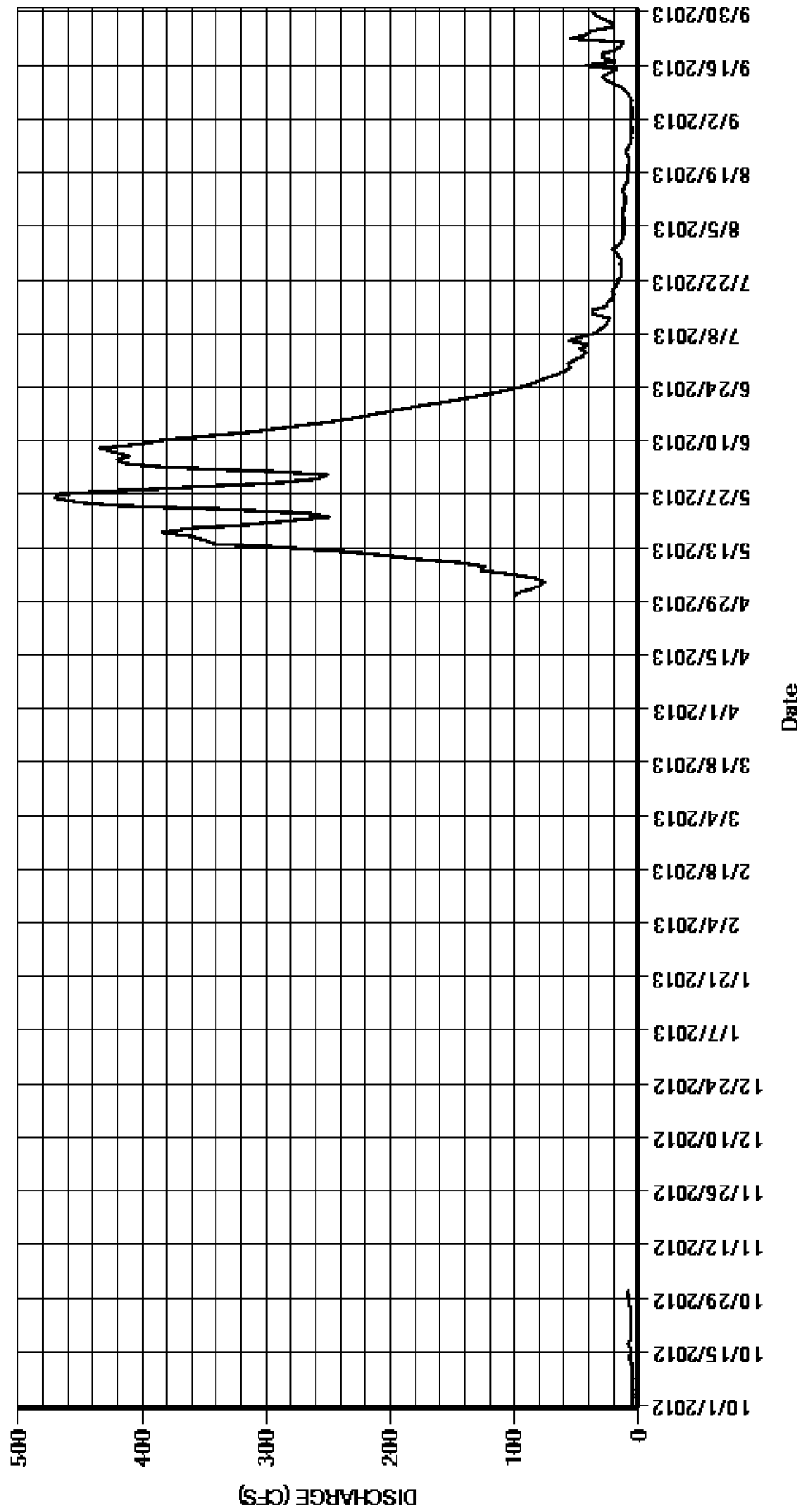
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.8	---	---	---	---	---	---	99	251	52	14	6.3
2	4.8	---	---	---	---	---	---	88	306	45	13	6.0
3	4.8	---	---	---	---	---	---	80	386	43	12	5.6
4	4.7	---	---	---	---	---	---	76	415	47	12	5.6
5	4.7	---	---	---	---	---	---	83	420	41	12	5.8
6	5.0	---	---	---	---	---	---	101	411	56	12	6.3
7	4.8	---	---	---	---	---	---	127	423	46	12	5.9
8	4.7	---	---	---	---	---	---	124	434	35	13	7.5
9	5.3	---	---	---	---	---	---	142	403	31	12	10
10	5.3	---	---	---	---	---	---	179	385	27	12	13
11	5.2	---	---	---	---	---	---	206	353	25	11	19
12	6.0	---	---	---	---	---	---	240	316	24	11	26
13	7.3	---	---	---	---	---	---	288	293	37	11	29
14	6.8	---	---	---	---	---	---	343	269	37	13	24
15	6.9	---	---	---	---	---	---	350	245	26	12	18
16	6.8	---	---	---	---	---	---	361	226	25	10	42
17	8.1	---	---	---	---	---	---	384	211	21	9.1	19
18	6.6	---	---	---	---	---	---	362	194	20	8.8	29
19	6.7	---	---	---	---	---	---	314	177	21	8.5	29
20	6.7	---	---	---	---	---	---	282	157	19	8.2	18
21	6.5	---	---	---	---	---	---	250	139	17	8.2	14
22	6.6	---	---	---	---	---	---	269	122	16	7.6	13
23	6.4	---	---	---	---	---	---	341	107	14	7.9	55
24	6.2	---	---	---	---	---	---	426	94	14	9.9	43
25	6.7	---	---	---	---	---	---	455	84	14	9.7	38
26	6.3	---	---	---	---	---	---	470	77	15	7.8	21
27	7.6	---	---	---	---	---	---	468	68	14	6.4	21
28	8.0	---	---	---	---	---	---	412	60	16	6.1	28
29	8.2	---	---	---	---	---	---	347	55	18	6.0	34
30	8.5	---	---	---	---	---	e100	287	57	21	5.8	37
31	e8.5	---	---	---	---	---	---	258	---	17	6.0	---
TOTAL	195.5	---	---	---	---	---	100	8212	7138	854	308.0	629.0
MEAN	6.31	---	---	---	---	---	100	265	238	27.5	9.94	21.0
AC-FT	388	---	---	---	---	---	198	16290	14160	1690	611	1250
MAX	8.5	---	---	---	---	---	100	470	434	56	14	55
MIN	4.7	---	---	---	---	---	100	76	55	14	5.8	5.6

CAL YR	2012	TOTAL	11526.6	MEAN	60.0	MAX	314	MIN	3.4	AC-FT	22860 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	17436.5	MEAN	94.3	MAX	470	MIN	4.7	AC-FT	34590 (PARTIAL YEAR RECORD)

MAX DISCH: 614 CFS AT 19:30 ON MAY 26, 2013 GH 2.09 FT SHIFT 0.06 FT  
 MAX GH: 2.09 FT AT 19:30 ON MAY 26, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09238500 WALTON CREEK NEAR STEAMBOAT SPRINGS, CO.  
WY2013 HYDROGRAPH



YAMPA RIVER BASIN  
WILLOW CREEK BELOW STEAMBOAT LAKE  
Water Year 2013

Location.-- Lat. 40° 47'28", Long. 106° 56'40", (Hahns Peak Quadrangle), in the SW¼ of the SE¼ Section 29, T10N, R85W in Routt County, Hydrologic Unit 14050001, on left bank 50-feet below the Steamboat Lake outlet.

Drainage Area and Period of Record.-- 35.5 square miles. ; Records kept from 1979 to present.

Equipment.-- Sutron shaft encoder (SDI12) housed in a steel box shelter on an 18-inch diameter corrugated metal pipe stilling well with two 2-inch intakes. The shaft encoder is connected via cable to a Sutron high data rate (HDR) data collection platform (DCP) with satellite telemetry. The DCP is located in a separate NEMA housing box several feet from the stilling well. There is no outside staff. Primary reference is an electronic drop tape referenced to a line at the base of the device, connected at the edge of the wood instrument shelf.

Hydrologic Conditions.-- The basin consists of steep mountainous terrain originating at the top of Sand Mountain, Diamond Peak, and other portions of the mountain range dividing the Elk River drainage and Little Snake River drainage. The channel slope is moderate at the gage and consists of small to medium size rock ranging from 4 to 12 inches in diameter. Releases from Steamboat Lake control the flow in Willow Creek.

Gage-Height Record.-- Primary record is 15-minute shaft encoder data from satellite telemetry with the DCP log as backup. Record was kept from October 1 to October 30, 2012 (DCP shut-down for winter) and May 1 (DCP start-up in spring) to September 30, 2013. The outlet gage height record is complete and reliable except for October 30, 2012 and May 1, 2013, which were estimated. Release from the reservoir was kept constant on October 30, 2012 and the outlet was not open on May 1, 2013, the days of estimated record. One instrument calibration correction was made during water year 2013 (+0.03 on 5/21/2013).

Datum Corrections.-- Levels were not run during water year 2013.

Rating.-- Control is a cobble/small boulder riffle located just downstream of the gage. Gage location is immediately downstream (75 ft) of the Steamboat Lake outlet and flow is dictated by the gate valve position. The channel slope is moderate and consists of small to medium size rock ranging from 4 to 12 inches in diameter. Channel is straight for at least 100-ft downstream of the gage. The right and left banks are subject to overflow.

Rating No. 12 (in use since October 1, 2008) was used the entire period of record. It is well defined to flows of 240 cfs, 150% of the historical highest discharge measurement made in WY2005. Nine measurements (numbers 110 to 118) were taken ranging in discharge from 5.96 to 48.1 cfs. These measurements cover the range in discharge except for lower daily flows on May 2-8 and July 14-17, 2013; and higher daily flows from May 10-14 and May 22 - June 1, 2013. The instantaneous peak discharge of 369 cfs occurred at 1530 on May 9, 2013 at a gage height of 3.56 ft with a shift of -0.03 ft. The peak discharge exceeded the stage of Measurement No. 114, made on May 21, 2013, by 1.80 ft.

Discharge.-- Shifting control method was applied throughout the record period. Shifts were applied directly and were distributed by time from October 1 to October 30, 2012 and May 1 to September 30, 2013. Open-water measurements showed unadjusted shifts ranging between -0.07 and -0.02 ft. All measurements were given full weight and applied directly except for measurement no. 111, 112 and 115-117 which were discounted from -4% to 6% to smooth shift distribution.

Special Computations.-- No water is released from the reservoir during the winter months and no outlet record is kept. Discharge for October 30, 2012 was estimated using flow measurement #113, partial day DCP data and consideration of the previous day's flow data. Discharge for May 1, 2013 was estimated based on observation of no flow.

Remarks.-- Record is considered good except for the day the gage was shut down for the winter which was estimated and should be considered fair. Days when the average daily flows exceeded 96.2 cfs (Flow exceeded twice the highest measured discharge this water year) should be considered fair. The peak flow (280 cfs) for the year is rated poor as it exceeded 150% of the highest measurement (157 cfs) ever recorded at this station. Station maintained and record developed by Dan Meyer.

Recommendations.-- Run levels to verify RP1 and length of electric drop tape.



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

WILLOW CREEK BELOW STEAMBOAT LAKE

RATING TABLE-- WILBSLCO12 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

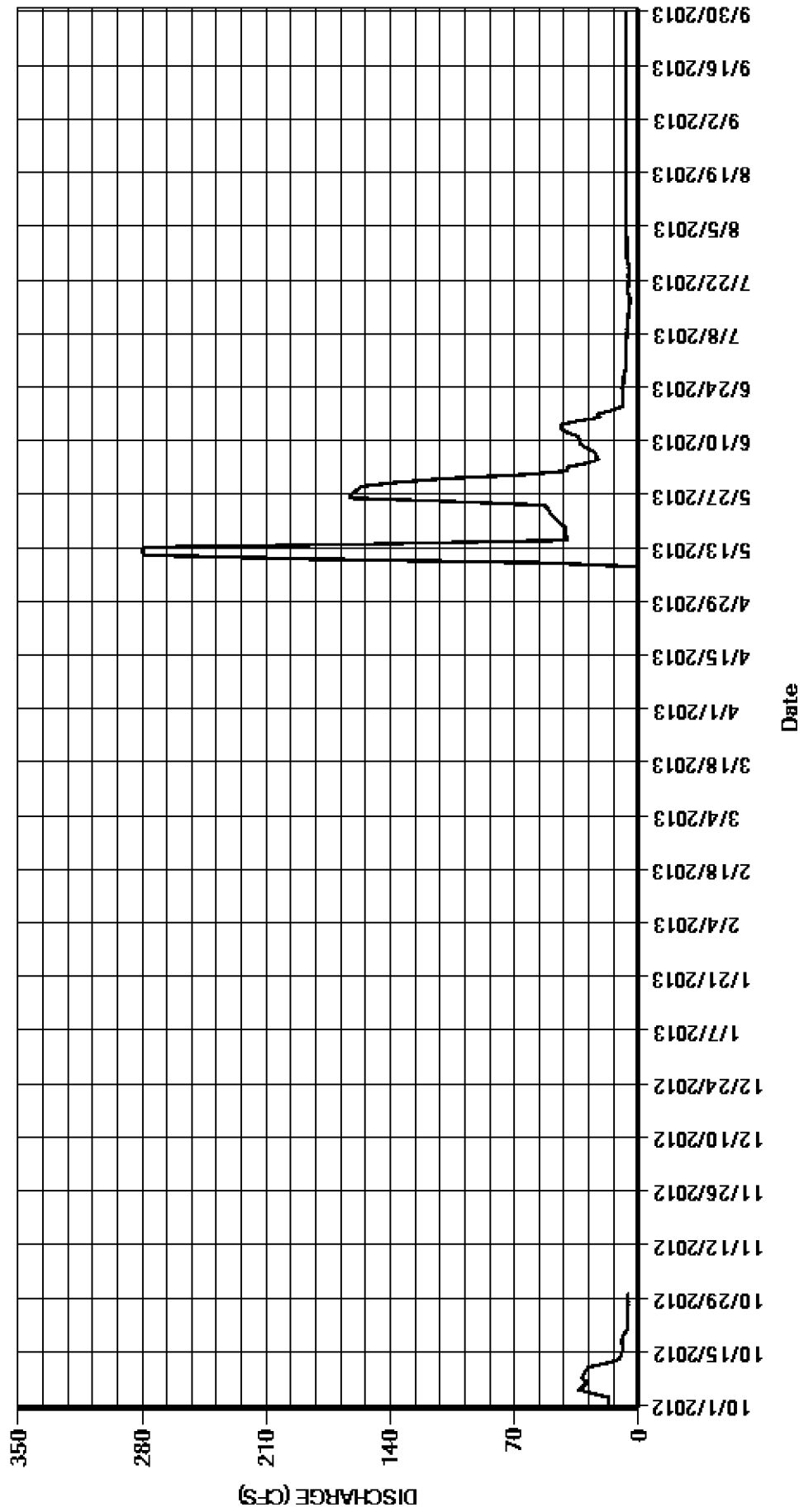
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	---	---	---	---	---	---	e0.00	66	7.3	6.7	7.3
2	17	---	---	---	---	---	---	0.00	40	7.3	6.8	7.3
3	17	---	---	---	---	---	---	0.00	40	7.2	7.0	7.3
4	26	---	---	---	---	---	---	0.00	29	7.0	7.0	7.3
5	34	---	---	---	---	---	---	0.00	23	7.0	7.0	7.3
6	31	---	---	---	---	---	---	0.00	24	7.0	7.0	7.3
7	29	---	---	---	---	---	---	0.00	25	6.8	7.0	7.3
8	32	---	---	---	---	---	---	0.61	29	6.7	7.0	7.3
9	31	---	---	---	---	---	---	52	33	6.5	7.0	7.0
10	30	---	---	---	---	---	---	186	33	6.3	7.0	7.0
11	28	---	---	---	---	---	---	279	34	6.3	7.0	7.0
12	18	---	---	---	---	---	---	280	40	6.0	7.0	7.0
13	11	---	---	---	---	---	---	279	44	5.8	7.2	7.0
14	10	---	---	---	---	---	---	143	44	5.5	7.2	7.0
15	9.2	---	---	---	---	---	---	40	35	5.2	7.3	7.0
16	9.2	---	---	---	---	---	---	41	22	5.0	7.3	7.0
17	9.2	---	---	---	---	---	---	41	23	4.9	7.3	7.0
18	9.5	---	---	---	---	---	---	41	14	5.7	7.3	7.0
19	9.1	---	---	---	---	---	---	43	8.8	6.1	7.3	7.0
20	7.5	---	---	---	---	---	---	46	8.8	6.0	7.2	7.1
21	6.3	---	---	---	---	---	---	48	8.9	5.8	7.2	7.2
22	6.3	---	---	---	---	---	---	50	9.2	5.7	7.3	7.3
23	6.3	---	---	---	---	---	---	51	9.2	5.8	7.1	7.2
24	6.3	---	---	---	---	---	---	53	9.4	5.7	7.3	7.2
25	6.3	---	---	---	---	---	---	103	8.5	5.7	7.3	7.3
26	6.3	---	---	---	---	---	---	163	8.4	5.7	7.3	7.3
27	6.0	---	---	---	---	---	---	162	8.4	6.4	7.3	7.3
28	6.0	---	---	---	---	---	---	159	7.8	6.8	7.3	7.3
29	6.0	---	---	---	---	---	---	156	7.3	6.7	7.3	7.3
30	e6.0	---	---	---	---	---	---	137	7.3	6.7	7.3	7.3
31	---	---	---	---	---	---	---	110	---	6.7	7.3	---
TOTAL	446.5	---	---	---	---	---	---	2663.61	700.0	193.3	221.6	215.2
MEAN	14.9	---	---	---	---	---	---	85.9	23.3	6.24	7.15	7.17
AC-FT	886	---	---	---	---	---	---	5280	1390	383	440	427
MAX	34	---	---	---	---	---	---	280	66	7.3	7.3	7.3
MIN	6.0	---	---	---	---	---	---	0.00	7.3	4.9	6.7	7.0

CAL YR	2012	TOTAL	3443.10	MEAN	18.0	MAX	75	MIN	4.2	AC-FT	6830 (PARTIAL YEAR RECORD)
WTR YR	2013	TOTAL	4440.21	MEAN	24.3	MAX	280	MIN	0.00	AC-FT	8810 (PARTIAL YEAR RECORD)

MAX DISCH: 369 CFS AT 15:30 ON MAY 09, 2013 GH 3.56 FT SHIFT -0.03 FT  
 MAX GH: 3.56 FT AT 15:30 ON MAY 09, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**WILLOW CREEK BELOW STEAMBOAT LAKE  
WY2013 HYDROGRAPH**



YAMPA RIVER BASIN  
WILLIAMS FORK AT MOUTH NEAR HAMILTON  
Water Year 2013

Location.-- Lat. 40°26'14", Long. 107°38'50", in SE1/4 of the NW1/4 of Section 31, T6N, R91W, Moffat County, Hydrologic Unit 14050001, on left bank at coal mine service road crossing, 2,300 ft upstream from confluence with Yampa River, 6.1 mi north-northeast of Hamilton, and 8 mi south-southwest of Craig, CO.

Drainage Area and Period of Record.-- 419 sq miles; Hydrographic record kept from October 1, 1983 to September 30, 2001 by the USGS and April 27, 2005 to present by the State Engineers Office.

Equipment.-- Sutron high data rate (HDR) data collection platform (DCP) driven by a Campbell Scientific radar gage and powered by a solar recharged 12-volt battery housed in a 6-foot square shelter over a 4-foot culvert well (no longer in use). A Sutron constant flow bubbler (CFB) is used as the backup to the radar. Outside gage (the primary reference gage) is a wire weight gage (WWG) mounted on the upstream side of the bridge almost directly above the orifice. A Sutron air temperature sensor is also in use at the station.

Hydrologic Conditions.-- The basin consists of moderate terrain near the gage station but originates in steep mountainous terrain in the Flattops. In the vicinity of the gage station, the channel slope is moderate. The bed material is composed of small rock, cobbles, and occasional large boulders. The primary use of water upstream of the gage is irrigation.

Gage-Height Record.-- Primary record is 15-minute radar data from satellite telemetry with DCP and CFB as backup. Continuous records were kept from October 1, 2012 through September 30, 2013. The record is complete and reliable except for the following days: December 19, 2012 to January 24, 2013 due to ice and snow below the radar unit. Instrument calibration corrections for WY2013 were made at the time of site visits and ranged from -0.02 to +0.08 ft.

Datum Corrections.-- Levels were not run during water year 2013.

Rating.-- Rating No. 7 (WMFKMHCO07), created on February 9, 2006 (and extended on May 20, 2008 to include the high gage heights recorded in water year 2008), was used throughout the entire water year. Thirteen measurements, numbered 91 through 103, were taken during water year 2013. Measurements ranged in discharge from 7.96 to 950 cfs and covered the range in stage, except for higher daily flows on May 14-18, 2013. The peak instantaneous flow of 1,310 cfs occurred at 0530 on May 15, 2013 at a gage height of 6.01 ft with a shift of 0.02 ft. The peak gage height exceeded the stage of Measurement 98 made May 13, 2013 by 0.62 ft.

Discharge.-- Shifting control method was applied throughout water year 2013. Shifts were applied as defined by measurements and were distributed by time throughout the water year. Variable shift curve WMFKMHCOVSC02c was developed and applied by time from January 8, 2013 to the peak discharge for water year 2013 at 0530 on May 15, 2013. Variable shift curve WMFKMHCOVSC03b was developed and applied by time from the peak discharge for water year 2013 to July 12, 2013. Open-water measurements showed shifts varying between -0.07 and 0.11 ft. Shifts were applied directly and given full weight, except for measurements Nos. 91, 95, and 100 which were discounted from -4% to -2% to smooth shift distribution and fit the variable shift curves. Shifts after adjustment ranged between -0.07 and 0.12 ft.

Special Computations.-- Discharge values were estimated for "a" (missing data) days (December 19, 2012 to January 24, 2013) by consideration of measurement data and observations, weather data and adjoining periods of good record.

Remarks.-- The record is good except for the period of ice affected record. Discharge values were estimated during these periods and the record is considered poor. The peak instantaneous flow should be considered good. Station maintained and record developed by Dan Meyer.

Recommendations.-- Levels should be run and the PZF assessed in water year 2014. In addition, Rating No. 7 should be evaluated based upon the results of levels data and consideration of lower flows.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

WILLIAMS FORK AT MOUTH NEAR HAMILTON

RATING TABLE-- WMFKMHCO07 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

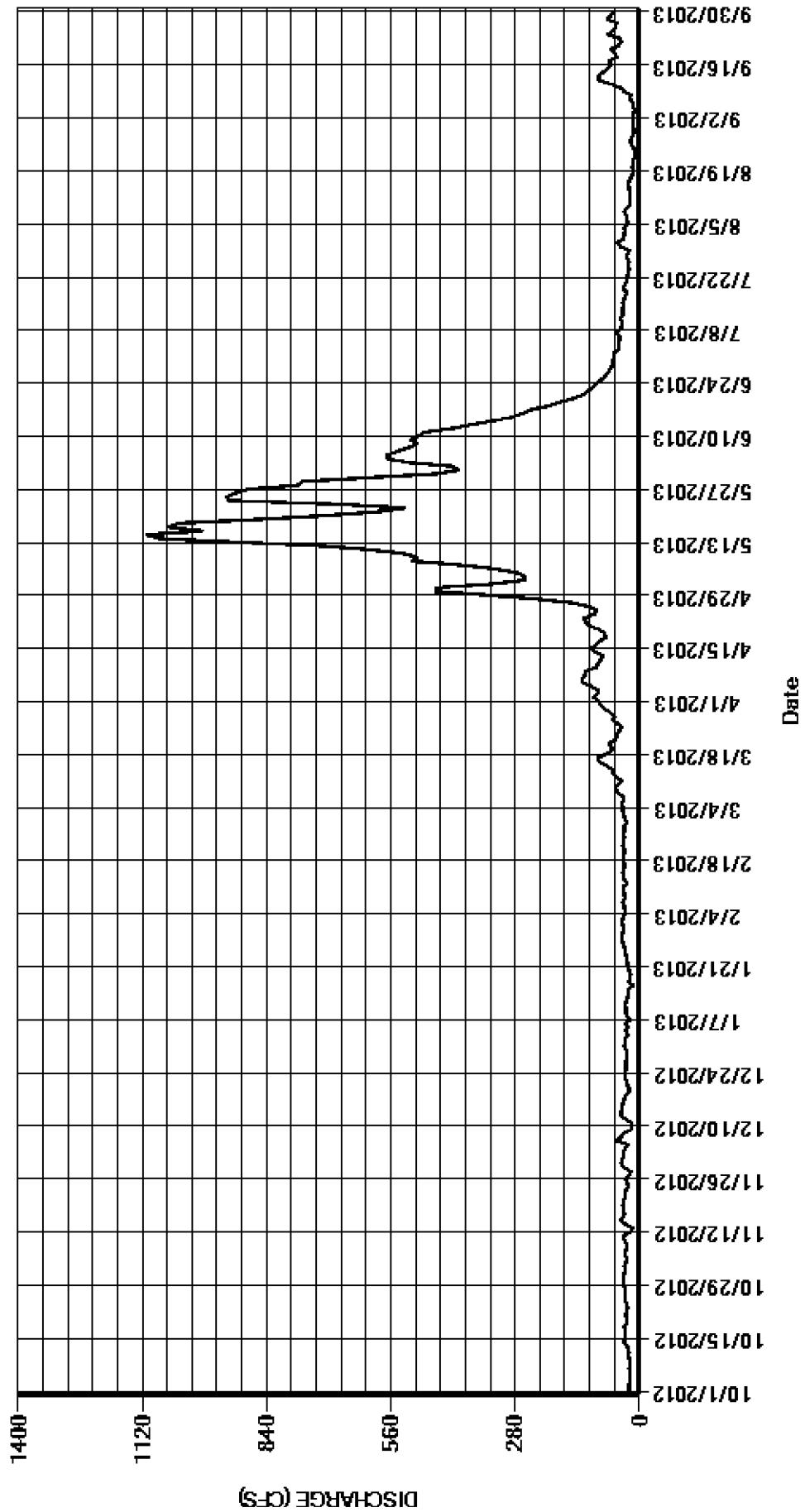
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	23	34	39	e32	38	33	92	458	407	57	37	14
2	23	33	36	e32	39	35	102	335	423	56	35	15
3	23	34	37	e25	37	37	95	260	520	46	33	14
4	22	30	32	e31	33	38	92	258	567	47	34	11
5	22	29	24	e27	33	39	110	277	569	46	26	15
6	22	32	52	e31	35	36	129	327	546	43	28	15
7	23	31	41	e21	37	37	130	407	520	51	29	21
8	22	29	35	e28	33	49	122	512	502	46	34	20
9	22	29	18	e31	34	54	123	501	515	40	30	35
10	24	35	18	e30	36	49	97	533	498	39	21	44
11	24	35	19	e32	36	40	94	611	484	44	22	68
12	26	20	35	e30	28	51	87	718	421	37	21	93
13	28	15	43	e27	34	59	82	905	377	38	21	92
14	35	32	40	e25	36	62	100	1080	330	37	23	83
15	33	42	40	e25	37	74	108	1110	289	37	24	71
16	32	35	37	e14	35	90	98	987	263	35	24	66
17	32	34	34	e24	34	94	87	1060	244	31	20	67
18	35	37	31	e22	36	77	75	1040	204	28	16	51
19	29	37	e23	e20	36	63	80	858	178	37	15	55
20	29	36	e24	e24	34	63	91	707	147	33	16	65
21	31	33	e28	e27	35	69	114	587	126	29	15	47
22	28	32	e30	e27	37	54	121	531	115	28	14	40
23	27	31	e32	e29	36	51	125	682	104	25	8.8	44
24	29	25	e32	e30	34	47	102	925	95	23	10	71
25	33	28	e30	32	35	40	97	930	84	25	13	59
26	32	31	e31	33	34	48	114	911	76	24	18	53
27	33	22	e30	37	35	60	153	883	70	29	21	52
28	32	20	e29	39	28	56	235	771	64	27	16	72
29	36	34	e28	39	---	65	343	760	61	23	13	64
30	35	41	e30	37	---	78	459	614	59	42	12	61
31	35	---	e34	36	---	86	---	459	---	51	15	---
TOTAL	880	936	992	897	975	1734	3857	20997	8858	1154	664.8	1478
MEAN	28.4	31.2	32.0	28.9	34.8	55.9	129	677	295	37.2	21.4	49.3
AC-FT	1750	1860	1970	1780	1930	3440	7650	41650	17570	2290	1320	2930
MAX	36	42	52	39	39	94	459	1110	569	57	37	93
MIN	22	15	18	14	28	33	75	258	59	23	8.8	11

CAL YR	2012	TOTAL	27966.0	MEAN	76.4	MAX	573	MIN	2.4	AC-FT	55470
WTR YR	2013	TOTAL	43422.8	MEAN	119	MAX	1110	MIN	8.8	AC-FT	86130

MAX DISCH: 1320 CFS AT 05:30 ON MAY 15, 2013 GH 6.01 FT SHIFT 0.02 FT  
 MAX GH: 6.01 FT AT 05:30 ON MAY 15, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WILLIAMS FORK AT MOUTH NEAR HAMILTON  
WY2013 HYDROGRAPH



GREEN RIVER BASIN  
POT CREEK AT UTAH-COLORADO STATELINE

Water Year 2013

Location.-- Lat. 40°40'25", Long. 109°03'03", (Hoy Mountain, Utah-Colorado Quadrangle), in Section 1, T2S, R25E Salt Lake Meridian in Daggett County, on left bank approximately 0.2 miles upstream from the Utah-Colorado state line.

Drainage Area and Period of Record.-- 107sq mi (from topographic maps);

Equipment.-- Sutron Stage-Discharge Recorder (SDR), housed in a 42-inch diameter corrugated metal pipe on left bank, connected to a high data rate Sutron Satlink data collection platform (DCP) with satellite telemetry. Well is equipped with two 2-inch intakes with standard inside flushing devices. The primary reference gage is a staff gage inside stilling well. Supplemental outside staff gages are located on left and right banks but are not used for reference purposes.

Hydrologic Conditions.-- Basin consists of moderate terrain near the gage station and originates in steep mountainous terrain in the Diamond and Uintah Mountain ranges. In the vicinity of the gage station, the channel slope is moderate with some sinuosity. The streambed is composed of sandstone and silt. Matt Warner, Calder and Crouse Reservoirs, located in Utah, all capture and control flow in Pot Creek upstream of gage. Irrigation diversions occur both upstream and downstream of the gage station and the river is subject to administration.

Gage-Height Record.-- Primary record is 15-minute satellite telemetry data with the DCP log and SDR as backup. Continuous record kept from October 1, 2012 through September 30, 2013. The gage station was not visited during Water Year 2013 due to no releases being made from upstream reservoirs and very little snowpack in the basin. Record is complete and reliable.

Datum Corrections.-- Levels have never been run by DWR personnel at this gage.

Rating.-- The control consists of an artificial weir type structure consisting of sandstone rocks grouted in place. Water pools upstream of the weir to a gage height of 0.50 ft (effective PZF=0.50 ft). Streamflow begins at gage heights exceeding 0.50 ft. Channel is straight for 100-feet upstream and bends to the left just below control before straightening for 150 feet downstream. Left bank is subject to overflow at higher stages. Right bank is almost vertical sandstone rock. Left bank covered with sagebrush and other native vegetation. This site is dry most of the year and the creek generally flows only in response to storm events, during the spring runoff period, and at times when water is released from upstream reservoirs in Utah. Due to weather constraints, the site is inaccessible during most of the year, including the late fall, winter and early spring months, which includes some periods when flow is recorded at the site during a typical water year. Rating No. 6 was created on November 16, 2005 and used for Water Year 2013. One day of flow was recorded at the site during Water Year 2013. No measurements were made this year as the creek was not flowing other than following a single flash type rain event. The peak instantaneous flow of 8.95 cfs occurred at 1600 on August 1, 2013 at a gage height of 1.16 ft. with a shift of -0.02 ft.

Discharge.-- Shifts were distributed by time throughout Water Year 2013 to the primary gage height record which showed gage heights below the PZF every day except August 1, 2013.

Special Computations.-- No special computations were required during Water Year 2013.

Remarks.-- The record is considered good for the entire period of Water Year 2013. There were no releases made by the upstream reservoirs during Water Year 2013. This was confirmed by the Utah Water Commissioner responsible for the operation of those reservoirs. Station maintained and record developed Dan Meyer.

Recommendations.-- Levels need to be run at this site. Handrails should be added to platform.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

POT CREEK AT UTAH-COLORADO STATELINE

RATING TABLE-- PTCKSLCO06 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

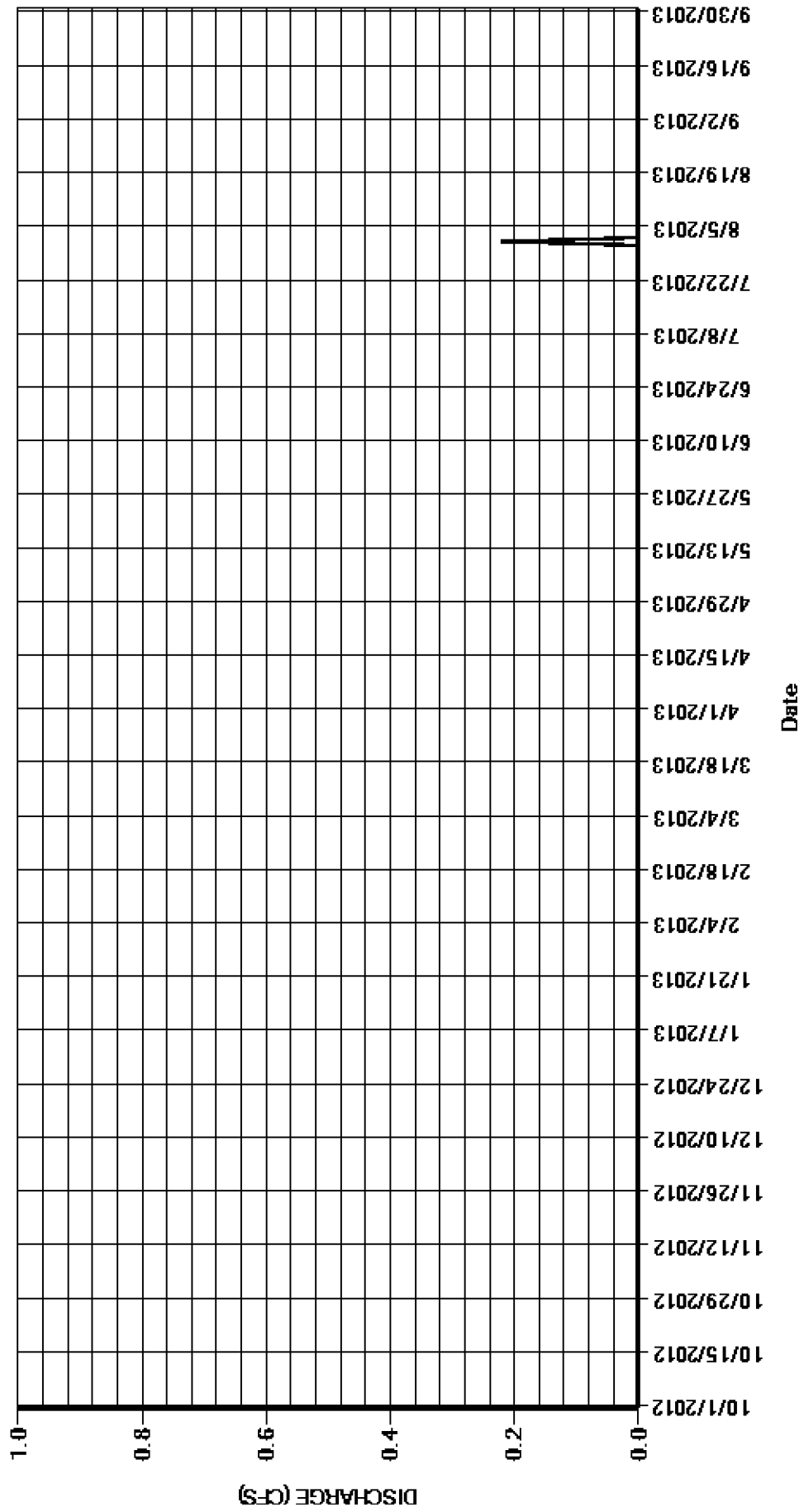
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.000
AC-FT	0	0	0	0	0	0	0	0	0	0	0.4	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CAL YR	2012	TOTAL	0.04	MEAN	0.0001	MAX	0.04	MIN	0.00	AC-FT	.08
WTR YR	2013	TOTAL	0.22	MEAN	0.0006	MAX	0.22	MIN	0.00	AC-FT	0.4

MAX DISCH: 8.95 CFS AT 16:00 ON AUG 01, 2013 GH 1.16 FT SHIFT -0.02 FT  
 MAX GH: 1.16 FT AT 16:00 ON AUG 01, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

POT CREEK AT UTAH-COLORADO STATELINE  
 WY2013 HYDROGRAPH





SAN JUAN RIVER BASIN  
DOLORES TUNNEL OUTLET NEAR DOLORES  
Water Year 2013

Location.-- Lat. 37°27'32.48", Long. 108°32'52.63" NAD83, in SW¼SE¼ sec. 18, T. 37 N., R. 15 W., NMPM, Montezuma County, Hydrologic Unit 14080202, on left bank about 90 ft downstream from outlet of the tunnel.

Drainage Area and Period of Record.-- N/A; Published record by CoDWR exists from Oct 1, 1993 through present.

Equipment.-- Sutron Satlink 2 high data rate DCP with a shaft encoder in a concrete shelter and well. The primary reference gage is an electric drop tape. The control is a 15 ft. concrete Parshall flume located approximately 80 ft. below the outlet of the tunnel.

Hydrologic Conditions.-- Water from McPhee Reservoir is released through the Dolores Tunnel where it is outlet into a straight vertical concrete wall channel that is 25-ft wide. The converging section of the concrete Parshall flume is located approximately 80 ft. downstream of the tunnel outlet. Surging occurs at higher flows in the converging section due to the close proximity of the tunnel outlet and Parshall flume.

Gage-Height Record.-- The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with the DCP download used as backup. The stilling well will isolate at a gage height below 0.14 ft. The gage was visited on 14 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted 1 time this water year: Apr. 02, 2013 (-0.01 ft). No flush corrections were made this water year. Record is complete and reliable for the entire period of record except for when the tunnel was shutdown for a partial day and the stilling well isolated while still showing discharge on Nov. 13, 2012.

Datum Corrections.-- Levels were run at this gage on Nov. 2, 2012. This was the first time levels were run at this gage; there were no corrections made with this levels run.

Rating.-- The control is a 15-foot concrete Parshall Flume. A non-standard Parshall flume rating is used. Moss in the flume can cause shifting. Rating 03, dated Oct. 12, 2010, was used for the entire water year. It is fairly well defined from 3.50 cfs to 360 cfs. Twelve measurements, Nos. 112-123, were made this year ranging in discharge from 3.17 cfs to 257 cfs. They cover the range-in-stage experienced except for the lower daily flows of Nov. 13, Dec. 8, 10, 16-19, 2012; Jan. 7, Feb. 16, and Mar. 16, 2013, and higher average daily flows of May 21-22, 2013. The peak discharge for the year of 427 cfs occurred at 1000 on Sep. 27, 2013, at a gage height of 3.37 ft. and a shift of -0.02 ft. The gage height at that time exceeded the gage height of Measurement No. 120 by 0.95 ft in stage.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by variable stage-discharge relationship and time. DOLTUNCOVS13A was developed based on measurements performed in water year 2013. VS12B from water year 2012 was continued through measurement no. 113. VS13A was transitioned into through proration by time between measurements 113 and 114. VS13A was used for the remainder of the water year. Open-water measurements showed unadjusted shifts varying from -0.07 to +0.01 feet. Shifts were applied directly and given full weight, except for Measurement No. 116, which was discounted -4.60% to smooth shift distribution.

Special Computations.-- The tunnel was briefly shutoff on Nov. 13, 2012 for routine maintenance from 0830 to 1615. The stilling well isolated at a gage height of 0.14 ft. The time period that the tunnel was off was assigned zero flow in record.

Remarks.-- Record rated 'good'. The instantaneous peak flow is rated 'fair'. Station operated and maintained by Brian Leavesley. Record developed by Brian Leavesley.

Recommendations.-- Independent benchmark should be installed for level runs in the future.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

DOLORES TUNNEL OUTLET NEAR DOLORES

RATING TABLE-- DOLTUNCO03 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

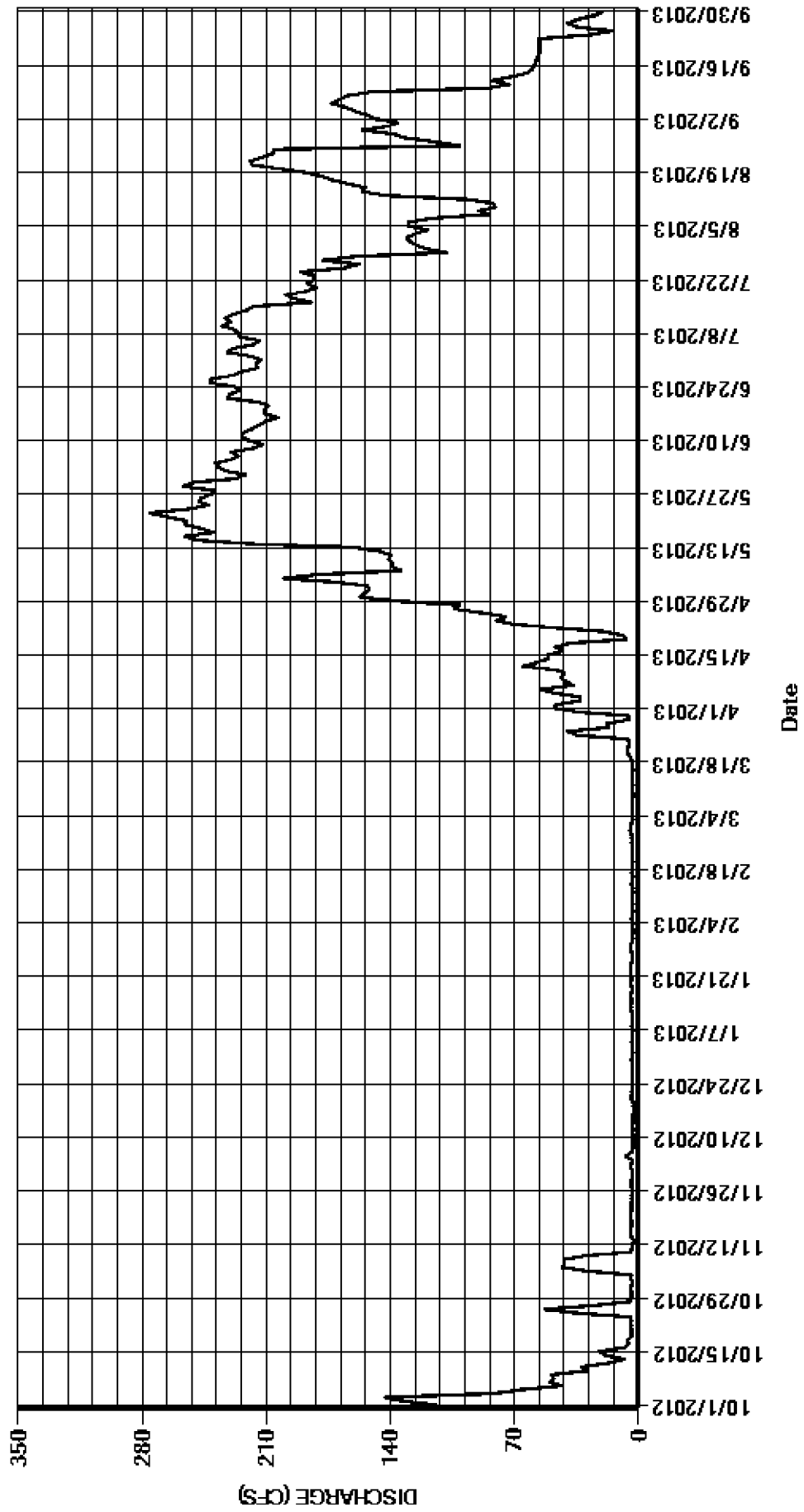
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	114	4.3	3.6	3.4	3.3	4.4	47	155	222	213	129	136
2	132	3.6	4.3	3.6	3.2	4.1	47	152	233	219	131	148
3	143	4.4	4.2	3.5	3.3	3.3	33	153	237	232	126	153
4	82	4.2	3.3	3.9	3.2	3.9	33	170	239	229	119	160
5	66	29	7.3	3.7	4.0	3.5	48	200	230	217	130	165
6	44	43	4.0	3.6	3.5	3.6	55	181	226	214	130	173
7	50	42	3.3	3.1	3.2	3.5	37	134	230	225	116	169
8	48	42	3.0	4.0	3.8	3.8	41	139	217	226	85	164
9	49	30	3.2	3.4	3.3	3.2	44	139	212	228	90	151
10	29	4.3	3.0	3.6	3.5	3.2	42	141	220	235	81	84
11	32	3.9	3.4	3.7	3.4	3.6	46	140	224	230	82	73
12	17	3.9	3.2	4.2	3.2	3.2	65	146	223	233	97	83
13	7.8	e2.6	3.4	4.2	3.3	3.6	58	161	218	228	143	72
14	19	4.3	3.2	4.1	4.1	3.5	51	219	214	221	156	63
15	22	4.6	3.2	3.9	3.7	3.5	51	249	210	217	154	60
16	7.9	4.6	3.1	4.6	3.1	3.1	43	256	203	185	164	59
17	5.9	4.0	2.8	4.0	3.9	3.7	47	240	211	194	173	58
18	6.1	3.9	3.0	3.8	3.8	3.4	39	247	211	199	179	57
19	4.0	4.6	3.0	4.4	3.4	4.4	7.0	256	209	187	189	56
20	4.0	4.4	4.1	4.1	3.4	6.0	8.8	255	214	182	203	56
21	4.2	4.1	3.9	4.2	3.7	6.1	19	266	232	187	218	56
22	4.2	4.0	3.9	4.4	3.5	5.8	46	276	231	183	219	56
23	4.3	4.0	3.6	4.3	3.7	5.4	71	254	225	183	212	56
24	4.4	3.9	3.6	4.3	3.7	6.0	80	243	228	191	206	27
25	34	3.9	3.6	3.9	3.9	35	75	248	242	166	206	15
26	53	3.6	3.6	3.8	3.9	40	89	247	241	158	101	35
27	25	4.1	3.5	3.7	3.9	17	104	241	229	178	115	40
28	5.0	4.1	3.4	4.5	4.8	18	101	240	224	160	132	34
29	4.3	3.9	3.6	4.4	---	5.6	136	257	215	108	138	25
30	3.9	3.7	4.1	3.8	---	5.5	157	252	216	119	156	20
31	4.2	---	3.7	3.3	---	34	---	227	---	125	142	---
TOTAL	1029.2	286.9	112.1	121.4	100.7	252.9	1720.8	6484	6686	6072	4522	2504
MEAN	33.2	9.56	3.62	3.92	3.60	8.16	57.4	209	223	196	146	83.5
AC-FT	2040	569	222	241	200	502	3410	12860	13260	12040	8970	4970
MAX	143	43	7.3	4.6	4.8	40	157	276	242	235	219	173
MIN	3.9	2.6	2.8	3.1	3.1	3.1	7.0	134	203	108	81	15

CAL YR	2012	TOTAL	44283.6	MEAN	121	MAX	338	MIN	2.6	AC-FT	87840
WTR YR	2013	TOTAL	29892.0	MEAN	81.9	MAX	276	MIN	2.6	AC-FT	59290

MAX DISCH: 427 CFS AT 10:00 ON SEP 27, 2013 GH 3.37 FT SHIFT -0.02 FT  
 MAX GH: 3.37 FT AT 10:00 ON SEP 27, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DOLORES TUNNEL OUTLET NEAR DOLORES  
WY2013 HYDROGRAPH



SAN JUAN RIVER BASIN  
LONE PINE CANAL BELOW GREAT CUT DIKE NEAR DOLORES  
Water Year 2013

Location.-- Lat. 37°30'42", Long. 108°35'21", in NW¼SW¼ sec. 35, T.38 N., R.16 W., NMPM, Montezuma County, Hydrologic Unit 14080202, on the right bank of the Lone Pine Canal 550 ft. downstream from the Great Cut Dike of McPhee Reservoir.

Drainage Area and Period of Record.-- N/A; Diversion record Nov. 1, 1987 to present (Structure ID = 3200815). Published streamflow record Oct. 1, 1993 to present.

Equipment.-- Sutron Satlink 2 DCP and Sutron Stage-Discharge Recorder (SDR). The SDR is located in a concrete shelter and well next to the flume. The Satlink 2 is housed in the Great Cut pumping plant building. SDR is set to outside staff gage. Control is a 12-foot concrete Parshall flume. A foot bridge is located at the throat of the flume where an 8 ft wading rod or a bridge crane is used to make high flow measurements. No changes this water year.

Hydrologic Conditions.-- The canal is filled by gravity from McPhee Reservoir. The channel upstream and downstream of the Parshall flume is straight. At high flows (GH > 2.50-ft) the canal surges and the approach velocity to the flume is fast. During the water year, some moss does grow in the channel above the flume and on the flume floor itself.

Gage-Height Record.-- The primary record is 15-minute SDR data downloaded from satellite telemetry with DCP downloaded data used for backup purposes. There is a power issue in communication between the SDR in the gage house and the DCP in the pumphouse. If the display of the SDR is on while the DCP is polling for its 15-minute gage height value, there is not enough power to transmit from the SDR to the DCP and the gage height is not recorded in the DCP. The intake to the stilling well isolates when the gage height is below 0.20 ft. Flows below a gage height of 0.20 ft. are negligible and a 0 flow is assigned to them. Gage height corrections due to SDR calibration to the staff gage occurred five (5) times over the water year: +0.02' on Nov. 19, 2012, -0.02' on Jan. 31, 2013, +0.01' on Mar. 26, 2013, -0.01 on May 28, 2013, and +0.02 on Aug. 02, 2013. Upon measurement on Feb. 28, the SDR was found to be reading 0.02 low from the outside staff gage, however the correction was not made in the field but was made in record development. During the water year it was observed that when the gage height changed from < 1 ft to near 2 ft there was a -0.02' correction to the SDR based on the outside staff gage. When the gage height changed back to < 1ft, the SDR was corrected back +0.02'. The changes between these gage heights are typically abrupt, so the corrections were distributed across the changes in gage height. Gage height record is complete and reliable for the entire period of record except for when the canal was shutoff and the stilling well was draining on Nov. 12-13 and Dec. 10-12, 2012. Also when the SDR tape was frozen to the instrument shelf Jan. 4-18, 2013.

Datum Corrections.-- Levels were not run in WY2013. Levels were last run on Oct. 6, 2010 using BM1 as the base. No corrections to the record were made in WY2013.

Rating.-- Rating MVIDIVCO03 (dated 10/8/2010) in use since Feb 18, 2010, a non-standard 12-ft. Parshall flume rating, was used for the entire water year. Rating 03 is fairly well defined from 20 cfs to 475 cfs. Fifteen discharge measurements (Nos. 110-124) were made this year ranging in discharge from 17.1 cfs to 308 cfs. Three observations of zero-flow were made this water year, Oct. 10, Nov. 2, 13, 2012. The measurements and observation of 0 flow cover the entire range-in-stage experienced except for the higher average daily flows of Sep. 26 - 29, 2013. The instantaneous peak flow of 321 cfs occurred at 1830 on Sep. 25, 2013 at a gage height of 3.26 ft. with a shift of -0.04 ft. The peak flow exceeded the stage of measurement no. 124 (GH = 3.18 ft.) by 0.08 ft. in stage.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by stage. Variable shift MVIDIVCOVS13A was developed and transitioned to from variable shift curve VS12C, developed for the previous water year, on Nov. 19, 2012 VS13A was used for the remainder of water year 2013. Open-water measurements showed unadjusted shifts varying between -0.10 and 0.00 feet. Shifts were applied directly and given full weight except measurement Nos. 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, and 123 which were discounted from -4% to 11% to smooth shift distribution.

Special Computations.-- The stilling well drained slowly when the canal was shutoff in the winter. Nov. 12-13 and Dec. 10-12 are estimated "e"-days. DWCD began to vary flows at the start of January, however, ice had formed between the SDR float tape and the instrument shelf, preventing movement of the SDR wheel. Flows between Jan. 4 and Jan. 18, 2013 are estimated "e"-days and were input based on DWCD gate setting records. The ice was cleared from the tape upon station visit on Jan. 18, 2013.

Remarks.-- Record is 'fair' for the entire period. The peak instantaneous flow should be considered 'fair'. Estimated "e"-days are also considered 'fair'. A 'fair' rating was given to the entire record due to the non-standard velocity profile discovered within verticals during discharge measurements. Measurements at .6 depth within the flume have shown a positive bias, as 3 -point measurement has shown a non-standard velocity profile within the flume measurement cross-section at the gage. Station maintained and record developed by Brian Leavesley.

Recommendations.-- An electric tape or drop tape should be installed. Levels should be run in WY14. Three-point measurements should be used at this site to capture more accurate velocities within measurement verticals. It has been shown in water year 2010 through water year 2013 that measurement at the gage within the flume showed a trend of positive shifts while measurements (when possible) within the channel above the flume would show less positive to negative shifts, even with measurements performed in succession on the same day. Measurements made in WY12 & WY13 discovered a non-standard velocity profile when measuring in the flume and above in the channel. All discharge measurements at this gage should use the 3-point method to determine discharge (when possible).

STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

LONE PINE CANAL BELOW GREAT CUT DIKE NEAR DOLORES

RATING TABLE-- MVIDIVCO03 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

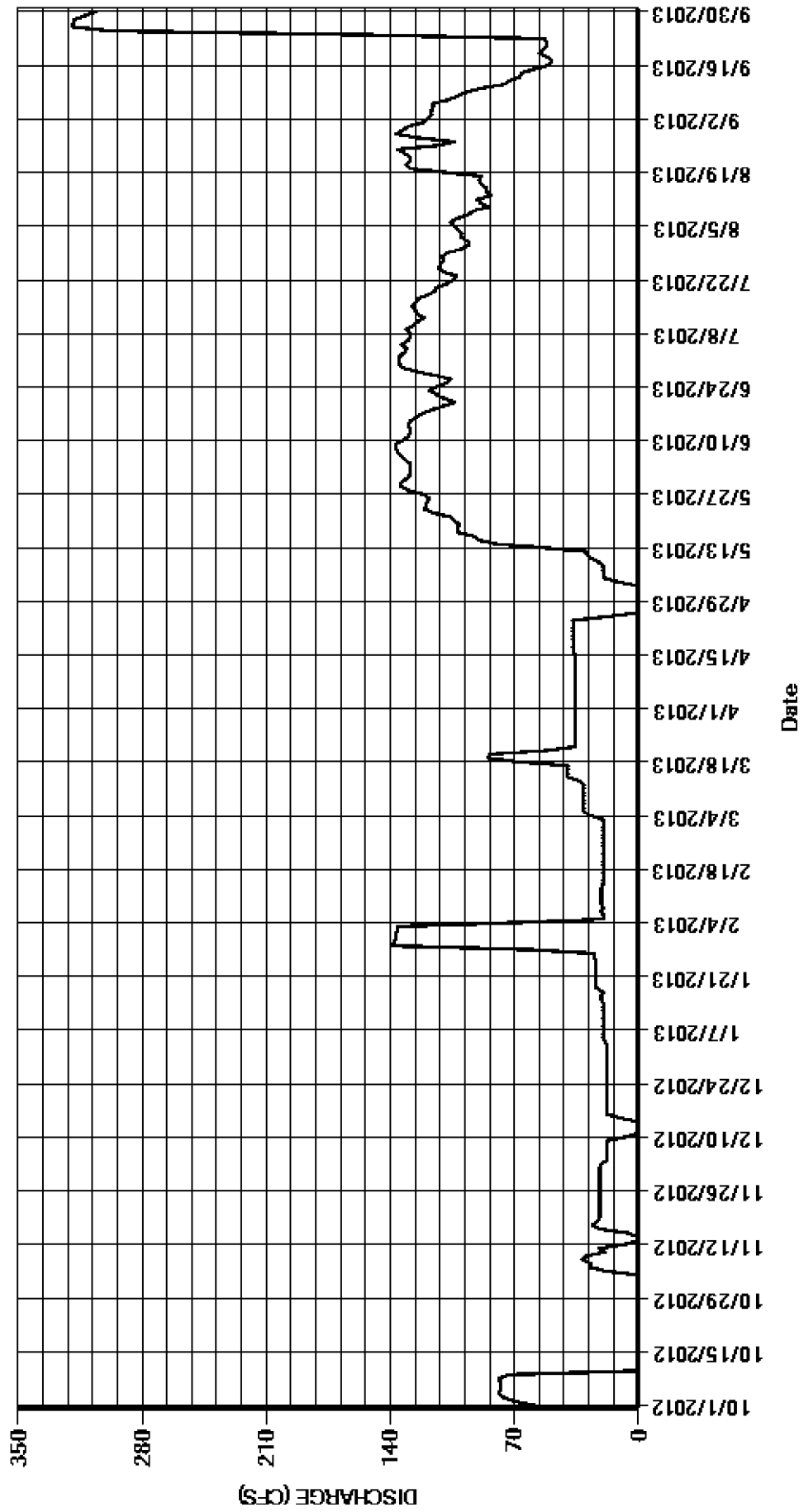
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	59	0.00	22	18	137	20	36	0.00	129	135	96	122
2	70	0.00	22	18	136	20	36	0.00	129	135	100	119
3	76	0.00	21	18	136	20	36	0.00	129	132	100	117
4	79	0.00	18	e19	69	27	36	11	129	131	102	117
5	78	19	18	e20	20	31	36	19	132	134	104	116
6	78	27	18	e20	20	31	36	20	134	130	106	116
7	78	27	18	e20	21	31	36	20	136	129	102	107
8	79	32	18	e20	20	31	36	20	137	129	96	102
9	73	29	18	e20	21	31	36	22	137	131	93	97
10	0.19	19	e7.9	e20	21	31	36	26	133	127	85	88
11	0.00	22	e0.00	e20	21	31	36	29	130	125	89	76
12	0.00	e8.0	e0.00	e20	21	31	36	30	129	121	91	73
13	0.00	e0.00	0.00	e20	21	33	36	56	129	125	83	67
14	0.00	0.00	0.00	e20	20	40	36	81	130	126	86	66
15	0.00	6.7	10	e21	20	40	36	90	129	128	86	59
16	0.00	22	18	e21	20	40	37	93	126	126	89	51
17	0.00	26	18	e20	20	40	37	102	122	124	90	49
18	0.00	23	18	e24	20	68	37	102	117	119	89	51
19	0.00	22	18	24	20	85	37	101	110	115	110	56
20	0.00	22	18	24	20	84	37	104	104	114	129	54
21	0.00	22	18	24	20	52	37	106	110	108	131	52
22	0.00	22	18	24	20	36	37	116	114	104	129	52
23	0.00	22	18	24	20	36	37	121	118	103	129	53
24	0.00	22	18	24	20	36	37	120	114	110	132	157
25	0.00	22	18	24	20	36	18	119	108	113	136	298
26	0.00	22	18	25	20	36	0.00	118	106	112	114	319
27	0.00	22	18	25	20	36	0.00	122	115	110	104	319
28	0.00	22	18	61	20	36	0.00	130	125	111	124	318
29	0.00	22	18	140	---	36	0.00	134	133	108	137	312
30	0.00	22	18	138	---	36	0.00	134	135	100	133	306
31	0.00	---	18	137	---	36	---	131	---	96	130	---
TOTAL	670.19	524.70	478.90	1053	964	1177	891.00	2277.00	3729	3711	3325	3889
MEAN	21.6	17.5	15.4	34.0	34.4	38.0	29.7	73.5	124	120	107	130
AC-FT	1330	1040	950	2090	1910	2330	1770	4520	7400	7360	6600	7710
MAX	79	32	22	140	137	85	37	134	137	135	137	319
MIN	0.00	0.00	0.00	18	20	20	0.00	0.00	104	96	83	49

CAL YR	2012	TOTAL	24350.79	MEAN	66.5	MAX	152	MIN	0.00	AC-FT	48300
WTR YR	2013	TOTAL	22689.79	MEAN	62.2	MAX	319	MIN	0.00	AC-FT	45010

MAX DISCH: 321 CFS AT 18:30 ON SEP 25, 2013 GH 3.26 FT SHIFT -0.04 FT  
MAX GH: 3.26 FT AT 18:30 ON SEP 25, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LONE PINE CANAL BELOW GREAT CUT DIKE NEAR DOLORES  
 WY2013 HYDROGRAPH



DOLORES RIVER BASIN  
DOLORES RIVER BELOW MCPHEE RESERVOIR  
Water Year 2013

Location.-- Lat. 37°34'31", Long. 108°34'37", in SE¼SE¼ sec. 2, T.38 N., R.16 W., NMPM, Montezuma County, Hydrologic Unit 14030002, on right bank about 880 ft downstream from toe of the dam on the Dolores River.

Drainage Area and Period of Record.-- 819 mi<sup>2</sup>.; Published by the USGS prior to the construction of McPhee Reservoir Oct. 1, 1938 to Sep. 30, 1952. Provisional graphic and electronic data Aug. 1985 to Sept. 1990. Published streamflow record Oct. 1990 to present.

Equipment.-- Sutron Satlink 2 HDR DCP and stage-discharge-recorder (SDR) in a 60"x 60" cast concrete shelter and well. Primary reference is an electric drop tape inside the gage house. Secondary reference is the outside staff gage (0.00 to 4.49 ft.) in the Parshall flume. The gage house is equipped with AC power. Control is a 15-foot concrete Parshall flume with flat concrete wing walls that extend the width of the channel and act as the 2nd stage control. No other changes this water year.

Hydrologic Conditions.-- Large rocks and cobble line the channel above and below the 15-ft concrete Parshall flume. Silt deposits typically do not occur at this gage since the gage is directly below McPhee Reservoir. Heavy moss growth on the control and in the channel above the control affects the stage-discharge relationship during the summer months. Moss growth in the flume tends to cause negative shifts.

Gage-Height Record.-- The primary record is 15-minute SDR data downloaded from satellite telemetry with DCP download data used for backup purposes. Data downloaded from the DCP was entered by hand to fill in missing data on Mar. 26; May 4, 15, 2013. The gage was visited on 22 separate occasions this water year to verify the instruments remained calibrated to the primary reference. The shaft encoder was adjusted two times this water year (Mar. 19, 2013 with a -0.01 ft. correction and Aug. 7, 2013 with a -0.01 ft. correction). Moss was removed from the control 7 times this water year. Moss removal was applied as a flush correction to transition water year 2012 to water year 2013. The remaining moss removal corrections were applied in the shift and distributed by time between each occurrence. Record is complete and reliable except for the period when the float weight was stuck on the stilling well. Gage height record when the float weight was stuck on the well should be considered poor. Float weight stuck ("a" days): Jan. 16-25, 2013.

Datum Corrections.-- Levels were run on Sep. 18, 2013 to the electric tape index (ETI) using BM1 as the base. The ETI was found to be reading 0.016 feet high. The electric tape length (TL\_ET) was found to be reading 0.010 feet long. No corrections were made since the ETI and TL\_ET were within the allowable error tolerances.

Rating.-- The control is compound control with a 15 foot Parshall flume acting as the first stage from an elevation of 0.00 ft. to 4.50 ft. The second stage is an 18-inch wide concrete weir that extends 50 ft. in both directions from Parshall flume. The crest of the weir is 4.50 ft. above the floor of the flume. The Parshall flume controls the stage-discharge relationship from a gage height of 0.00 ft. to 2.70 ft (0.00 cfs to 280 cfs). The rating does not follow a standard Parshall flume rating because water can seep under the flume and wing walls. At gage heights between 2.70 ft. and 5.10 ft. (280 cfs to 1,660 cfs) the control transitions from the flume to the weir. Gage heights 5.10 ft. to 7.50 ft. (1,660 cfs to 5,470 cfs) the flume will drown out and the weir will control the stage-discharge relationship. Rating DOLBMCCO04A, dated Nov. 9, 2004, was used the entire water year. It is fairly well defined from 13 cfs to 5,580 cfs. Eleven measurements, Nos. 238 -248, were completed this year ranging in discharge from 11.7 cfs to 35.9 cfs. They cover the range-in-stage experienced except for the lower daily flows of Jun. 22, 23, 2013 and the higher daily flows of Oct. 1-31, 2012; Mar. 26-31, 2013. The peak instantaneous flow of 43.1 cfs occurred at 1015 on Mar. 11, 2013 at a gage height of 0.90 ft. with a shift of -0.04 ft. It exceeded the stage of measurement No. 238, made Oct. 10, 2012 by 0.10 feet in stage.

Discharge.-- Shifting control method was used during the entire water year. Shifts were distributed by time for the entire period of record. Measurements show shifts varying from -0.05 ft to +0.01 ft. All shifts were given full weight except for measurement Nos. 238, 239 and 243, which were discounted from -5% to -2% to smooth the shift distribution. Discharge measurement no. 244 was not used because of poor cross-section and the shift for measurement no. 245 was not used because the measurement was made in the flume.

Special Computations.-- Record during the period when the float was stuck on the stilling well was estimated from flow meter readings provided by the Dolores Water Conservancy District.

Remarks.-- Record good, except for the period when the float weight was stuck on the stilling well. Record during this period was estimated should be considered poor. The peak instantaneous flow should be considered good. Station maintained by Jody Payne (DWCD), Doug Pickering, Brian Leavesley and Brian Boughton. Record developed by Brian Boughton.

Recommendations.-- Currently no recommendations have been made this water year.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

DOLORES RIVER BELOW MCPHEE RESERVOIR

RATING TABLE-- DOLBMCCO04A USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	37	23	24	27	26	35	30	17	23	12	16	13
2	37	22	24	27	26	35	30	17	23	12	16	13
3	37	22	24	27	26	35	30	17	18	12	16	13
4	37	23	24	27	26	35	30	21	16	12	15	13
5	37	23	24	27	26	35	30	20	16	12	15	13
6	37	23	24	27	27	35	30	20	16	12	15	13
7	37	23	24	27	27	35	29	18	16	12	16	13
8	37	23	24	27	27	35	30	16	15	12	16	13
9	37	23	24	28	27	35	30	16	15	12	16	14
10	37	23	24	27	27	35	29	16	15	12	16	14
11	37	23	25	27	27	35	30	16	15	12	16	13
12	37	23	27	28	27	34	29	16	15	12	16	14
13	37	23	27	28	27	34	29	16	15	12	16	13
14	38	23	27	28	27	35	29	16	15	12	16	14
15	40	23	27	28	27	35	24	16	15	12	16	14
16	40	23	27	e27	28	35	16	16	15	14	16	14
17	40	23	27	e25	27	34	16	17	15	16	16	14
18	39	23	27	e25	28	34	16	17	15	16	16	14
19	40	24	27	e25	28	34	16	17	15	16	16	14
20	40	24	27	e25	28	35	16	17	15	16	16	14
21	39	24	27	e25	27	35	16	16	14	16	16	14
22	39	24	27	e25	27	35	17	16	10	16	16	14
23	39	24	27	e25	27	35	17	16	11	16	16	14
24	39	24	27	e25	27	35	17	16	12	16	16	14
25	39	24	27	e25	27	35	17	16	12	16	16	14
26	39	24	27	26	26	37	17	16	12	16	16	14
27	39	25	27	26	25	38	17	16	12	16	16	14
28	39	25	27	26	29	38	17	16	12	16	16	14
29	39	24	27	26	---	38	17	16	12	16	16	14
30	39	24	27	26	---	38	17	16	12	16	16	14
31	37	---	27	26	---	38	---	16	---	16	16	---
TOTAL	1185	702	805	818	754	1097	688	518	442	434	493	410
MEAN	38.2	23.4	26.0	26.4	26.9	35.4	22.9	16.7	14.7	14.0	15.9	13.7
AC-FT	2350	1390	1600	1620	1500	2180	1360	1030	877	861	978	813
MAX	40	25	27	28	29	38	30	21	23	16	16	14
MIN	37	22	24	25	25	34	16	16	10	12	15	13

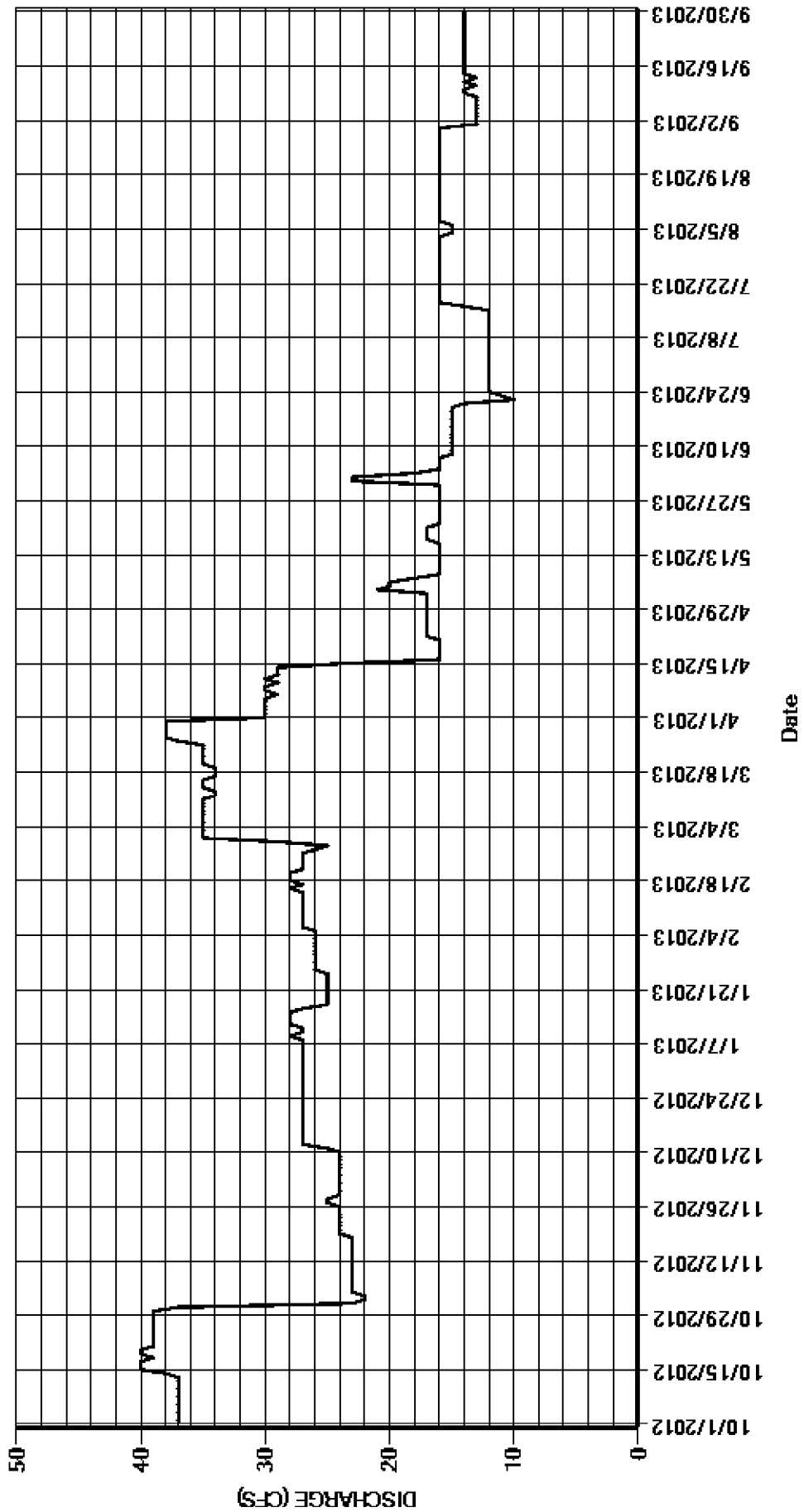
CAL YR	2012	TOTAL	16797	MEAN	45.9	MAX	80	MIN	22	AC-FT	33320
WTR YR	2013	TOTAL	8346	MEAN	22.9	MAX	40	MIN	10	AC-FT	16550

MAX DISCH: 43.1 CFS AT 10:15 ON MAR 11, 2013 GH 0.90 FT SHIFT -0.04 FT  
 MAX GH: 0.90 FT AT 10:15 ON MAR 11, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



DOLORES RIVER BELOW MCPHEE RESERVOIR  
WY2013 HYDROGRAPH



SAN JUAN RIVER BASIN  
BLANCO DIVERSION NEAR PAGOSA SPRINGS

Water Year 2013

Location.-- Lat. 37°12'13", Long. 106°48'40", in NW¼NE¼ sec. 11, T.34 N., R.1 E., NMPM, Archuleta County.

Drainage Area and Period of Record.-- Basin area above diversion is 67.8 sq. mi. ; Diversion record Mar. 5, 1974 to present. Published stream flow record Oct 1, 1993 to present.

Equipment.-- Graphic water stage-recorder and Sutron Satlink 2 HDR satellite monitoring DCP with stage-discharge recorder (SDR). The SDR and graphic recorder are on separate floats in a concrete shelter and well. The primary reference is an electric drop tape at the edge of the instrument shelf. No outside staff gage. The control is a 12-ft concrete Parshall flume set in an underground concrete box culvert. A backup battery is used to maintain voltage in the SDR. An AC to DC power converter is used to maintain voltage in the backup battery. No changes this water year.

Hydrologic Conditions.-- This diversion is the beginning of the Azotea Tunnel. This portion of the tunnel runs from the Blanco Diversion to the Little Oso Diversion. This is the first leg in the trans-mountain diversion of the San Juan / Chama project. Cobble, gravel, and silt are deposited in the box culvert above the Parshall flume. The hydraulic conditions cannot be directly observed since the structure is located underground.

Gage-Height Record.-- The primary record is 15-minute SDR data downloaded from satellite telemetry with SDR download, chart record, and DCP data used for backup purposes. The gage was visited on eighteen (18) separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The SDR was not adjusted this water year. The gage is visited almost daily (during normal business hours) by the USBR/Chama personnel during the diversion season. USBR personnel will adjust the graphic water stage-recorder but do not make adjustments to the SDR. The record is complete and reliable.

Datum Corrections.-- Levels were not run in WY 2013. Levels were run in WY 2011 on the surface (not in to the flume floor). The reference point and diversion house floor were surveyed in reference to a brass cap located outside the diversion house. Using as-built drawings of the diversion structure, there is a discrepancy of the tape length being +0.05 ft longer than it should be. Further survey to flume floor will be required to confirm this. No correction was made due to the tape length discrepancy in water year 2013.

Rating.-- The control is a 12-foot concrete Parshall flume. The Parshall flume is located underground and approximately 50 to 80 ft downstream of the radial gates. The only access point is located at the radial gates. One channel at all stages. Rating No. 1 was used the entire water year. Rating No. 1 is a standard 12- foot Parshall flume rating at and above a gage height of 0.06-ft. Flows at or below a gage height of 0.05-ft are assumed to be negligible and assigned zero discharge. No discharge measurements have ever been made at the gage due to tunnel access not being possible during diversion. The peak instantaneous flow of 564 cfs occurred at 1800 on Aug. 07, 2013 at a gage height of 4.74 ft with a shift of 0.00 ft.

Discharge.-- No discharge measurements are made at this gage since the control structure is located underground. The standard 12-ft Parshall flume rating was applied directly to the gage height record to calculate the discharge.

Special Computations.-- No special computations were necessary in water year 2013.

Remarks.-- The record is fair as the tape length discrepancy remains to be confirmed. The peak instantaneous flow is rated fair. Station maintained and record developed by Brian Leavesley.

Recommendations.-- Try for WY2014 to obtain levels on the control structure in the tunnel.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

BLANCO DIVERSION NEAR PAGOSA SPRINGS

RATING TABLE-- BLADIVCO01 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

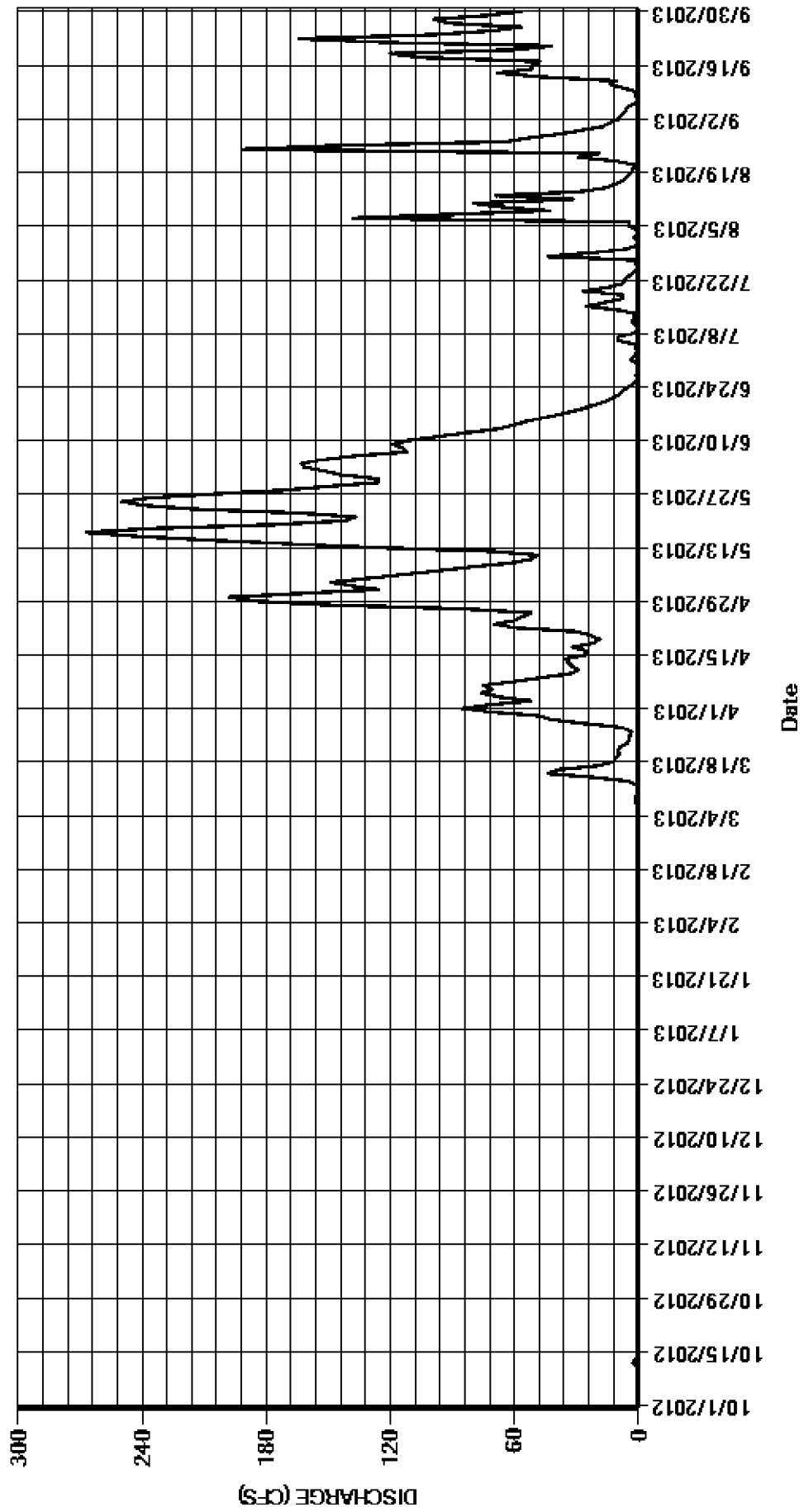
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.17	85	163	144	3.5	0.74	14
2	0.00	0.00	0.00	0.00	0.00	0.23	72	126	152	2.2	2.2	9.5
3	0.00	0.00	0.00	0.00	0.00	0.30	52	138	162	1.0	0.00	8.4
4	0.00	0.00	0.00	0.00	0.00	0.00	67	149	163	1.1	0.88	6.5
5	0.00	0.00	0.00	0.00	0.00	0.08	76	131	152	0.99	4.7	5.5
6	0.00	0.00	0.00	0.00	0.00	0.52	71	114	137	10	4.5	1.8
7	0.00	0.00	0.00	0.00	0.00	1.0	75	96	112	10	138	0.80
8	0.00	0.00	0.00	0.00	0.00	1.6	60	80	114	2.6	90	1.5
9	0.00	0.00	0.00	0.00	0.00	1.3	47	61	119	0.26	43	0.94
10	0.00	0.00	0.00	0.00	0.00	0.59	33	52	111	1.2	66	7.5
11	0.00	0.00	0.00	0.00	0.00	0.54	29	49	97	3.0	80	14
12	2.8	0.00	0.00	0.00	0.00	0.86	32	71	83	2.3	32	11
13	1.7	0.00	0.00	0.00	0.25	4.6	34	130	68	0.84	69	47
14	0.00	0.00	0.00	0.00	0.05	22	35	169	60	9.4	28	68
15	0.00	0.00	0.00	0.00	0.05	44	26	207	54	25	16	52
16	0.00	0.00	0.00	0.00	0.09	38	25	243	45	16	11	51
17	0.00	0.00	0.00	0.00	0.25	20	32	267	37	7.8	7.3	48
18	0.00	0.00	0.00	0.00	0.11	12	22	235	29	7.7	5.1	106
19	0.00	0.00	0.00	0.00	0.08	11	19	176	23	27	3.5	120
20	0.00	0.00	0.00	0.00	0.00	9.3	23	142	17	15	2.8	60
21	0.00	0.00	0.00	0.00	0.00	9.9	30	137	13	7.8	1.6	42
22	0.00	0.00	0.00	0.00	0.00	9.2	59	164	9.1	6.7	11	124
23	0.00	0.00	0.00	0.00	0.00	5.4	70	215	7.6	4.5	29	164
24	0.00	0.00	0.00	0.00	0.00	4.6	60	240	4.9	2.1	19	99
25	0.00	0.00	0.00	0.00	0.02	4.1	56	250	1.7	0.20	192	71
26	0.00	0.00	0.00	0.00	0.00	3.4	52	237	0.69	1.3	146	57
27	0.00	0.00	0.00	0.00	0.00	8.2	85	207	1.4	0.00	64	92
28	0.00	0.00	0.00	0.00	0.08	26	150	172	0.75	44	53	99
29	0.00	0.00	0.00	0.00	---	42	186	150	0.91	22	38	73
30	0.00	0.00	0.00	0.00	---	48	198	126	0.59	6.0	27	57
31	0.00	---	0.00	0.00	---	71	---	126	---	1.1	17	---
TOTAL	4.50	0.00	0.00	0.00	0.98	399.89	1861	4823	1919.64	242.59	1202.32	1511.44
MEAN	0.15	0.000	0.000	0.000	0.035	12.9	62.0	156	64.0	7.83	38.8	50.4
AC-FT	8.9	0	0	0	1.9	793	3690	9570	3810	481	2380	3000
MAX	2.8	0.00	0.00	0.00	0.25	71	198	267	163	44	192	164
MIN	0.00	0.00	0.00	0.00	0.00	0.00	19	49	0.59	0.00	0.00	0.80

CAL YR	2012	TOTAL	11702.67	MEAN	32.0	MAX	253	MIN	0.00	AC-FT	23210
WTR YR	2013	TOTAL	11965.36	MEAN	32.8	MAX	267	MIN	0.00	AC-FT	23730

MAX DISCH: 564 CFS AT 18:00 ON AUG 07, 2013 GH 4.74 FT SHIFT 0 FT  
 MAX GH: 4.74 FT AT 18:00 ON AUG 07, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

BLANCO DIVERSION NEAR PAGOSA SPRINGS  
WY2013 HYDROGRAPH



SAN JUAN RIVER BASIN

09343300 RIO BLANCO BELOW BLANCO DIVERSION DAM NEAR PAGOSA

Water Year 2013

Location.-- Lat. 37°12'12.89", Long. 106°48'43.40", in NW¼, NE¼ sec. 11, T.34 N., R.1E., NMPM, Archuleta County, Hydrologic Unit 14080101, on left bank 250 ft downstream from Blanco Diversion Dam, 1.1 mi downstream from Leche Creek, and 12 mi southeast of Pagosa Springs.

Drainage Area and Period of Record.-- 69.1 mi<sup>2</sup>.; March 1971 to current year.

Equipment.-- Graphic water stage-recorder, Sutron Satlink 2 HDR satellite monitoring DCP and a Sutron stage discharge recorder (SDR). The SDR and graphic recorder are on separate floats in a 48-inch by 48-inch concrete shelter and well. The primary reference is an electric drop tape at the edge of the instrument shelf. No outside staff gage. A tipping bucket, precipitation gage Texas Electronics, TR- 525USW is located on the top of the diversion shelter. The control is a 4-ft steel Parshall flume set in a concrete structure that acts as a weir at high flows. A manned cableway constructed with a steel pipe A-frame (located on the left side of the stream) is connected by a 5/8" plow steel galvanized smooth coil track strand cable to a concrete mass anchor (located on the right side of stream). The cableway utilizes a sit down type cable car and is located 18 ft. upstream of the gage. The cableway is used to measure high flows. The cable and cable car was observed to be damaged in water year 2013. No other changes this water year.

Hydrologic Conditions.-- Cobble, gravel, and silt are deposited in the stilling pool above the control. Once a year, or at least every other year, the USBR removes the deposits above the control section. Approximately 250 feet above the control is a USBR diversion dam for the San Juan/Chama Project.

Gage-Height Record.-- The primary record is 15-minute SDR data downloaded from satellite telemetry with chart record and DCP data used for backup purposes. The gage was visited on 20 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The SDR was adjusted three (3) times this water year: -0.01' on Oct. 22, 2012, +0.01' on Jan. 09, 2013, and -0.01' on Mar. 04, 2013. The gage is visited almost daily (during normal business hours) by the USBR-Chama personnel. USBR personnel will adjust the graphic water stage-recorder but do not make adjustments to the SDR. During the approximate period of Jul. 25 – Sep. 30, 2013 construction activities on the diversion dam ogee crest directly above the gaging station necessitated fill and construction of settling ponds in the stilling basin for the 4' flume. The river was channelized by berms and a ~36" ABS culvert pipe. During low flows, this did not allow the river to still and flow was super-critical all the way through the flume. At higher flows (when water depth exceeded the top of the 4' Parshall during storm runoff) the excess fill and severely affected the stage-discharge relationship. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice causing backwater on the control ('b'-days): Nov. 12-13, Dec. 20, 26, 29, 2012, Jan. 1-4, 12-15, Feb. 12, 28, 2013; ice forming over the control causing well drawdown on ('a'-days): Jan. 5-9, 16-23, 2013; also, the days when storm runoff flowed over the entire width of the control but was affected by construction activities on ('e'-days): Aug. 7, 10, 25, and Sep. 22, 2013.

Datum Corrections.-- Levels not run this water year. Levels were last run on October 14, 2010 (WY2011). Levels were run to the inside gage (ET index) using RM#1 as the base. No corrections were made to the electric tape index or electric tape length.

Rating.-- The control is a four-foot Parshall flume installed in December 1979 to replace a v-notch weir. At an elevation of 3.00 feet, horizontal concrete wing walls extend in both directions for a total of 76 feet. There is one channel at all stages. Rating No. 6, in use since Oct. 1, 2000, continued to be used this water year. Rating No. 6 is based on the general shape of a four foot Parshall flume theoretical rating, and is the same as Rating No. 5, dated Dec. 26, 1985, above 3.00 feet. It is fairly well defined from 4.0 to 780 cfs. Eighteen measurements (Nos. 840 – 857) were made during this water year ranging in discharge from 10.8 to 38.9 cfs. They cover the range in stage experienced except for the lower average daily flows of Oct. 25 – Nov. 8, Dec. 6-16, 19-20, 25-31, 2012, Jan. 1-12, 14-15, Feb. 26, 2013 and the higher average daily flows of May 1-30, Jul. 14, Aug. 10, 25, Sep. 22-23, 2013. The peak instantaneous flow for water year 2013 is unknown as the condition of the control was not good for measuring peak events due to construction activities. The maximum gage height for the year occurred on Aug. 10, 2013 at 2115 at 4.27 ft. This gage height was influenced by construction activities in the stilling basin of the flume.

Discharge.-- Shifting section control method was used for all periods of good record. Shifting is mainly caused by erosion and deposition of small to medium gravels in the approach section of the flume and by the accumulation of trash and debris on the wing walls at flows above gage height of 2.70 ft. The approach sections and the wing walls are periodically cleaned by the USBR or State of Colorado employees and are noted on the chart. Shifts were applied as defined by measurements, flow events, and cleaning of the channel above the flume and were distributed by time for the entire period of record. Measurements showed unadjusted shifts from 0.00 ft. to +0.19 ft. (due to poor flume approach conditions during construction). All were given full weight and applied directly except for measurement Nos. 842, 844, and 856 which were discounted from -2.48% and +3.76% to smooth shift distribution. No measurements were made during ice affect; winter measurement days may have been 'b'-days, but the flume was cleared for good gage height during the measurement.

Special Computations.-- Daily average discharge during construction activities for days with storm runoff on Aug. 7, 10, 25, and Sep. 22, 2013 were estimated using the relationship of peak data between RIOBLACO and RIOMOUCO (Rio Blanco at the Mouth) on good days. Data varied, however the discharge during peaks at RIOBLACO was typically 1.5 to 2.0 times the peak discharge at RIOMOUCO for the same flow event due to attenuation of the hydrograph. Discharge for periods of ice-affected gage height ('a' and 'b'-days) was estimated using daily temperature data from the Navajo River at Banded Peak Ranch gaging station. Estimation was performed by looking at the base flow between affected periods and adjusting baseflow by observed trends in discharge-temperature relationship on good record days adjacent to the estimated period. Graphical data was a secondary source for estimation.

Remarks.--

The record is good, except for the period when ice on/over the control affected the stage discharge relationship, which is estimated and should be considered poor. The period of Jul. 25 – Sep. 30, 2013 should also be considered poor while flow was channelized through the flume. Also, flows above 211 cfs should be considered fair record. The peak instantaneous flow is unknown for water year 2013. Station maintained and record developed by Brian Leavesley.

Recommendations.--

A crest gage should be installed at the gage to maintain a peak gage height record. Levels should be rerun at the gage in water year 2014 to tie in new R.M. #4. GPS should be taken to the site to obtain refined LAT/LONG coordinates as there is discrepancy in the seconds of longitude between the station description and AQUAMAP GIS. Cableway inspection should take place to assess damage to cable and cable car that occurred during water year 2013 (see "Equipment" above).

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09343300 RIO BLANCO BELOW BLANCO DIVERSION DAM NEAR PAGOSA

RATING TABLE-- RIOBLACO06 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

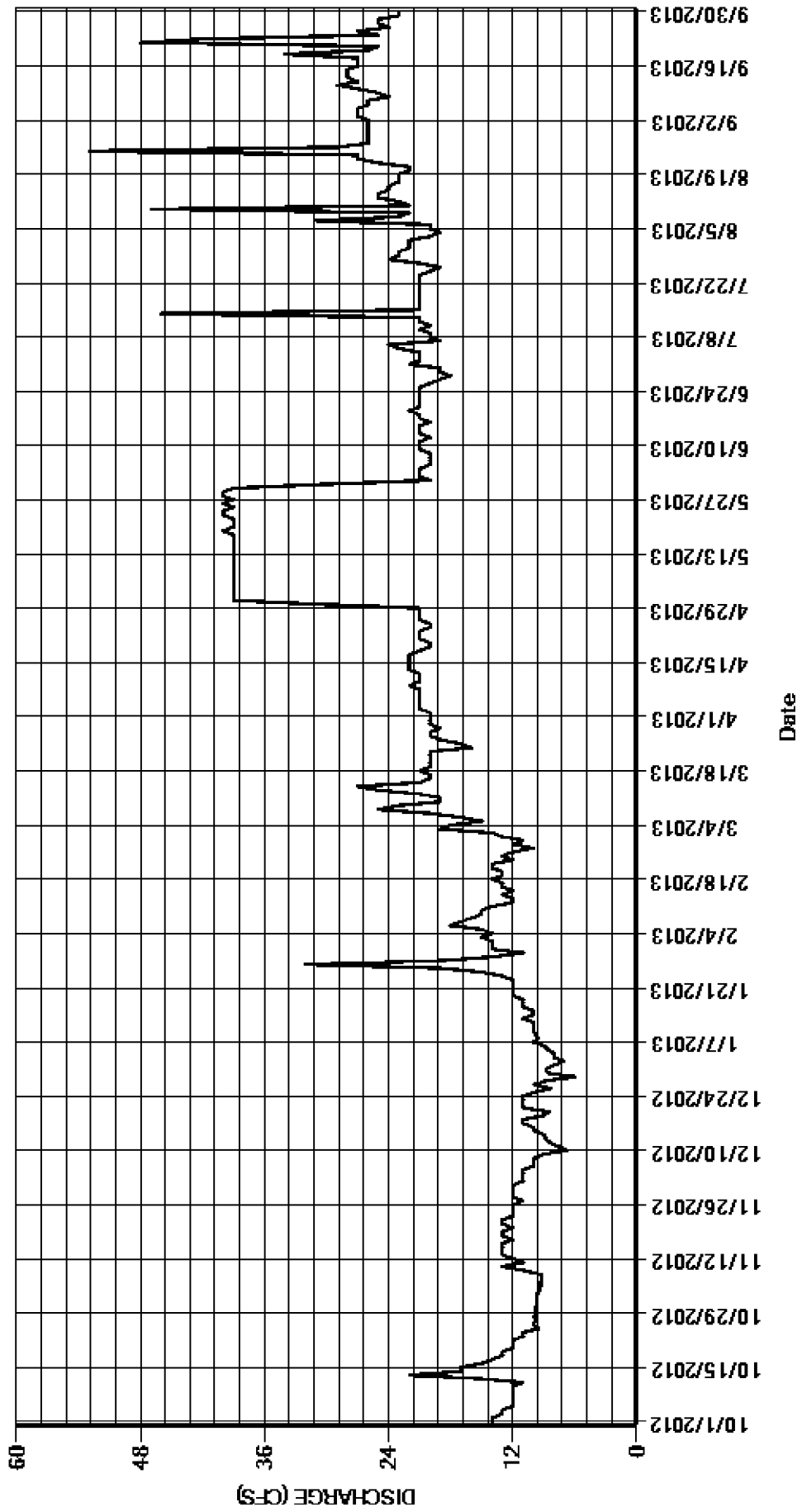
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	9.7	12	e8.0	14	13	20	39	20	22	22	26
2	14	9.7	11	e7.0	14	14	20	39	21	21	22	26
3	13	9.6	11	e8.0	15	19	21	39	21	21	20	27
4	13	9.4	11	e8.0	14	18	21	39	21	21	19	27
5	12	9.3	11	e8.6	15	15	21	39	20	23	20	27
6	12	9.3	10	e9.0	18	17	21	39	20	24	20	26
7	12	9.2	10	e10	17	20	21	39	20	19	e31	26
8	12	9.3	9.9	e9.5	16	25	21	39	20	20	23	24
9	12	11	9.1	e9.8	15	23	22	39	21	20	22	25
10	12	13	6.7	10	15	19	21	39	21	21	e47	27
11	11	11	7.6	10	14	19	21	39	21	20	22	29
12	15	e12	8.4	e10	e12	21	21	39	20	21	23	27
13	22	e13	8.8	e11	12	25	22	39	21	21	25	28
14	17	13	9.0	e10	13	27	22	39	21	46	25	28
15	17	13	9.9	e10	12	21	22	39	21	21	24	28
16	15	13	10	e11	13	20	22	39	20	21	24	27
17	14	12	11	e11	13	20	22	39	21	21	23	27
18	13	13	11	e11	14	21	21	39	21	21	23	27
19	13	13	9.0	e12	13	20	20	40	22	21	23	34
20	12	12	e8.5	e12	13	20	20	39	21	21	22	26
21	12	13	11	e12	14	20	21	39	21	21	22	25
22	12	13	11	e12	14	20	21	39	21	21	25	e48
23	11	12	11	e12	12	20	21	40	21	21	27	42
24	11	12	11	13	13	16	20	40	21	21	27	25
25	9.5	12	9.8	15	12	17	20	39	21	20	e53	27
26	10	12	e8.3	19	10	19	21	40	20	19	29	24
27	9.8	11	9.9	32	12	20	21	39	19	21	26	25
28	9.9	12	8.8	19	e11	20	21	40	18	24	26	25
29	9.7	12	e6.0	14	---	19	21	40	19	23	26	23
30	9.8	12	8.6	11	---	20	31	39	19	23	26	23
31	9.7	---	e8.8	14	---	20	---	30	---	22	26	---
TOTAL	389.4	345.5	299.1	368.9	380	608	640	1206	614	682	793	829
MEAN	12.6	11.5	9.65	11.9	13.6	19.6	21.3	38.9	20.5	22.0	25.6	27.6
AC-FT	772	685	593	732	754	1210	1270	2390	1220	1350	1570	1640
MAX	22	13	12	32	18	27	31	40	22	46	53	48
MIN	9.5	9.2	6.0	7.0	10	13	20	30	18	19	19	23

CAL YR	2012	TOTAL	7417.0	MEAN	20.3	MAX	178	MIN	6.0	AC-FT	14710
WTR YR	2013	TOTAL	7154.9	MEAN	19.6	MAX	53	MIN	6.0	AC-FT	14190

MAX DISCH: (UNKNOWN)  
 MAX GH: 4.27 FT AT 21:15 ON AUG 10, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09343300 RIO BLANCO BELOW BLANCO DIVERSION DAM NEAR PAGOSA  
WY2013 HYDROGRAPH





SAN JUAN RIVER BASIN  
RIO BLANCO AT THE MOUTH NEAR TRUJILLO

Water Year 2013

Location.-- Lat. 37°07'40.37", Long. 107°02'07.13" NAD83, in SW¼SE¼ sec. 2, T.33 N., R.2 W., NMPM, Archuleta County, Hydrologic Unit 14080101, on the right bank 0.75 miles upstream of San Juan River and 5.7 miles downstream of Rito Blanco.

Drainage Area and Period of Record.-- 170 mi<sup>2</sup>.; Published record November 17, 1970 to present.

Equipment.-- A Sutron Satlink 2 DCP connected to a shaft encoder and Sutron Constant Flow Bubbler (CFB), a shaft encoder, and a graphic water stage-recorder on a separate float in a 48-inch diameter corrugated well and a 96-inch X 60-inch wooden shelter. The primary reference gage is a steel drop tape referenced to an adjustable reference point (RP). The CFB provides primary gage height record independent of the stilling well with the shaft encoder and graphic stage recorder used for backup purposes. An air temperature sensor to aid in ice day estimation is mounted to the streamside of the house. No changes this water year.

Hydrologic Conditions.-- Large cobbles and boulders line the channel above and below the gage. A large boulder weir was installed below the gage which acts as a control at higher flows (> 35 cfs). The United States Bureau of Reclamation diverts a majority of the water upstream of the gage for the San Juan Chama Project. The gage is located approximately one mile above the confluence with the San Juan River.

Gage-Height Record.-- The primary record is 15-minute CFB data downloaded from satellite telemetry with shaft encoder and chart record for backup purposes. The CFB appeared to be in error once this water year from Jun. 6, 2013 @ 2330 to Jun. 16, 2013 @ 2100. Shaft encoder data was used for this period. CFB data is used due to gage heights occurring in the channel which can fall below the level of the intakes to the stilling well. The stilling well becomes isolated at a gage height of 1.07 ft. The gage was visited on 16 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted on 1 occasion, May 22, 2013 (+1.46 ft), when a suspected lightning storm reset the encoder to 0.00. The CFB was adjusted on 3 separate occasions, -0.03 ft on Nov. 16, 2012, -0.01 ft on Mar. 14, 2013, and +0.01 on Apr. 17, 2013. On May 22 and Jul 29, 2013 the CFB was adjusted +0.01' before the measurement and -0.01' following the measurement resulting in zero net change to the CFB. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Nov. 12, 14 – 17, 27 – 30, 2012, Dec. 6, 2012 – Mar. 4, 11, 13, 2013.

Datum Corrections.-- Levels were run on Sep. 19, 2013. Levels were run using BM #1 as a base. The brass cap installed in water year 2012 was verified not to have moved in the year following its installation. No changes to the datum were made.

Rating.-- The low flow control is a cobble riffle 15-ft below the gage. At medium and high flows a boulder weir located 30-ft. below the gage controls. Small gravels fill and scour with the change in stage causing shifts. Rating No. 5, in use for record purposes since Mar. 30, 2010 was used for the entire water year. Eleven measurements (Nos. 656-666) were made during the water year ranging in discharge from 5.66 to 60.2 cfs. They cover the range in stage experienced except for the higher average daily flows of May 1, Aug. 26, and Sep. 23, 2013. The instantaneous peak flow of 219 cfs occurred at 0245, Sep. 23, 2013 at a gage height of 2.61 ft and a shift of -0.04 ft. It exceeded Measurement No. 659 made Mar. 14, 2013 by 0.92 ft in stage.

Discharge.-- Shifting control method was used during the entire water year. Shifts were distributed by stage for the period of record. Shifting is mainly caused by erosion and deposition of small to medium gravels on the control section. Measurements show unadjusted shifts from -0.07 ft. to +0.02 ft. Shifts were applied directly and given full weight except for Measurement Nos. 660, 661, 663, 665, and 666 which were discounted -9% to +4% to smooth shift distribution. Variable stage-shift relationship VS12b was ended Oct. 3, 2012 and transitioned into VS13c. Variable stage-shift relationship VS13c was used to capture the low end of the rating curve at gage heights below isolation of the stilling well as well as storm peak flows. VS13c was used from Oct.3, 2012 through Aug. 26, 2013. Following storm hydrograph peaks in August, discharge measurements showed a different shift regime and VS13c was transitioned to VS13d for the remainder of the water year.

Special Computations.-- Discharge for periods of ice affected record was estimated on the basis of adjacent good record days, partial good record days, comparison with the discharge at Rio Blanco below the Blanco Diversion Dam (RIOBLACO) gage and air temperature records.

Remarks.-- Record rated as fair, except for those periods of ice affect which should be considered poor. The instantaneous peak flow should be considered fair. Station maintained and record developed by Brian Leavesley.

Recommendations.-- Install an outside chain gage in WY2014 to measure gage heights below the isolation level of the stilling well. Survey in BM #1 again in WY2014 to ensure stability. Ventilation of the house should be improved to reduce humidity that causes mold growth.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

RIO BLANCO AT THE MOUTH NEAR TRUJILLO

RATING TABLE-- RIOMOU005 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

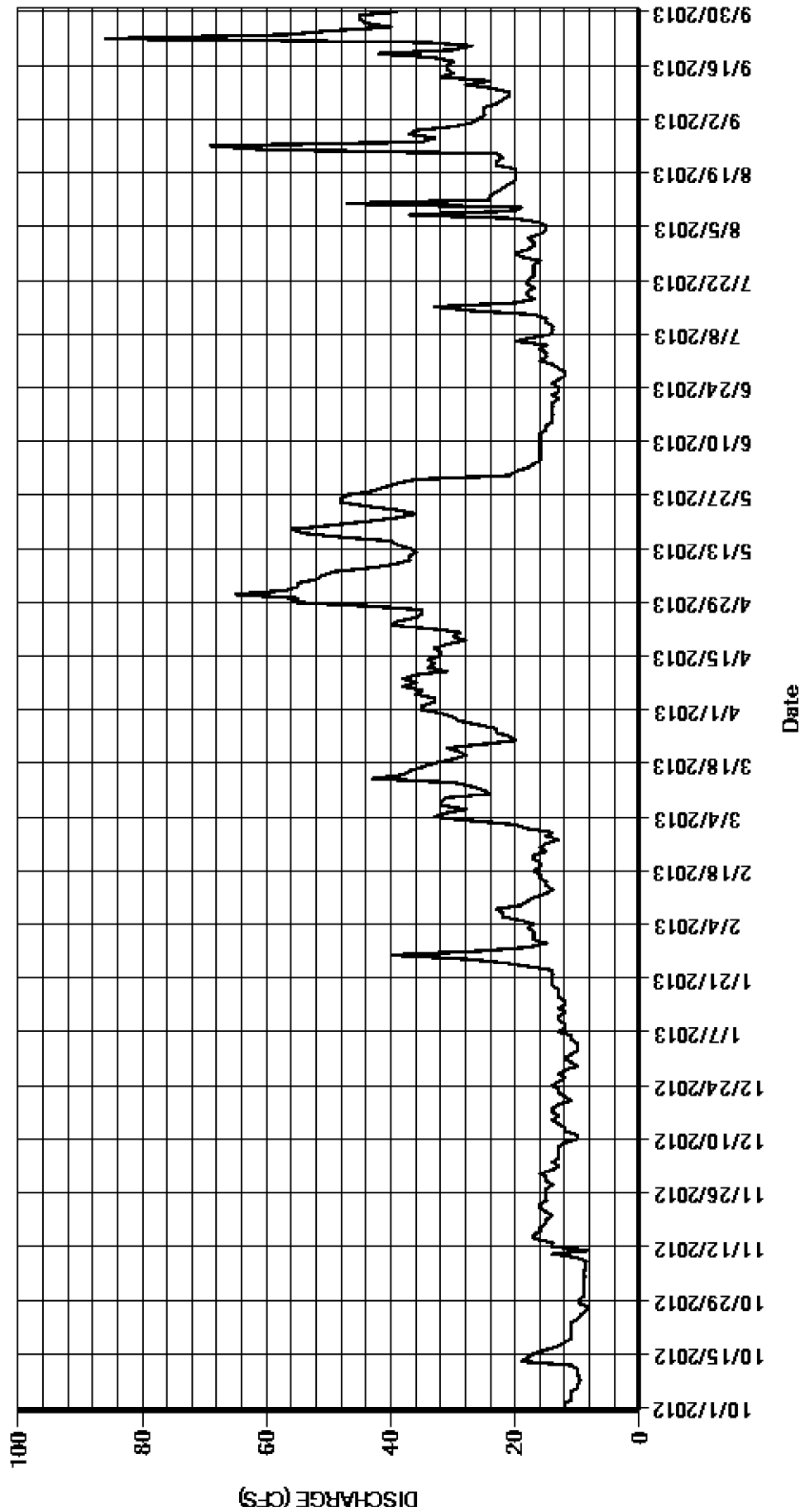
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	9.0	16	e11	e17	e18	35	65	21	16	17	27
2	12	9.0	14	e10	e17	e20	35	57	20	15	18	26
3	11	9.0	13	e10	e18	e27	33	55	18	15	16	25
4	11	8.8	14	e10	e17	e33	33	55	17	16	15	25
5	11	8.9	13	e11	e19	31	36	52	16	15	15	25
6	10	8.8	e13	e11	e22	28	35	51	16	20	16	23
7	9.9	8.7	e13	e13	e22	32	38	49	16	17	20	22
8	9.6	8.6	e13	e12	e23	32	36	43	16	14	37	21
9	9.8	10	e12	e12	e19	31	38	39	16	14	20	21
10	10	14	e10	e13	e18	24	36	37	16	14	19	24
11	10	8.4	e10	e13	e17	e25	31	37	16	15	47	28
12	11	e14	e12	e12	e15	27	34	36	16	15	24	24
13	19	14	e12	e13	e14	e30	33	37	15	17	24	32
14	18	e17	e13	e12	e15	43	34	39	15	27	23	30
15	17	e17	e14	e12	e15	38	32	40	14	33	22	31
16	15	e16	e13	e13	e16	37	32	48	14	20	21	31
17	13	e16	e14	e13	e16	35	33	54	14	17	20	30
18	12	15	e14	e13	e17	33	31	56	14	18	20	33
19	11	15	e13	e14	e16	30	28	50	14	18	20	42
20	11	14	e11	e14	e16	28	30	44	14	17	20	30
21	11	15	e12	e14	e17	29	29	39	13	18	23	27
22	11	16	e13	e14	e17	31	33	36	14	18	23	34
23	11	16	e13	e14	e15	25	40	39	13	17	22	86
24	10	15	e14	e18	e16	20	39	44	13	17	23	57
25	9.5	15	e13	e22	e15	21	36	48	14	17	60	50
26	8.8	15	e12	e28	e13	23	35	48	13	17	69	40
27	8.1	e15	e13	e40	e15	23	35	47	12	16	35	44
28	9.6	e14	e12	e26	e14	26	44	43	12	19	33	45
29	9.7	e15	e10	e18	---	29	56	41	13	20	37	45
30	8.9	e15	e11	e15	---	30	55	39	14	18	36	39
31	8.9	---	e12	e17	---	32	---	36	---	17	30	---
TOTAL	349.8	392.2	392	468	471	891	1075	1404	449	547	825	1017
MEAN	11.3	13.1	12.6	15.1	16.8	28.7	35.8	45.3	15.0	17.6	26.6	33.9
AC-FT	694	778	778	928	934	1770	2130	2780	891	1080	1640	2020
MAX	19	17	16	40	23	43	56	65	21	33	69	86
MIN	8.1	8.4	10	10	13	18	28	36	12	14	15	21

CAL YR	2012	TOTAL	8884.6	MEAN	24.3	MAX	208	MIN	4.5	AC-FT	17620
WTR YR	2013	TOTAL	8281.0	MEAN	22.7	MAX	86	MIN	8.1	AC-FT	16430

MAX DISCH: 219 CFS AT 02:45 ON SEP 23, 2013 GH 2.61 FT SHIFT -0.04 FT  
 MAX GH: 2.61 FT AT 02:45 ON SEP 23, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**RIO BLANCO AT THE MOUTH NEAR TRUJILLO  
WY2013 HYDROGRAPH**



SAN JUAN RIVER BASIN  
09344000 NAVAJO RIVER AT BANDED PEAK RANCH NEAR CHROMO  
Water Year 2013

Location.-- Lat. 37°05'07", Long. 106°41'22", in SE¼NW¼ sec. 24, T.33 N., R.2 E., NMPM, Archuleta County, Hydrologic Unit 14080101, on right bank at downstream side of private bridge on Banded Peak Ranch, 0.5 mi downstream from Cutthroat Creek, 2.8 mi downstream from East Fork of the Navajo River, and 11.2 mi northeast of Chromo, Co.

Drainage Area and Period of Record.-- 69.8 mi<sup>2</sup>.; Continuous record kept by USGS, Oct. 1, 1936 to Sep. 30, 1995. Oct 1, 1995 to present by Colorado Division of Water Resources.

Equipment.-- Graphic water stage-recorder and shaft encoder connected to a Sutron Satlink 2 DCP in a 48-inch x 48-inch redwood shelter and well. The shaft encoder and graphic recorder are on separate floats. The floats are located inside a 14-inch PVC oil cylinder. The primary reference gage is an electric drop tape in the gage. A drop tape is a supplemental reference gage and is mainly used in the oil cylinder when the well is frozen. A Sutron constant-flow bubbler (CFB), air temperature sensor and tipping bucket precipitation gage are used for supplemental purposes. A Campbell Scientific radar water level sensor was installed on Aug. 21, 2013. No other changes this water year.

Hydrologic Conditions.-- The stream is composed of sand, gravel, and large cobble. In the spring, sustained high water scours sand and gravel from the streambed. In mid-Summer to late Fall and Winter, the sand and gravel are deposited in the channel at the gage. The control and channel are highly susceptible to fill and scour events.

Gage-Height Record.-- The primary record is 15-minute constant-flow bubbler data, shaft encoder data, and radar data downloaded from satellite telemetry with the DCP log, shaft encoder data, CFB data, and chart record for backup purposes. CFB data was used from Oct. 1, 2012 to Apr. 22, 2013, shaft encoder data was used from Apr. 22 to Jun. 24, CFB data was used from Jun. 24 to Aug. 21, and radar data was used from Aug. 21 to the end of the water year. The gage was visited on 23 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. Three corrections were made to the primary record gage throughout the water year: -0.03 ft on Oct. 1, 2012 to the CFB, -0.03 ft on Sep. 3, 2013 to the radar unit, and -0.02 ft on Sep. 5, 2013 to the radar. The CFB and shaft encoder matched fairly well until late April when the CFB began to error in the higher runoff flows. In past years it has been noticed that the middle (mid-level) intake to the stilling well would cause drawdown in the stilling well. For this water year, the mid-intake was left closed during the spring runoff period with only the lower intake (typically under shallow gravels) was left open. Shaft encoder data was used April to June until the CFB was deemed to be recording properly. Primary GH was changed to the radar unit on Aug. 21, 2013 and used through the end of the water year. Record is complete and reliable, except for the following periods when the stage-discharge relationship was affected by ice on the control: Nov. 11 – 12, Dec. 9 – 13, 19 – 23, 26, 29, 2012, Jan. 1 – 6, 8 – 13, 15 – 23, 30 – 31, Feb. 1 – 2, 4 – 7, 12 – 17, 19, 21, 23, 25 – 28, Mar. 1 – 2, 5 – 6, 10 – 11, 24 – 25, 2013.

Datum Corrections.-- Levels were last run on Sep. 12, 2012 using BM#6 as the base. The electric tape index was found to be +0.014 ft and the drop tape reference point was +0.013 ft from their established elevations. No corrections were made since the electric tape index and drop tape index was found to be within allowable error tolerances.

Rating.-- The control consists of a cobble riffle whose location varies during the year from 30 to 70 feet below the gage. Shifting occurs throughout the range-in-stage. Rating No. 23, dated Aug. 22, 1996, was continued in use this year. It is fairly well defined between 22 and 603 cfs. Twenty-two measurements (Nos. 885 – 906) were made during the current water year ranging in discharge from 20.3 to 195 cfs. They cover the range in stage except for the higher daily flows of May 15 – 18, 23 – 30, Jun. 2 – 6, 2013, and the lower daily flows on Oct. 25 – 28, 2012. The peak discharge of 343 cfs occurred at 0100 on Sep. 19, 2013 at a gage height of 3.23 feet with a shift of -0.15 feet. It exceeded high Measurement No. 900 by 0.26 ft in stage. The maximum gage height of 3.27 ft occurred at 2215 on May 24, 2013.

Discharge.-- Shifting control method was used during the entire water year. Shifting is caused mainly by erosion and deposition on the control section below the gage. Shifts were distributed by time with consideration given to changes in stage from Oct. 1, 2012 to Apr. 30, 2013, and from Jun. 24, 2013 to the end of the water year. Shifts were distributed by stage using variable stage shift relationship NAVBANCOVS13a based on Msmts 896 – 900, from 1500 Apr. 30 to 2130 Jun. 3. NAVBANCOVS13b, based on msmts 900 – 902 was then instituted from Jun. 3 at 2145 to Jun. 24 at 1415. Measurements showed unadjusted shifts from -0.21 to -0.04 ft. All were given full weight and applied directly except for Measurement Nos. 886, 887, 889, 891, 898, 899, 900, & 906 which were discounted from -3 to +4 % to smooth the shift distribution. Measurement no. 890 was made during an ice affected period and its shift was not used. Measurement no. 892 was believed to have been a bad measurement, the shift was not used.

Special Computations.-- Discharge for periods of ice effect was estimated on the basis of good record before and after ice effect, partial day of good records, and the temperature record from the air temperature sensor at the gaging station.

Remarks.-- Record is considered good, except for periods of ice effect, which were estimated and should be considered poor. The peak instantaneous flow should be considered fair. Station maintained by Brian Leavesley, Brian Boughton and Sherry Schutz. Record developed by Brian Leavesley.

Recommendations.-- An outside reference gage should be installed in WY 2014 to set the radar unit to. The shelter should be restrained to prevent deterioration. Levels should be run in water year 2013 or 2014, as the tape length was not recorded with levels run in water year 2012. Fix the upper (high-water intake valve).

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09344000 NAVAJO RIVER AT BANDED PEAK RANCH NEAR CHROMO

RATING TABLE-- NAVBANCO23 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

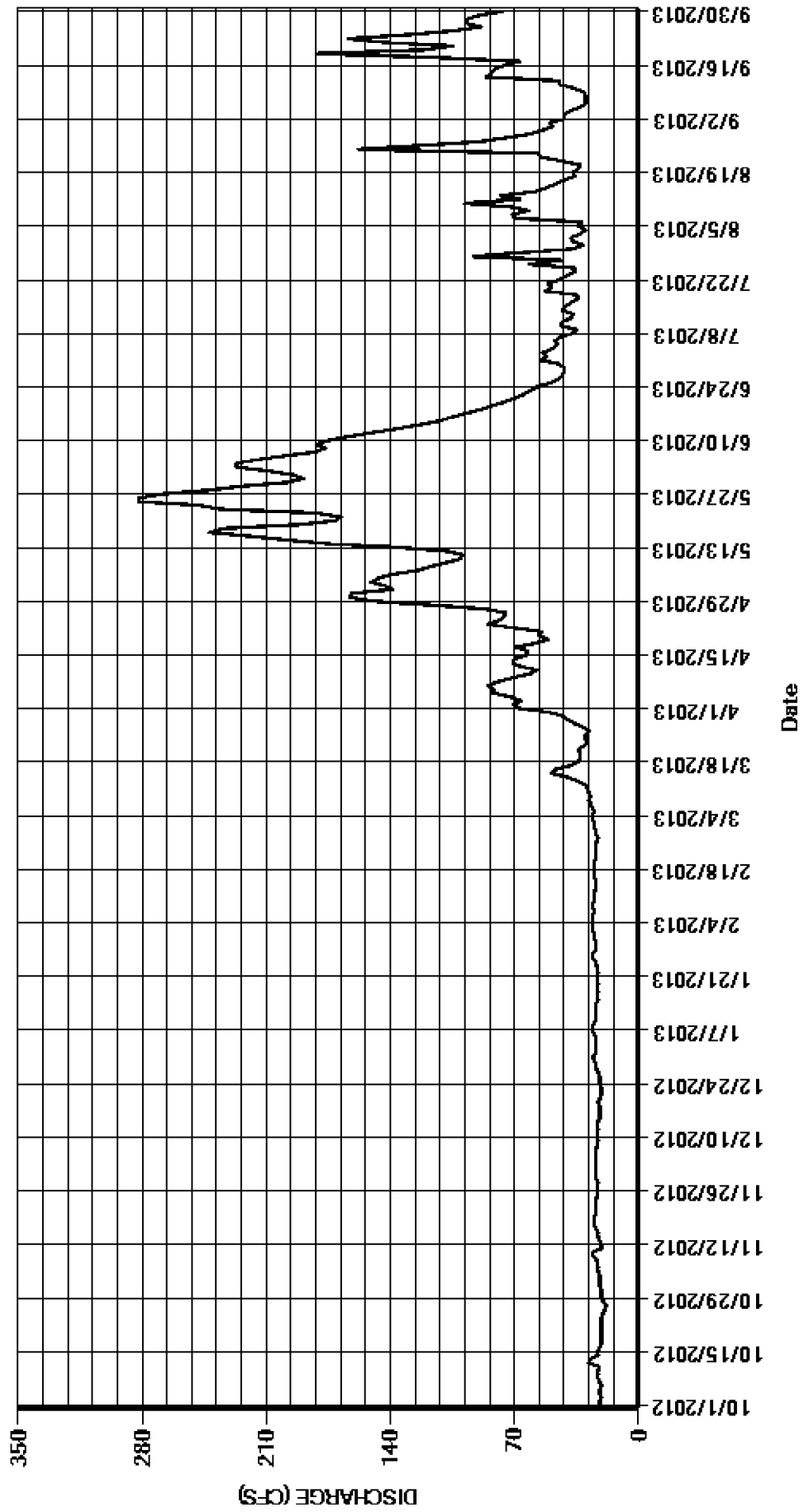
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	22	24	e24	e25	e25	67	162	195	55	37	50
2	22	22	24	e24	e26	e25	71	139	209	52	38	42
3	21	22	24	e24	26	26	66	143	227	54	33	42
4	22	22	24	e24	e26	26	72	151	227	48	30	39
5	22	23	24	e24	e26	e25	82	147	215	46	34	33
6	21	23	24	e25	e26	e26	82	140	200	47	32	30
7	22	23	24	26	e25	27	85	125	182	44	70	30
8	23	24	23	e26	26	28	79	118	177	37	71	30
9	23	26	e23	e25	26	27	71	109	182	35	62	31
10	23	26	e23	e24	25	e28	61	101	175	44	71	37
11	22	e21	e23	e24	25	e29	57	99	164	43	98	45
12	28	e21	e23	e24	e25	30	67	108	150	38	67	45
13	27	22	e23	e24	e24	34	71	135	137	37	78	86
14	23	23	23	24	e24	40	70	175	124	43	58	83
15	23	23	22	e23	e24	49	63	197	113	41	52	81
16	22	24	22	e23	e25	47	63	219	106	38	47	76
17	21	25	22	e23	e25	39	69	242	98	34	42	67
18	21	25	22	e23	25	34	58	234	90	35	36	115
19	21	25	e23	e23	e25	33	51	192	83	53	37	181
20	21	24	e22	e23	25	33	56	171	76	49	34	121
21	21	24	e21	e23	e24	34	55	168	70	51	33	105
22	21	24	e21	e23	24	32	70	182	65	45	43	144
23	21	24	e21	e23	e24	29	85	236	61	41	55	164
24	21	24	22	24	24	e30	79	248	57	36	57	130
25	20	23	22	24	e24	e30	76	282	50	36	158	105
26	19	23	e22	26	e23	28	75	282	45	62	124	89
27	18	23	23	26	e24	31	87	269	43	44	90	97
28	20	23	24	24	e24	36	118	243	42	93	75	97
29	21	24	e24	24	---	40	150	225	42	67	61	90
30	21	24	25	e24	---	43	163	199	45	38	54	77
31	21	---	26	e25	---	51	---	189	---	31	48	---
TOTAL	674	702	713	746	695	1015	2319	5630	3650	1417	1825	2362
MEAN	21.7	23.4	23.0	24.1	24.8	32.7	77.3	182	122	45.7	58.9	78.7
AC-FT	1340	1390	1410	1480	1380	2010	4600	11170	7240	2810	3620	4690
MAX	28	26	26	26	26	51	163	282	227	93	158	181
MIN	18	21	21	23	23	25	51	99	42	31	30	30

CAL YR	2012	TOTAL	23043	MEAN	63.0	MAX	251	MIN	18	AC-FT	45710
WTR YR	2013	TOTAL	21748	MEAN	59.6	MAX	282	MIN	18	AC-FT	43140

MAX DISCH: 343 CFS AT 01:00 ON SEP 19, 2013 GH 3.23 FT SHIFT -0.15 FT  
 MAX GH: 3.27 FT AT 22:15 ON MAY 24, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09344000 NAVAJO RIVER AT BANDED PEAK RANCH NEAR CHROMO  
WY2013 HYDROGRAPH



SAN JUAN RIVER BASIN  
OSO DIVERSION NEAR CHROMO, CO.

Water Year 2013

Location.-- Lat. 37°01'49", Long. 106°44'14", in NE¼NE¼ sec. 9, T.32 N., R.2 E., NMPM, Archuleta County, Hydrologic Unit 14080101, on the left bank 7 miles upstream of the confluence with the Little Navajo River.

Drainage Area and Period of Record.-- Drainage area above the diversion is 97.2 sq. mi. ; Diversion record Nov. 1, 1973 to present. Published streamflow record Oct. 1, 1990 to present.

Equipment.-- Sutron Satlink 2 DCP and a Sutron stage-discharge recorder (SDR) in a concrete control house used by the Bureau of Reclamation (Bureau) to house the telemetry for control of the Oso diversion structure. The Bureau utilizes a Stevens A-71 chart recorder with an attached signal converter to send data to their SCADA system. The primary reference gage is an electric drop tape inside the gage house. Control is a 15-foot concrete Parshall flume set into the diversion tunnel below ground. No changes this water year.

Hydrologic Conditions.-- The Oso diversion is part of the San Juan-Chama Project and is a transmountain diversion structure which creates an on-stream reservoir on the Navajo River above the diversion to collect runoff and settle out sediment. Water can be released downstream by means of a vertical Tainter gate or taken into the Azotea Tunnel which conveys water to the Rio Grande basin. Diversion amount is controlled by the capacity of the tunnel as water in the tunnel is also diverted from the Little Navajo River and Rio Blanco. The measurement flume is located within the diversion tunnel. It is typically a seasonal diversion where the Bureau attempts to capture and divert the maximum amount of spring runoff while adhering to minimum release limits set forth in the legislation for the San Juan-Chama Project and agreements between the Bureau and State of Colorado. Since the diversion primarily operates in the Spring and Summer, ice does not affect the control. Occasionally, the Tainter gates on the diversion tunnel will become stuck open from ice and diversion into the tunnel will take place.

Gage-Height Record.-- The primary record is 15-minute SDR data downloaded from satellite telemetry with DCP downloads used for backup purposes. The record is complete and reliable. The station was visited 21 times over the water year by DWR personnel to ensure that the SDR remained calibrated to the primary reference. No adjustments were made to the SDR in water year 2013, however there was one adjustment made on Oct. 2, 2013 (+0.01 ft) that affects water year 2013 as it is prorated by time back to Sep. 23, 2013.

Datum Corrections.-- No levels run this water year. Levels were run at the control house on Feb. 24, 2011 to tie in the reference point in the control house to a brass cap (BM#1) outside. The flume itself was not surveyed. No corrections to the datum were made.

Rating.-- The control is a standard 15-ft. concrete Parshall flume. Rating No. 1 (OSODIVCO01) is a standard 15-ft. Parshall flume rating above a gage height of 0.05 ft, and was used the entire water year. The stilling well occasionally has issues throughout the water year draining when flow is stopped. There are varying gage heights through the record which are assumed to have zero flow. No measurements are made at this gage because the flume is located underground. The peak instantaneous flow of 351 cfs occurred at 1200 on Aug. 08, 2013 at a gage height of 3.09 ft. with a shift of 0.00 ft.

Discharge.-- No measurement of this diversion has taken place. When diverting, a 0.00 shift was applied for the entire year. OSODIVCOVS12A was developed to trim out gage heights 0.08 ft and below as zero flow. VS12A was continued from water year 2012 until Aug. 15, 2013 when the stilling well began to drain to a zero flow gage height when the diversion was stopped. A 0.00' shift was run for the remainder of the water year. The discharge record was computed by direct application of the rating to the gage height record. When the Bureau began to fill the stilling basin above the diversion in March 2013 (Mar. 8 – 22), there was seepage observed occurring around the closed diversion gates to the tunnel. The gage height indicated flow and it was field verified therefore retained in record.

Special Computations.-- No special computations in water year 2013.

Remarks.-- Record is rated as fair for the entire period. A fair rating was given due to the fact that levels have never been run in the tunnel to determine the actual elevation of the flume; also, measurements have never taken place due to the inaccessibility of the flume. The peak instantaneous flow is rated fair. Station maintained and record developed by Brian Leavesley.

Recommendations.-- Run levels in the tunnel on the flume/intake.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

OSO DIVERSION NEAR CHROMO, CO.

RATING TABLE-- OSODIVCO01 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	49	92	146	0.00	0.00	4.6
2	0.00	0.00	0.00	0.00	0.00	0.00	58	53	155	0.00	0.00	2.9
3	0.00	0.00	0.00	0.00	0.00	0.00	44	66	171	0.00	0.00	3.3
4	0.00	0.00	0.00	0.00	0.00	0.00	41	79	181	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	56	75	176	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	56	64	164	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	61	46	146	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.03	57	36	134	0.00	35	0.00
9	0.00	0.00	0.00	0.00	0.00	1.2	51	27	144	0.00	21	0.00
10	0.00	0.00	0.00	0.00	0.00	0.45	40	19	132	0.00	15	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	31	16	120	0.00	73	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	42	24	99	0.00	20	0.00
13	0.00	0.00	0.00	0.00	0.00	0.03	46	47	82	0.00	27	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	47	87	68	0.00	11	0.00
15	0.00	0.00	0.00	0.00	0.00	1.1	40	115	55	0.00	3.1	0.00
16	0.00	0.00	0.00	0.00	0.00	1.4	34	148	45	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	1.5	46	188	36	0.00	0.00	6.5
18	0.00	0.00	0.00	0.00	0.00	1.5	31	188	29	0.00	0.00	56
19	0.00	0.00	0.00	0.00	0.00	1.4	25	140	23	0.00	0.00	133
20	0.00	0.00	0.00	0.00	0.00	1.5	28	107	17	0.00	0.00	68
21	0.00	0.00	0.00	0.00	0.00	1.4	23	100	12	0.00	0.00	47
22	0.00	0.00	0.00	0.00	0.00	9.7	38	112	7.4	0.00	0.00	72
23	0.00	0.00	0.00	0.00	0.00	0.00	55	175	4.1	0.00	0.00	131
24	0.00	0.00	0.00	0.00	0.00	0.00	48	205	1.6	0.00	0.00	87
25	0.00	0.00	0.00	0.00	0.00	0.00	44	231	0.50	0.00	0.00	63
26	0.00	0.00	0.00	0.00	0.00	0.00	41	233	0.00	0.00	46	48
27	0.00	0.00	0.00	0.00	0.00	6.1	49	213	0.00	0.00	30	50
28	0.00	0.00	0.00	0.00	0.00	17	84	171	0.00	0.00	21	48
29	0.00	0.00	0.00	0.00	---	22	125	152	0.00	0.00	11	44
30	0.00	0.00	0.00	0.00	---	24	113	125	0.00	0.00	4.3	31
31	0.00	---	0.00	0.00	---	38	---	126	---	0.00	3.4	---
TOTAL	0.00	0.00	0.00	0.00	0.00	128.31	1503	3460	2148.60	0.00	320.80	895.30
MEAN	0.000	0.000	0.000	0.000	0.000	4.14	50.1	112	71.6	0.000	10.3	29.8
AC-FT	0	0	0	0	0	255	2980	6860	4260	0	636	1780
MAX	0.00	0.00	0.00	0.00	0.00	38	125	233	181	0.00	73	133
MIN	0.00	0.00	0.00	0.00	0.00	0.00	23	16	0.00	0.00	0.00	0.00

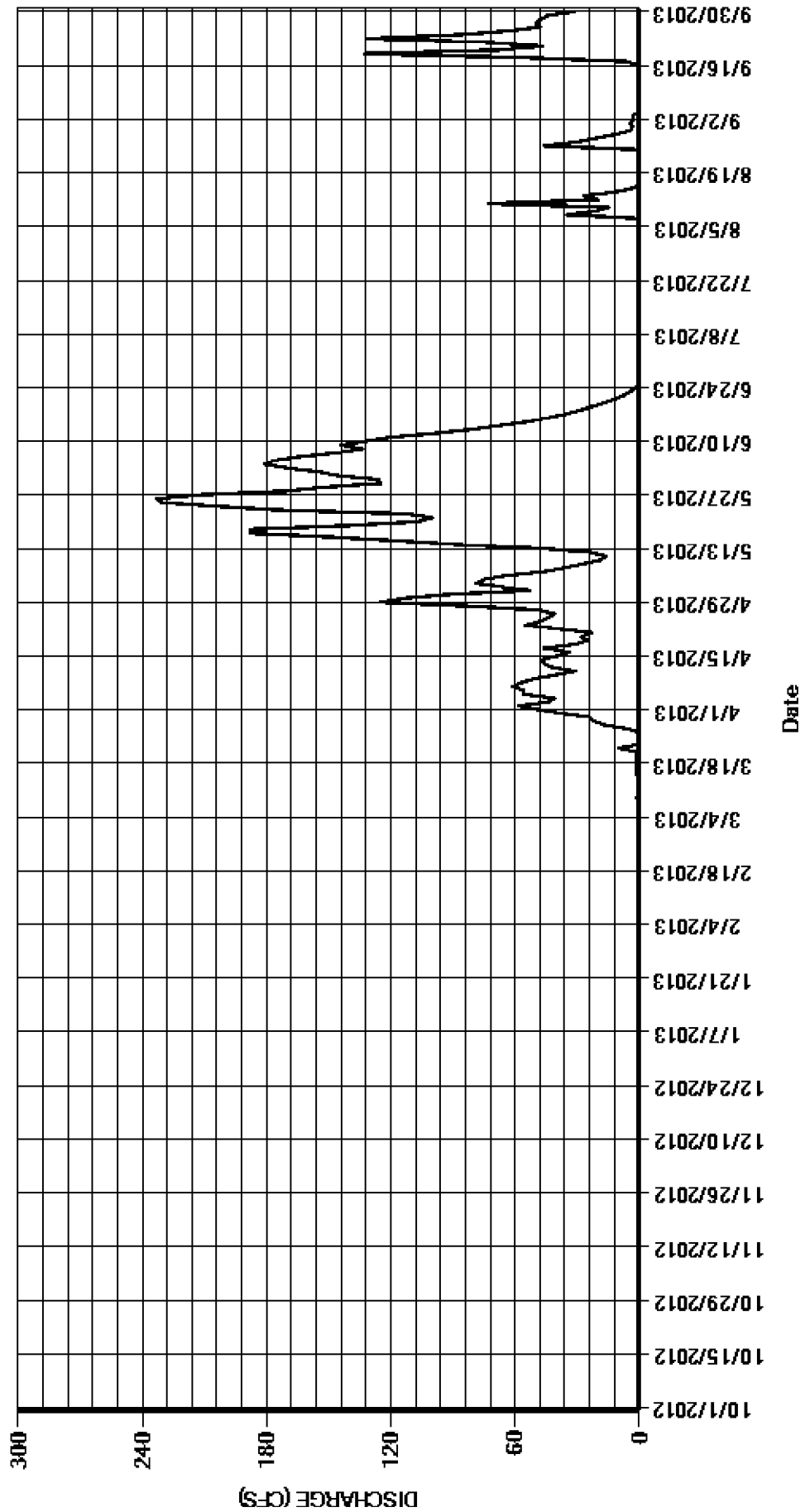
CAL YR	2012	TOTAL	10907.14	MEAN	29.8	MAX	241	MIN	0.00	AC-FT	21630
WTR YR	2013	TOTAL	8456.01	MEAN	23.2	MAX	233	MIN	0.00	AC-FT	16770

MAX DISCH: 351 CFS AT 12:00 ON AUG 08, 2013 GH 3.09 FT SHIFT 0 FT  
 MAX GH: 3.09 FT AT 12:00 ON AUG 08, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



OSO DIVERSION NEAR CHROMO, CO.  
WY2013 HYDROGRAPH



SAN JUAN RIVER BASIN

09344400 NAVAJO RIVER BELOW OSO DIVERSION DAM NEAR CHROMO

Water Year 2013

Location.--	Lat. 37°01'49", Long. 106°44'14", in NW¼NE¼ sec. 9, T.32 N., R.2 E., NMPM, Archuleta County, Hydrologic Unit 14080101, on left bank 600 ft downstream from Oso Diversion Dam, 5.8 mi east of Chromo, and 6.1 mi upstream from Little Navajo River.
Drainage Area and Period of Record.--	100.5 mi <sup>2</sup> .; Published by USGS March 1, 1971 to Sept. 30, 1998; published by Colorado Division of Water Resources Oct. 1, 1998 to present.
Equipment.--	Graphic water stage-recorder and Sutron Satlink 2 DCP satellite monitoring connected to a Sutron Stage-Discharge Recorder (SDR) unit. Recorders are on separate floats in a concrete shelter and well. The primary reference gage is an electric drop tape in the gage house. No outside staff gage. Control is an 8-foot Parshall flume set in a 60-foot wide concrete structure that acts as a weir at higher flows. No changes this water year.
Hydrologic Conditions.--	Cobble and gravel are deposited in the stilling pool above the control throughout the water year. At least once per year the USBR removes sediment deposited above the control section. Approximately 250 feet above the control is a USBR diversion dam (Oso Diversion structure) for the San Juan/Chama Project. The San Juan/Chama Project is a trans-basin diversion that diverts water through a pipeline and is delivered to the Rio Grande River basin in New Mexico.
Gage-Height Record.--	The primary record is 15-minute SDR data downloaded from satellite telemetry with chart record and DCP data used for backup purposes. Missing data on Mar. 20 and May 11, 2013 was filled in by hand for the corresponding time period from the DCP download data. The increase in gage height at 12:30 and 12:45 on Mar. 4, 2013 was caused by wading in the flume. The gage heights were corrected by hand to the values before and after the wading measurement. The gage was visited on 22 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The gage is visited almost daily (during normal business hours over the diversion season) by the USBR/Chama personnel. USBR personnel will adjust the graphic water stage-recorder but do not make adjustments to the SDR. One adjustment was made to the SDR unit this water year (-0.01 ft on 5/15/2013). The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control ("b" days): Dec. 11, 21 – 31, 2012; Jan. 1 – Feb. 3, Feb. 12 – 13, 15 – 16, 27 – 28, Mar. 1, 2013. USBR also cleaned the communication pipe between the flume and stilling well by pumping water into the well on 8/15/2013 which caused an artificial gage height rise. Gage height was estimated for 45 minutes as it was the same value on either side of the cleaning event.
Datum Corrections.--	Levels were run on Sep. 5, 2013 using BM1 as the base. The ET1 was found to be 0.006 ft. higher than established and the TL_ET was found to be 0.007 ft. long, giving a near zero net datum change; no corrections were made.
Rating.--	The control is an 8-foot Parshall flume installed in September 1979 to replace a V-notch weir. At an elevation of 3.00 ft, horizontal concrete wing walls extend in both directions for a total of 60 feet. Rating No. 4 was developed and put into use on October 1, 2002. It is fairly well defined between 22 cfs and 1,100 cfs. It was used all year. Eighteen measurements (Nos. 856 – 873) were made during the current water year ranging in discharge from 18.6 cfs to 89.6 cfs. They cover the entire range in stage experienced except for the higher daily flows of Jul. 29, Aug. 25, Sep. 15, 2013 and the lower daily flows of Oct. 1 – 3, 2012. The peak instantaneous flow of 346 cfs occurred at 0745 on August 25, 2013 at a gage height of 3.49 feet with a shift of 0.00 feet. It exceeded measurement No. 864, made April 30, 2013, by 1.57 feet in stage. The peak gage height was 4.91 feet at 1600 on Jan. 31, 2013, caused by backwater from ice.
Discharge.--	Shifting control method was used all year. Shifting is mainly caused by erosion and deposition of small to medium gravels in the approach section of the flume and by the accumulation of trash and debris on the wing walls. Shifts were applied as defined by measurements and flow events. All shifts were distributed by time. Measurements show unadjusted shifts varying from -0.01 to +0.05 ft. Shifts from measurements were applied directly and given full weight except for Measurement No. 871, which was discounted -0.70%, to smooth shift distribution. No measurements were made during ice affected periods.
Special Computations.--	Discharge during ice-affected periods was estimated by considering baseflow discharge on either side of affected record period and smoothing the record between. Temperature and discharge data from Navajo River at Banded Peak Ranch (NAVBANCO), located 6 miles upstream was the primary means of estimating discharge variation around the baseflow during ice-affected days.
Remarks.--	Record rated as good, except for those periods of ice affect and when water stage in the channel approaches the top of the flume or spills over the weir which should be considered poor. Days when ice on the control affected the stage discharge relationship, 'b'-days, should be considered fair. The peak instantaneous flow should be considered fair. Station maintained and record developed by Brian Leavesley.
Recommendations.--	The manned cableway should be inspected in water year 2014.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09344400 NAVAJO RIVER BELOW OSO DIVERSION DAM NEAR CHROMO

RATING TABLE-- NAVOSOCO04 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

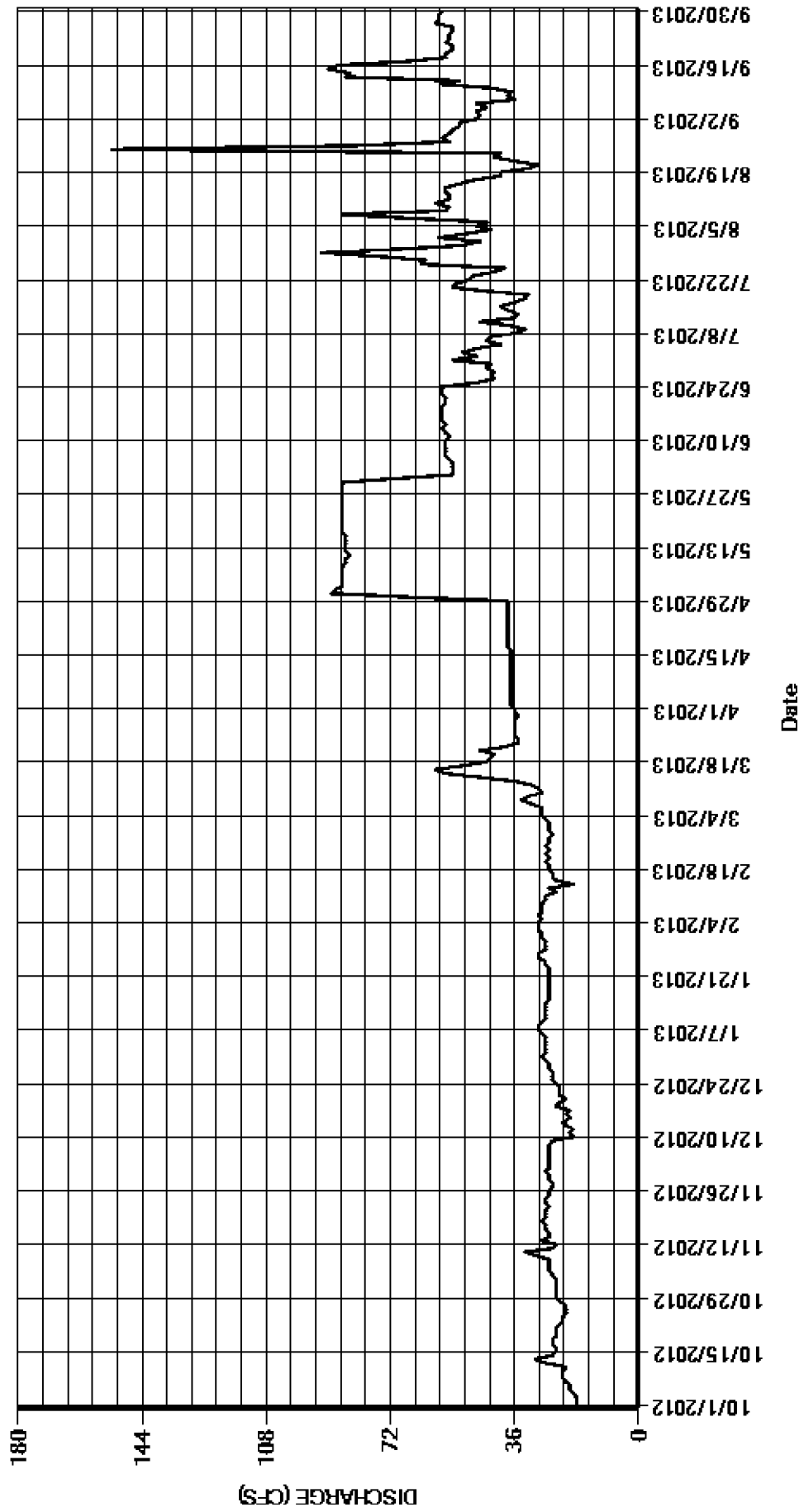
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	24	27	e27	e28	e26	36	89	54	54	46	52
2	18	24	26	e27	e29	26	37	88	54	47	58	47
3	18	24	26	e27	e29	27	37	86	54	51	50	46
4	19	25	26	e27	29	28	37	86	54	47	43	47
5	20	26	26	e27	28	28	37	86	55	40	47	44
6	20	26	26	e28	29	28	37	86	56	44	44	47
7	21	26	26	e29	28	31	37	86	56	43	67	36
8	22	26	26	e29	28	34	37	86	56	36	86	38
9	22	30	25	e28	28	32	37	85	56	33	56	37
10	22	33	19	e27	27	28	37	85	56	37	55	43
11	21	25	e20	e27	27	29	37	84	55	46	59	57
12	27	24	19	e27	e24	31	37	85	56	36	55	52
13	30	28	21	e27	e26	36	37	85	57	35	55	85
14	25	26	22	e27	19	46	37	85	56	38	56	84
15	24	26	20	e26	e24	56	37	85	57	40	56	90
16	24	27	21	e26	e25	59	37	85	57	36	52	87
17	25	27	20	e26	25	51	38	86	57	33	48	67
18	25	28	24	e26	26	44	38	86	57	32	40	56
19	24	27	23	e26	26	43	38	86	57	44	40	56
20	24	27	21	e26	27	42	38	86	56	54	32	54
21	24	27	e23	e26	26	46	38	86	56	53	29	54
22	23	26	e23	e26	27	39	38	86	57	49	36	56
23	22	27	e23	e26	26	35	38	86	57	48	42	55
24	22	27	e24	e27	27	35	38	86	57	42	40	55
25	21	26	e25	e27	26	36	38	86	47	39	153	54
26	21	26	e25	e29	26	36	38	86	42	63	82	54
27	21	25	e25	e29	e25	36	38	86	43	62	55	59
28	23	25	e26	e27	e26	36	38	86	42	75	57	58
29	24	26	e26	e27	---	36	38	86	44	92	55	58
30	24	26	e27	e27	---	35	66	86	43	69	54	57
31	24	---	e28	e28	---	36	---	71	---	51	52	---
TOTAL	698	790	739	839	741	1131	1151	2647	1604	1469	1700	1685
MEAN	22.5	26.3	23.8	27.1	26.5	36.5	38.4	85.4	53.5	47.4	54.8	56.2
AC-FT	1380	1570	1470	1660	1470	2240	2280	5250	3180	2910	3370	3340
MAX	30	33	28	29	29	59	66	89	57	92	153	90
MIN	18	24	19	26	19	26	36	71	42	32	29	36

CAL YR	2012	TOTAL	14082	MEAN	38.5	MAX	93	MIN	18	AC-FT	27930
WTR YR	2013	TOTAL	15194	MEAN	41.6	MAX	153	MIN	18	AC-FT	30140

MAX DISCH: 346 CFS AT 07:45 ON AUG 25, 2013 GH 3.49 FT SHIFT 0 FT  
 MAX GH: 4.91 FT AT 16:00 ON JAN 31, 2013 (BACKWATER FROM ICE)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09344400 NAVAJO RIVER BELOW OSO DIVERSION DAM NEAR CHROMO  
 WY2013 HYDROGRAPH



SAN JUAN RIVER BASIN  
LITTLE OSO DIVERSION NEAR CHROMO  
Water Year 2013

Location.-- Lat. 37°04'32", Long. 106°48'38", in SW¼SE¼ sec. 23, T.33 N., R.1 E., NMPM, Archuleta County.

Drainage Area and Period of Record.-- 13.4 sq. mi. ; March 1971 to current year.

Equipment.-- A Sutron Satlink 2 DCP connected to a Sutron stage-discharge recorder (SDR). Building used by the Bureau of Reclamation (Bureau) to house the telemetry for control of the Little Oso diversion structure. The Bureau utilizes a Stevens A-71 chart recorder with an attached signal converter to send stage data to their SCADA system. SDR is set to an inside electric tape. The primary reference gage is an electric drop tape inside the gage house. Control is a 6-foot concrete Parshall flume set into the diversion tunnel below ground. No changes this water year.

Hydrologic Conditions.-- The Little Oso Diversion is part of the San Juan-Chama Project. It is a transmountain diversion structure which creates an on-stream reservoir on the Little Navajo River to collect runoff and settle out sediment. Water can be released downstream by means of either a vertical Tainter slide gate or an adjustable Cipoletti weir. The water above the dam can be taken into the Azotea Tunnel which conveys water to the Rio Grande Basin. Diversion amounts are limited by the minimum downstream flow requirements of the Little Navajo River and the capacity of the tunnel. The Blanco diversion on the Rio Blanco is located above and the Oso diversion on the Navajo River is below the Little Oso, on the tunnel system. The Parshall flume is located within the diversion tunnel. It is typically a seasonal diversion where the Bureau attempts to capture and divert the maximum amount of spring runoff while adhering to minimum release requirements set forth in legislation for the San Juan-Chama Project and agreements between the Bureau and State of Colorado. Since the diversion primarily operates in the Spring and Summer, ice does not affect the control.

Gage-Height Record.-- The primary record is 15-minute stage-discharge-recorder data downloaded from satellite telemetry with the DCP and chart record used for backup purposes. The gage was visited on seven (7) separate occasions by DWR staff to ensure that the SDR remained calibrated to the primary reference gage. One datum correction took place during the water year. There was a +0.05 ft. adjustment to the SDR on Mar. 20, 2013, when the electric drop tape was lengthened +0.05' and the SDR was changed to match. A +0.05 ft. datum correction was applied to the record from the beginning of the water year until the tape length adjustment on Mar. 20, 2013. The gage height record is complete and reliable for the entire period.

Datum Corrections.-- Levels were run on Mar. 20, 2013. The electric tape index was found to be 0.008 ft. higher than its established elevation and the electric tape was found to be -0.04 ft. too short. The electric tape was corrected +0.05 ft on Mar. 20, 2013. A +0.05 ft. correction was made in the gage height record for the time prior to the correction in water year 2013.

Rating.-- The control is a standard 6-ft. concrete Parshall flume. Rating No. 1 (LOSODVCO01), a standard 6-ft. Parshall flume rating above a gage height of 0.15 ft, was used the entire water year. The flows below a gage height of 0.15 ft. are assumed to be 0. This is caused by either the intake to the stilling well being 0.15 ft. above the floor of the flume or the stilling well does not provide sufficient depth. No measurements were made this water year because the flume is located underground. The instantaneous peak flow of 24.4 cfs occurred at 2045 on Apr. 28, 2013 at a gage height of 1.01 ft, with a shift of 0.00 ft.

Discharge.-- The Parshall flume is located underground, and for safety reasons, no measurements have been made at this gage. The rating was directly applied to the gage height record to compute discharge.

Special Computations.-- No special computations in water year 2013.

Remarks.-- Record is rated as fair for the entire period of record. A fair rating was given due to the fact that measurements have never taken place due to the inaccessibility of the flume. The instantaneous peak flow is rated fair. Station maintained and record developed by Brian Leavesley.

Recommendations.-- A theoretical rating based on levels run on the flume should be tested.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

LITTLE OSO DIVERSION NEAR CHROMO

RATING TABLE-- LOSODVCO01 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

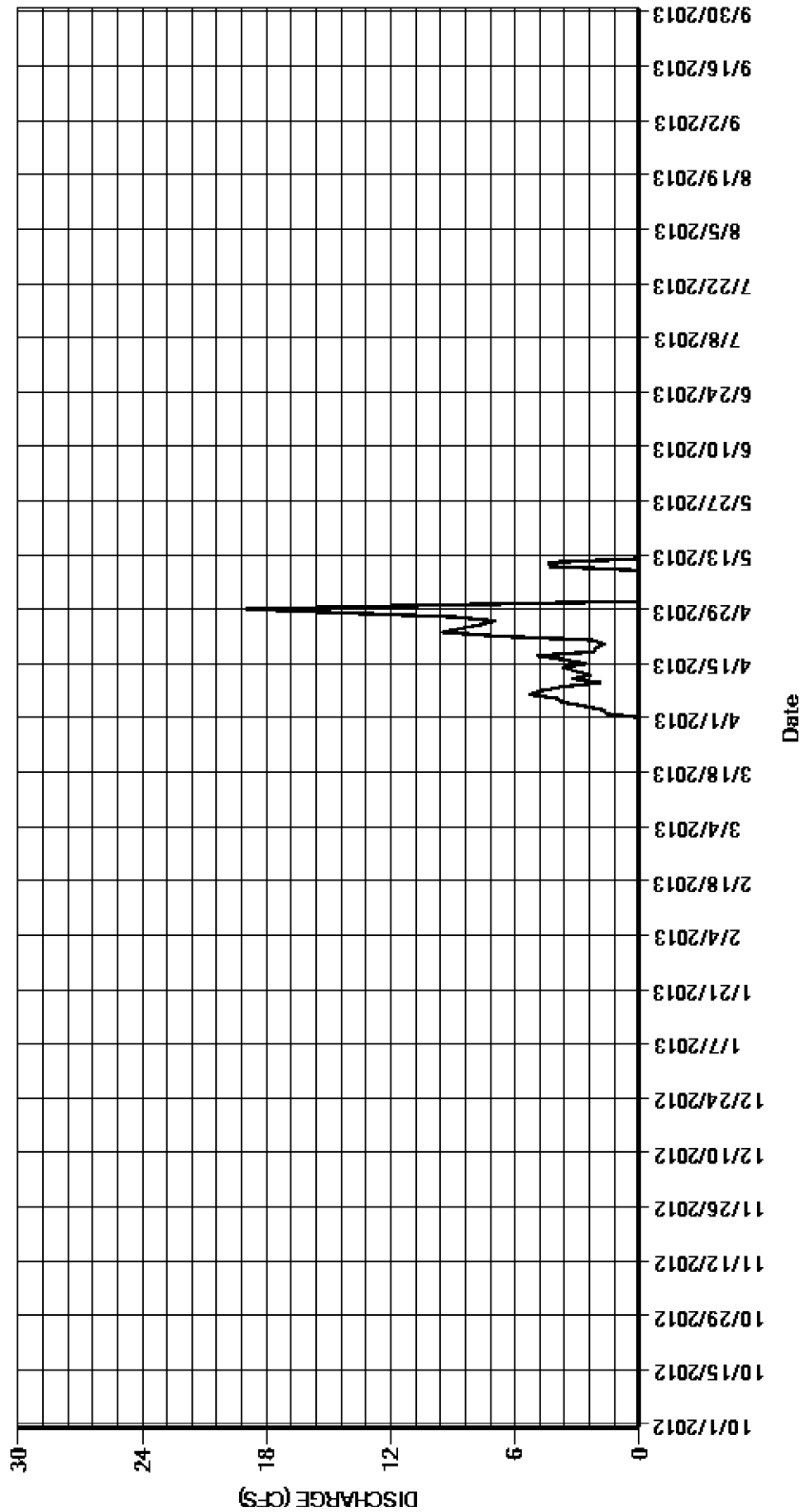
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	1.6	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	1.7	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	2.6	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	3.7	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	4.0	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	5.3	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	4.7	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	3.7	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	1.9	4.3	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	3.2	4.4	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	2.4	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	3.1	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	3.7	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	2.6	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	3.7	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	4.9	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	2.2	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	1.7	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	2.3	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	6.9	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	9.5	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	8.6	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	7.7	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	7.0	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	8.9	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	14	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	19	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	10	0.00	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	152.70	8.70	0.00	0.00	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	5.09	0.28	0.000	0.000	0.000	0.000
AC-FT	0	0	0	0	0	0	303	17	0	0	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	19	4.4	0.00	0.00	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CAL YR	2012	TOTAL	706.10	MEAN	1.93	MAX	28	MIN	0.00	AC-FT	1400
WTR YR	2013	TOTAL	161.40	MEAN	0.44	MAX	19	MIN	0.00	AC-FT	320

MAX DISCH: 24.4 CFS AT 20:45 ON APR 28, 2013 GH 1.01 FT SHIFT 0 FT  
 MAX GH: 1.01 FT AT 20:45 ON APR 28, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LITTLE OSO DIVERSION NEAR CHROMO  
WY2013 HYDROGRAPH



SAN JUAN RIVER BASIN  
LITTLE NAVAJO RIVER BELOW LITTLE OSO DIVERSION DAM  
Water Year 2013

Location.-- Lat. 37°04'37.8", Long. 106°48'41.3", in SW¼SE¼ sec. 23, T.33 N., R.1 E., NMPM, Archuleta County (Chromo, CO quad., scale 1:24,000, 1968), Hydrologic Unit 14080101. On right bank downstream from Little Oso Diversion Dam.

Drainage Area and Period of Record.-- 13.4 mi<sup>2</sup>. ; Record published by USGS May 26, 1971 to September 30, 1996. Published by Colorado Division of Water Resources December 5, 1996 to current year.

Equipment.-- Graphic water stage-recorder and Sutron Satlink 2 DCP connected to a Sutron stage-discharge recorder (SDR) on separate floats in a wooden shelter and concrete well. The primary reference gage is a steel drop tape in the gage with an outside staff gage used for supplemental purposes. Control is a steel 5-foot Parshall flume set in concrete. No changes this water year.

Hydrologic Conditions.-- The channel is straight for approximately 80-ft up and downstream of the control. The gage is located approximately 200-ft downstream of the Little Oso Diversion Dam. A large CMP culvert is located approximately 50-ft downstream of the gage. Snow, ice, trash and debris can collect in front of the CMP culvert and submerge the flume. The channel consists of small cobbles and sand.

Gage-Height Record.-- The primary record is 15-minute SDR data downloaded from satellite telemetry with DCP and SDR downloaded data as backup. Chart record exists for additional backup purposes. The gage was visited on 17 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The SDR unit was adjusted 4 times throughout the water year. Corrections were made on: Jan. 24, 2013 (-0.01 ft), Apr. 01, 2013 (+0.02 ft), May 01, 2013 (+0.01 ft), and Sep. 19, 2013 (-0.04). The SDR correction on Sep. 19 was made to match the tape length adjustment of -0.04 ft made that day. Record is complete and reliable except for the following days when ice on the control affected the stage-discharge relationship. Ice on the control: Nov. 7-8, 11-12, 18-30, Dec. 1-24, 31, 2012, Jan. 2-8, 13, 23, Mar. 7-8, 24 -26, 2013. The well heater also was not working which caused the stilling well to freeze resulting in no gage height record on: Jan. 30 – Mar. 04, 2013. Moss growth in the flume was removed by scraping on Sep. 05, 2013, resulting in a -0.03 ft change in gage height. This change was prorated by time back to the previous gage visit and measurement on Jul. 08, 2013.

Datum Corrections.-- Levels were run on Sep. 05, 2013. This was the first time levels have been run at this gage. Establishing the base benchmark (BM#1) as the point of the floor of the flume at the outside staff gage, the tape length was found to be +0.04 ft too long. The tape length was corrected on Sep. 19, 2013. The tape length was corrected -0.04 ft. Application of the gage datum correction began at measurement no. 246 (Jul. 8, 2013).

Rating.-- The control is a 5-foot Parshall flume installed in October 1996 to supplement an inverted Cippolletti weir at the Bureau's diversion structure. Sand/siltbars above the flume cause some shifting. Rating No. 1, a standard 5 foot Parshall flume rating, was used for the entire period of record. Twelve measurements (Nos. 236-247) were made during the current water year ranging in discharge from 0.99 cfs to 23.6 cfs. The measurements cover the entire range-in-stage experienced except for the lower average daily flows of Oct. 1-11, 17-27, 30-31, Nov. 1-4, 12-16, 25-28, 30, Dec. 1-3, 8-26, 2012, Jan. 3-10, 13 -22, 2013 and higher average daily flow of May 1, 2013. The instantaneous peak flow of 41.4 cfs occurred at 2145 on Aug. 10, 2013 at a gage height of 1.59 ft with a shift of -0.01 ft. It exceeded measurement No. 244, made May 15, 2013, by 0.46 ft in stage.

Discharge.-- Shifting control method was used during the entire water year. Shifting is mainly caused by erosion and deposition of sand and silts on the approach section above the flume. The USBR periodically opens the gate to the diversion stilling basin above the station and releases a large amount of silt and gravel upstream of the flume. Shifts were applied as defined by measurements. They were distributed by time with consideration of stage-change and storm events. Changes in shift were distributed across flow events such as rainfall and reservoir operations at the diversion. Measurements show shifts varying from 0.00 to -0.05 feet. All shifts were applied directly and given full weight. Measurement No. 240 was performed while the stilling well was thawing, however the well thawed by the end of the measurement providing good gage height record.

Special Computations.-- Discharge for periods of ice-affected record was estimated on the basis of good record before and after ice, temperature records from the Navajo River at Banded Peak Ranch gaging station (NAVBANCO), precipitation record from Rio Blanco below Blanco Diversion gaging station (RIOBLACO), and partial days of good record.

Remarks.-- Record is rated as good, except for those periods of ice affected and no gage height record, which are estimated and considered poor. The instantaneous peak discharge is rated fair. Station maintained by Brian Leavesley and Sherry Schutz and record developed by Brian Leavesley.

Recommendations.-- Gage station door should be painted in 2014, also stronger hinges should be installed on the well access door in the floor of the gage house.



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

LITTLE NAVAJO RIVER BELOW LITTLE OSO DIVERSION DAM

RATING TABLE-- LITOSOCO01 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

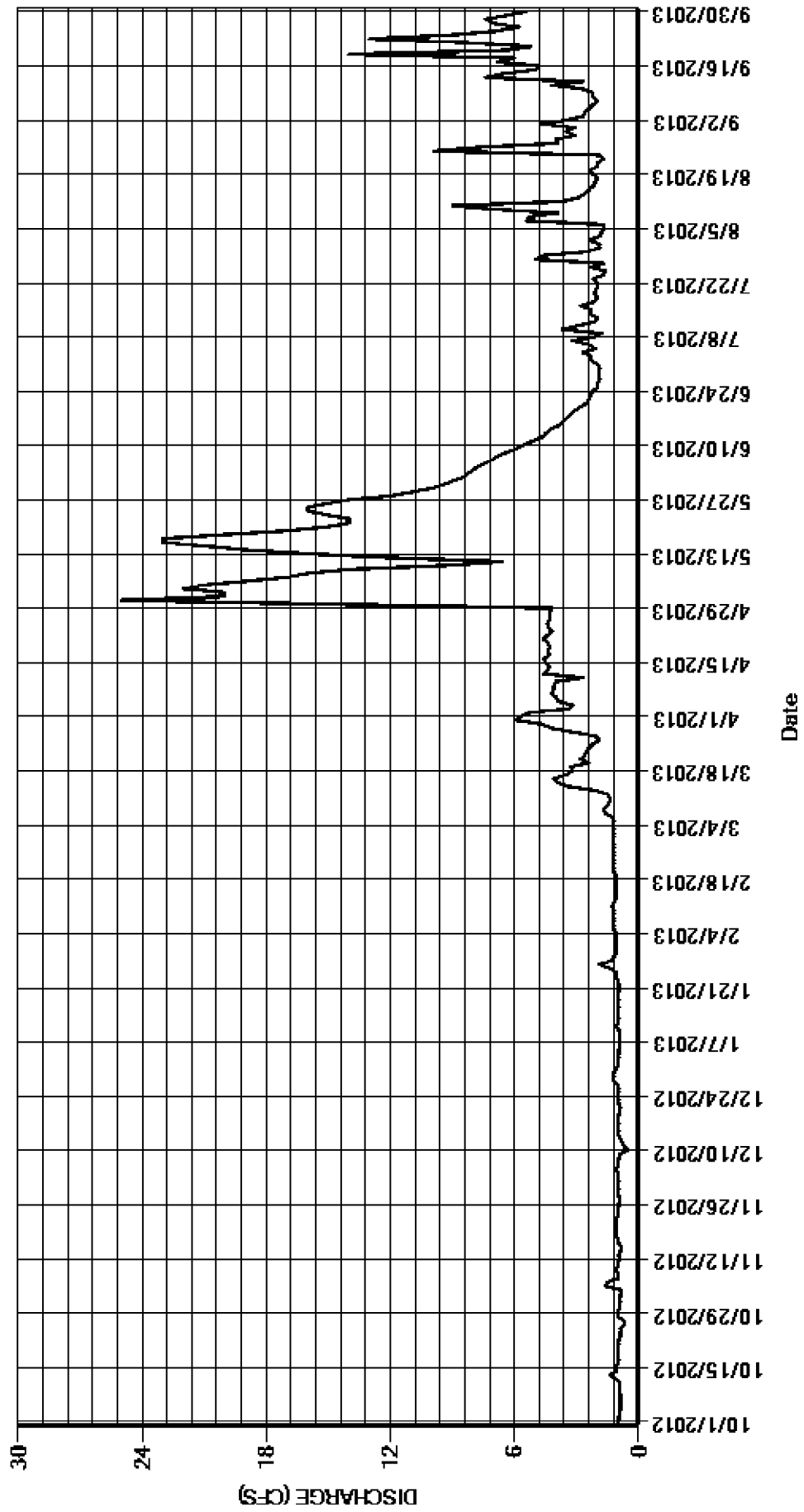
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.98	0.90	e0.98	1.0	e1.1	e1.2	5.7	25	8.9	2.0	1.9	4.7
2	0.96	0.90	e0.98	e1.0	e1.1	e1.2	5.3	20	8.4	2.3	2.4	3.5
3	0.92	0.87	e0.98	e0.98	e1.1	e1.2	3.4	20	8.2	2.3	1.9	2.7
4	0.89	0.86	e1.0	e0.96	e1.1	e1.2	3.2	22	7.9	2.7	1.8	2.6
5	0.88	1.6	e1.1	e0.95	e1.2	1.2	3.9	21	7.6	2.1	1.7	2.4
6	0.88	1.5	e1.0	e0.93	e1.2	1.3	4.0	19	7.2	2.4	1.7	2.2
7	0.88	e1.0	e1.0	e0.92	e1.2	e1.6	4.2	17	6.9	3.2	5.4	2.0
8	0.89	e1.0	e0.96	e0.91	e1.2	e1.7	4.1	16	6.5	2.1	5.3	2.2
9	0.93	1.1	e0.90	0.91	e1.2	1.5	4.1	14	6.0	1.8	3.9	2.2
10	0.93	1.0	e0.50	0.94	e1.2	1.4	4.0	9.4	5.6	3.7	7.1	2.7
11	0.92	e1.0	e0.70	1.1	e1.3	1.4	2.7	6.6	5.2	2.9	9.0	4.2
12	1.1	e0.90	e0.80	1.0	e1.2	1.5	4.6	12	4.7	2.1	3.7	2.7
13	1.4	0.97	e0.90	e0.98	e1.1	2.1	4.4	16	4.5	2.0	2.9	7.4
14	1.1	0.89	e0.98	0.98	e1.1	3.4	4.3	19	4.3	2.4	2.6	6.6
15	1.1	0.84	e0.98	0.99	e1.1	3.9	4.5	21	3.9	2.3	2.4	5.0
16	1.0	0.97	e0.98	0.98	e1.1	4.1	4.6	23	3.7	2.8	2.2	4.8
17	0.98	1.0	e0.98	0.99	e1.1	3.5	4.3	23	3.5	2.2	2.1	6.8
18	0.98	e1.1	e0.98	0.98	e1.1	3.2	4.4	20	3.3	2.0	2.0	6.0
19	0.98	e1.1	e0.98	0.98	e1.1	3.3	4.3	17	3.1	2.1	2.2	14
20	0.98	e1.1	e0.90	0.98	e1.2	2.4	4.4	15	2.8	2.1	2.4	6.3
21	0.98	e1.1	e0.90	0.94	e1.2	2.8	4.6	14	2.5	2.0	2.0	5.2
22	0.96	e1.1	e0.96	0.98	e1.2	2.6	4.4	14	2.4	2.0	2.0	8.3
23	0.90	e1.0	e0.98	e1.0	e1.2	2.5	4.2	15	2.3	2.2	1.7	13
24	0.88	e1.0	e0.98	1.1	e1.2	e2.4	4.4	16	2.2	1.7	1.9	9.0
25	0.87	e0.98	0.98	1.1	e1.2	e2.2	4.4	16	2.0	1.6	9.9	6.9
26	0.69	e0.96	0.98	1.4	e1.2	e1.9	4.3	15	2.0	2.3	7.7	5.8
27	0.71	e0.94	1.0	1.9	e1.2	2.1	4.3	14	1.9	1.7	3.9	7.0
28	1.0	e0.94	1.2	1.3	e1.2	3.2	4.3	12	1.9	5.0	4.0	7.4
29	1.0	e1.0	1.2	1.2	---	4.2	4.2	11	1.9	4.6	3.1	6.4
30	0.95	e0.98	1.2	e1.1	---	4.7	15	10	1.9	2.5	3.5	5.4
31	0.93	---	e1.1	e1.1	---	5.9	---	9.4	---	1.9	3.1	---
TOTAL	29.55	30.60	30.06	32.58	32.6	76.8	138.5	502.4	133.2	75.0	107.4	165.4
MEAN	0.95	1.02	0.97	1.05	1.16	2.48	4.62	16.2	4.44	2.42	3.46	5.51
AC-FT	59	61	60	65	65	152	275	997	264	149	213	328
MAX	1.4	1.6	1.2	1.9	1.3	5.9	15	25	8.9	5.0	9.9	14
MIN	0.69	0.84	0.50	0.91	1.1	1.2	2.7	6.6	1.9	1.6	1.7	2.0

CAL YR	2012	TOTAL	1147.39	MEAN	3.13	MAX	21	MIN	0.50	AC-FT	2280
WTR YR	2013	TOTAL	1354.09	MEAN	3.71	MAX	25	MIN	0.50	AC-FT	2690

MAX DISCH: 41.4 CFS AT 21:45 ON AUG 10, 2013 GH 1.59 FT SHIFT -0.01 FT  
 MAX GH: 1.59 FT AT 21:45 ON AUG 10, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LITTLE NAVAJO RIVER BELOW LITTLE OSO DIVERSION DAM  
WY2013 HYDROGRAPH



SAN JUAN RIVER BASIN  
AZOTEA TUNNEL OUTLET NEAR CHAMA, NM  
Water Year 2013

Location.-- Lat. 36° 51' 02.2" N; Long 106° 40' 18.4" W; By road, the station is 8.2 mi west of Chama, NM. Gage is located on the left side of diversion tunnel outlet.

Drainage Area and Period of Record.-- Drainage area is combined areas above diversion dams on the Rio Blanco (69.1 sq mi), Little Navajo River (13.4 sq mi), and Navajo River (100.5 sq mi). Total combined drainage area is 183 sq mi.; Historical record maintained from October 1, 1970 to September 30, 2008 by USGS. October 1, 2008 to present by Colorado Division of Water Resources.

Equipment.-- A Sutron SatLink 2 high data rate DCP is connected to a stage-discharge recorder (SDR). The equipment is located in a concrete control house maintained by the U.S. Bureau of Reclamation (USBR) to house the telemetry for measurement of the outlet tunnel for the San Juan-Chama Project. The USBR utilizes a Stevens chart recorder with an attached signal converter to determine water stage within measurement flume. The primary reference gage is an electric drop tape inside the gage house. Control is a 10 ft -concrete Parshall flume. No changes this water year.

Hydrologic Conditions.-- The Azotea Tunnel Outlet is the outfall of the San Juan-Chama Project's trans-mountain diversions of flows from Rio Blanco, Little Navajo River, and Navajo River in the San Juan River Drainage Basin of Colorado to the Rio Grande River Drainage Basin in New Mexico. The tunnel daylights to a 10-ft concrete Parshall flume and canal system. Downstream of the outlet the channel is composed of large riprap and boulders.

Gage-Height Record.-- The primary record is 15-minute SDR data downloaded from satellite telemetry with SDR downloaded and paper chart data used for backup purposes. Diversions through this gage are typically not made during winter months and not affected by ice. The gage house is not heated and the stilling well will freeze, however the floats typically free upon start of diversion in the spring. The gage was visited on 8 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The SDR was adjusted 4 times on 3 separate occasions: +0.02 ft on Mar. 7, +0.01 ft on Jul. 23 (which was not applied in the record due to matching gage height readings by USBR before and after the adjustment), +0.03 ft and -0.01 ft on Aug. 14 (before and after measurement). The corrections were prorated and distributed by time to the last known matching reading (typically the last station visit with matching readings between electric tape and SDR by either DWR or USBR personnel). The stilling well was drained and plug left open on Oct. 4, 2012 by USBR personnel; it is unknown if this had an effect on diversion record on Oct. 13-14. On Aug. 7, 2013 from 0445 to 1245 the SDR tape became stuck and did not record a diversion hydrograph, however paper chart record was good for this period and 15-minute data was input from the paper chart. The record is complete and reliable for the entire water year.

Datum Corrections.-- Levels were not run this water year. Levels were last run on Sep. 6, 2012 for the first time. BM 1 was established as a brass cap at the headwall of the Azotea Tunnel, approximately 150 ft. upstream of the tunnel mouth. BM 1 is stamped with the elevation 7532.30 (gage datum = 12.417 ft). BM 2 was established as the flume floor at the staff gage in the tunnel flume. BM 2 was used as the base. The electric tape length was found to be 0.024 ft too long. There were no corrections made in the field.

Rating.-- The control is a 10 ft concrete Parshall flume. The rating (AZOTUNNM02) is a non-standard Parshall flume rating, developed Nov. 30, 2011. The rating was developed based on 1 year of measurements (water year 2011). The rating was used for the entire period of record in water year 2013. Seven (7) measurements (No. 15-21) were made during the water year ranging in discharge from 1.89 cfs to 314 cfs. An observation of trickle flow (estimated as 5 to 10 gpm) was made on Oct. 1, 2012. For record purposes, at gage heights of 0.10 ft and below, zero (negligible) flow is assumed. The trickle flow observation is within this range and accepted as a zero flow observation. An observation of zero flow and measurement covered the range in stage experienced except for the higher average daily flows of: Apr. 29 – 30, May 15 – 19, 23 – 29, Jun. 3 – 5, and Sep. 23, 2013. The peak flow of 606 cfs occurred at 0030 on May 26, 2013, at a gage height of 5.38 ft and 0.00 ft shift. It exceeded the stage of measurement No. 19, made Jun. 3, 2013 by 1.86 feet in stage.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by stage. The variable shift curve AZOTUNNM12A was used for the entire period of record. The variable shift curve is a 0.00 ft shift at a gage height of 0.11 ft and above. Flows at a gage height of 0.10 ft and below were assumed to be negligible and reduced to 0. Open-water measurements showed unadjusted shifts varying between -0.04 ft and +0.06 ft. Shifts were applied directly and given full weight except measurement Nos. 17, 18, 19, 20, and 21 which were discounted from -6% to +3% back to the rating.

Special Computations.-- The SDR float hung up on Aug. 7, 2013 from 0445 – 1245 during a storm hydrograph event. 15-minute paper chart data was used to fill bad SDR data for this period until the USBR freed the float between 1245 and 1300. A visual estimate of 5-10 gallons per minute (0.04 ft gage height) was made at a station visit on Oct. 1, 2012. A gage height of 0.10 ft was chosen to be the cutoff for measureable flow at the tunnel outlet.

Remarks.-- The record should be considered good except for diversion in October 2012 when the drain to the stilling well was open and should be considered fair. Station maintained by USBR and Colorado Division of Water Resources, record developed by Brian Leavesley.

Recommendations.-- Levels should be run again in water year 2014. Continued discharge measurement to confirm and refine developed rating curve.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

AZOTEA TUNNEL OUTLET NEAR CHAMA, NM

RATING TABLE-- AZOTUNNM02 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

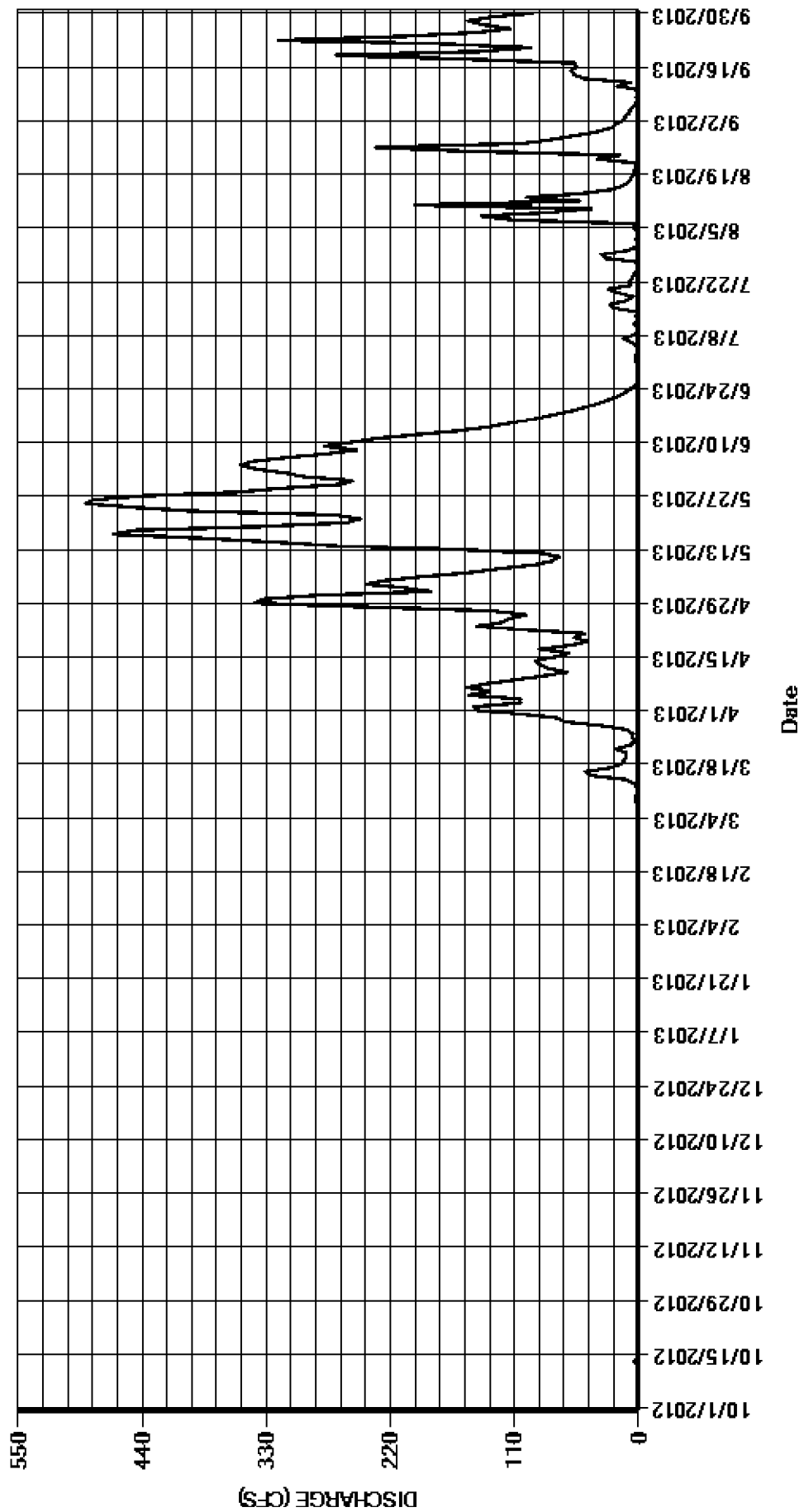
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	142	286	297	2.6	1.1	21
2	0.00	0.00	0.00	0.00	0.00	0.00	146	185	314	2.0	2.4	14
3	0.00	0.00	0.00	0.00	0.00	0.00	105	206	340	2.0	0.76	12
4	0.00	0.00	0.00	0.00	0.00	0.15	105	241	353	1.3	0.01	8.5
5	0.00	0.00	0.00	0.00	0.00	0.00	150	224	343	1.2	5.0	7.3
6	0.00	0.00	0.00	0.00	0.00	0.00	132	190	314	6.0	0.93	3.0
7	0.00	0.00	0.00	0.00	0.00	1.3	152	149	277	13	111	1.6
8	0.00	0.00	0.00	0.00	0.00	2.1	133	124	250	5.1	139	1.9
9	0.00	0.00	0.00	0.00	0.00	2.3	108	92	279	1.1	79	0.51
10	0.00	0.00	0.00	0.00	0.00	1.8	83	77	255	0.09	42	1.3
11	0.00	0.00	0.00	0.00	0.00	1.4	63	70	233	3.9	198	19
12	0.00	0.00	0.00	0.00	0.00	1.5	80	85	196	1.3	53	7.4
13	4.8	0.00	0.00	0.00	0.00	4.6	87	163	160	2.2	99	48
14	0.16	0.00	0.00	0.00	0.00	12	92	272	133	1.3	49	57
15	0.00	0.00	0.00	0.00	0.00	42	74	322	115	22	24	60
16	0.00	0.00	0.00	0.00	0.00	47	62	388	94	25	14	55
17	0.00	0.00	0.00	0.00	0.00	25	88	466	79	10	8.9	57
18	0.00	0.00	0.00	0.00	0.00	15	60	449	62	5.2	6.6	153
19	0.00	0.00	0.00	0.00	0.00	13	46	336	50	17	4.6	268
20	0.00	0.00	0.00	0.00	0.00	11	57	259	37	27	3.6	142
21	0.00	0.00	0.00	0.00	0.00	11	48	247	27	7.7	3.1	96
22	0.00	0.00	0.00	0.00	0.00	20	98	269	18	8.2	3.1	168
23	0.00	0.00	0.00	0.00	0.00	7.2	143	395	12	5.7	37	319
24	0.00	0.00	0.00	0.00	0.00	3.9	122	450	7.0	4.0	17	210
25	0.00	0.00	0.00	0.00	0.00	5.5	114	490	2.2	1.1	154	144
26	0.00	0.00	0.00	0.00	0.00	5.3	100	484	0.75	1.1	233	114
27	0.00	0.00	0.00	0.00	0.00	11	130	442	0.92	0.39	103	137
28	0.00	0.00	0.00	0.00	0.00	33	241	356	0.58	29	77	151
29	0.00	0.00	0.00	0.00	---	66	341	317	0.29	33	57	131
30	0.00	0.00	0.00	0.00	---	73	333	264	0.47	11	37	94
31	0.00	---	0.00	0.00	---	103	---	254	---	2.2	25	---
TOTAL	4.96	0.00	0.00	0.00	0.00	519.05	3635	8552	4250.21	252.68	1588.10	2501.51
MEAN	0.16	0.000	0.000	0.000	0.000	16.7	121	276	142	8.15	51.2	83.4
AC-FT	9.8	0	0	0	0	1030	7210	16960	8430	501	3150	4960
MAX	4.8	0.00	0.00	0.00	0.00	103	341	490	353	33	233	319
MIN	0.00	0.00	0.00	0.00	0.00	0.00	46	70	0.29	0.09	0.01	0.51

CAL YR	2012	TOTAL	23888.36	MEAN	65.3	MAX	530	MIN	0.00	AC-FT	47380
WTR YR	2013	TOTAL	21303.51	MEAN	58.4	MAX	490	MIN	0.00	AC-FT	42260

MAX DISCH: 606 CFS AT 00:30 ON MAY 26, 2013 GH 5.38 FT SHIFT 0.00 FT  
 MAX GH: 5.38 FT AT 00:30 ON MAY 26, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**AZOTEA TUNNEL OUTLET NEAR CHAMA, NM  
WY2013 HYDROGRAPH**



SAN JUAN RIVER BASIN  
09362750 FLORIDA RIVER ABOVE LEMON RESERVOIR NEAR DURANGO  
Water Year 2013

Location.-- Lat. 37°25'38.51", Long. 107°40'29.76" NAD83, in NW¼SE¼ sec. 31, T.37 N., R.7 W., NMPM, La Plata County, Hydrologic Unit 1408104, on the left bank 1.7 miles upstream of Miller Creek and 0.1 miles upstream of Willow Creek.

Drainage Area and Period of Record.-- 50.9 mi<sup>2</sup>.; July 1, 1972 to present.

Equipment.-- Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float located in a 72-inch by 72-inch exposed aggregate concrete shelter and a 42-inch corrugated metal pipe well. The floats are located inside of a 14-inch PVC oil cylinder. A Sutron Constant Flow Bubbler (CFB) is a secondary sensor that is used to help maintain good record when the intakes are plugged and winter periods when ice forms under the oil within the oil cylinder. The station is also equipped with a Sutron air-temperature sensor. The primary reference gage is an electric drop tape with a separate steel drop tape used when the well is frozen around the oil cylinder. No changes this water year.

Hydrologic Conditions.-- Small boulders and cobble line the channel above and below the concrete ramp flume. The concrete ramp flume creates a large stilling pool above the control. Lemon Reservoir is below the gage but does not create backwater effect as the gage is well above the pool elevation in the reservoir.

Gage-Height Record.-- The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with DCP log, CFB log, and chart record used for backup purposes. The gage was visited on 14 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted two times this water year. The adjustments made were +0.01 on Oct. 30, 2012 and -0.01 on Jul. 8, 2013. The corrections were distributing by time to the last known matched reading. The record is complete and reliable except for the days when ice on the control affected the stage-discharge relationship ("b" days): Dec. 11, 29-31, 2012; Jan. 1-7, 12-16; Mar. 11-23, 2013 and when an ice disk formed below the oil in the oil cylinder ("a" days): Jan. 21-23; Feb. 26-28; Mar. 1, 2013.

Datum Corrections.-- No levels were run this water year. Levels were last run on Sep. 1, 2011 to the electric tape index (ETI) using BM2 as the base. Corrections were made to the electric tape (TL\_ET) and drop tape length (TL\_DT) on Nov. 15, 2011. Tape lengths were 0.030 ft. long.

Rating.-- On April 2, 2002 a long throated flume, also known as a ramp flume was activated to act as the control section for the gage. Rating No. 7, in use since April 4, 2006, was continued in use for the duration of water year 2013. It is fairly well defined from 4.50 to 999 cfs. Fifteen measurements (Nos. 670-684) were made during the water year. They range in discharge from 4.80 cfs to 188 cfs. They cover the range in stage experienced except for the lower average daily flows of Nov. 11; Dec. 3-31, 2012; Jan. 1-19, 21-26, 29, 2013 and the higher average daily flows of Apr. 29-30; May 2-5, 14-19, 22-27; Sep. 11-16, 18-20, 23, 24, 2013. The peak instantaneous flow of 583 cfs occurred at 1300 on Sep. 11, 2013 at a gage height of 3.31 ft with a shift of +0.01 ft. It exceeded the stage of measurement No. 677 by 0.84 feet in stage.

Discharge.-- Shifting control method was used during the entire water year. Shifting is caused mainly by aquatic growth on the ramp flume and the fill and scour of sand and gravel above the concrete ramp flume. Shifts were applied as defined by measurements and were distributed by time and stage. Shift curve FLOALECOVS12A was carried from last water year until Oct. 5, 2012. Shift curve FLOALECOVS13A was used to define most of the summer period (Apr. 5, 2013 to Jul. 31, 2013). Shifts were distributed by time the other remaining periods of the water year. Shifts were applied directly and given full weight except for measurement Nos. 671, 672, 676, 677, 679, 680, 683 and 684 which were discounted from -6% to 6% to smooth shift distribution. The shift for measurement no. 675 was not used as the stage-discharge relationship was affected by ice on the control.

Special Computations.-- Gage height record from the CFB was used to compare record from the shaft encoder. The comparison was used to determine when an ice disk formed below the oil in the oil cylinder. Discharge for periods of ice affect was estimated on the basis of partial day record, good record before and after ice affect and temperature data obtained from a temperature sensor at the gage house.

Remarks.-- Record is good, except for the period when ice affected the stage-discharge relationship and when an ice disk formed below the oil. Ice affected period was estimated and should be considered poor. The instantaneous peak flow should be considered good. Station maintained and record developed by Brian Boughton.

Recommendations.-- No recommendations this water year.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09362750 FLORIDA RIVER ABOVE LEMON RESERVOIR NEAR DURANGO

RATING TABLE-- FLOALECO07 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

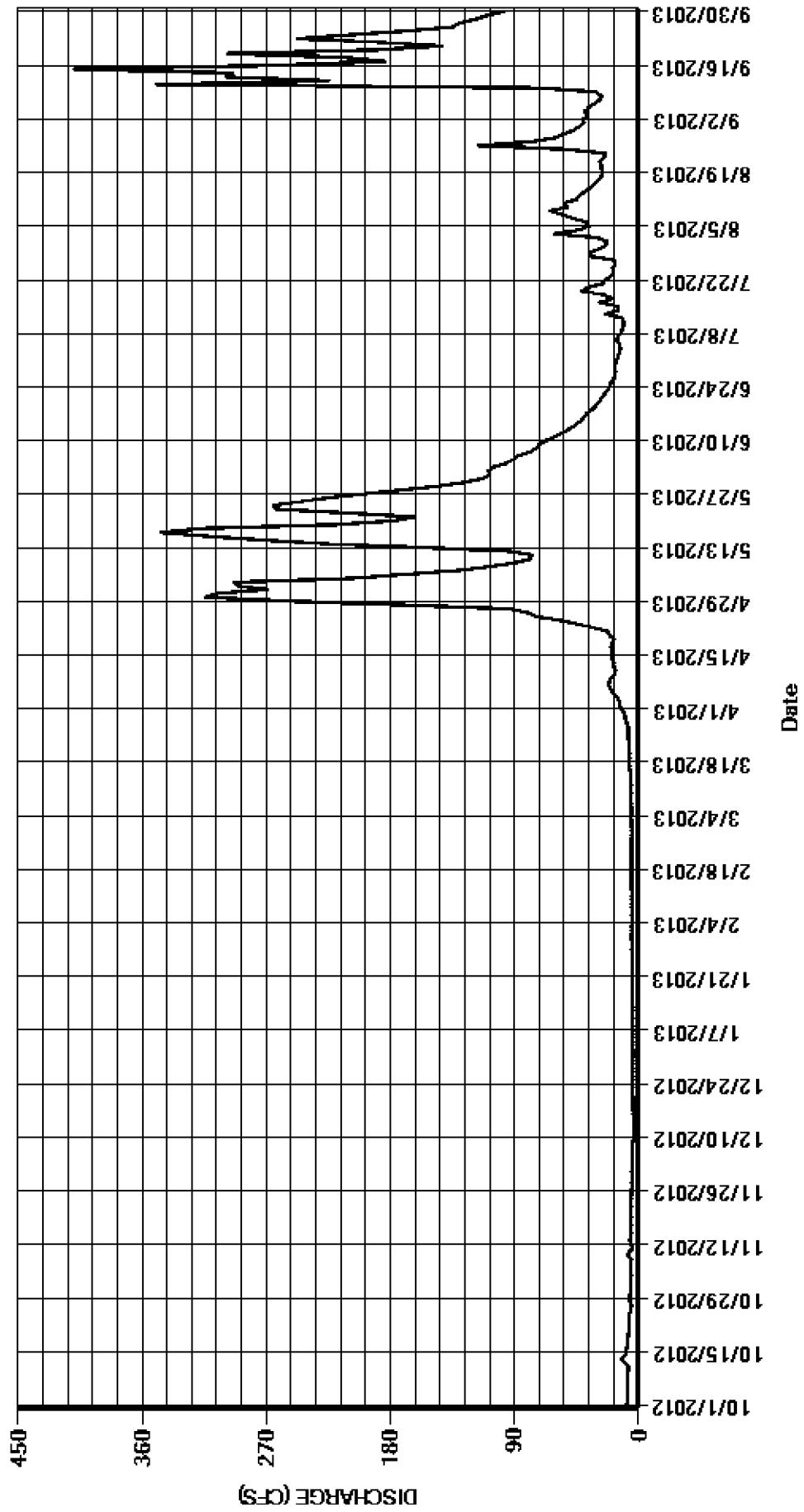
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.7	5.9	5.0	e4.1	5.0	e5.0	13	306	108	16	23	40
2	8.3	5.7	4.8	e4.2	5.0	5.2	14	269	109	15	30	40
3	8.2	5.6	4.7	e4.2	5.1	5.4	14	291	105	14	61	37
4	8.2	5.5	4.6	e4.2	4.9	5.3	16	293	96	13	43	39
5	7.9	5.9	4.7	e4.2	4.9	5.0	19	209	91	14	36	36
6	7.9	5.7	4.7	e4.2	5.0	5.3	20	171	88	16	38	32
7	8.0	5.6	4.7	e4.2	4.9	5.5	22	132	79	15	48	28
8	8.0	5.4	4.5	4.3	5.0	5.8	21	109	74	13	56	27
9	7.8	7.9	4.1	4.3	5.0	5.7	20	90	72	12	64	31
10	7.6	7.1	3.2	4.3	5.1	5.4	17	79	67	11	52	71
11	7.4	4.4	e3.5	4.3	5.0	e5.4	17	77	61	11	54	350
12	10	5.5	3.7	e4.3	4.8	e5.5	18	93	55	12	45	225
13	13	6.4	3.8	e4.3	5.2	e5.5	18	159	50	24	43	299
14	9.8	5.6	3.7	e4.5	5.2	e6.0	19	227	46	15	39	295
15	9.1	5.4	3.7	e4.5	5.3	e6.0	19	271	42	15	35	409
16	8.5	5.6	3.8	e4.5	5.3	e6.5	19	313	40	28	32	261
17	8.2	5.5	3.9	4.6	5.3	e6.5	20	346	38	19	29	184
18	8.1	5.6	4.0	4.5	5.3	e6.5	19	317	34	25	27	213
19	7.6	5.4	3.9	4.7	5.2	e6.5	18	219	31	41	26	298
20	7.3	5.5	3.9	4.8	5.3	e6.5	21	177	29	37	27	189
21	7.1	5.6	4.4	e4.5	5.3	e7.0	22	163	27	26	27	143
22	7.1	5.5	4.4	e4.5	5.1	e7.0	32	210	25	24	28	187
23	7.0	5.6	4.3	e4.5	5.3	e7.0	44	263	23	20	25	247
24	6.9	5.5	4.4	4.7	5.3	7.3	56	265	21	18	24	208
25	6.5	5.3	4.3	4.5	5.2	7.5	74	245	20	19	52	167
26	5.7	5.2	4.3	4.4	e5.0	7.6	80	227	18	17	116	135
27	5.3	4.8	4.2	4.8	e5.0	7.6	94	201	17	17	78	130
28	6.5	5.0	4.2	4.9	e5.0	8.4	171	174	17	34	61	118
29	6.3	4.9	e4.2	4.5	---	9.6	254	147	17	36	54	110
30	6.2	4.9	e4.2	4.8	---	10	314	127	17	29	47	97
31	6.0	---	e4.2	5.3	---	11	---	114	---	24	43	---
TOTAL	240.2	167.5	130.0	138.6	143.0	204.5	1505	6284	1517	630	1363	4646
MEAN	7.75	5.58	4.19	4.47	5.11	6.60	50.2	203	50.6	20.3	44.0	155
AC-FT	476	332	258	275	284	406	2990	12460	3010	1250	2700	9220
MAX	13	7.9	5.0	5.3	5.3	11	314	346	109	41	116	409
MIN	5.3	4.4	3.2	4.1	4.8	5.0	13	77	17	11	23	27

CAL YR	2012	TOTAL	17611.4	MEAN	48.1	MAX	372	MIN	3.2	AC-FT	34930
WTR YR	2013	TOTAL	16968.8	MEAN	46.5	MAX	409	MIN	3.2	AC-FT	33660

MAX DISCH: 583 CFS AT 13:00 ON SEP 11, 2013 GH 3.31 FT SHIFT 0.01 FT  
 MAX GH: 3.31 FT AT 13:00 ON SEP 11, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09362750 FLORIDA RIVER ABOVE LEMON RESERVOIR NEAR DURANGO  
WY2013 HYDROGRAPH





SAN JUAN RIVER BASIN  
FLORIDA RIVER BELOW LEMON RESERVOIR  
Water Year 2013

Location.-- Lat. 37°22'50", Long. 107°39'43", in NE¼NW¼ sec. 20, T.36 N., R.7 W., NMPM, La Plata County, Hydrologic Unit 1408104, on the right bank next to the emergency spillway at the toe of the dam.

Drainage Area and Period of Record.-- 69.1 mi<sup>2</sup>.; Published by the USGS (sta. no. 09362900) Oct. 1, 1955 to Sept. 30, 1963. Published streamflow record Colorado Division of Water Resources July 1, 1972 to present.

Equipment.-- Stevens A-71 graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder. Graphic recorder and shaft encoder are on a separate floats in a 42 inch corrugated metal shelter and well. The primary reference gage is a steel drop tape referenced to a nonadjustable flat head screw set into the wooden instrument shelf. A tipping bucket rain gage (Texas Electronics, TR-525USW) was installed at the gage to measure precipitation. The gage is located within the stilling pool below the reservoir. The control is a concrete broad crested weir located approximately 200 ft. below the gage. A bank operated cableway is located approximately 400 ft. below the gage.

Hydrologic Conditions.-- The weir below Lemon Reservoir creates a large stilling pool below Lemon Reservoir dam. Flow in the channel is controlled by releases from the reservoir.

Gage-Height Record.-- The primary record is 15-minute shaft encoder data from satellite telemetry with DCP download data and graphic chart record for backup purposes. The gage was visited on 15 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was not adjusted this water year. No flush corrections were made this water year. The record is complete and reliable.

Datum Corrections.-- Levels were not run this water year. Levels were last run on Sep. 1, 2011 to the nonadjustable reference (RP), located inside the gage shelter using BM1 as the base. The drop tape reference point was found to be reading -0.002 ft. low. The drop tape reference was not adjusted as it was found to be within the allowable error tolerances. The drop tape length was reading correct and not adjusted.

Rating.-- The control is a concrete broad-crested weir located 200 ft. below the gage. Shifts occur as a result of moss growth on the weir. Rating No. 2, dated Jan. 11, 1977, was continued in use this year. It is well defined from 0.6 to 980 cfs. The point-of-zero-flow (PZF) was measured on Nov. 19, 2012. The PZF was found to be 1.10 ft. Fifteen measurements (Nos. 549 - 563) were made during the current water year ranging in discharge from 4.99 cfs to 226 cfs. These measurements cover the range in stage experienced this water year. The peak instantaneous flow of 227 cfs occurred at 1145 on Jun. 2, 2013 at a gage height of 3.18 ft. with a shift of 0.00 ft. It did not exceed the stage of measurement No. 557, made Jun. 3, 2013.

Discharge.-- Shifting control method was used, for the entire water year. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were distributed by time from the beginning of the water year until Oct. 5, 2012 and Jul. 7, 2013 until the end of the water year. Shift curve FLOBLECOVS13A was used from Oct. 5, 2012 until Jul. 7, 2013. Open water measurements show unadjusted shifts varying from -0.06 ft. to +0.01 ft. Shifts were applied directly and given full weight except for measurement nos. 549, 551, 552, 553, 556, 558, 559, 561 and 563 which were discounted -10% to 9% to smooth shift distribution.

Special Computations.-- No special computations were necessary this water year.

Remarks.-- Record and instantaneous peak flow should be considered good. Station maintained by Brian Leavesley and Brian Boughton. Record developed by Brian Boughton.

Recommendations.-- None.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

FLORIDA RIVER BELOW LEMON RESERVOIR

RATING TABLE-- FLOBLECO02 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

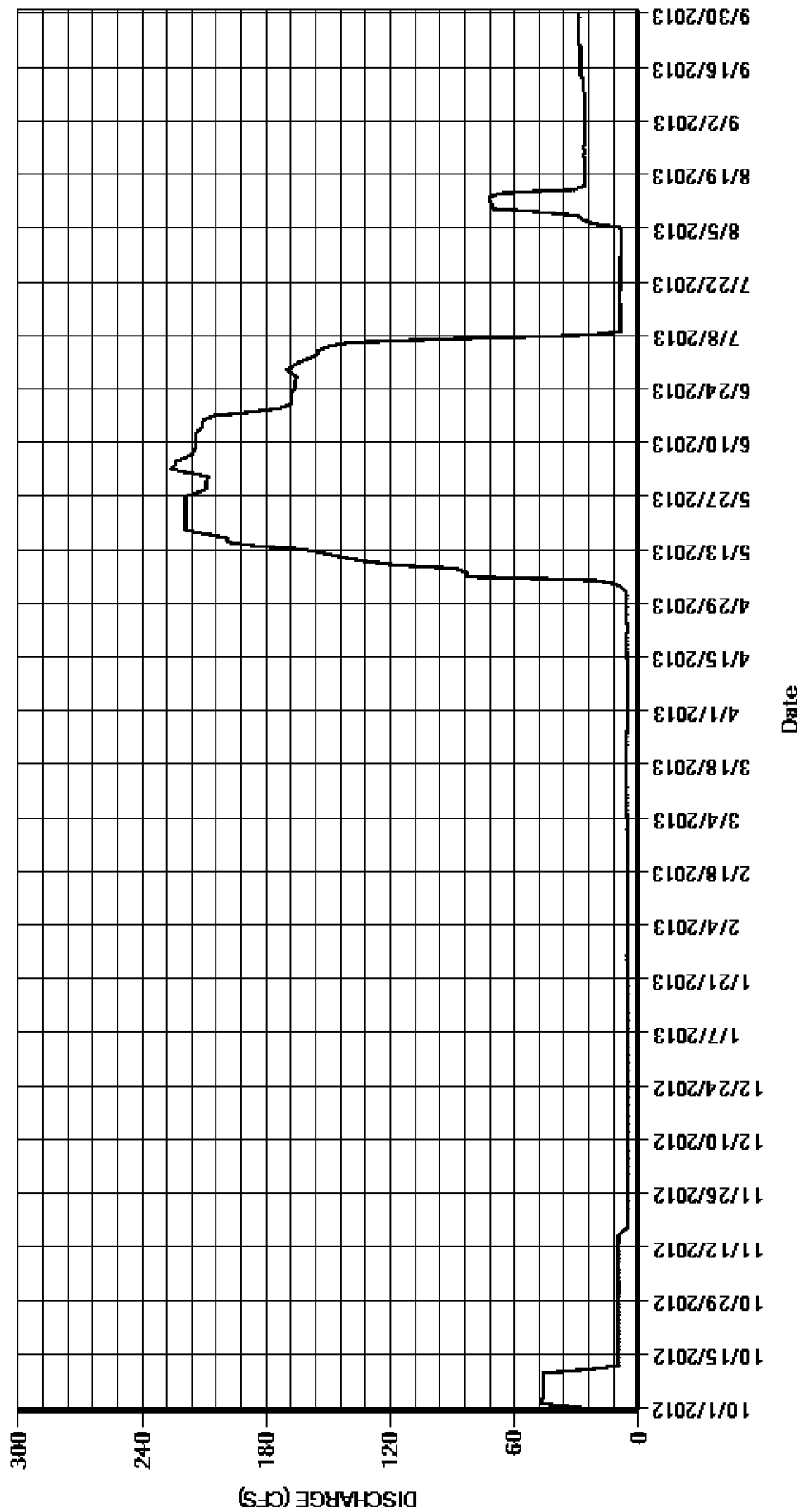
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	28	9.5	5.2	5.2	5.5	5.6	5.5	5.9	208	164	8.4	26
2	47	9.6	5.2	5.2	5.5	5.5	5.5	5.9	217	159	8.4	26
3	47	9.7	5.2	5.2	5.5	5.5	5.5	8.0	226	155	8.4	26
4	46	9.7	5.2	5.2	5.5	5.7	5.5	11	224	155	8.4	26
5	46	9.7	5.2	5.2	5.5	5.9	5.5	21	224	150	8.4	26
6	46	9.7	5.2	5.2	5.5	5.9	5.5	83	219	140	21	26
7	46	9.7	5.2	5.2	5.5	5.9	5.5	83	216	87	27	26
8	46	9.7	5.2	5.2	5.5	5.9	5.5	88	215	23	29	26
9	46	9.7	5.2	5.2	5.5	5.9	5.6	119	214	8.5	45	26
10	46	9.7	5.2	5.2	5.5	5.9	5.5	133	214	8.8	70	27
11	24	9.7	5.2	5.2	5.5	5.9	5.6	144	214	8.8	71	27
12	9.7	9.7	5.2	5.2	5.5	5.9	5.5	152	214	8.8	72	27
13	9.7	9.7	5.2	5.2	5.5	6.0	5.5	162	213	8.8	72	27
14	9.7	9.6	5.2	5.2	5.5	6.3	5.6	187	211	8.8	67	28
15	9.7	9.7	5.2	5.2	5.5	6.3	5.8	199	211	8.9	31	28
16	9.7	7.6	5.2	5.2	5.5	6.3	5.8	199	210	8.9	26	28
17	9.7	5.2	5.2	5.2	5.5	6.3	5.9	208	205	9.2	26	28
18	9.7	5.2	5.2	5.2	5.5	6.3	5.8	219	186	9.2	26	28
19	9.7	5.2	5.2	5.2	5.5	6.3	5.9	219	173	9.2	26	28
20	9.7	5.2	5.2	5.2	5.5	6.2	5.9	219	168	8.8	26	28
21	9.7	5.2	5.2	5.2	5.5	6.1	5.9	219	168	8.8	26	28
22	9.7	5.2	5.2	5.2	5.5	5.9	5.3	219	168	8.8	26	29
23	9.7	5.2	5.2	5.3	5.5	5.9	5.5	219	168	8.8	26	29
24	9.7	5.2	5.2	5.5	5.5	5.9	5.9	219	166	8.8	27	29
25	9.7	5.2	5.2	5.5	5.5	5.9	5.9	219	166	8.8	26	29
26	9.8	5.2	5.2	5.6	5.5	5.9	5.9	219	166	8.8	27	29
27	9.7	5.2	5.2	5.8	5.5	5.6	5.9	219	165	8.8	26	29
28	9.7	5.2	5.2	5.5	5.5	5.5	5.9	213	168	8.9	26	29
29	9.8	5.2	5.2	5.5	---	5.5	5.9	209	170	8.4	26	29
30	9.8	5.2	5.2	5.5	---	5.5	5.9	209	167	8.4	26	29
31	9.6	---	5.2	5.5	---	5.5	---	209	---	8.4	26	---
TOTAL	662.2	225.5	161.2	164.1	154.0	182.7	170.4	4838.8	5854	1235.4	965.0	827
MEAN	21.4	7.52	5.20	5.29	5.50	5.89	5.68	156	195	39.9	31.1	27.6
AC-FT	1310	447	320	325	305	362	338	9600	11610	2450	1910	1640
MAX	47	9.7	5.2	5.8	5.5	6.3	5.9	219	226	164	72	29
MIN	9.6	5.2	5.2	5.2	5.5	5.5	5.3	5.9	165	8.4	8.4	26

CAL YR	2012	TOTAL	22090.9	MEAN	60.4	MAX	238	MIN	5.2	AC-FT	43820
WTR YR	2013	TOTAL	15440.3	MEAN	42.3	MAX	226	MIN	5.2	AC-FT	30630

MAX DISCH: 227 CFS AT 11:45 ON JUN 02, 2013 GH 3.18 FT SHIFT 0.00 FT  
 MAX GH: 3.18 FT AT 11:45 ON JUN 02, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

FLORIDA RIVER BELOW LEMON RESERVOIR  
WY2013 HYDROGRAPH



SAN JUAN RIVER BASIN  
09357500 ANIMAS RIVER AT HOWARDSVILLE, CO

Water Year 2013

Location.-- Lat. 37°49'58.50", Long 107°35'58.42", (Howardsville, Colo., Quad., scale, 1:24,000), San Juan County, Hydrologic Unit 14080104, unsurveyed on right bank 1,000 ft downstream from bridge on State Highway 110, 0.4 miles southwest of Howardsville, 0.4 miles downstream from Cunningham Creek, and 1.66 miles upstream of Arrastra Creek.

Drainage Area and Period of Record.-- 55.9 mi<sup>2</sup>.; USGS published record October 1935 to September 1982; Colorado Division of Water Resources published record October 1982 to present.

Equipment.-- Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float in a 36-in x 36-in wooden shelter and well. The primary reference gage is a steel drop tape referenced to an adjustable reference point (RP). An air temperature sensor is located at the gage as well. The control is a cobble riffle located approximately 50-ft. below the gage. An unmanned cableway was installed this water year and will help in obtaining high discharge measurement at the gage. It replaces the existing manned cableway. No other changes this water year.

Hydrologic Conditions.-- Drainage area consists of forested mountains with many rocky peaks above 11,000 ft. in elevation. Cobbles and boulders line the channel above and below the gage. Avalanches above the gage can diminish the flows at the gage but the events are typically short lived.

Gage-Height Record.-- The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with the DCP and chart record for backup purposes. Missing value on Apr. 29, 2013 was filled in by hand referencing the DCP download data. The gage was visited on 20 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted 3 times this water year: +0.01 ft on Apr. 29, -0.01 ft on May 20, and -0.01 ft on Sep. 17. The corrections were prorated and distributed by time to the last known matching reading (typically the last station visit). The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Nov. 11 – 12, 27 – 28, Dec. 9 – 10, 12 – 13, 16 – 23, 25 – 26, 28 – 30, 2012, Jan. 1 – 15, 18 – 23, 28 – 29, Feb. 1 – 10, 12 – 17, 19, 22 – 28, Mar. 5 – 6, 10 – 11, 22 – 25, Apr. 18 – 19, 2013. It was noticed in this and previous water years that the SE wheel will ice up during cold periods in winter months causing the tape to become dislodged from the pins. When corrected, it is difficult to determine where to begin the correction, but it typically can be seen in partial days of good record. The lower intake appeared to plug on May 21, leaving the upper intake as the only open one, the upper intake also appeared to be partially plugged, creating a choppy gage height record. On May 24, the upper intake was flushed, but the lower remained plugged until May 30. Flushing the upper created a smoother gage height record. The stilling well and intakes were cleaned using pumps on Jul. 3, 2013. Errors in the recorded gage heights on May 24 and Jul. 3, 2013 were caused by flushing the well. Gage heights were corrected using good data before and after the flush.

Datum Corrections.-- Levels were not run in water year 2013. Levels were last run on September 2, 2011, using BM1 as the base. No corrections were made as the elevation of the drop tape index and drop tape length were both found to be within allowable tolerances.

Rating.-- One channel at all stages. The control is a large cobble riffle located below the station. The channel controls at high flow. Cobble movement, gravel and sand fill and scour, cause shifts. Rating No. 09, instituted on May 13, 2009, was used for the entire water year. Eighteen measurements (Nos. 1234 - 1251) were made during the current water year ranging in discharge from 11.0 to 226 cfs. They cover the range in stage experienced except for the average daily flows of May 14 – 19, 21 – 31 and Jun. 1 – 11, 2013. The peak flow of 689 cfs occurred at 2030 on May 23, 2013 at a gage height of 3.00 ft. with a shift of -0.02 ft. The peak exceeded Measurement No. 1245 by 1.05 ft. in stage.

Discharge.-- Shifting control method was used during the entire water year. Shifting is caused mainly by erosion and deposition of small cobble and gravels on the control section below the gauge. Shifts were applied as defined by measurements and were distributed by stage and time. Shifts were distributed by stage continuing the ANIHOWVS12b variable shift curve from water year 2012 from 0000 Oct. 1, 2012 until the 1st measurement 1400 Oct. 15, 2012. Shifts were distributed by time for the remainder of water year 2013. Unadjusted measurements show shifts varying from -0.08 to +0.04 ft. All were given full weight and applied directly except for Measurement No. 1250 which was discounted -7% to smooth shift distribution. Measurement no. 1239 was made during a period of ice effect on the control, the shift was not used. Measurement 1247 was a pygmy meter measurement from which the shift was not used in record.

Special Computations.-- Discharge for the days when ice affected the gage height record was estimated on the basis of partial days of good record, good gage data before and after ice affected data, measurements, and air temperature data collected at the gage.

Remarks.-- Record good, except for the winter periods affected by ice, which are estimated and should be considered poor. Record for the period from May 21 – 24, 2013, when the lower intake to the stilling well was plugged and upper partially plugged, should be considered fair. The peak instantaneous flow should be considered fair. Station maintained and record developed by Brian Leavesley.

Recommendations.-- Design a cover for the SE wheel to reduce accumulation of moisture and icing on the tape wheel. For low water measurements up to the depth of Price AA meter, the FlowTracker should be used due to turbulence caused by cobble upstream of the measurement section.

STATE OF COLORADO  
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09357500 ANIMAS RIVER AT HOWARDSVILLE, CO

RATING TABLE-- ANIHOWCO09 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

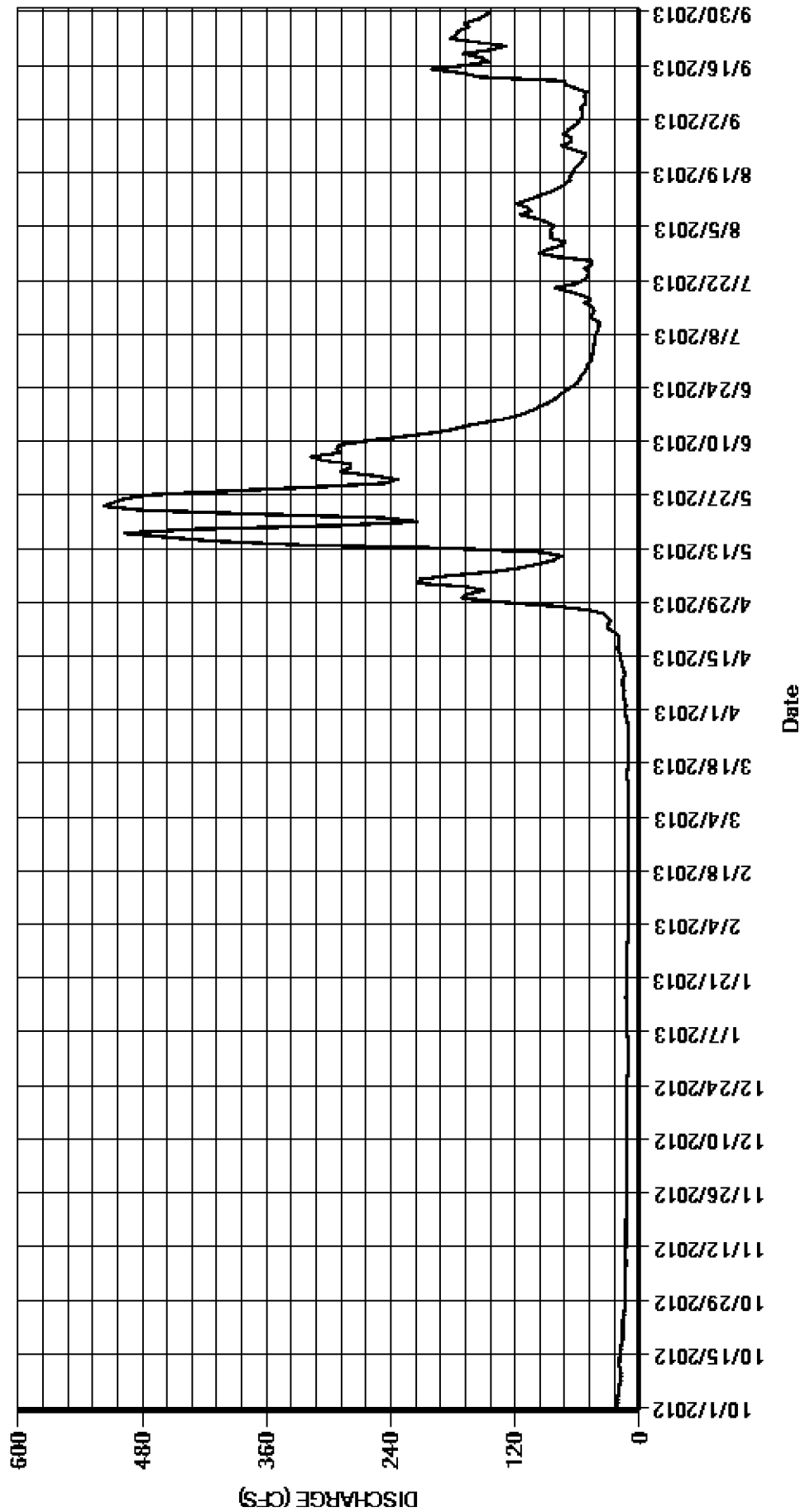
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	14	12	e11	e11	11	14	167	258	47	72	60
2	21	14	12	e11	e11	11	13	150	289	46	86	57
3	21	14	12	e11	e11	11	14	166	279	45	85	55
4	21	14	12	e11	e11	11	15	214	279	45	86	55
5	20	14	12	e11	e11	e11	15	212	307	44	82	57
6	20	14	12	e12	e11	e11	15	182	317	43	89	52
7	19	13	12	e12	e11	11	16	139	290	43	99	52
8	18	13	12	e12	e11	11	16	115	292	42	115	53
9	18	14	e12	e12	e11	11	16	97	290	40	105	51
10	18	14	e12	e12	e11	e11	14	82	266	39	108	62
11	18	e14	12	e12	11	e11	15	76	234	39	119	71
12	20	e13	e12	e12	e11	11	16	94	203	46	107	73
13	19	13	e12	e12	e11	11	17	182	181	46	97	154
14	19	13	12	e12	e11	12	18	335	166	44	86	171
15	18	13	12	e12	e11	12	18	412	146	46	78	200
16	18	13	e12	13	e11	12	20	458	127	53	72	168
17	18	13	e12	12	e11	11	21	497	114	47	67	146
18	17	13	e12	e12	11	11	e20	434	104	56	67	153
19	16	13	e12	e12	e11	11	e20	289	97	67	64	170
20	16	12	e12	e12	11	11	20	215	88	81	63	144
21	16	12	e12	e12	11	11	23	249	82	63	59	129
22	16	12	e12	e12	e11	e11	30	380	77	54	56	155
23	16	12	e12	e12	e11	e11	31	483	72	50	53	183
24	16	12	12	12	e11	e11	28	517	66	49	52	177
25	15	12	e12	12	e11	e11	31	508	60	53	64	175
26	15	12	e12	12	e11	11	34	498	58	46	75	165
27	14	e12	11	12	e11	11	50	474	57	47	66	169
28	14	e12	e11	e12	e11	11	84	398	53	79	66	156
29	14	12	e11	e12	---	12	134	317	51	97	73	149
30	14	12	e11	12	---	13	171	246	50	89	69	144
31	14	---	11	11	---	14	---	234	---	76	64	---
TOTAL	541	388	367	367	308	350	949	8820	4953	1662	2444	3606
MEAN	17.5	12.9	11.8	11.8	11.0	11.3	31.6	285	165	53.6	78.8	120
AC-FT	1070	770	728	728	611	694	1880	17490	9820	3300	4850	7150
MAX	22	14	12	13	11	14	171	517	317	97	119	200
MIN	14	12	11	11	11	11	13	76	50	39	52	51

CAL YR	2012	TOTAL	21309	MEAN	58.2	MAX	350	MIN	11	AC-FT	42270
WTR YR	2013	TOTAL	24755	MEAN	67.8	MAX	517	MIN	11	AC-FT	49100

MAX DISCH: 689 CFS AT 20:30 ON MAY 23, 2013 GH 3.00 FT SHIFT -0.02 FT  
 MAX GH: 3.00 FT AT 20:30 ON MAY 23, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09357500 ANIMAS RIVER AT HOWARDSVILLE, CO  
WY2013 HYDROGRAPH



SAN JUAN RIVER BASIN  
LA PLATA AND CHERRY CREEK DITCH NEAR HESPERUS  
Water Year 2013

Location.-- Lat. 37°19'26", Long. 108°03'41", in NW¼ NW¼ sec. 3, T.35 N., R.11 W., NMPM, La Plata County, hydrologic unit 14080105, on the right bank approximately 1.1 miles downstream of the headgate and 2.5 miles north of the town of Hesperus, CO.

Drainage Area and Period of Record.-- NA. ; Diversion record 1948 to present. Published streamflow record Oct. 1, 1993 to present.

Equipment.-- Sutron Satlink 2 DCP with a shaft encoder in a wood shelter and 22" x 22" concrete well. Primary reference gage is a staff gage located on the inside of the stilling well. A tipping bucket, precipitation gage Texas Electronics, TR- 525USW is located at the top of the antenna mast. Control is a 5-foot concrete Parshall flume. No other changes this water year.

Hydrologic Conditions.-- The ditch above and below the control is sand, gravel, cobble and sparse small boulders with a very well defined stilling pool. The stilling pool fills with sand and gravel causing the approach velocity to increase. Beavers have been known to build dams downstream of the flume which can submerge the flume.

Gage-Height Record.-- The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with DCP download data for backup purposes. Data downloaded from the DCP was entered by hand to fill in missing data on Jan. 16, 2013. Data downloaded from the DCP was entered electronically to fill in missing data on Jul. 29, 30; Sep. 10, 19, 20, 23, 2013. The gage was visited on 12 separate occasions this water year to verify the shaft encoder remained calibrated to the primary reference. One adjustment was made to the shaft encoder. The adjustment was made on May 2, 2013 (+0.03 ft. correction). Record is complete and reliable.

Datum Corrections.-- Levels were not run this water year. Levels were last run on August 22, 2008 to the inside staff gage. The staff gage was found to be reading +0.006 ft. high. No corrections were made as the staff gage was found to be within allowable tolerances.

Rating.-- The control is a 5-foot concrete Parshall flume. Rating No. 02 in use since January 1, 2011 was used the entire water year. Rating No. 2 defines the control with gravel and cobble in the stilling pool above the Parshall flume. The intake to the stilling well is 0.04 ft. above the floor of the flume. Flows below a gage height of 0.04 ft. are assumed to be negligible and a 0 flow is assigned to them. Five discharge measurements (Nos. 52-56) were made this year, ranging in discharge from 1.96 cfs to 27.5 cfs. Observations of zero flow were made on Oct. 2, 2012 and Jun. 7, 2013. Measurements and observation of zero flow cover the range-in-stage experienced except for higher average daily flows of May 22-25, 2013. The peak instantaneous flow of 29.8 cfs occurred at 1630 on May 18, 2013 at a gage height of 1.19 ft. with a shift of 0.00 ft. It exceeded the stage of measurement no. 55 made May 23, 2013 by 0.05 feet in stage.

Discharge.-- Shifting control method was used all water year. Shifts were distributed by time. Open-water measurements showed raw shifts varying between -0.03 and +0.01 feet. All measurements were given full weight except for Measurement Nos. 52, 53, 54 and 55 which were discounted -5% to 2% to smooth shift distribution.

Special Computations.-- No special computations were necessary this water year.

Remarks.-- Record is good. Instantaneous peak flow should be considered good. Station maintained by Russell Crangle, Brian Leavesley and Brian Boughton. Record developed by Brian Boughton.

Recommendations.-- None.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

LA PLATA AND CHERRY CREEK DITCH NEAR HESPERUS

RATING TABLE-- LPCDITCO02 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22	19	1.3	2.4	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21	17	0.86	2.2	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21	14	0.58	2.3	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21	4.9	0.36	2.3	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24	0.00	0.00	1.9	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25	0.00	0.00	1.5	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22	0.00	0.00	1.9	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	0.00	0.00	3.1	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17	0.00	0.00	3.9	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17	0.00	0.00	2.5	4.3
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20	0.00	0.00	4.0	8.8
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22	0.00	0.00	0.23	5.9
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26	7.2	0.00	0.00	4.7
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27	15	0.00	0.00	4.4
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22	14	0.00	0.00	4.2
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25	13	0.00	0.00	3.9
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27	11	0.00	0.00	3.7
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26	8.9	0.00	0.00	3.6
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25	7.7	0.00	0.00	3.5
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23	7.7	0.00	0.00	3.4
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26	6.4	0.00	0.00	3.3
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29	5.1	0.00	0.00	3.3
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28	4.3	0.00	0.00	3.0
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28	3.4	0.00	0.00	2.9
25	0.00	0.00	0.00	0.00	0.00	0.00	7.4	29	2.9	0.00	0.00	2.8
26	0.00	0.00	0.00	0.00	0.00	0.00	20	26	2.4	0.00	4.7	2.7
27	0.00	0.00	0.00	0.00	0.00	0.00	21	23	2.1	0.00	4.1	2.6
28	0.00	0.00	0.00	0.00	0.00	0.00	21	23	1.8	0.00	5.1	2.5
29	0.00	0.00	0.00	0.00	---	0.00	20	22	1.6	0.74	2.5	2.4
30	0.00	0.00	0.00	0.00	---	0.00	21	22	1.5	1.3	0.48	2.3
31	0.00	---	0.00	0.00	---	0.00	---	21	---	1.9	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	110.40	729	170.90	7.04	45.11	78.20
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	3.68	23.5	5.70	0.23	1.46	2.61
AC-FT	0	0	0	0	0	0	219	1450	339	14	89	155
MAX	0.00	0.00	0.00	0.00	0.00	0.00	21	29	19	1.9	5.1	8.8
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17	0.00	0.00	0.00	0.00

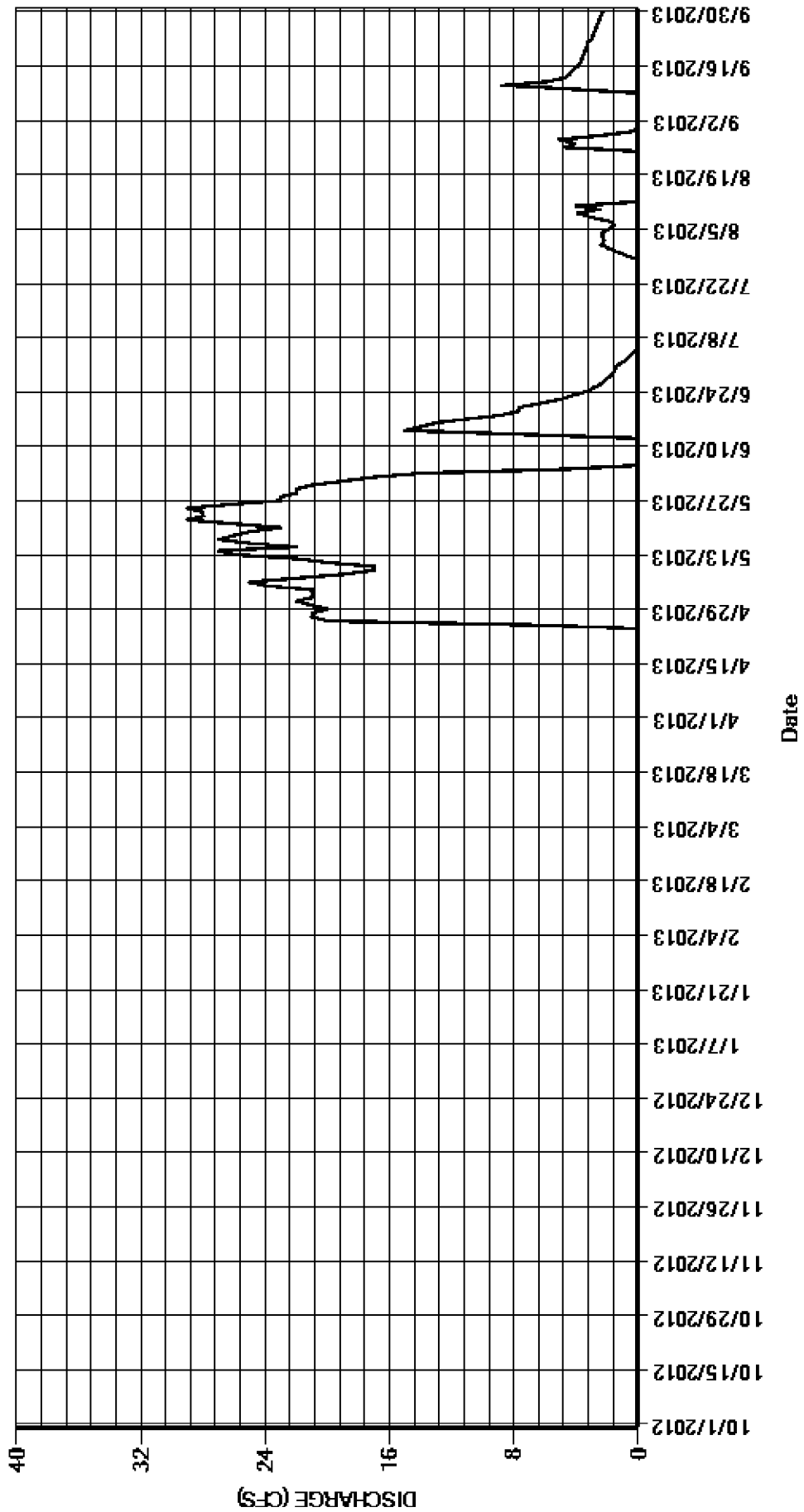
CAL YR	2012	TOTAL	1451.40	MEAN	3.97	MAX	30	MIN	0.00	AC-FT	2880
WTR YR	2013	TOTAL	1140.65	MEAN	3.13	MAX	29	MIN	0.00	AC-FT	2260

MAX DISCH: 29.8 CFS AT 16:30 ON MAY 18, 2013 GH 1.19 FT SHIFT 0 FT  
 MAX GH: 1.19 FT AT 16:30 ON MAY 18, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



LA PLATA AND CHERRY CREEK DITCH NEAR HESPERUS  
 WY2013 HYDROGRAPH



SAN JUAN RIVER BASIN  
PINE RIDGE DITCH NEAR HESPERUS

Water Year 2013

Location.-- Lat. 37°17'42.87", Long. 108°02'24.40" NAD83, in NE¼ NW¼ sec. 14, T.35 N., R.11 W., NMPM, La Plata County, Hydrologic Unit 14030105, on the left bank approximately 0.9 miles below the head-gate and 0.3 miles north of the Town of Hesperus.

Drainage Area and Period of Record.-- Drainage Area = NA. ; Period of Record - Diversion record (Structure ID 3300533) 1948 to present. Published streamflow record Oct. 1, 1993 to present.

Equipment.-- Sutron Satlink 2 DCP with a shaft encoder in a 30-in diameter corrugated metal well and a 42-in diameter corrugated metal shelter. The primary reference gage is outside staff gage installed in flume (0.00-ft to 2.00-ft.). The control is a 3-foot steel Parshall flume with a depth of 2-ft. The shaft encoder was replaced with a Stage-Discharge-Recorder (SDR) on May 17, 2013. No other changes this year.

Hydrologic Conditions.-- The ditch above and below the control is silt and gravel with a very well defined stilling pool. The approach conditions into the flume are good. Vegetative growth downstream of the flume can cause submergence if the ditch is not maintained. On April 29, 2008 a 34 in x 50 in elliptical corrugated metal pipe was installed in the ditch approximately 200-ft below the gage. The culvert appears to be adequate and allows the flume to operate under free-flow conditions. The culvert was installed to access the Indian Shadows subdivision.

Gage-Height Record.-- The primary record is 15-minute shaft encoder and SDR data downloaded from satellite telemetry with the DCP log as backup. The gage was visited on 9 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted on Apr. 30, May 10, 17, 2013. The reason for the shaft encoder corrections remains unknown. The shaft encoder malfunctioned and was replaced on May 17, 2013. The SDR malfunctioned on Aug. 9 and was corrected on Aug. 12. The water commissioner indicated verbally there was no water in the ditch on Aug. 12. There are 3 unit values missing on Aug. 27 and were not estimated as the discharge was 0 cfs. The record is complete and reliable except for the period from Apr. 24-30; May 1-17, 2013 when the shaft encoder malfunctioned leaving the gage height record uncertain. Gage height record Sep. 11-24, 2013 is good but the discharge record is suspect as the flume operated partially submerged.

Datum Corrections.-- Levels were not run this water year. Levels were last run on August 22, 2008.

Rating.-- The control is a standard, 3-foot, steel Parshall flume. Rating No. 01 in use since the gage was installed was used all water year. Rating No. 01 is a standard 3-ft Parshall flume rating above a gage height of 0.06-ft. At gage heights below 0.06-ft the well becomes isolated as the invert of the intake is 0.06-ft. above the floor of the flume at the staff gage. Flows below a gage height of 0.06-ft. are assumed to be negligible and a 0 discharge is assigned to them. Three discharge measurements (No. 22-24) were made this water year, ranging in discharge from 4.41 to 7.90 cfs. Observations of zero flow were made on Oct. 2, 2012; May 9, 10; Aug. 12, 27, 2013. Measurements and observation of zero flow cover the range-in-stage. The peak instantaneous flow of 12.4 cfs occurred at 2100 on May 16, 2013 at a gage height of 1.04 ft. with a shift of -0.02 ft. It exceeded the stage of measurement No. 24 (GH = 0.85), made Sep. 11, 2013 by 0.19 ft. in stage. The peak instantaneous gage height of 1.10 ft. occurred at 1815 on Sep. 18, 2013. The gage height was affected by vegetation in the channel below the control causing the flume to partially submerge.

Discharge.-- Shifts were applied as defined by measurements and were distributed by stage. Shift curve PINDITCOVS11A was applied from the beginning of the water year until Aug. 31, 2013. Variable shift curve PINDITCOVS13A was used Sep. 1, 2013 until the end of the water year. Variable shift curve (VS13A) was used when the flume was partially submerged. Measurements are made at the staff gage and well intake, in the flume. All measurements made were given full weight.

Special Computations.-- No special computations were necessary this water year.

Remarks.-- Record is good, except for the period when the shaft encoder readings are uncertain. Record during this period is suspect and should be considered poor. Record when the flume operated partially submerged is considered fair. The peak instantaneous flow should be considered poor. Station maintained by Russell Crangle, Matt Schmitt and Brian Boughton. Record developed by Brian Boughton.

Recommendations.-- None.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

PINE RIDGE DITCH NEAR HESPERUS

RATING TABLE-- PINDITCO01 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

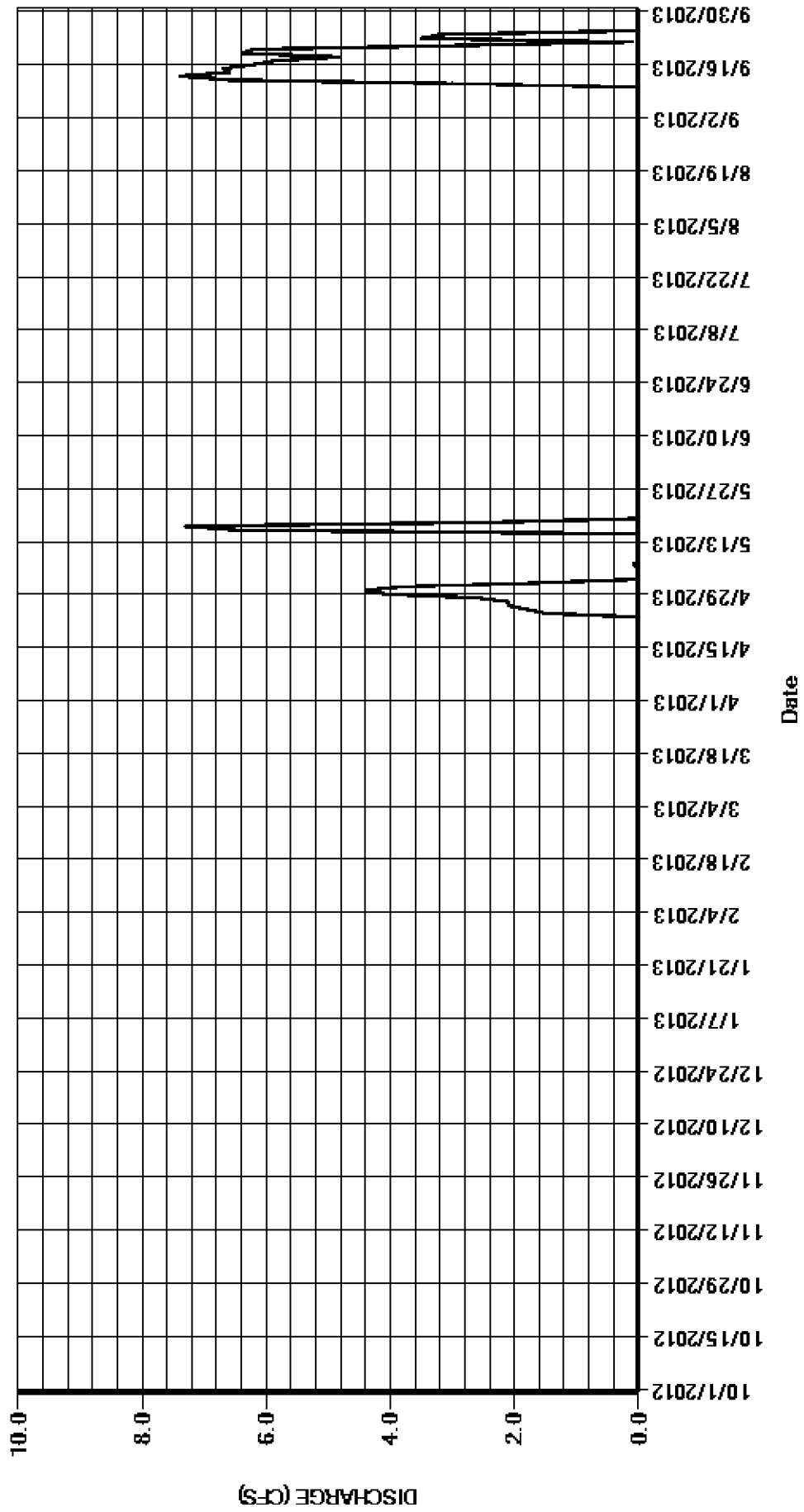
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.7	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.00	3.0
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.00	6.6
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.4
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.6
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.7
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.5	0.00	0.00	0.00	6.2
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.3	0.00	0.00	0.00	5.9
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.4	0.00	0.00	0.00	4.8
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.4
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.2
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.5
24	0.00	0.00	0.00	0.00	0.00	0.00	1.5	0.00	0.00	0.00	0.00	3.2
25	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	2.6	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	4.1	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	4.4	0.00	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	18.60	21.83	0.00	0.00	0.00	69.50
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.62	0.70	0.000	0.000	0.000	2.32
AC-FT	0	0	0	0	0	0	37	43	0	0	0	138
MAX	0.00	0.00	0.00	0.00	0.00	0.00	4.4	7.3	0.00	0.00	0.00	7.4
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CAL YR	2012	TOTAL	131.42	MEAN	0.36	MAX	8.4	MIN	0.00	AC-FT	261
WTR YR	2013	TOTAL	109.93	MEAN	0.30	MAX	7.4	MIN	0.00	AC-FT	218

MAX DISCH: 12.4 CFS AT 21:00 ON MAY 16, 2013 GH 1.04 FT SHIFT -0.02 FT  
 MAX GH: 1.10 FT AT 18:15 ON SEP 18, 2013 (Backwater from vegetation)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PINE RIDGE DITCH NEAR HESPERUS  
 WY2013 HYDROGRAPH



SAN JUAN RIVER BASIN  
09365500 LA PLATA RIVER AT HESPERUS

Water Year 2013

Location.-- Lat. 37°17'23", Long. 108°02'24", in NE¼SW¼ sec. 14, T.35 N., R.11 W., NMPM La Plata County, Hydrologic Unit 14080105, on right bank at Hesperus 700 ft downstream from U.S. Highway 160.

Drainage Area and Period of Record.-- 37 mi<sup>2</sup>, approximately. ; Periodic data June 1904 to Nov. 1910. Continuous from June 1917 to current year, with some periods of monthly data only.

Equipment.-- Graphic water-stage recorder and a Sutron Satlink 2 HDR DCP with a shaft encoder on a separate float in a 64-inch x 64-inch concrete block shelter and a 42-inch diameter corrugated metal well. The primary reference gage is an electric drop tape inside the gage house. The station is also equipped with a Sutron air temperature sensor and an electric float tank heater which is used to keep the well from freezing in the winter. Control is man-made concrete ramp flume located approximately 15 feet downstream. A steel foot bridge is located 60 feet below the gage house. No changes this year.

Hydrologic Conditions.-- Drainage area above the gage is 37 square miles. The basin begins in high mountain terrain above 11,000 feet and drops to 8,100 feet at the gage from USGS topographic maps. The basin mainly consists of rock and forested mountains above the gage and changes to agricultural lands of moderate slope terrain below the gage. Small cobbles and gravel are deposited in the stilling pool above the control during low flow and scour during moderate to high flow events. The La Plata and Cherry Creek Ditch and the Pine Ridge Ditch export water above the gage for irrigation of approximately 2,600 acres. The Pine Ridge Ditch exports water into the Lightner Creek drainage basin for domestic purposes.

Gage-Height Record.-- The primary record is 15-minute shaft encoder data from satellite telemetry with DCP download data and graphic chart record for backup purposes. Data downloaded from the DCP was used from 1745 on Jan. 26, 2013 to 0130 on Jan. 27, 2013 to fill in missing telemetry data. The gage was visited 33 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted on 3 separate occasions (Mar. 6, 2013 with +0.02 ft correction, Jun. 27, 2013 with a -0.01 ft correction and Aug. 27, 2013 with +0.01 ft correction). The record was corrected by distributing the correction by time to the last known matched reading. The intake will isolate from the stream when the stage falls below 3.08 ft. The record is complete and reliable, except for the following days when the stage-discharge relationship was affected by ice on the control and the upper intake was isolated from the stream for more than 4 hours. Ice on the control ("b" days): Nov. 12, 27, 28; Dec. 9-17, 20-25, 28-31, 2012; Jan. 1-24, 26-31; Feb. 1-7, 10-28; Mar. 1, 2, 5, 6, 9-12, 23-25, 2013. Intake isolated ("a" days): Dec. 19, 2012.

Datum Corrections.-- Levels were not run this water year. Levels were last run on Aug. 27, 2012 to the electric tape index (ET index) using RM #1 as the base. The ET index was found to be reading -0.008 ft. low. The electric tape length was found to be reading +0.005 ft. long. No corrections were made since the ET index and ET length were found to be within the allowable error tolerances. Levels were also run to the three other reference marks (RM#2, RM#3 and RM#4). RM#2 was found to be reading -0.002 feet low. RM#3 was found to be reading +0.005 feet high and RM#4 was found to be reading -0.010 feet low.

Rating.-- The control is a long throated flume, hereafter referred to as a "Ramp Flume" that was constructed in August of 2000 to act as the control section for the gage. Low flows (0 to 4 cfs) are controlled by the low flow notch in the ramp flume. Medium flows (4 cfs to 500 cfs) are controlled by the second stage of the ramp flume and high flows (flows above 500 cfs) are controlled by the channel. The ramp flume is located about 15 feet below the inlets to the gage. A concrete ledge with an eight-inch "I" beam, located about 60 feet below the station and a large boulder drop structure, located 30 feet below the station, act to limit scour but do not act as a control section. Flows are contained within a single channel up to a gage height of 5.8 feet. Flows above a gage height of 5.8 feet will overbank on the right side only. The left bank is contained by the small mesa that is approximately 15-feet above the flow line of the channel. Rating No. 39 began on Nov. 22, 2011 and was used the entire water year. The rating is well-defined to 560 cfs. Fifteen discharge measurements (Nos. 1499-1513) were made this year, ranging in discharge from 3.90 to 174 cfs. They cover the range in stage experienced except for the lower daily flows of Nov. 4-8, 12-30, Dec. 1, 2, 10-31, 2012, Jan. 1-31, Feb. 1-27, 2013. The peak instantaneous flow of 174 cfs occurred at 0945 Sep. 11, 2013 at a gage height of 4.38 ft. with a shift of 0.00 ft. It exceeded the stage of measurement No. 1513, made Sep. 11, 2013 by 0.03 feet in stage.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by time. Open-water measurements showed shifts varying between -0.02 and +0.03 feet. Shifts were applied directly and given full weight except measurement Nos. 1499, 1500, 1503, 1506, 1508, 1510, 1512 and 1513 which were discounted from -8% to +8% to smooth shift distribution. The shift for measurement no. 1502 was not used as the gage height was affected by ice on the control.

Special Computations.-- Discharge for periods of ice-affected record was estimated on the basis of good record before and after ice, temperature records, by cutting off ice peaks on graphic chart and partial days of good record. The gage hydrograph was used to determine periods of ice-affected record.

Remarks.-- Record good, except for periods when ice affected the stage-discharge relationship and when the intake is isolated. Record during this period was estimated and should be considered poor. The peak instantaneous flow should be considered good. Station maintained by Russell Crangle and Brian Boughton. Record developed by Brian Boughton.

Recommendations.-- Currently, the top of the sill of the shelter door is at a gage height of 5.80 ft. Although high flow events above a gage height of 5.80 ft are rare, they occur, and may warrant the installation of a crest gage. The large boulder weir that was installed stabilized the control but made the high water measurement section poor. A bank operated cableway may need to be installed in the weir pool above the gage to provide more reliable high water measurements.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

09365500 LA PLATA RIVER AT HESPERUS

RATING TABLE-- LAPHESCO39 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

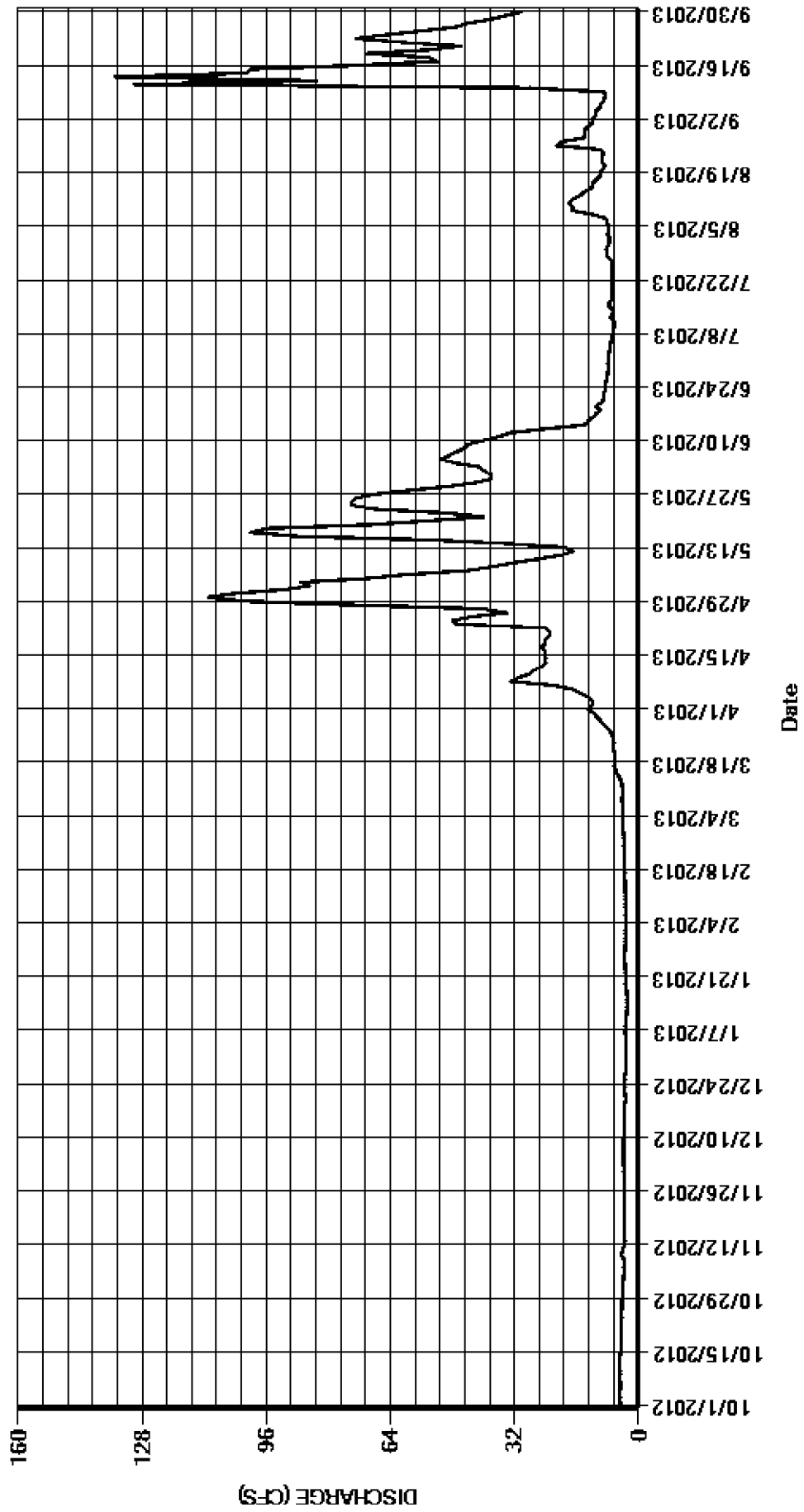
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.7	4.1	3.8	e3.3	e3.4	e4.0	13	104	38	7.8	7.5	12
2	4.8	4.0	3.8	e3.3	e3.4	e4.0	12	91	40	7.9	7.6	12
3	4.8	3.9	3.9	e3.3	e3.4	4.1	12	85	41	7.6	8.0	11
4	4.8	3.8	3.9	e3.3	e3.4	4.0	13	87	47	7.4	7.8	11
5	4.8	3.8	3.9	e3.3	e3.4	e4.0	15	70	51	7.3	7.7	10
6	4.7	3.8	3.9	e3.5	e3.4	e4.0	17	60	49	7.1	8.2	9.7
7	4.8	3.7	3.9	e3.5	e3.4	4.2	22	44	47	7.0	8.5	8.9
8	4.9	3.7	3.9	e3.4	3.4	4.4	33	38	45	6.7	12	8.7
9	4.8	4.6	e3.9	e3.4	3.4	e4.2	31	32	44	6.5	17	8.9
10	4.8	4.2	e3.8	e3.3	e3.4	e4.2	28	26	40	6.3	17	28
11	4.9	4.1	e3.7	e3.1	e3.4	e4.2	27	20	36	6.4	18	130
12	5.0	e3.5	e3.7	e3.0	e3.5	e4.3	25	17	33	7.2	17	83
13	5.0	3.6	e3.7	e3.0	e3.5	4.5	24	19	24	6.8	15	135
14	4.8	3.7	e3.7	e3.0	e3.5	5.0	24	33	14	6.5	14	101
15	4.6	3.7	e3.7	e3.0	e3.5	5.6	24	52	13	7.7	12	100
16	4.6	3.7	e3.7	e3.0	e3.6	6.0	24	88	12	7.5	12	72
17	4.6	3.7	e3.7	e3.1	e3.6	6.3	25	100	11	6.9	11	52
18	4.6	3.7	3.7	e3.2	e3.6	6.2	24	96	10	6.7	10	54
19	4.5	3.7	e3.5	e3.4	e3.6	6.1	24	69	11	6.9	9.9	70
20	4.5	3.7	e3.4	e3.4	e3.7	6.1	23	54	9.3	6.8	9.1	54
21	4.5	3.7	e3.5	e3.4	e3.7	6.4	23	40	9.1	6.8	8.8	46
22	4.5	3.7	e3.6	e3.4	e3.7	6.6	24	49	9.0	6.9	9.5	61
23	4.5	3.7	e3.6	e3.5	e3.7	e6.4	47	68	8.7	6.9	9.4	73
24	4.4	3.7	e3.6	e3.5	e3.8	e6.6	48	74	8.5	6.7	9.0	65
25	4.5	3.7	e3.6	3.6	e3.8	e6.8	43	74	8.5	6.8	10	56
26	4.3	3.7	3.7	e3.6	e3.8	7.3	34	73	8.2	6.8	21	47
27	4.3	e3.7	3.3	e3.6	e3.8	8.1	40	68	8.1	7.0	20	44
28	4.3	e3.7	e3.2	e3.5	e4.0	9.3	74	59	7.9	8.1	14	38
29	4.2	3.7	e3.2	e3.5	---	10	102	49	7.9	8.1	14	34
30	4.1	3.7	e3.3	e3.4	---	11	111	42	7.9	8.4	14	30
31	4.1	---	e3.3	e3.4	---	12	---	38	---	7.9	13	---
TOTAL	142.7	113.7	113.1	103.2	99.8	185.9	986	1819	699.1	221.4	372.0	1465.2
MEAN	4.60	3.79	3.65	3.33	3.56	6.00	32.9	58.7	23.3	7.14	12.0	48.8
AC-FT	283	226	224	205	198	369	1960	3610	1390	439	738	2910
MAX	5.0	4.6	3.9	3.6	4.0	12	111	104	51	8.4	21	135
MIN	4.1	3.5	3.2	3.0	3.4	4.0	12	17	7.9	6.3	7.5	8.7

CAL YR	2012	TOTAL	7796.6	MEAN	21.3	MAX	153	MIN	3.2	AC-FT	15460
WTR YR	2013	TOTAL	6321.1	MEAN	17.3	MAX	135	MIN	3.0	AC-FT	12540

MAX DISCH: 174 CFS AT 09:45 ON SEP 11, 2013 GH 4.38 FT SHIFT 0.00 FT  
 MAX GH: 4.38 FT AT 09:45 ON SEP 11, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09365500 LA PLATA RIVER AT HESPERUS  
WY2013 HYDROGRAPH



SAN JUAN RIVER BASIN  
CHERRY CREEK AT THE MOUTH NEAR RED MESA  
Water Year 2013

Location.-- Lat. 37°07'04.69", Long. 108°11'54.92" NAD 83, in NW¼ SW¼ sec. 7, T.33 N., R.12 W., NMPM, La Plata County, Hydrologic Unit 14080105. Approximately 860-ft upstream of the confluence with the LaPlata River.

Drainage Area and Period of Record.-- 75.3 mi<sup>2</sup>. ; Colorado Division of Water Resources published record October 1988 to present.

Equipment.-- Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float in a 42-in corrugated metal well in a concrete block shelter. The primary reference gage is a steel drop tape referenced to a nonadjustable reference point on the wooden instrument shelf. No changes this water year.

Hydrologic Conditions.-- The channel bottom is composed of cobble and gravel. Dense willows line the channel banks. At higher flows the willows impact the stage discharge relationship. The ephemeral creek flows during the spring snow melt, significant rain events and return flows from irrigation on the La Plata and Cherry Creek Ditch.

Gage-Height Record.-- The primary record is 15-minute shaft encoder data from satellite telemetry with DCP download data and graphic chart record for backup purposes. Missing value on May 11, 2013 was filled in by hand referencing the DCP download data. The gage was visited on 28 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted one time this water year. A -0.03 ft. correction was applied on Sep. 23, 2013. Shaft encoder correction was distributed by time back to the beginning of the high flow event that began on Sep. 22, 2013. The high water line from the event was observed on Sep. 23, 2013 and a black line marked in the grout on the east outside wall of the cinder block shelter recorded the elevation. The mark was surveyed on Jan. 3, 2014 using BM1 as the base. The high water marks inside and outside the shelter did not match. The record is complete and reliable, except for the following days when floats froze in the stilling well, Jan. 28-30, 2013, the stage-discharge relationship was affected by ice on the control, Mar. 24-25, 2013 and when the gage height record was inaccurate during the peak of the high flow event, Sep. 22, 2013.

Datum Corrections.-- Concrete posts with brass caps (benchmark no. 1 and 2) were installed near the gage on Nov. 8, 2012. Levels were run on Nov. 21, 2012, using the drop tape reference mark (RP\_DT) as the base. The elevation of benchmarks no. 1 and 2 were established. Benchmark no. 1 (BM1) was established at an elevation of 7.018 ft. and no. 2 (BM2) is 11.760 ft. The tape length (TL\_DT) was measured 8.790 ft. Levels were run again on Sep. 12, 2013 using BM1 as the base. The levels were used to evaluate the stability of BM1 and BM2. Benchmark no. 3 (BM3) was established on Sep. 12, 2013. The levels indicate BM1 and BM2 have settled 0.005 ft. No corrections were made since BM1, BM2, RP\_DT and TL\_DT were found to be within the allowable error tolerances.

Rating.-- The control at low flow is a natural cobble riffle located 5-ft. below the gage. Willows line the banks of the channel below the gage and act as the control at high flow. Willow growth also causes the shifts to vary at high flows. Rating No. 4, in use since Oct. 13, 2010 was used for the entire water year. Rating no. 4 is fairly well defined from 0 to 55 cfs. Five measurements (Nos. 110-114) were made during the current water year ranging in discharge from 0.65 to 10.6 cfs. Sixteen observation of zero flow were made this water year. Observations of zero flow were made on Oct. 4, Nov. 1, 5, 8, 21, 2012; Jan. 24, 30, Jun. 13, Jul. 2, 22, Aug. 6, 23, Sep. 6, 12, 13, 16, 2013. Observations of zero flow and the discharge measurements cover the range in stage experienced except for the higher daily flow on Sep. 22, 2013. The peak instantaneous flow this water year is unknown as the stage exceeded the stage-discharge relationship. The peak gage height was 7.47 ft.

Discharge.-- Shifting control method was used for the entire water year. Shifting is caused by willows, trash, leaf debris and the movement of sediment. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were distributed by time from the beginning of the water year until May 10, 2013. Shifts were distributed by stage from May 10, 2013 until Sep. 22, 2013 using variable shift curve CHEREDCOVS13A and Sep. 22, 2013 until the end of the water year using variable shift curve CHEREDCOVS14A. Both variable shift curves apply a 0.00 ft. shift at a gage height of 1.09 ft. and above. The point of zero flow (PZF) appears to have shifted or was not accurately measured when rating 4 was developed. Flows at and below a gage height of 1.08 ft. were reduced to 0. Open-water measurements showed unadjusted shifts varying from 0.00 to +0.03 ft. Shifts were applied directly and given full weight except for measurement no. 114 which was adjusted 6.0% to smooth shift distribution. Adjusted shifts varied from 0.00 to +0.01.

Special Computations.-- The administrative record for the La Plata River below Cherry Creek (LAPCHECO) was developed for Sep. 22, 2013 and compared with the record for Cherry Creek. The trend at the Cherry Creek gage before and after the high water event occurred was about 14% to 25% of the flow at the La Plata River below Cherry Creek gage. The period from 16:30 to 20:45 on Sep. 22, 2013 when the stage exceeded the stage-discharge relationship was assumed to be about 14% to 25% of the flow at the La Plata gage.

Remarks.-- Record is fair except for the periods when floats were frozen in the well and when ice affected the stage-discharge relationship. Periods of ice affected record should be considered poor. The record on Sep. 22, 2013 should be considered poor. The peak instantaneous flow is unknown. Station maintained by Russell Crangle, Matt Schmitt, Brian Leavesley and Brian Boughton. Record developed by Brian Boughton.

Recommendations.-- Continue to monitor BM1 and BM2 for stability.



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

CHERRY CREEK AT THE MOUTH NEAR RED MESA

RATING TABLE-- CHEREDCO04 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

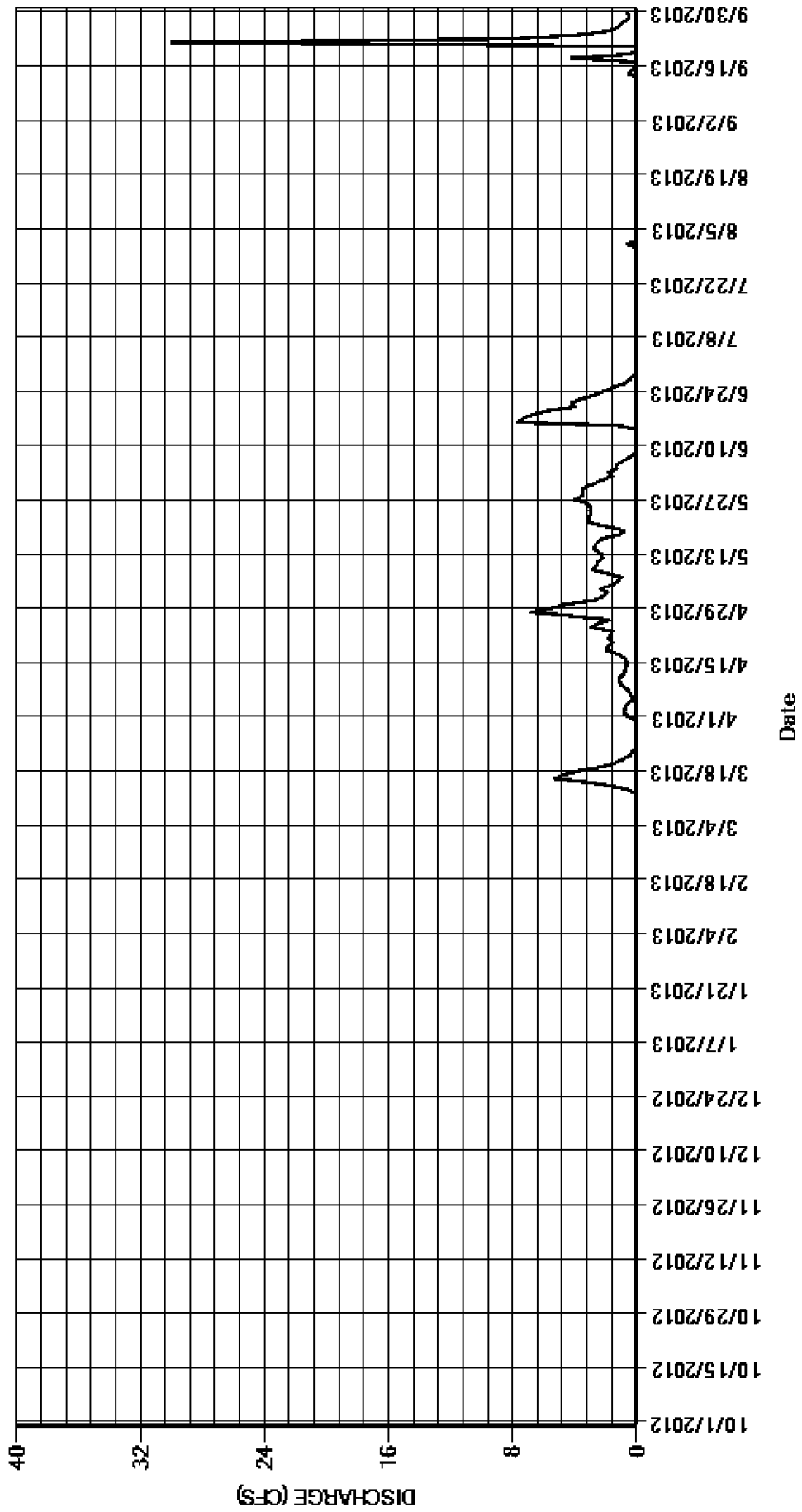
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.56	2.7	2.3	0.01	0.58	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.82	2.2	1.6	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.76	1.9	1.8	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.66	2.3	1.3	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.37	1.6	1.3	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.32	1.2	0.87	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.98	0.48	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.58	1.9	0.12	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.99	2.9	0.07	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	1.1	2.6	0.02	0.00	0.00	0.03
11	0.00	0.00	0.00	0.00	0.00	0.00	1.1	2.5	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.01	0.84	2.2	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.42	0.74	2.3	0.00	0.00	0.00	0.01
14	0.00	0.00	0.00	0.00	0.00	1.5	0.69	2.7	0.00	0.00	0.00	0.53
15	0.00	0.00	0.00	0.00	0.00	3.1	0.62	2.7	0.97	0.00	0.00	0.27
16	0.00	0.00	0.00	0.00	0.00	5.3	0.76	2.5	7.7	0.00	0.00	0.01
17	0.00	0.00	0.00	0.00	0.00	4.7	1.1	2.2	7.3	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	3.7	1.9	1.1	6.7	0.00	0.00	4.2
19	0.00	0.00	0.00	0.00	0.00	2.2	1.9	0.78	5.7	0.00	0.00	0.47
20	0.00	0.00	0.00	0.00	0.00	1.4	1.6	1.9	4.0	0.00	0.00	0.05
21	0.00	0.00	0.00	0.00	0.00	0.82	1.8	3.0	4.2	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.41	1.7	3.1	3.6	0.00	0.00	e30
23	0.00	0.00	0.00	0.00	0.00	0.27	1.6	3.0	2.7	0.00	0.00	8.5
24	0.00	0.00	0.00	0.00	0.00	e0.10	3.0	3.0	2.1	0.00	0.00	3.8
25	0.00	0.00	0.00	0.00	0.00	e0.10	2.5	3.0	1.5	0.00	0.00	1.9
26	0.00	0.00	0.00	0.01	0.00	0.09	1.8	3.2	0.78	0.00	0.00	1.2
27	0.00	0.00	0.00	0.11	0.00	0.06	4.2	4.0	0.45	0.00	0.00	0.94
28	0.00	0.00	0.00	e0.01	0.00	0.06	6.8	3.5	0.20	0.00	0.00	0.57
29	0.00	0.00	0.00	e0.00	---	0.06	5.5	3.5	0.06	0.00	0.00	0.49
30	0.00	0.00	0.00	e0.00	---	0.05	4.6	3.5	0.04	0.00	0.00	0.65
31	0.00	---	0.00	0.00	---	0.09	---	2.8	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.13	0.00	24.44	51.32	76.76	57.86	0.01	0.58	53.62
MEAN	0.000	0.000	0.000	0.004	0.000	0.79	1.71	2.48	1.93	0.0003	0.019	1.79
AC-FT	0	0	0	0.3	0	48	102	152	115	.02	1.2	106
MAX	0.00	0.00	0.00	0.11	0.00	5.3	6.8	4.0	7.7	0.01	0.58	30
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.78	0.00	0.00	0.00	0.00

CAL YR	2012	TOTAL	842.88	MEAN	2.30	MAX	26	MIN	0.00	AC-FT	1670
WTR YR	2013	TOTAL	264.72	MEAN	0.73	MAX	30	MIN	0.00	AC-FT	525

MAX DISCH: (UNKNOWN)  
 MAX GH: 7.47 FT AT 17:45 ON SEP 22, 2013 (SURVEYED HIGH WATER MARK)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CHERRY CREEK AT THE MOUTH NEAR RED MESA  
 WY2013 HYDROGRAPH



SAN JUAN RIVER BASIN  
LONG HOLLOW AT THE MOUTH NEAR RED MESA

Water Year 2013

Location.-- Lat. 37°03'02", Long. 108°10'23", in SE¼SW¼ sec. 32, T.33 N., R.12 W., NMPM, La Plata County, Hydrologic Unit 14080105, on the right bank 600 feet downstream of Government Draw and 2.6 miles south of the town of Redmesa.

Drainage Area and Period of Record.-- 46.5 mi<sup>2</sup>.; October 1, 1988 to present.

Equipment.-- Graphic water stage-recorder and Sutron Satlink 2 satellite monitoring DCP and shaft encoder on separate floats in a wooden shelter and well at a 4-foot steel Parshall flume. Primary reference gage is outside staff gage installed in flume. An insulated floor is installed in the stilling well when the temperatures fall below freezing. The floor was installed on Nov. 27, 2012 and removed on Mar. 14, 2013. The shaft encoder was removed on Aug. 20, 2013 and replaced with a Stage-Discharge-Recorder (SDR). No other changes.

Hydrologic Conditions.-- The drainage area above the gage is 46.5 square miles. The creek above and below the control is mainly silt with some sand and gravel. The approach conditions into the flume are poor. The stilling pool above the flume is poor. Excessive approach velocities tend to cause a positive shift to a standard Parshall flume rating. The creek base flow is from irrigation return flows and flashy rain events. Construction of Long Hollow Reservoir (located approximately 700 to 1,000 feet above the gage) began July 2012 and caused the flows to become more erratic than usual. Surface flows were diverted and dam site was dewatered when necessary for construction purposes.

Gage-Height Record.-- The primary record is 15-minute shaft encoder and SDR data downloaded from satellite telemetry with chart record used for backup purposes. Missing data on Mar. 14, and Aug. 20, 2013 were filled in by interpolation. The erroneous value on Mar. 14, 2013 was caused when the stilling well was dewatered to work on the valve and the missing values on Aug. 20, 2013 were caused when the shaft encoder was removed and replaced with an SDR. Missing data on Nov. 12-16, 2012 was entered by hand referencing the DCP download file. The gage was visited on 20 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted two times this water year. The shaft encoder corrections were made on Jan. 24, 2013 (-0.04 ft.) and Apr. 15, 2013 (+0.01). The shaft encoder corrections were distributed by time to the last inspection when the shaft encoder matched the primary reference gage. Moss and silt were removed from the control on several occasions, resulting in a range of corrections from 0.00 ft to -0.07 ft. The corrections were distributed within the shift distributions between the times the flume was cleaned. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Jan. 12-17, 2013.

Datum Corrections.-- Levels were not run this year. Levels were last run on Mar. 2, 2009 using the floor of the flume at the staff gage as the base. Levels were used to determine if the converging section of the flume is level. Results indicate the flume is -0.07 ft. low on the intake side (right-edge-of-water). No other benchmarks were set at the time.

Rating.-- The control is a 4-foot Parshall flume installed in 1988 to monitor the return flows through Long Hollow for the Animas/La Plata Conservancy District. Horizontal dirt and grass wing walls extend in both directions above an elevation of 2.25 feet. LONREDCO02, in use since Nov. 22, 2011 was used the entire water year. Rating 02 is a nonstandard 4-foot Parshall flume rating developed from discharge measurements 206, 212, 215-222. Gage heights above 2.25 ft. drown out the Parshall flume and flows in the natural channel. A theoretical rating was developed above a gage of 2.25 ft. No measurements have been made above a stage 2.25. The rating is well defined from 1.44 to 29 cfs. Nine discharge measurements (nos. 219-227) were made this water year ranging in discharge from 2.05 to 5.92 cfs. They cover the range in stage experienced except for the lower average daily flows of Oct. 1, 2, 2012, Jun. 5-10, 17-30, Jul. 1-31, Aug. 1-31, Sep. 1-14, 17, 21, 30, 2013 and the higher average daily flow of Jan. 27-29, Jun. 12, 13, Sep. 23, 2013. The peak instantaneous flow of 19 cfs occurred at 1030 on Sep. 23, 2013 at a gage height of 1.03 ft. and a shift of -0.01 ft. It exceeded the stage of measurement No. 226, made Jun. 13, 2013 by 0.55 ft. in stage.

Discharge.-- Shifting control method was used during the entire water year. Shifting is mainly caused by moss growth in the flume and was applied between flume cleanings. Open-water measurements showed unadjusted shifts varying between -0.01 and +0.01 feet. Shifts were applied directly and given full weight except for measurement nos. 219, 220, 221, 222, 223, and 227 which were discounted -6% to +7% to smooth shift distribution.

Special Computations.-- Discharge for periods of ice-affected record was estimated on the basis of good record before and after ice, temperature records (LAPMEXCO), by cutting off ice peaks on graphic chart and partial days of good record. The gage hydrograph was used to determine periods of ice-affected record.

Remarks.-- Record is fair, except for the period when ice formed on the control affecting the stage-discharge relationship. Record during ice affect should be considered poor. The peak instantaneous flow should be considered fair. Station maintained by Russell Crangle and Brian Boughton. Record developed by Brian Boughton.

Recommendations.-- Levels should be run in Water Year 2014.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

LONG HOLLOW AT THE MOUTH NEAR RED MESA

RATING TABLE-- LONREDCO02 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

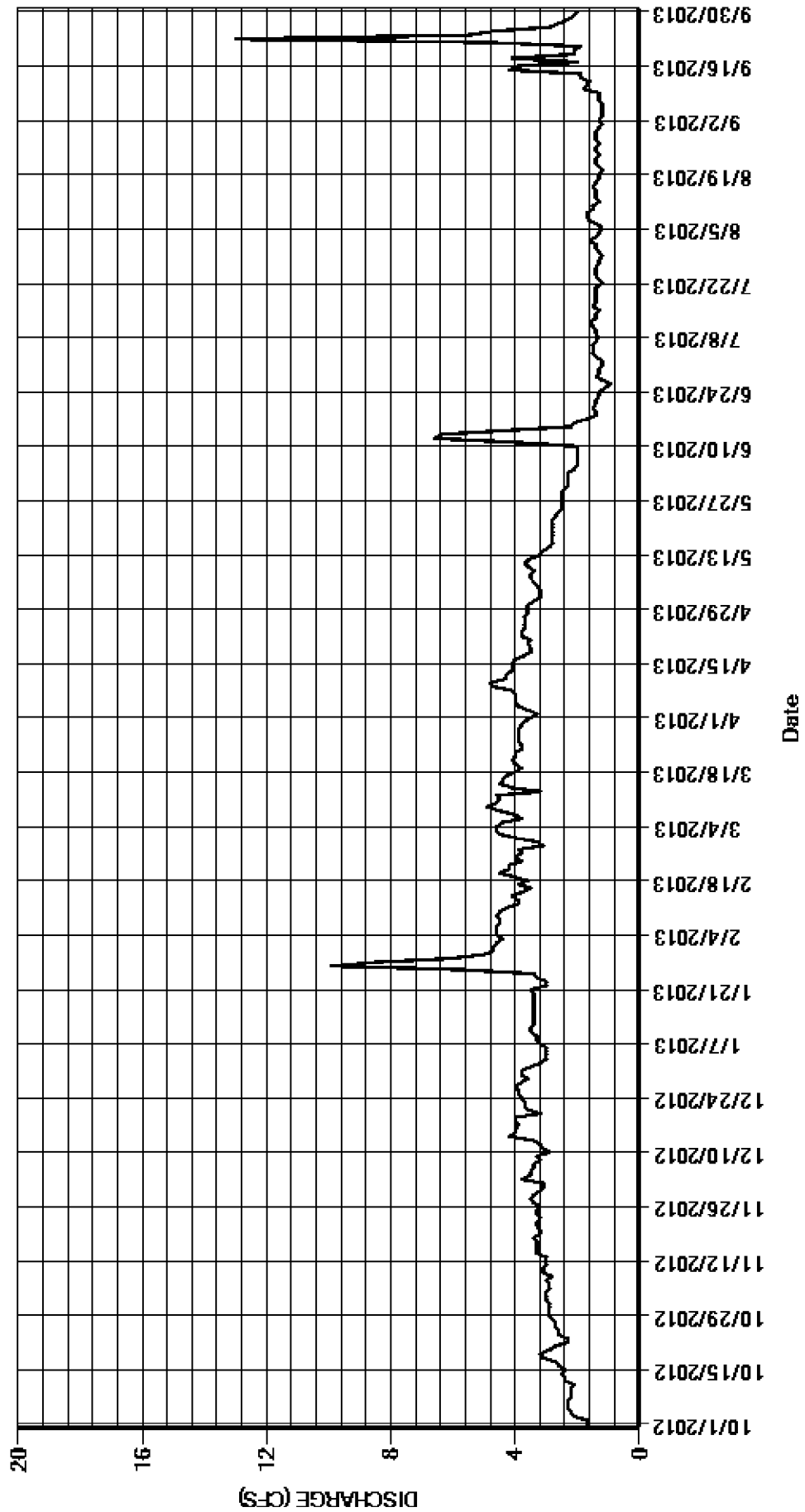
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.7	2.9	3.1	3.5	4.7	4.0	3.5	3.4	2.3	1.2	1.4	1.2
2	1.7	3.0	3.1	3.2	4.6	4.5	3.3	3.2	2.3	1.2	1.6	1.3
3	2.1	3.0	3.8	3.0	4.4	4.6	3.6	3.2	2.3	1.4	1.4	1.2
4	2.2	3.0	3.5	3.0	4.6	4.6	3.9	3.2	2.1	1.5	1.3	1.2
5	2.3	2.9	3.5	3.0	4.6	4.4	4.0	3.3	2.0	1.5	1.2	1.2
6	2.3	2.9	3.4	3.0	4.6	3.8	4.0	3.4	2.0	1.5	1.3	1.2
7	2.3	3.0	3.4	3.2	4.5	4.0	4.0	3.5	2.0	1.4	1.6	1.3
8	2.2	2.8	3.2	3.3	4.5	4.5	4.1	3.5	2.0	1.3	1.7	1.3
9	2.2	3.1	3.3	3.3	4.6	4.9	4.7	3.4	2.0	1.4	1.7	1.3
10	2.2	3.1	2.9	3.5	4.5	4.6	4.8	3.6	2.0	1.4	1.5	1.8
11	2.1	3.0	3.1	3.5	4.3	4.5	4.3	3.7	4.0	1.5	1.5	1.7
12	2.4	3.0	3.2	e3.4	3.9	4.6	4.3	3.5	6.6	1.6	1.3	1.6
13	2.4	3.0	3.4	e3.4	3.9	3.2	4.1	3.2	6.4	1.4	1.4	1.9
14	2.5	3.3	4.2	e3.4	4.1	4.1	4.1	3.1	4.3	1.4	1.4	1.9
15	2.4	3.3	4.0	e3.4	3.8	4.5	4.1	2.9	2.2	1.3	1.4	4.2
16	2.6	3.3	4.0	e3.4	3.5	4.4	4.0	2.8	2.1	1.5	1.5	3.9
17	2.7	3.3	3.9	e3.4	3.9	4.3	3.7	2.8	1.7	1.4	1.4	2.0
18	3.1	3.4	4.0	3.4	3.6	4.0	3.5	2.8	1.4	1.4	1.3	4.1
19	3.2	3.2	4.0	3.4	4.0	3.8	3.5	2.8	1.4	1.4	1.3	2.1
20	2.9	3.2	3.2	3.4	4.5	4.0	3.6	2.8	1.5	1.4	1.2	2.1
21	2.7	3.3	3.6	3.5	4.2	4.1	3.5	2.8	1.4	1.4	1.3	1.9
22	2.3	3.3	3.7	3.0	4.2	4.0	3.8	2.8	1.4	1.2	1.4	4.6
23	2.3	3.2	3.7	3.0	3.8	4.0	3.8	2.7	1.3	1.3	1.4	13
24	2.6	3.3	3.8	3.3	4.0	3.8	3.7	2.6	1.3	1.4	1.3	5.5
25	2.6	3.3	3.9	3.4	3.8	3.8	3.7	2.5	1.1	1.4	1.4	4.7
26	2.7	3.2	3.9	5.7	3.9	3.9	3.7	2.5	0.93	1.4	1.4	2.9
27	2.7	3.4	4.0	9.9	3.1	3.9	3.7	2.5	1.2	1.3	1.3	2.6
28	2.8	3.5	3.8	8.5	3.3	3.9	3.6	2.5	1.4	1.3	1.4	2.3
29	2.9	3.4	3.6	6.1	---	3.9	3.6	2.5	1.3	1.2	1.4	2.1
30	2.9	3.2	3.8	5.0	---	3.8	3.6	2.4	1.3	1.3	1.4	2.0
31	2.9	---	3.8	4.7	---	3.7	---	2.3	---	1.4	1.3	---
TOTAL	76.9	94.8	111.8	122.2	115.4	128.1	115.8	92.2	65.23	42.7	43.4	80.1
MEAN	2.48	3.16	3.61	3.94	4.12	4.13	3.86	2.97	2.17	1.38	1.40	2.67
AC-FT	153	188	222	242	229	254	230	183	129	85	86	159
MAX	3.2	3.5	4.2	9.9	4.7	4.9	4.8	3.7	6.6	1.6	1.7	13
MIN	1.7	2.8	2.9	3.0	3.1	3.2	3.3	2.3	0.93	1.2	1.2	1.2

CAL YR	2012	TOTAL	1245.30	MEAN	3.40	MAX	7.3	MIN	1.3	AC-FT	2470
WTR YR	2013	TOTAL	1088.63	MEAN	2.98	MAX	13	MIN	0.93	AC-FT	2160

MAX DISCH: 19.0 CFS AT 10:30 ON SEP 23, 2013 GH 1.03 FT SHIFT -0.01 FT  
 MAX GH: 1.03 FT AT 10:30 ON SEP 23, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**LONG HOLLOW AT THE MOUTH NEAR RED MESA  
WY2013 HYDROGRAPH**



SAN JUAN RIVER BASIN  
PIONEER DITCH AT THE COLORADO-NEW MEXICO STATELINE

Water Year 2013

Location.-- Lat. 36°59'55", Long. 108°11'12" referenced to North American Datum of 1983, in NW¼SE¼ sec. 10, T.32 N., R.13 W., NMPM, La Plata County, CO, Hydrologic Unit 14080105, on right bank at Colorado-New Mexico State line.

Drainage Area and Period of Record.-- N/A; Diversion record Nov. 1, 1973 to present (Structure ID = 3304640). Published streamflow record Oct. 1, 1993 to present.

Equipment.-- A Sutron high data rate Satlink 2 DCP with a shaft encoder in a 30-inch diameter corrugated metal pipe shelter and a 20-inch X 20-inch concrete well. The Satlink 2 was replaced with a Satlink2-V2 and the shaft encoder was replaced with a Stage-Discharge-Recorder (SDR) on Aug. 20, 2013. Primary reference gage is outside staff gage (0 to 1.02-ft) installed in flume. Control is a 1-foot concrete Parshall flume. No other changes this year.

Hydrologic Conditions.-- Heavy vegetation growth upstream and downstream will cause changes in shifts from year to year. A head gate to the first ditch lateral is located approximately 25-ft below the flume. On occasion the vegetation growth downstream and operations at the head gate can submerge the Parshall flume. The ditch was last cleaned in March 2012.

Gage-Height Record.-- The primary record is 15-minute shaft encoder data from satellite telemetry with DCP as backup. Data downloaded from the DCP was entered by hand to fill in the missing data from Jul. 5-9, 2013 when the battery voltage was too low to transmit data to the satellite. Missing data caused by removing the shaft encoder and installing an SDR on Aug. 20, 2013 was edited by hand. The gage was visited on 20 separate occasions this water year to verify the shaft encoder and SDR remained calibrated to the primary reference gage. The SDR was adjusted one time this water year (Sep. 16, 2013). The adjustment made was +0.01 feet. The adjustment was distributed by time to the last known correct reading. The record is complete and reliable, except for the following days when ice in the well heaved the float and when the floats were sitting on mud in the stilling well. Float frozen in the well ("a" days) Jan. 26, 2013; Feb. 1-2, 2013. Float in the mud ("a" days) Sep. 26-30, 2013.

Datum Corrections.-- Levels were run on Dec. 3, 2012 to the outside staff gage (OSG) using BM1 as the base. This is the first level set run at this gage and was used to establish elevations. BM1 is the floor of the flume at the staff gage (0.00 ft.). BM2 is the top of the bolt at the northwest corner of the gage house (2.121 ft.). The OSG is the top of the outside staff gage (1.02 ft.). The OSG was found to be reading +0.006 ft. high. No corrections were made since the OSG were found to be within the allowable error tolerances.

Rating.-- The control is a standard, 1-foot, concrete Parshall flume. Rating No. 01 is a standard 1-ft Parshall flume rating above a gage height of 0.12-ft. The intake to the stilling well is 0.12-ft above the floor of the flume. Flows below a gage height 0.12-ft are assumed to be negligible and a 0 flow is assigned to them. Rating No. 01 has been used since the gage was installed and was used all water year. One discharge measurement was made this water year, No. 26. The measured flow was 1.80 cfs. Seven observations of zero or negligible flow were made this water year. They were made on Oct. 4; Dec. 3, 11, 2012; Jun. 27; Jul. 2, 9; Aug. 20, 2013. Discharge measurements and observations of zero flow cover range in stage experienced except for the higher daily flow of Mar. 22-26, Apr. 18-30, May 1-4, 6-12, 14-31; Jun. 1-10, 12, 17-19, 21; Sep. 19-23, 2013. The peak instantaneous flow of 7.26 cfs occurred at 1300 on Sep. 22, 2013 at a gage height of 1.48 ft with a shift of 0.00 ft.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by time. Shifts were distributed using a 0 shift. The shift for the open water measurement was -0.02. It was discounted -4% to the rating.

Special Computations.-- The head gate was closed on Sep. 26, 2013. Once the water drained from the ditch and stilling well, the silt in the bottom of the stilling well would not allow the float to settle below a gage height of 0.20. Flows were assumed to be 0 once the gage height was at or below a gage height of 0.20 ft. for the period Sep. 26-30, 2013.

Remarks.-- Record is good except for the period when ice heaved the float and when the float was sitting on mud. Record during this period should be considered fair. The peak instantaneous flow is assumed to be good, but it is unknown if the flume was submerged. Station maintained by Matt Schmitt, Russell Crangle and Brian Boughton. Record developed by Brian Boughton.

Recommendations.-- Currently the bottom of the well is level with the bottom of the intake. Mud and silt can build up enough and not allow the float to settle to the bottom. The existing stilling well should be removed and a deeper one installed or the bottom of the existing well should be removed and excavated deeper.

STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

PIONEER DITCH AT THE COLORADO-NEW MEXICO STATELINE

RATING TABLE-- PIODITCO01 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

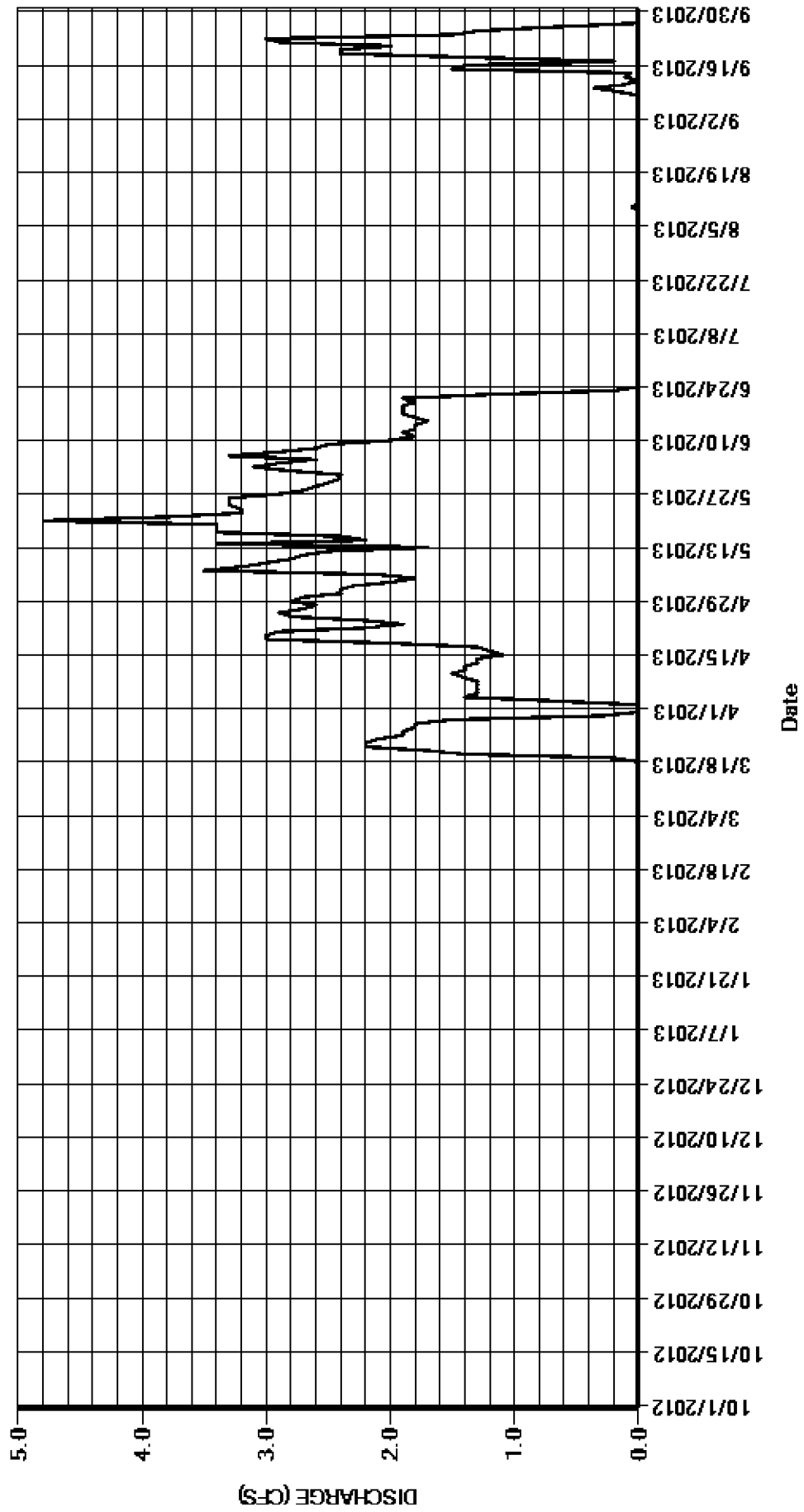
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	e0.00	0.00	0.00	2.4	2.4	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	e0.00	0.00	0.00	2.4	2.8	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.70	2.3	3.1	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	1.4	2.0	2.9	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	1.3	1.8	2.6	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	1.3	2.1	3.3	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	1.3	3.5	2.9	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	1.3	3.2	2.6	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	1.4	3.0	2.5	0.00	0.00	0.15
10	0.00	0.00	0.00	0.00	0.00	0.00	1.5	2.8	2.0	0.00	0.05	0.36
11	0.00	0.00	0.00	0.00	0.00	0.00	1.4	2.7	1.8	0.00	0.00	0.11
12	0.00	0.00	0.00	0.00	0.00	0.00	1.4	2.5	1.9	0.00	0.00	0.01
13	0.00	0.00	0.00	0.00	0.00	0.00	1.3	1.7	1.8	0.00	0.00	0.11
14	0.00	0.00	0.00	0.00	0.00	0.00	1.3	3.4	1.8	0.00	0.00	0.06
15	0.00	0.00	0.00	0.00	0.00	0.00	1.1	2.2	1.7	0.00	0.00	1.5
16	0.00	0.00	0.00	0.00	0.00	0.00	1.2	2.4	1.8	0.00	0.00	1.4
17	0.00	0.00	0.00	0.00	0.00	0.00	1.3	3.4	1.9	0.00	0.00	0.20
18	0.00	0.00	0.00	0.00	0.00	0.00	2.0	3.4	1.9	0.00	0.00	1.3
19	0.00	0.00	0.00	0.00	0.00	0.20	3.0	3.4	1.9	0.00	0.00	2.4
20	0.00	0.00	0.00	0.00	0.00	1.4	3.0	4.8	1.8	0.00	0.00	2.4
21	0.00	0.00	0.00	0.00	0.00	1.7	2.9	3.8	1.9	0.00	0.00	2.0
22	0.00	0.00	0.00	0.00	0.00	2.2	2.2	3.2	1.2	0.00	0.00	2.9
23	0.00	0.00	0.00	0.00	0.00	2.2	1.9	3.2	0.19	0.00	0.00	3.0
24	0.00	0.00	0.00	0.00	0.00	2.1	2.2	3.3	0.00	0.00	0.00	1.5
25	0.00	0.00	0.00	0.00	0.00	1.9	2.8	3.3	0.00	0.00	0.01	1.3
26	0.00	0.00	0.00	e0.00	0.00	1.9	2.9	3.3	0.00	0.00	0.00	e0.68
27	0.00	0.00	0.00	0.00	0.00	1.8	2.7	2.9	0.00	0.00	0.00	e0.00
28	0.00	0.00	0.00	0.00	0.00	1.8	2.6	2.7	0.00	0.00	0.00	e0.00
29	0.00	0.00	0.00	0.00	---	1.5	2.8	2.6	0.00	0.00	0.00	e0.00
30	0.00	0.00	0.00	0.00	---	0.29	2.7	2.5	0.00	0.00	0.00	e0.00
31	0.00	---	0.00	0.00	---	0.00	---	2.4	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	18.99	52.90	88.6	48.69	0.00	0.06	21.38
MEAN	0.000	0.000	0.000	0.000	0.000	0.61	1.76	2.86	1.62	0.000	0.002	0.71
AC-FT	0	0	0	0	0	38	105	176	97	0	0.1	42
MAX	0.00	0.00	0.00	0.00	0.00	2.2	3.0	4.8	3.3	0.00	0.05	3.0
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.7	0.00	0.00	0.00	0.00

CAL YR	2012	TOTAL	252.22	MEAN	0.69	MAX	4.4	MIN	0.00	AC-FT	500
WTR YR	2013	TOTAL	230.62	MEAN	0.63	MAX	4.8	MIN	0.00	AC-FT	457

MAX DISCH: 7.26 CFS AT 13:00 ON SEP 22, 2013 GH 1.48 FT SHIFT 0 FT  
 MAX GH: 1.48 FT AT 13:00 ON SEP 22, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PIONEER DITCH AT THE COLORADO-NEW MEXICO STATELINE  
 WY2013 HYDROGRAPH





SAN JUAN RIVER BASIN  
ENTERPRISE DITCH AT THE COLORADO-NEW MEXICO STATELINE  
Water Year 2013

Location.-- Lat. 37°00'34.6", Long. 108°11'23.3", in SW¼SE¼ sec. 3, T.32 N., R.13 W., NMPM, La Plata County, CO, Hydrologic Unit 14080105, on left bank 2,200 ft. upstream of the confluence of La Plata River and Johnny Pond Arroyo .

Drainage Area and Period of Record.-- NA; Diversion record Nov. 1, 1948 to present (Structure ID = 3300540 – water used in Colorado) and/or diversion record Nov. 1, 1973 to Oct. 31, 2010 (Structure ID = 3304639 – water used in New Mexico). Diversion record Nov. 1, 2010 to present (Structure ID = 3300540 - water used in Colorado and New Mexico).

Equipment.-- Published streamflow record Oct. 1, 1993 to present.

Equipment.-- Sutron Satlink 2 high data rate DCP with a shaft encoder in a 30" diameter corrugated metal pipe shelter and 24" X 17" X 27" (L, W, H) concrete stilling well. Primary reference gage is an outside staff gage installed in flume. Control is a 2-foot concrete Parshall flume. No changes this year.

Hydrologic Conditions.-- The ditch above and below the control is silt with a very well defined stilling pool above the flume. The approach conditions into the flume are good but can degrade if willow growth along the ditch is not maintained. The last time ditch maintenance occurred near the flume was May 4-10, 2006. Silt can deposit in the stilling pool above the flume causing the velocity to increase. Vegetative growth downstream can submerge the flume if the ditch is not maintained.

Gage-Height Record.-- The primary record is 15-minute shaft encoder data downloaded from satellite telemetry. Data downloaded from the DCP was used to fill in missing data on Mar. 29 and Apr. 24, 2013. The gage was visited on 27 separate occasions this water year to verify the shaft encoder remained calibrated to the primary reference gage. The shaft encoder was adjusted four times this water year (-0.01 on Oct. 4, 2012, -0.02 on Oct. 17, 2012, -0.02 on May 6, 2013 and +0.01 on May 20, 2013). Moss was removed on Jul. 2, 2013 and resulted in a -0.03 correction. Water leaked past the head-gate all winter long and froze in the flume and stilling well. The period affected by ice in the flume ("b" day) is Dec. 9, 14-17, 2012. The period affected by the freezing well or intake ("a" day) is Dec. 10-13, 18-31, 2012; Jan. 1-31; Feb. 1-28; Mar. 1-14, 2013. Floats were freed from the ice on Mar. 14, 2013. Record is complete and reliable.

Datum Corrections.-- Levels were run on Dec. 3, 2012 to the outside staff gage (OSG) using BM1 as the base. BM1 is the floor of the flume at the staff gage (0.00 ft.). BM2 was established as the top of the bolt at the northwest corner of the gage house (1.842 ft.). The OSG is the top of the outside staff gage (1.56 ft.). The OSG was found to be reading 0.002 ft. low. No corrections were made since the OSG was found to be within the allowable error tolerances.

Rating.-- The control is a 2 foot concrete Parshall flume. Rating No. 01 is a standard 2-ft. Parshall flume rating above a gage height of 0.03 ft. and was used the entire water year. The intake to the stilling well is 0.03 ft. above the floor of the flume. Flows at and below a gage height 0.03 ft. are assumed to be negligible and a 0 discharge is assigned to them. The rating is fairly well defined to 7.4 cfs. Three discharge measurements and 3 observations of zero flow (Nov. 19, 26, 2012; Mar. 25, 2013) were made this water year. They range in discharge from 0.00 to 6.54 cfs. The measurements cover the entire range in stage experienced. The peak instantaneous flow of 6.44 cfs occurred at 1430 on Apr. 30, 2013 at a gage height of 0.87 ft with a shift of 0.00 ft. It matched the stage of measurement No. 34, made on Apr. 30, 2013.

Discharge.-- Shifting section control method was used for all periods of good record as the range in stage experienced this year was confined to the Parshall flume. Measurements are made in the flume at the staff gage and well intake. Shifts were applied as defined by measurements and were distributed by time. All measurements were given full weight and applied directly except for measurement nos. 33, 34 and 35 which were discounted (1.5% to 4.5%) back to the rating. A 0.00 ft. shift was applied for the entire period of record.

Special Computations.-- Discharge for periods of ice-affected record was estimated on the basis of good record before and after ice and onsite observations. It was assumed the gate leakage was consistent during the winter period. The gage hydrograph was used to determine periods of ice-affected record.

Remarks.-- Record good, except for periods when ice affected the stage-discharge relationship. Record during this period was estimated and should be considered poor. Peak instantaneous flow should be considered good. Station maintained by Matt Schmitt, Russell Crangle and Brian Boughton. Record developed by Brian Boughton.

Recommendations.-- Additional benchmarks should be established at the gage.

STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

ENTERPRISE DITCH AT THE COLORADO-NEW MEXICO STATELINE

RATING TABLE-- ENTDTICO01 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

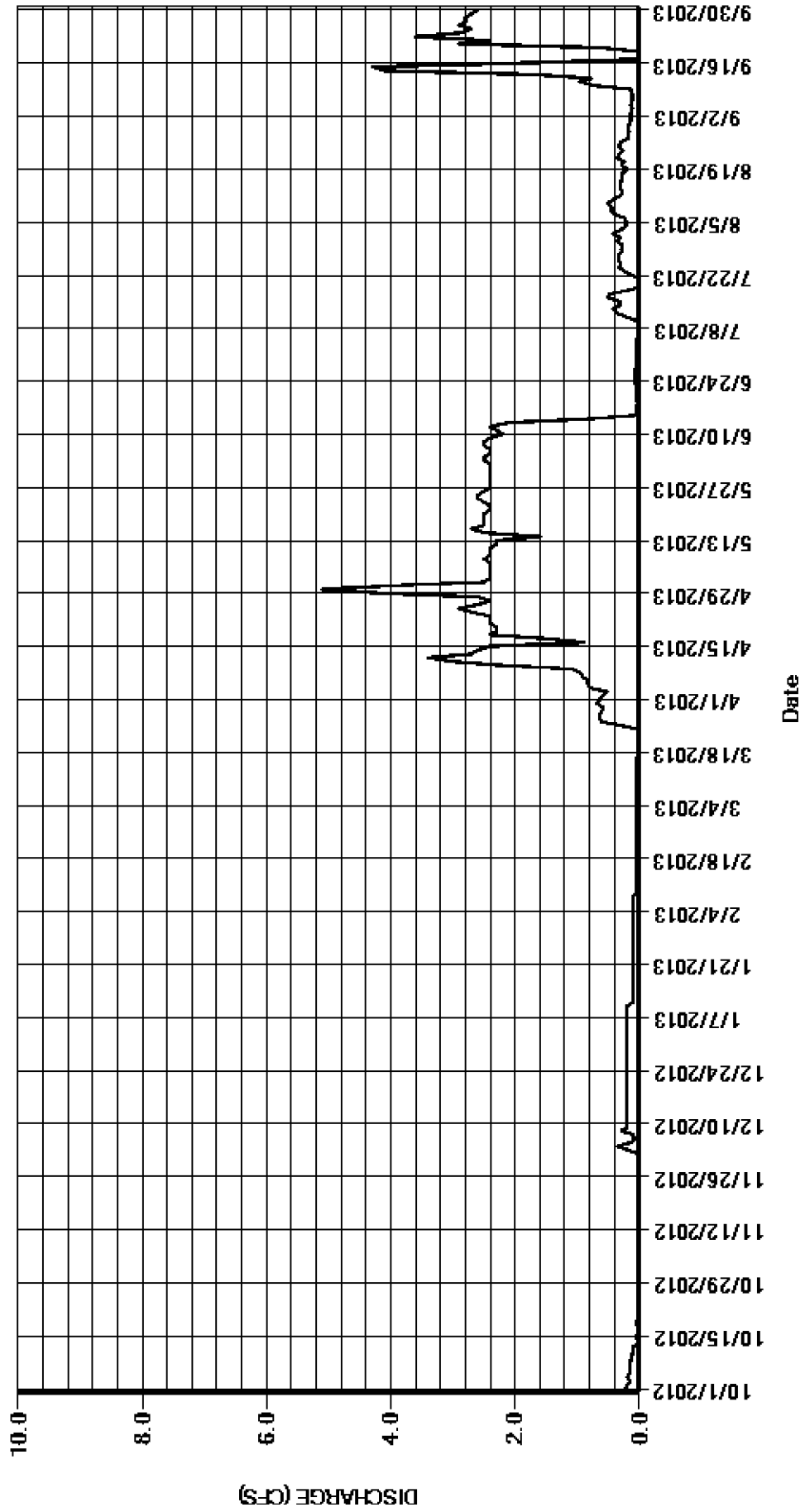
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.23	0.00	0.00	e0.20	e0.10	e0.05	0.64	4.0	2.4	0.05	0.31	0.13
2	0.19	0.00	0.00	e0.20	e0.10	e0.05	0.58	2.5	2.4	0.05	0.42	0.16
3	0.15	0.00	0.19	e0.20	e0.10	e0.05	0.53	2.4	2.5	0.04	0.30	0.13
4	0.19	0.00	0.35	e0.20	e0.10	e0.05	0.79	2.4	2.5	0.04	0.22	0.12
5	0.16	0.00	0.13	e0.20	e0.10	e0.05	0.83	2.4	2.4	0.04	0.22	0.14
6	0.16	0.00	0.08	e0.20	e0.10	e0.05	0.83	2.4	2.4	0.00	0.23	0.12
7	0.16	0.00	0.10	e0.20	e0.10	e0.05	0.92	2.4	2.5	0.00	0.40	0.11
8	0.15	0.00	0.29	e0.20	e0.10	e0.05	0.95	2.5	2.5	0.00	0.45	0.12
9	0.13	0.00	e0.20	e0.20	e0.05	e0.05	1.1	2.4	2.4	0.00	0.45	0.13
10	0.12	0.00	e0.20	e0.20	e0.05	e0.05	2.2	2.4	2.2	0.05	0.52	0.73
11	0.10	0.00	e0.20	e0.10	e0.05	e0.05	3.0	2.4	2.3	0.22	0.42	0.96
12	0.10	0.00	e0.20	e0.10	e0.05	e0.05	3.4	2.3	2.4	0.37	0.30	0.78
13	0.01	0.00	e0.20	e0.10	e0.05	e0.05	2.7	2.3	2.1	0.42	0.28	1.7
14	0.04	0.00	e0.20	e0.10	e0.05	e0.05	2.6	1.6	0.83	0.32	0.31	4.1
15	0.04	0.00	e0.20	e0.10	e0.05	0.05	2.4	2.5	0.05	0.32	0.31	4.3
16	0.00	0.00	e0.20	e0.10	e0.05	0.05	0.89	2.7	0.05	0.50	0.29	1.9
17	0.00	0.00	e0.20	e0.10	e0.05	0.03	1.5	2.5	0.05	0.48	0.28	0.00
18	0.04	0.00	e0.20	e0.10	e0.05	0.02	2.4	2.5	0.03	0.18	0.27	0.00
19	0.04	0.00	e0.20	e0.10	e0.05	0.00	2.3	2.5	0.04	0.00	0.19	0.00
20	0.01	0.00	e0.20	e0.10	e0.05	0.00	2.3	2.5	0.04	0.00	0.29	0.62
21	0.00	0.00	e0.20	e0.10	e0.05	0.00	2.4	2.4	0.05	0.00	0.25	2.9
22	0.00	0.00	e0.20	e0.10	e0.05	0.00	2.4	2.4	0.05	0.11	0.36	2.4
23	0.00	0.00	e0.20	e0.10	e0.05	0.00	2.4	2.5	0.06	0.25	0.32	3.6
24	0.00	0.00	e0.20	e0.10	e0.05	0.00	2.7	2.6	0.08	0.32	0.27	2.9
25	0.00	0.00	e0.20	e0.10	e0.05	0.28	2.9	2.6	0.08	0.31	0.33	2.7
26	0.00	0.00	e0.20	e0.10	e0.05	0.61	2.6	2.5	0.08	0.33	0.31	2.9
27	0.00	0.00	e0.20	e0.10	e0.05	0.64	2.4	2.4	0.08	0.34	0.19	2.8
28	0.00	0.00	e0.20	e0.10	e0.05	0.64	2.6	2.4	0.05	0.29	0.18	2.8
29	0.00	0.00	e0.20	e0.10	---	0.60	4.2	2.4	0.05	0.29	0.17	2.7
30	0.00	0.00	e0.20	e0.10	---	0.59	5.1	2.4	0.05	0.28	0.18	2.6
31	0.00	---	e0.20	e0.10	---	0.68	---	2.4	---	0.35	0.16	---
TOTAL	2.02	0.00	5.74	4.10	1.80	4.89	62.56	76.6	32.72	5.95	9.18	44.55
MEAN	0.065	0.000	0.19	0.13	0.064	0.16	2.09	2.47	1.09	0.19	0.30	1.48
AC-FT	4.0	0	11	8.1	3.6	9.7	124	152	65	12	18	88
MAX	0.23	0.00	0.35	0.20	0.10	0.68	5.1	4.0	2.5	0.50	0.52	4.3
MIN	0.00	0.00	0.00	0.10	0.05	0.00	0.53	1.6	0.03	0.00	0.16	0.00

CAL YR	2012	TOTAL	330.12	MEAN	0.90	MAX	6.1	MIN	0.00	AC-FT	655
WTR YR	2013	TOTAL	250.11	MEAN	0.69	MAX	5.1	MIN	0.00	AC-FT	496

MAX DISCH: 6.44 CFS AT 14:30 ON APR 30, 2013 GH 0.87 FT SHIFT 0 FT  
MAX GH: 0.87 FT AT 14:30 ON APR 30, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ENTERPRISE DITCH AT THE COLORADO-NEW MEXICO STATELINE  
WY2013 HYDROGRAPH



SAN JUAN RIVER BASIN

09366500 LA PLATA RIVER AT THE COLORADO-NEW MEXICO STATELINE

Water Year 2013

Location.-- Lat. 36°59'58.87", Long. 108°11'19.22" NAD83, in NW¼SE¼ sec. 10, T.32 N., R.13 W., NMPM, La Plata County, CO, Hydrologic Unit 14080105, on right bank at Colorado-New Mexico State line, 0.5 mi downstream of Johnny Pond Arroyo, and 4.9 mi north of La Plata, NM.

Drainage Area and Period of Record.-- 331 mi<sup>2</sup>. ; Jan. 1920 to current year. Monthly data only for some periods.

Equipment.-- Graphic water stage-recorder and Sutron Satlink 2 Data Collection Platform (DCP) and shaft encoder on separate floats in a 42-inch diameter CMP well and 64-inch by 64-inch cement block shelter. The Satlink 2 was removed and a Sutron Satlink2-V2 was installed on Aug. 20, 2013. The shaft encoder was removed and a Stage-Discharge-Recorder (SDR) was installed on Aug. 20, 2013. The floats are located inside of a 14 inch PVC oil cylinder. The primary reference gage is an electric drop tape inside the gage house. A secondary reference gage is a steel drop tape referenced to a line on an adjustable brass nut attached to the front of the instrument shelf. The secondary reference gage is used to reference the gage height inside the oil cylinder when the well is frozen. The station is also equipped with an air temperature sensor. The control is a compound concrete long throated flume, hereafter referred to as a "ramp flume". A foot bridge located 6 feet below the gage house is used for access and to make high flow measurements. No other changes this water year.

Hydrologic Conditions.-- The drainage area above the gage is 331 square miles. The basin begins in high mountain terrain above 11,000 feet and drops to 5,972 feet at the gage. The gage is located at the Colorado-New Mexico Stateline. The basin mainly consists of rock and forested mountains to an elevation of 8,000 feet (Hesperus) and changes to agricultural from Hesperus to the Stateline. Many diversions for irrigation occur above this gage.

Gage-Height Record.-- The primary record is 15-minute shaft encoder and SDR data downloaded from satellite telemetry with DCP download data and graphic chart record for backup purposes. Missing data on May 4, 15, 2013 was filled in by hand for the corresponding time period from the DCP download data. Missing data on Aug. 20, 2013 when the DCP was replaced was not filled in. The gage was visited on 45 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted 5 times this water year (Oct. 4, 2012 with +0.02 ft. correction, Feb. 22, 2013 with -0.01 ft. correction, Apr. 15, 2013 with +0.01 ft. correction, Apr. 30, 2013 with -0.01 ft. correction and Sep. 23, 2013 with -0.01 ft. correction). The record was corrected by distributing the correction by time to the last known matched reading. Two flush corrections were applied this water year (Nov. 6, 2012 with a +0.01 ft. correction and Apr. 22, 2013 with a +0.02 ft. correction). An oil correction was applied on Sep. 22, 23, 2013. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Nov. 12-15, 25-30; Dec. 8-31, 2012; Jan. 1-31; Feb. 1-10, 13-15, 19, 20, 2013.

Datum Corrections.-- No levels were run this water year. Levels were last run on Aug. 23, 2012 to the electric tape index (ETI) using RM #3 as the base. No corrections were made since the ETI and electric tape length (TL\_ET) were found to be within the allowable error tolerances.

Rating.-- The control is a long throated flume, hereafter referred to as a "Ramp Flume" that was constructed in August of 2001 to act as the control section for the gage. Low flows, 0 to 1.6 cfs, (GH 2.80 ft. to 3.30 ft.) are controlled by the low flow notch in the ramp flume. Medium flows, 1.6 cfs to 320 cfs, (GH 3.30 ft. to 5.37 ft.) are controlled by the second stage of the ramp flume. High flows (above 320 cfs) are controlled by the channel. High flows begin when the stage reaches 5.37 ft. At stages 5.37 ft. to 8.40 ft., water will overbank on the left side into a natural section lined with grass, trees and willows. The ramp flume is located about 14 feet below the inlets to the gage. The point-of-zero-flow (PZF) is approximately 2.80 ft. The PZF was not measured this water year. Rating No. 33 in use since Oct. 1, 2008 was used the entire water year. The rating is well-defined to 572 cfs. The upper end of the rating table (above 1200 cfs) is based on the poor measurement made Sept. 9, 2003. Fifteen discharge measurements (Nos. 1449-1463) were made this year, ranging in discharge from 0.43 to 123 cfs. Six observations of 0 flow were made this year. Observations of 0 flow were made on Jul. 9, 22, Aug. 6, 16, 20, Sep. 13, 2013. Measurements and observations of 0 flow cover the range in stage experienced except for the higher daily flows of Sep. 22, 23, 2013. The peak instantaneous flow of 1,210 cfs occurred at 0015 on Sep. 23, 2013 at a gage height of 8.39 ft. with a shift of 0.00 ft. It exceeded the stage of measurement No. 1462, made Sep. 23, 2013 by 3.77 feet in stage.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by time and stage. The variable shift curve LAPMEXCOVS12B in use at the end of water year 2012 continued until Mar. 27, 2013. Shifts were distributed by time from Mar. 27, 2013 until Apr. 15, 2013. Variable shift curve LAPMEXCOVS13A began on Apr. 15, 2013 and was used the remaining part of the water year. Open-water measurements showed unadjusted shifts varying between -0.07 and +0.01 feet. Shifts were applied directly and given full weight except measurement Nos. 1449, 1455, 1456, 1458, 1460, 1461, and 1462 which were discounted from -11% to 8% to smooth shift distribution. The shift for measurement no. 1450 was not used. The shift from check measurement no. 1451, made the same day, was used. The shift for measurement no. 1453 was not used because it was affected by ice on the control.

Special Computations.-- The Stateline hydrograph along with air temperature collected at the gage and site visits were used to determine periods of ice-affected record. The Long Hollow at the Mouth (LONREDCO) gage was primary record used to compare and estimate flows at the Stateline gage. The control at the Long Hollow gage is a Parshall flume and will remain ice free most of the winter. The gage is also a good comparison because it is the only live tributary to the La Plata River above the Stateline gage. The La Plata River above the confluence of Long Hollow was dry all winter. The high flows on Sep. 22, 23, 2013 caused the stage to rise above the top of the cylinder. The top of the oil cylinder was found to be 6.04 feet. A correction was applied to the record to account for the oil in the stilling well.

Remarks.--

Record is good, except for periods when ice affected the stage-discharge relationship. Records during these periods were estimated and should be considered poor. Record when the flows exceeded 200 cfs should be considered poor. The peak instantaneous flow should be considered poor. Station maintained by Russell Crangle, Matt Schmitt and Brian Boughton. Record developed by Brian Boughton.

Recommendations.-- Install a crest gage.

STATE OF COLORADO  
DIVISION OF WATER RESOURCES  
OFFICE OF STATE ENGINEER

09366500 LA PLATA RIVER AT THE COLORADO-NEW MEXICO STATELINE

RATING TABLE-- LAPMEXCO33 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

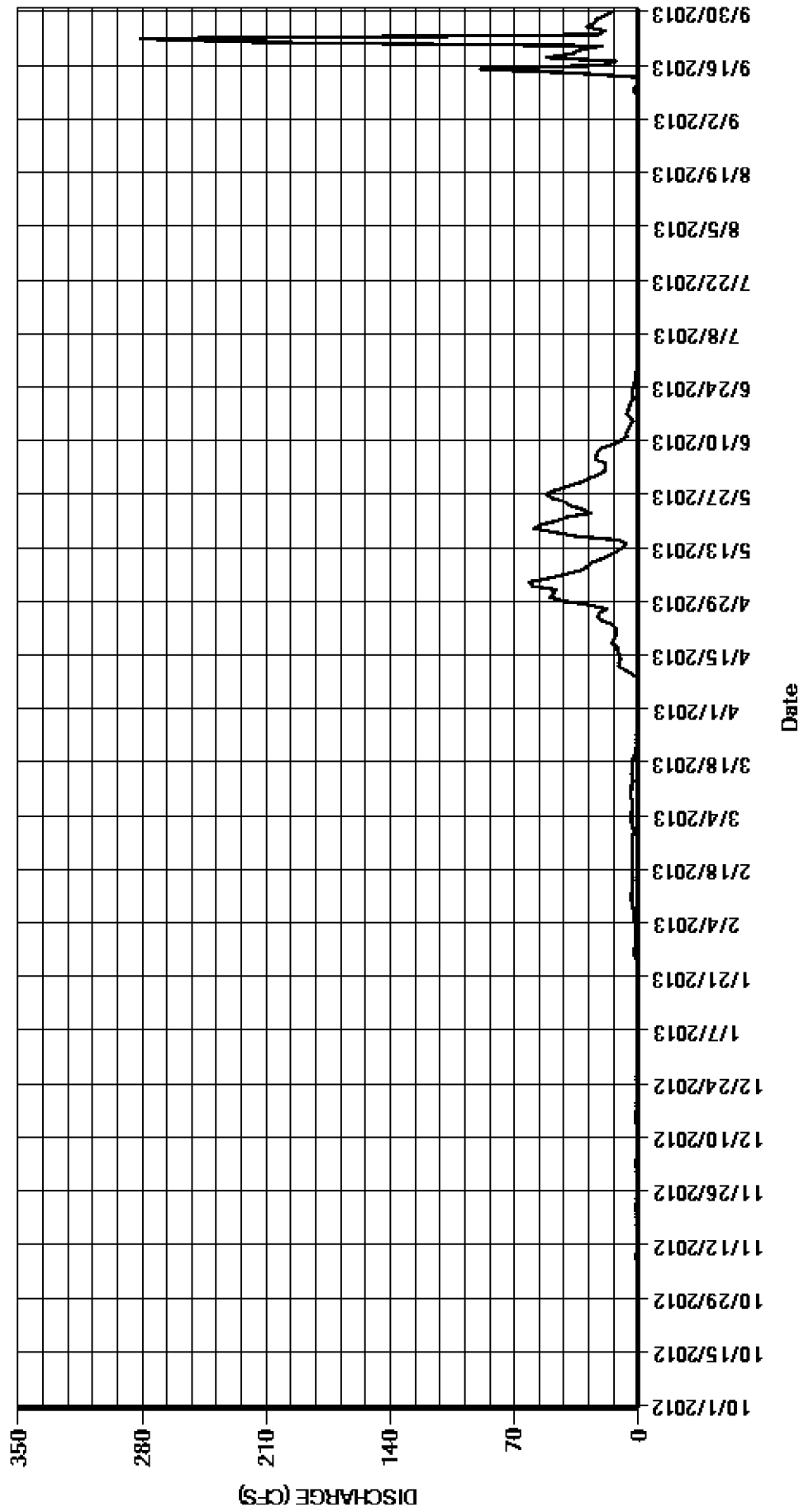
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.31	0.99	1.2	e1.0	e1.6	3.4	0.47	48	23	0.57	0.00	0.00
2	0.24	0.98	1.2	e1.0	e1.7	3.9	0.38	47	19	0.44	0.00	0.00
3	0.20	0.98	1.6	e1.0	e1.9	4.0	0.35	60	19	0.66	0.00	0.00
4	0.43	1.1	1.4	e1.0	e2.2	4.0	0.66	62	19	0.38	0.00	0.00
5	0.40	1.1	0.13	e1.0	e2.4	4.0	0.67	51	24	0.34	0.00	0.00
6	0.43	1.1	0.04	e1.1	e2.6	3.5	0.70	42	24	0.21	0.00	0.00
7	0.40	1.1	0.03	e1.1	e2.8	3.4	0.65	33	23	0.13	0.00	0.00
8	0.44	1.2	e0.20	e1.1	e3.2	3.8	0.62	29	21	0.06	0.00	0.00
9	0.50	1.5	e0.40	e1.1	e3.7	4.4	0.88	27	14	0.05	0.00	2.8
10	0.43	1.1	e0.50	e1.1	e4.0	4.3	3.8	21	9.9	0.04	0.06	2.1
11	0.36	0.95	e0.80	e1.0	4.1	4.0	7.7	16	6.8	0.01	0.01	0.02
12	0.37	e0.70	e1.0	e0.90	3.9	4.0	11	12	6.9	0.00	0.00	0.00
13	0.42	e0.80	e1.1	e0.90	e3.7	3.1	11	9.1	5.7	0.00	0.00	2.9
14	0.44	e0.90	e1.3	e0.90	e3.6	3.5	10	7.0	4.7	0.00	0.00	37
15	0.41	e1.0	e1.3	e0.90	e3.3	3.9	11	11	3.2	0.00	0.00	89
16	0.42	1.1	e1.3	e1.0	3.3	3.7	12	35	4.8	0.00	0.00	21
17	0.50	1.2	e1.2	e1.0	3.7	3.7	12	47	6.6	0.00	0.00	13
18	0.60	1.2	e1.2	e1.0	3.7	3.4	15	59	5.9	0.00	0.00	52
19	1.0	1.2	e1.2	e1.0	e3.6	3.2	14	55	5.1	0.00	0.00	37
20	0.82	1.2	e0.80	e1.0	e3.8	1.8	13	46	4.3	0.00	0.00	33
21	0.82	1.3	e0.90	e1.0	3.7	1.8	13	40	3.0	0.00	0.00	21
22	0.62	1.4	e1.1	e1.0	3.8	1.2	13	27	3.5	0.00	0.00	215
23	0.55	1.2	e1.1	e1.0	3.5	1.2	15	32	3.7	0.00	0.00	281
24	0.58	1.2	e1.2	e1.0	3.7	1.2	21	39	2.9	0.00	0.00	23
25	0.64	e1.2	e1.2	e1.0	3.4	1.2	23	42	2.4	0.00	0.00	19
26	0.84	e1.1	e1.2	e1.7	3.5	0.61	22	49	1.7	0.00	0.08	29
27	0.94	e1.1	e1.1	e3.0	3.2	0.64	18	52	1.5	0.00	0.00	25
28	0.96	e1.1	e1.1	e2.4	2.7	0.61	28	47	1.2	0.00	0.00	24
29	1.0	e1.1	e1.1	e1.8	---	0.56	42	40	0.87	0.00	0.00	19
30	0.94	e1.1	e1.1	e1.4	---	0.49	50	33	0.86	0.00	0.00	15
31	0.99	---	e1.0	e1.6	---	0.53	---	28	---	0.00	0.00	---
TOTAL	18.00	33.20	30.00	37.00	90.3	83.04	370.88	1146.1	271.53	2.89	0.15	960.82
MEAN	0.58	1.11	0.97	1.19	3.22	2.68	12.4	37.0	9.05	0.093	0.005	32.0
AC-FT	36	66	60	73	179	165	736	2270	539	5.7	0.3	1910
MAX	1.0	1.5	1.6	3.0	4.1	4.4	50	62	24	0.66	0.08	281
MIN	0.20	0.70	0.03	0.90	1.6	0.49	0.35	7.0	0.86	0.00	0.00	0.00

CAL YR	2012	TOTAL	3579.98	MEAN	9.78	MAX	80	MIN	0.01	AC-FT	7100
WTR YR	2013	TOTAL	3043.91	MEAN	8.34	MAX	281	MIN	0.00	AC-FT	6040

MAX DISCH: 1210 CFS AT 00:15 ON SEP 23, 2013 GH 8.39 FT SHIFT 0.00 FT  
MAX GH: 8.39 FT AT 00:15 ON SEP 23, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09366500 LA PLATA RIVER AT THE COLORADO-NEW MEXICO STATELINE  
WY2013 HYDROGRAPH



SAN JUAN RIVER BASIN  
MANCOS RIVER NEAR MANCOS

Water Year 2013

Location.-- Lat. 37°21'15", Long. 108°15'33", in NE¼NE¼ sec. 27, T.36 N., R.13 W., NMPM, Montezuma County, Hydrologic Unit 14080107, on the right bank 0.32 miles downstream of the confluence of the East and West Mancos River, 2 miles upstream from the town of Mancos, CO.

Drainage Area and Period of Record.-- 72.6 mi<sup>2</sup>. ; Published by the USGS Oct. 1, 1931 to Sept. 30, 1938. Published by the Colorado Division of Water Resources Nov. 1953 to present.

Equipment.-- Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float in a 64 in x 64 in concrete block shelter and a 42 in CMP well. The primary reference gage is a steel drop tape referenced to an adjustable reference point (RP). An air temperature gage is installed to assist in ice day estimates. The shaft encoder was replaced with a Sutron stage-discharge recorder (SDR) on May 7, 2013. The paper chart recorder was malfunctioning and was replaced with another on Dec. 13, 2012. No other changes in WY 2013.

Hydrologic Conditions.-- Large cobbles and boulders line the channel above and below the gage. Diversions for irrigation and filling reservoirs affect the flow at the gage.

Gage-Height Record.-- The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with the DCP and chart record used for backup purposes. The gage was visited on 26 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder/SDR was adjusted seven (7) times throughout the year, ranging from -0.01 ft to +0.01 ft. Eight (8) flush corrections occurred this water year. The flush corrections occurred on Apr. 25 (+0.01 ft.), May 7 (+0.01 ft.), May 16 (+0.04 ft.), May 29 (+0.04 ft.), Jun. 13 (+0.02 ft.), Sep. 13 (-0.01 ft.), Sep. 20 (+0.01 ft.), and Sep. 25 (+0.01 ft.). The flush corrections were distributed by time within the final record depending on the time of a close inflection point on the hydrograph. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice: Nov. 12, 27, Dec. 9 – 11, 15 – 17, 19 – 22, 25, 28 – 29, 2012, Jan 5 – 6, 29 – 31, Feb. 1 – 27, Mar. 2, 5, 10 – 11, 24 – 25, 2013.

Datum Corrections.-- Levels were not run in water year 2013. Levels were last run on Oct. 6, 2010 using the drop tape reference point (RP) as the base. The benchmarks established on Aug. 16, 2007 were not used because the level loop did not close within allowable error tolerances. Elevations on BM 1 and BM 2 were established from the Oct.6, 2010 set of levels. No adjustments to the datum were made.

Rating.-- The control is a rock riffle located directly below the gage. The channel is the control at high flow. Gravel and sand fill and scour on the control section causing shifts. Rating No. 10, in use since October 28, 2008, was used for the entire water year. It is well defined from 0.99 cfs to 800 cfs. Twenty-one (21) measurements (Nos. 668 - 688) were made during the water year ranging in discharge from 1.60 cfs to 105 cfs. They cover the range in stage experienced except for the lower average daily flows of Oct. 28, Dec. 11 – 12, 22 – 26, 2012, Jan. 1 – 4, 14 – 17, 23, Apr. 21, 2013. The peak instantaneous flow of 150 cfs occurred at 1915 on Sep. 22, 2013 at a gage height of 4.38 ft. with a shift of +0.03 ft. It exceeded the stage of Measurement No. 687, made Sep. 13, 2013 by 0.14 feet in stage.

Discharge.-- Shifting control method was used during the entire water year. Shifting is caused mainly by gravel and sand filling and scouring on the control section and by cobbles moving position on the control. Shifts were transitioned (prorated by time) from water year 2012 through to the third measurement of water year 2013 and then distributed by stage using variable shift curve MANMANCOVS13b from Nov. 26, 2012 until May 7, 2013 where MANMANCOVS13c was transitioned to for the remainder of the water year. Measurements show unadjusted shifts varying from -0.04 feet to +0.04 feet. Shifts were applied directly and given full weight except Measurement Nos. 670, 672, 675, 682, 684, and 686, which were discounted from -8% to +7% to smooth shift distribution. No measurements were made during ice affected times.

Special Computations.-- Discharge for periods of ice affect was estimated on the basis of good partial day record, interim good record, and air temperature record at the gage.

Remarks.-- Record good, except for those periods of ice affected record, which are estimated and poor. The peak instantaneous flow should be considered good. Station maintained by Division 7 staff and record developed by Brian Leavesley.

Recommendations.-- A threshold should be installed to prevent mice and rodents from entering the shelter. Levels should be run in WY 2014.



STATE OF COLORADO  
 DIVISION OF WATER RESOURCES  
 OFFICE OF STATE ENGINEER

MANCOS RIVER NEAR MANCOS

RATING TABLE-- MANMANCO10 USED FROM 01-OCT-2012 TO 30-SEP-2013

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2012 TO SEPTEMBER 2013

MEAN VALUES

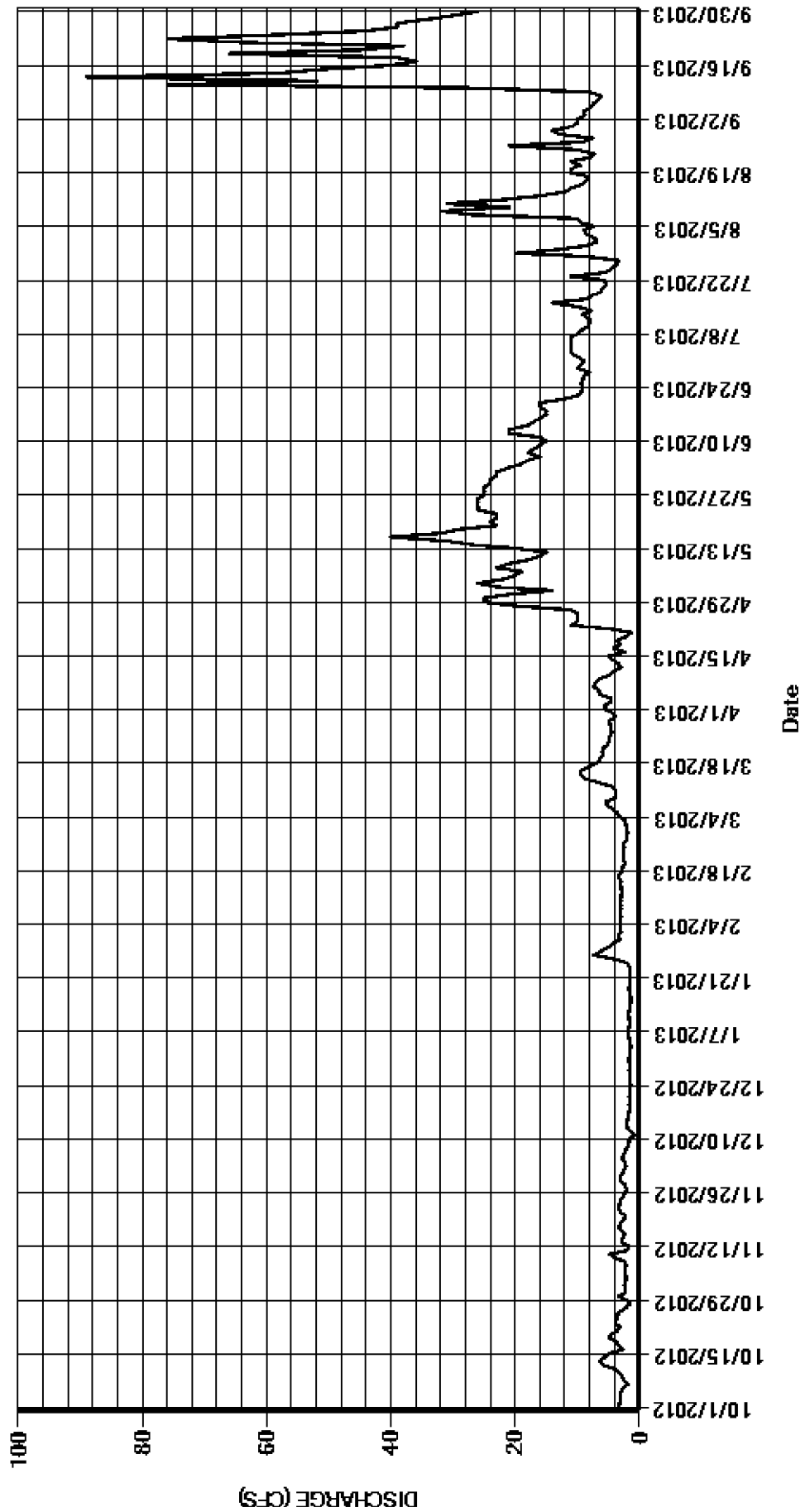
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.3	2.3	2.7	1.5	e3.4	2.1	5.4	21	23	8.9	6.9	10
2	3.2	2.4	2.5	1.5	e3.0	e2.2	5.7	14	23	10	7.1	10
3	3.1	2.2	2.2	1.4	e3.0	2.3	4.6	23	21	11	8.6	8.9
4	3.1	2.1	2.3	1.5	e3.0	3.2	4.6	26	19	11	8.9	8.9
5	3.0	2.3	2.8	e1.6	e3.0	e3.6	6.4	22	18	11	7.4	7.9
6	2.6	2.3	2.5	e1.8	e3.0	4.2	6.6	20	16	11	9.5	7.4
7	1.9	2.2	2.3	1.9	e3.0	5.2	7.4	19	18	11	10	6.6
8	2.5	2.4	1.8	1.7	e3.0	5.3	7.0	23	17	9.9	27	6.2
9	2.8	4.0	e1.7	1.6	e3.0	3.8	6.3	21	16	9.3	32	8.0
10	3.2	4.8	e1.6	1.6	e3.0	e3.8	4.7	18	15	8.2	21	26
11	3.9	2.0	e0.80	1.7	e3.0	e3.9	4.1	16	16	8.0	31	76
12	5.8	e1.7	1.5	1.7	e2.9	4.5	3.0	15	21	8.1	22	52
13	6.3	2.8	1.9	1.6	e2.9	6.6	3.3	20	21	9.2	16	89
14	5.7	2.8	2.1	1.5	e3.0	8.8	4.3	27	18	7.8	12	58
15	4.9	2.4	e1.9	1.4	e3.0	9.4	5.0	31	17	9.9	11	51
16	2.7	2.8	e1.8	1.4	e3.3	9.5	2.3	40	16	14	9.2	40
17	3.2	3.3	e1.7	1.5	e3.3	8.1	4.1	32	15	8.6	8.5	36
18	3.7	3.0	1.6	1.7	e2.8	6.9	3.0	29	15	7.6	8.3	39
19	4.7	2.5	e1.6	1.6	e2.7	6.4	3.5	23	16	6.2	11	66
20	4.7	2.3	e1.6	1.6	e2.3	5.9	2.2	24	16	5.9	11	45
21	3.6	3.1	e1.6	1.6	e2.6	6.0	1.4	23	12	5.3	9.5	38
22	3.1	3.3	e1.5	1.6	e2.6	5.8	4.5	23	9.7	5.7	11	64
23	3.9	3.2	1.5	1.5	e2.6	5.1	11	26	9.3	11	8.0	76
24	3.7	3.1	1.4	1.7	e2.5	e4.8	10	26	9.1	5.4	7.3	58
25	3.6	2.6	e1.5	2.0	e2.6	e4.8	10	26	9.4	4.5	10	44
26	3.1	2.2	1.5	4.2	e2.0	4.5	10	26	9.1	3.7	21	39
27	2.2	e2.1	1.6	7.3	e2.1	4.6	11	25	9.0	3.3	9.2	39
28	1.5	2.3	e1.6	6.2	1.9	4.7	20	25	8.0	7.8	7.5	34
29	2.2	3.0	e1.6	e5.0	---	4.9	25	25	9.9	20	13	30
30	3.3	3.1	1.6	e4.3	---	3.9	25	24	9.4	13	14	26
31	2.3	---	1.7	e3.2	---	4.3	---	24	---	8.6	11	---
TOTAL	106.8	80.6	56.00	70.4	78.5	159.1	221.4	737	451.9	274.9	399.9	1099.9
MEAN	3.45	2.69	1.81	2.27	2.80	5.13	7.38	23.8	15.1	8.87	12.9	36.7
AC-FT	212	160	111	140	156	316	439	1460	896	545	793	2180
MAX	6.3	4.8	2.8	7.3	3.4	9.5	25	40	23	20	32	89
MIN	1.5	1.7	0.80	1.4	1.9	2.1	1.4	14	8.0	3.3	6.9	6.2

CAL YR	2012	TOTAL	4293.00	MEAN	11.7	MAX	57	MIN	0.80	AC-FT	8520
WTR YR	2013	TOTAL	3736.40	MEAN	10.2	MAX	89	MIN	0.80	AC-FT	7410

MAX DISCH: 150 CFS AT 19:15 ON SEP 22, 2013 GH 4.38 FT SHIFT 0.03 FT  
 MAX GH: 4.38 FT AT 19:15 ON SEP 22, 2013

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**MANCOS RIVER NEAR MANCOS  
WY2013 HYDROGRAPH**



## Station Identification Codes

## DIV I

CODE	NAME
ADANETCO	ALVA B. ADAMS TUNNEL AT EAST PORTAL (NET), NEAR ESTES PARK
ADATUNCO	ALVA B. ADAMS TUNNEL AT EAST PORTAL, NEAR ESTES PARK
BCRMORCO	BEAR CREEK AT MORRISON
BCRSHECO	BEAR CREEK AT SHERIDAN
BERDITCO	BERTHOUD PASS DITCH AT BERTHOUD PASS
BFCLYOCO	BOULDER CREEK FEEDER CANAL NEAR LYONS
BIGLASCO	BIG THOMPSON AT MOUTH, NEAR LA SALLE
BOBGLNCO	BOB CREEK DITCH NEAR GLENDEVEY
BOCBGRCO	SOUTH BOULDER CREEK BELOW GROSS RESERVOIR
BOCELSCO	SOUTH BOULDER CREEK NEAR ELDORADO SPRINGS
BOCOBOCO	BOULDER CREEK AT BOULDER
BOCOROCO	BOULDER CREEK NEAR ORODELL
BORDITCO	BOREAS PASS DITCH AT BOREAS PASS
BOSDELCO	SOUTH BOULDER CREEK, DIVERSION NR ELDORADO SPRINGS
BTABESCO	BIG THOMPSON RIVER ABOVE LAKE ESTES
BTBLESCO	BIG THOMPSON RIVER BELOW LAKE ESTES
BTANYCO	BIG THOMPSON RIVER AT MOUTH OF CANYON, NEAR DRAKE
BTNFDRCO	NORTH FORK BIG THOMPSON RIVER AT DRAKE
BTPFMCCO	CHARLES HANSEN FEEDER CANAL POWER PLANT TO BIG THOMPSON
CAPDCPCO	CAMERON PASS DITCH NEAR CAMERON PASS
CLAFITCO	CACHE LA POUFRE AT CANYON MOUTH, NEAR FORT COLLINS
CLAGRECO	CACHE LA POUFRE NEAR GREELEY
CLAWASCO	CACHE LA POUFRE AT GREELEY WASTEWATER TREATMENT PLANT
CLEDERCO	CLEAR CREEK AT DERBY
COCREPCO	COAL CREEK NEAR PLAINVIEW
DEADDFCO	DEADMAN DITCH NEAR DEADMAN PARK
DILTUNCO	DILLE TUNNEL NEAR DRAKE
GRNDRDCO	GRAND RIVER DITCH AT LA POUFRE PASS
GUMGLRCO	A.P. GUMBLICK TUNNEL RELEASE TO CLEAR CREEK AT JONES PASS
HFCBBSCO	CHARLES HANSEN FEEDER CANAL BELOW BIG THOMPSON SIPHON
HFCWASCO	CHARLES HANSEN FEEDER CANAL WASTEWAY TO BIG THOMPSON
HOMSPICO	AURORA HOMESTAKE PIPELINE
HSPTUNCO	HOOSIER PASS TUNNEL AT MONTGOMERY RES., NEAR ALMA
LAPTUNCO	LARAMIE POUFRE TUNNEL
LEFTHDCO	LEFTHAND DIVERSION S. ST. VRAIN CREEK NEAR WARD
MICDCPCO	MICHIGAN DITCH AT CAMERON PASS
MIDSTECO	MIDDLE ST. VRAIN CREEK NR. PEACEFUL VALLEY
MOFTUNCO	MOFFAT WATER TUNNEL, GILPIN COUNTY
OLYTUNCO	OLYMPUS TUNNEL (ESTES FOOTHILLS CANAL) AT LAKE ESTES
ONEJURCO	SOUTH PLATTE RIVER AT JULESBURG CHANNEL #1
PIOHDGCO	PIONEER DITCH AT HEADGATE
PIOSTLCO	PIONEER DITCH AT CO/NE STATE LINE
PLABALCO	SOUTH PLATTE RIVER AT COOPER BRIDGE, NEAR BALZAC
PLACHACO	SOUTH PLATTE RIVER BELOW CHATFIELD RESERVOIR
PLACHECO	SOUTH PLATTE RIVER BL. CHEESMAN RESERVOIR
PLADENCO	SOUTH PLATTE RIVER AT DENVER
PLAGEOCO	SOUTH PLATTE RIVER NEAR LAKE GEORGE
PLAGRACO	NORTH FORK SOUTH PLATTE RIVER AT GRANT
PLAHARCO	SOUTH PLATTE RIVER ABOVE ELEVENMILE RESERVOIR
PLAHENCO	SOUTH PLATTE RIVER AT HENDERSON
PLAJUCCO	SOUTH PLATTE RIVER AT JULESBURG COMBINED
PLAJURCO	SOUTH PLATTE RIVER AT JULESBURG RIGHT CHAN. #2
PLAKERCO	SOUTH PLATTE RIVER NEAR KERSEY
PLASPICO	SOUTH PLATTE RIVER ABOVE SPINNEY RESERVOIR
PLASPLCO	SOUTH PLATTE RIVER AT SOUTH PLATTE
PLASTRCO	SOUTH PLATTE RIVER BELOW STRONTIA SPRINGS
PLAWATCO	SOUTH PLATTE RIVER AT WATERTON
PLAWELCO	SOUTH PLATTE RIVER NEAR WELDONA
ROBTUNCO	ROBERTS TUNNEL AT EAST PORTAL NEAR GRANT
SKYDCLCO	SKYLINE DITCH AT CHAMBERS LAKE
SSVWARCO	SOUTH ST. VRAIN NEAR WARD
STCTUNCO	STRAIGHT CREEK TUNNEL AT EISENHOWER TUNNEL
STLINECO	STATELINE DITCH RETURN NEAR JULESBURG
SVCLYOCO	SAINT VRAIN CREEK AT LYONS
SVCLPLCO	ST. VRAIN CREEK AT MOUTH, NEAR PLATTEVILLE

SVSLYOCO	ST. VRain SUPPLY CANAL NEAR LYONS
TARTARCO	TARRYALL CREEK BELOW TARRYALL RESERVOIR
VIDLUNCO	VIDLER TUNNEL NEAR ARGENTINE PASS
WINBYPCO	WIND RIVER BY-PASS NEAR ESTES PARK
WINDESCO	WIND RIVER NEAR ESTES PARK
WSDEARCO	WILSON SUPPLY DITCH NEAR EATON RESERVOIR

DIV II

CODE	NAME
ARXCACCO	ARKANSAS RIVER AND CATLIN CANAL COMBINED
ARXCANCO	ARKANSAS RIVER AT CANYON CITY
ARXCARCO	ARKANSAS RIVER BELOW X-Y DITCH DAM NEAR CARLTON
ARXCATCO	ARKANSAS RIVER BELOW CATLIN DAM NEAR FOWLER
ARXGRNCO	ARKANSAS RIVER AT GRANITE
ARXLAJCO	ARKANSAS RIVER AT LA JUNTA
ARXNEPCO	ARKANSAS RIVER NEAR NEPESTA
ARXNECCO	ARKANSAS RIVER AT NEPESTA ROAD BRIDGE COMBINED
ARXPORCO	ARKANSAS RIVER AT PORTLAND
ARXPUECO	ARKANSAS RIVER ABOVE PUEBLO
ARXROCCO	ARKANSAS RIVER AT ROCKY FORD
ARXSALCO	ARKANSAS RIVER AT SALIDA
ARXWELCO	ARKANSAS RIVER NEAR WELLSVILLE
BOXTUNCO	CHARLES H. BOUSTEAD TUNNEL
BUSTUNCO	BUSK-IVANHOE TUNNEL
CATCANCO	CATLIN CANAL AT CATLIN DAM, NEAR FOWLER
CANSWKCO	CROOKED ARROYO NEAR SWINK
CCACCRCO	CLEAR CREEK ABOVE CLEAR CREEK RESERVOIR
CCBCCRCO	CLEAR CREEK BELOW CLEAR CREEK RESERVOIR
CHCRNACO	CHALK CREEK AT NATHROP
COLDITCO	COLUMBINE DITCH
COCRBVCO	COTTONWOOD CREEK NEAR BUENA VISTA
CRBRLVCO	CUCHARAS RIVER AT BOYD RANCH NEAR LA VETA
CRHBLVCO	CUCHARAS RIVER AT HARRISON BRIDGE NEAR LA VETA
EWIDITCO	EWING DITCH
GRAWESCO	GRAPE CREEK NEAR WESTCLIFFE
HILCANCO	HIGHLAND CANAL BELOW HIGHLAND DAM NEAR LAS ANIMAS
HOMTUNCO	HOMESTAKE TUNNEL
HRC194CO	HORSE CREEK AT HIGHWAY 194
HUREDCCO	HUERFANO RIVER NEAR REDWING
LAKATLCO	LAKE CREEK ABOVE TWIN LAKES RESERVOIR
LAKBTLCO	LAKE CREEK BELOW TWIN LAKES RESERVOIR
LARDITCO	LARKSPUR DITCH AT MARSHALL PASS
LFCBSLCO	LAKE FORK CREEK BELOW SUGAR LOAF DAM NEAR LEADVILLE
MUDTOOCO	MUDDY CREEK NEAR TOONERVILLE
NMCHIGCO	NINEMILE CANAL AT NINEMILE DAM NEAR HIGBEE
OXFDITCO	OXFORD FARMERS DITCH NEAR NEPESTA
PURHILCO	PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMAS
PURHICCO	PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMAS (COMBINED)
PURNICCO	PURGATOIRE R AT NINEMILE DAM, NR HIGBEE COMBINED
PURNINCO	PURGATOIRE RIVER AT NINEMILE DAM, NEAR HIGBEE
PURTRICO	PURGATOIRE RIVER AT TRINIDAD
RACRSTCO	RATON CREEK ABOVE STARKVILLE
RULTOOCO	RULE CREEK NEAR TOONERVILLE
TWITUNCO	TWIN LAKES TUNNEL
WURDITCO	WURTZ DITCH NEAR TENNESSEE PASS
WUREXTCO	WURTZ EXTENSION DITCH NEAR TENNESSEE PASS

DIV III

CODE	NAME
ALABELCO	ALAMOSA CREEK BELOW TERRACE RESERVOIR
ALARANCO	ALAMOSA RIVER BELOW RANGER CREEK
ALATERCO	ALAMOSA CREEK ABOVE TERRACE RESERVOIR
ALAWIGCO	ALAMOSA RIVER ABOVE WIGHTMAN FORK NEAR JASPER
BIGSPGCO	BIG SPRING CREEK AT MEDANO RANCH NEAR MOSCA
CARLAGCO	CARNERO CREEK NEAR LA GARITA
CBPALACO	CLOSED BASIN PROJECT CANAL NEAR ALAMOSA
CHECRECO	CHERRY CREEK NEAR CRESTONE
COCRMICO	COTTON CREEK NEAR MINERAL HOT SPRINGS
COCRESCO	COTTONWOOD CREEK NEAR CRESTONE
CONLASCO	COMBINED CONEJOS RIVER (NORLASCO SOULASCO)

CONMOGCO	CONEJOS RIVER NEAR MOGOTE
CONPLACO	CONEJOS RIVER BELOW PLATORO RESERVOIR
CULSANCO	CULEBRA CREEK AT SAN LUIS
DEDMOUCC	DEADMAN CREEK AT MOUTH OF CANYON NEAR CRESTONE
DEDCRECO	DEADMAN CREEK NEAR CRESTONE
DLFDT0CO	DON LA FONT DITCH, COMBINED, AT PIEDRA PASS
DLFDT1CO	DON LA FONT DITCH NO. 1 AT PIEDRA PASS
DLFDT2CO	DON LA FONT DITCH NO. 2 AT PIEDRA PASS
GARVILCO	GARNER CREEK NEAR VILLA GROVE
GOOWAGCO	GOOSE CREEK AT WAGONWHEEL GAP
KERVILCO	KERBER CREEK NEAR VILLA GROVE
LAGLAGCO	LA GARITA CREEK NEAR LA GARITA
LAJCAPCO	LAJARA CREEK AT GALLEGOS RANCH NEAR CAPULIN
LITSPGCO	LITTLE SPRING CREEK AT MEDANO RANCH NEAR MOSCA
LOSORTCO	LOS PINOS RIVER NEAR ORTIZ
MAJVILCO	MAJOR CREEK NEAR VILLA GROVE
NCLCONCO	NORTH CLEAR CREEK BELOW CONTINENTAL RESERVOIR
NOCRESCO	CRESTONE CREEK, NORTH NEAR CRESTONE
NORDLSCO	NORTON DRAIN NEAR LA SAUSES
NORDSCCO	SOUTH CHANNEL NORTON DRAIN DITCH NEAR LA SAUSES
NORLASCO	NORTH CHANNEL CONEJOS RIVER NEAR LASAUSES
PINDELCO	PINOS CREEK NEAR DEL NORTE
PRWDITCO	PINE RIVER WEMINUCHE PASS DITCH AT WEMINUCHE PASS
RIOALACO	RIO GRANDE RIVER AT ALAMOSA
RIODELCO	RIO GRANDE NEAR DEL NORTE
RIOLINCO	RIO GRANDE AT RIO GRANDE-ALAMOSA COUNTY LINE
RIOLOBCO	RIO GRANDE NEAR LOBATOS
RIOMILCO	RIO GRANDE AT THIRTY MILE BRIDGE
RIOMONCO	RIO GRANDE AT MONTE VISTA
RIOSFKCO	SOUTH FORK RIO GRANDE RIVER AT SOUTH FORK
RIOTRICO	RIO GRANDE RIVER ABOVE THE MOUTH OF TRINCHERA CREEK
RIOWAGCO	RIO GRANDE RIVER AT WAGONWHEEL GAP
RITCRECO	RITO ALTO CREEK NEAR CRESTONE
SAGSAGCO	SAGUACHE CREEK NEAR SAGUACHE
SANCRECO	SAN ISABEL CREEK NEAR CRESTONE
SANFTGCO	SANGRE DE CRISTO CREEK NEAR FT. GARLAND
SANMANCO	SAN ANTONIO RIVER NEAR MANASSA
SANORTCO	SAN ANTONIO RIVER AT ORTIZ
SOUCRECO	SOUTH CRESTONE CREEK NEAR CRESTONE
SOULASCO	SOUTH CHANNEL CONEJOS RIVER NEAR LASAUSES
SPACRECO	SPANISH CREEK NEAR CRESTONE
TABDITCO	TABOR DITCH AT SPRING CREEK PASS
TARBELCO	TARBELL DITCH NEAR COCHETOPA PASS
TREDITCO	TREASURE PASS DITCH AT WOLF CREEK PASS
TRIMTNCO	TRINCHERA CREEK ABOVE MOUNTAIN HOME RESERVOIR
TRISMICO	TRINCHERA CREEK BELOW SMITH RESERVOIR
TRITURCO	TRINCHERA CREEK AB. TURNER'S RANCH
UTEFTGCO	UTE CREEK NEAR FORT GARLAND
WCSBITCO	WILLIAM'S CREEK-SQUAW PASS DITCH AT SQUAW PASS
WEMDITCO	WEMINUCHE PASS DITCH AT WEMINUCHE PASS
WFKMOUCO	WIGHTMAN FORK AT MOUTH AT ALAMOSA RIVER
WFKCROCO	WIGHTMAN FORK BELOW CROPSY CREEK NEAR SUMMITVILLE
WILCRECO	WILLOW CREEK NEAR CRESTONE

DIV IV

CODE	NAME
ABCLATCO	ABC LATERAL
GUNREDCO	GUNNISON RIVER BELOW REDLANDS DIVERSION DAM
MUDAPRCO	MUDDY CREEK ABOVE PAONIA RESERVOIR
MUDBPRCO	MUDDY CREEK BELOW PAONIA RESERVOIR
RLCGRJCO	REDLANDS CANAL NR GRAND JUNCTION
SOUCANCO	SOUTH CANAL NR MONTROSE
UNCBGRCO	UNCOMPAHGRE RIVER AT UNCOMPAHGRE ROAD BRIDGE
UNCOLACO	UNCOMPAHGRE RIVER NEAR OLATHE
UNCUPSCO	UNCOMPAHGRE RIVER UPSTREAM OF SOUTH CANAL

DIV V

CODE	NAME
BLUNINCO	BLUE RIVER AT HIGHWAY 9 BRIDGE
CHAGULCO	CHAPMAN GULCH NEAR NAST
CRYDOWCO	CRYSTAL RIVER AT DOW FISH HATCHERY NEAR CARBONDALE
FRYIVLCO	FRYINGPAN RIVER NEAR IVANHOE LAKE
FRYMERCO	FRYINGPAN RIVER AT MEREDITH
FRYNFNCO	NORTH FORK FRYINGPAN RIVER NEAR NORRIE
FRYSFUCO	SOUTH FORK FRYINGPAN RIVER AT UPPER STATION
FRYTHOCO	FRYINGPAN RIVER NEAR THOMASVILLE
IVCRNACO	IVANHOE CREEK NEAR NAST
RFCMERCO	ROCKY FORK CREEK NEAR MEREDITH
ROABMCCO	ROARING FORK RIVER BELOW MAROON CREEK NEAR ASPEN
SNAKEYCO	SNAKE RIVER AT KEYSTONE
WSDRAVCO	WEST DIVIDE CREEK NEAR RAVEN

DIV VI

CODE	NAME
ILLRANCO	ILLINOIS RIVER NEAR RAND
MICMERCO	MICHIGAN RIVER NEAR MEADOW CREEK RESERVOIR
MICWLDCO	MICHIGAN RIVER NEAR WALDEN
MORBSCCO	MORRISON CREEK BELOW SILVER CREEK
PTCKSLCO	POT CREEK AT UTAH-COLORADO STATELINE NEAR VERNAL
WILBSLCO	WILLOW CREEK BELOW STEAMBOAT LAKE
WLTNCKCO	WALTON CREEK NEAR STEAMBOAT SPRINGS
WMFKHMCO	WILLIAMS FORK AT MOUTH NEAR HAMILTON
YAMABVCO	YAMPA RIVER ABOVE LAKE CATAMOUNT

DIV VII

CODE	NAME
ANIHOWCO	ANIMAS RIVER NEAR HOWARDSVILLE
AZOTUNNM	AZOTEA TUNNEL OUTLET NEAR CHAMA NM
BLADIVCO	BLANCO DIVERSION NEAR PAGOSA SPRINGS
CHEREDCO	CHERRY CREEK AT THE MOUTH NEAR RED MESA
DOLBMCCO	DOLORES RIVER BELOW MCPHEE RESERVOIR
DOLTUNCO	DOLORES TUNNEL OUTLET NEAR DOLORES
ENTDITCO	ENTERPRISE DITCH AT THE COLO-NEW MEXICO STATELINE
FLOALECO	FLORIDA RIVER ABOVE LEMON RESERVOIR NEAR DURANGO
FLOBLECO	FLORIDA RIVER BELOW LEMON RESERVOIR
LAPHESCO	LA PLATA RIVER AT HESPERUS
LAPMEXCO	LA PLATA RIVER AT THE COLORADO/NEW MEXICO LINE
LITOSOCO	LITTLE NAVAJO RIVER BELOW LITTLE OSO DIVERSION DAM NEAR CHROMO
LONREDCO	LONG HOLLOW AT THE MOUTH NEAR RED MESA
LOSODVCO	LITTLE OSO DIVERSION NEAR CHROMO
LPCDITCO	LA PLATA AND CHERRY CREEK DITCH NEAR HESPERUS
MANMANCO	MANCOS RIVER NEAR MANCOS
MVIDIVCO	LONE PINE CANAL BELOW GREAT CUT DIKE NEAR DOLORES
NAVBANCO	NAVAJO RIVER AT BANDED PEAKS RANCH NEAR CHROMO
NAVOSOCO	NAVAJO RIVER BELOW OSO DIVERSION DAM NEAR CHROMO
OSODIVDO	OSO DIVERSION NEAR CHROMO
PINDITCO	PINE RIDGE DITCH NEAR HESPERUS
PIODITCO	PIONEER DITCH AT THE COLORADO-NEW MEXICO STATELINE
RIOBLACO	RIO BLANCO BELOW BLANCO DIVERSION DAM NEAR PAGOSA
RIOMOUCO	RIO BLANCO AT THE MOUTH NEAR TRUJILLO