COLORADO
Parks and Wildlife
Department of Natural Resources

Water Resources Section – Aquatic, Terrestrial, and Natural Resources Branch

January 6, 2021

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

Subject: Instream Flow Recommendations for Redstone Creek in Water Division 1, Larimer County to be presented at the January 2021 CWCB Meeting

Dear Ms. Bassi:

The information contained in and referred to in this letter forms the scientific and biological basis for an instream flow (ISF) recommendation on Redstone Creek in Water Division 1. The field investigations relating to this ISF recommendations were conducted by Colorado Parks and Wildlife (CPW) and Colorado Water Conservation Board (CWCB) personnel in 2019 and 2020 alongside representatives from Larimer County. Larimer County brought this stream candidate to CPW and is supportive of the proposed ISF reach. This stream reach was presented to interested parties at the ISF Workshop in January 2019 and 2020. It is the CPW staff's opinion that the information contained in this letter is sufficient for the CWCB's staff to recommend an ISF appropriation to the Board on Redstone Creek and to specifically address the findings required in Rule 5(i) of the Instream Flow Program Rules.

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

Dan Prenzlow, Director, Colorado Parks and Wildlife • Parks and Wildlife Commission: Marvin McDaniel, Chair • Carrie Besnette Hauser, Vice-Chair
Marie Haskett, Secretary • Taishya Adams • Betsy Blecha • Charles Garcia • Dallas May • Duke Phillips, IV • Luke B. Schafer • James Jay Tutchton • Eden Vardy

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

Recommended Segments

CPW is proposing an ISF recommendation on Redstone Creek from its headwaters (located at UTM 13T 472175 4496738) to the confluence with Buckhorn Creek (UTM 13T 482372 448078). The reach is approximately 15 miles in length. Approximately 7 percent of the proposed reach is on public lands managed by Larimer County as Horsetooth Mountain Open Space; the rest of the proposed reach is under private ownership. This recommendation is a continuation of efforts by CPW to work collaboratively with Larimer County to secure ISF protection on streams adjacent to properties protected as open space.

Natural Environment and Biological Summary

Redstone Creek is a tributary of Buckhorn Creek near Masonville. The stream's hydrology is dominated by snowmelt from lower elevation snow reserves from a maximum elevation of 8,300 feet. Redstone Creek's contributing basin receives approximately 20 inches of precipitation a year and is 31 square miles. Based on observations in 2019 and 2020, streamflow in this reach typically ceases to flow by mid to late-summer. Redstone Creek is a first to third order stream through the proposed reach. The lower portion of Redstone Creek on Larimer County Horsetooth Mountain Open Space is lower gradient with substrate that varies from medium-cobble to sand.

The reach investigated by CPW has a mixture of riffles, runs, glides, and pools, containing good fish habitat, including some large woody debris. Riparian communities include mature cottonwood galleries and juniper. Upland species supported by Redstone Creek include mountain mahogany and Bell's twin pod, considered to be imperiled at a global and state level by Colorado Natural Heritage Program. A 1993 CPW fish survey indicates populations of creek chub, longnose dace, and white sucker. Abundant riparian vegetation provides shading and cover for fish. Although no fish were observed during site visits, macroinvertebrates were noted in the field, including mayfly, caddisfly larvae, and diptera.

Initial Biological Flow Recommendation

Initial biological instream flow recommendations were developed using the R2Cross methodology (Espegren, 1996). R2Cross uses field data that has been collected in riffle habitat type. The field data collection includes a survey of stream channel geometry, a longitudinal slope of the water surface, and a streamflow measurement. This data is used by R2Cross to model

three hydraulic parameters; average depth, average velocity, and percent wetted perimeter. Maintaining these hydraulic parameters at adequate levels across riffle habitat types will also maintain aquatic habitat in pools and runs for most life stages of fish. Flow recommendations are developed based on the flows that meet two of the three hydraulic criteria and three of the three hydraulic criteria as described in Nehring (1979) and Espergren (1996).

In 2019 and 2020, CPW, CWCB, and Larimer County collected three cross-section data sets on Redstone Creek. The results of the R2CROSS analysis are summarized below.

	Bankfull Top Width	**Date Measured**	**Q measured**	**Accuracy Range**	**Flow Meeting Two Criteria**	**Flow Meeting Three Criteria**
1	24 ft	5/30/2019	11.6 cfs	4.6 – 29 cfs	Out of range	Out of range
2	25 ft	5/30/2019	11.4 cfs	4.6 – 29 cfs	Out of range	7.33 cfs
3	23 ft	4/29/2020	12.0 cfs	2.8 – 30 cfs	Out of range	4.96 cfs
Averaged Cross Section Results					**None**	**6.15 cfs**

The initial biological recommendation is 6.2 cfs during the high flow period. The lower portion of Redstone Creek has been observed to exhibit intermittent streamflow, but supports healthy riparian and macroinvertebrate communities. Therefore, CPW does not recommend a baseflow rate outside of the spring to early-summer period. The initial biological summer flow recommendation of 6.2 cfs maintains velocity of 1 foot per second (fps), depths of 0.2 feet, and at least 50 percent wetted perimeter of the stream channel on average over the cross-sections.

Water Availability

In order to make a preliminary determination whether water is available for the R2CROSS-based flow recommendations and to determine the appropriate seasonal transition dates, CPW examined basic hydrologic data and water rights information for Redstone Creek. Redstone Creek does not have any gage data other than the temporary gage CWCB installed in June 2019. The CWCB gage record is limited to less than two years of data, of which 2019 was relatively wet and 2020 exhibited a very pronounced early spring peak runoff and quick recession to a dry spring and summer. As such, CWCB and CPW also relied on records from the nearby USGS gage "Buckhorn Creek near Masonville" to determine the seasonality of the flow recommendation.

CPW is aware of the following water rights within the reach:

DITCH	**WDID**
SODERBERG BROS DITCH 1	400882
BUCKHORN METHODIST AUG IMPACT REACH	402229
BUCKSKIN RESERVOIR	403335
MCKEON UPPER POND	403607
BLEASDALE STOCK POND	403614
GATES LOWER RESERVOIR	403635
GATES MIDDLE RESERVOIR	403636
GATES UPPER RESERVOIR	403637
MOORE RESERVOIR	403672

SODERBERG RANCH RESERVIOR	403686
BUCKHORN METHODIST POND	403710
ESH POND	403712

Biological Flow Recommendation

CPW's analysis of the hydrological data indicates that the following flow rate is needed to protect the natural environment to a reasonable degree. Since no flow has been observed in the lower portion of Redstone Creek after late June and the stream supports healthy riparian and macroinvertebrate communities, no baseflow rate is recommended outside of the runoff period.

- Summer Seasonal Flow Recommendation: 6.2 cfs (May 1 through June 15)
    - This flow rate will provide adequate average depth and percent wetted perimeter across the surveyed riffles although velocity of 1 fps is not quite met in the widest riffle (cross-section 2).

The purpose of this letter is to formally transmit this ISF recommendation to CWCB for their Board's consideration. Based on CPW's opinion that there is a flow-dependent natural environment in Redstone Creek that can be preserved to a reasonable degree with an ISF water right in the recommended rate. Please refer to attachments which include; R2Cross field forms, R2CROSS output, CPW fish survey data, and photographs at each cross section location.

CPW personnel will be available at the January 2021 CWCB meeting to answer any questions that the Board might have regarding these flow recommendations. We appreciate your consideration.

Sincerely,

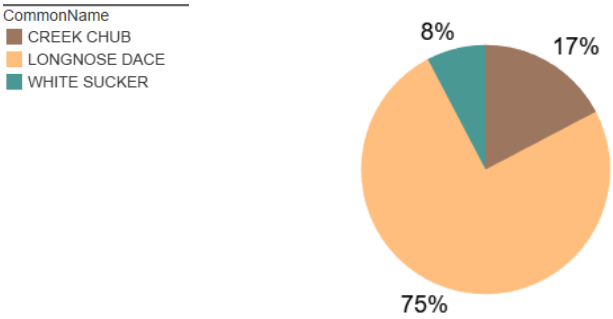
Katie Birch

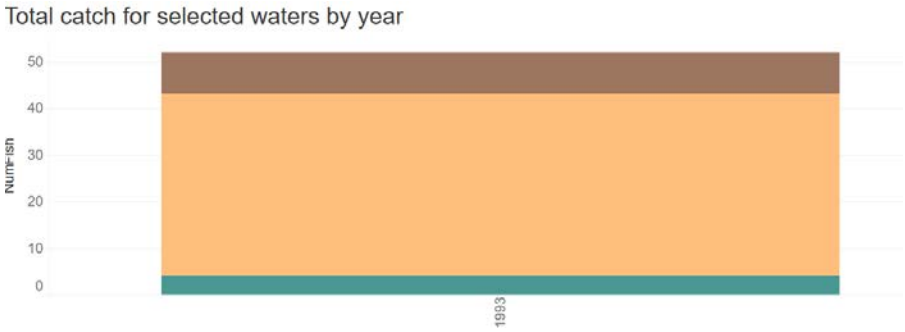
Katie Birch
CPW Instream Flow Program Coordinator
Attachments (as stated)

Redstone Creek

1993 Fishery Survey

Water: Redstone Creek
Station: SP0705
Station Description: Above Glade Road #1
Sampling Date: 8/18/1993
Method: Presence/Absence
Drainage: South Platte
Water Code: 12889





COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Redstone Creek					CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: @ Larimer county property					
DATE: 5/30/19	OBSERVERS: Birch, Scheel, Gilboy, A. (Larimer County)				
LEGAL DESCRIPTION	¼ SECTION: GPS Taken	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY:	WATERSHED:	WATER DIVISION:	DOW WATER CODE:		
MAP(S): USGS:	13T 482367				
USFS:	4486274				

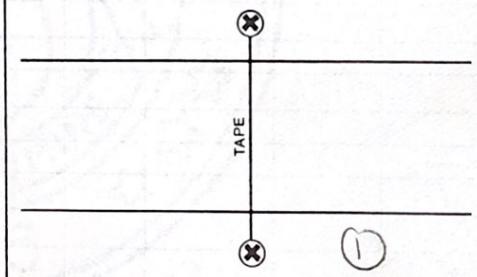
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) / NO	METER TYPE: Marsh McB			
METER NUMBER:	DATE RATED:	CALIB/SPIN: _____ sec	TAPE WEIGHT: _____ lbs/foot	TAPE TENSION: _____ lbs
CHANNEL BED MATERIAL SIZE RANGE:	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS:		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	~
⊗ Tape @ Stake RB	0.0	~
① WS @ Tape LB/RB	0.0	/
② WS Upstream	> 51.5	5.11
③ WS Downstream		5.90
SLOPE	0.79 / 51.5 = 0.015	

SKETCH



LEGEND:
- Stake ⊗
- Station ①
- Photo ①
- Direction of Flow

AQUATIC SAMPLING SUMMARY

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

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

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

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

COMMENTS

Rip: Unique mosaic - cottonwood/juniper (CNHP) Bell's Twin Pool & Mtn Mahogany
Dominant nostoc algae + aquatic plant
CAddis larvae

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Red Stone CR	CROSS-SECTION NO.: 1	DATE: 5/30/19	SHEET 1 OF __
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: ____ ft	TIME: 10:45

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
S	0		3.9								
	3.8		3.9								
BF	4.6		4.4								
	5.5		4.8								
WL	6.2		5.29	0					0		
	7		5.5	0.3					0.12		
	8		5.7	0.45					1.05		
	9		5.7	0.5					1.0		
	10		5.9	0.7					1.47		
	11		5.8	0.7					1.85		
	12		5.9	0.7					0.72		
	13		5.9	0.7					0.56		
	14		6.0	0.7					1.92		
	15		5.7	0.5					2.08		
	16		5.7	0.5					2.53		
	17		5.8	0.6					2.31		
	18		5.7	0.5					2.07		
	19		5.6	0.4					1.93		
	20		5.6	0.4					1.04		
	21		5.5	0.2					0.4		
	22		5.4	0.05					0		
WL	22.5		5.36						0		
	24.0		5.2								
	26.0		4.8								
BF	28.5		4.4								
	32.0		3.7								
TOTALS:											

End of Measurement	Time: 11:20	Gage Reading: ____ ft	CALCULATIONS PERFORMED BY:	CALCULATIONS CHECKED BY:

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Redstone Creek					CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: pLarimer County property					
DATE: 5/30/19	OBSERVERS: Birch, Scheel, Gilboy, A				
LEGAL DESCRIPTION	¼ SECTION: GPS Collected	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY: Larimer	WATERSHED:	WATER DIVISION:	DOW WATER CODE:		
MAP(S): USGS: 13T 482361	USFS: 4486346				

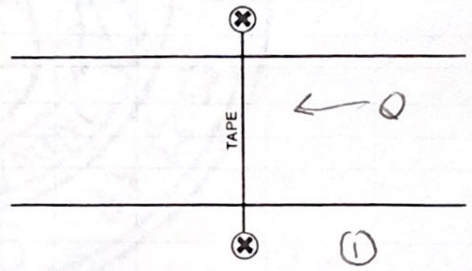
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO	METER TYPE: Marsh McB			
METER NUMBER:	DATE RATED:	CALIB/SPIN: _____ sec	TAPE WEIGHT: _____ lbs/foot	TAPE TENSION: _____ lbs
CHANNEL BED MATERIAL SIZE RANGE:	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS:		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	~
⊗ Tape @ Stake RB	0.0	~
① WS @ Tape LB/RB	0.0	5.45 / 5.47
② WS Upstream	> 32'	5.45
③ WS Downstream		5.59
SLOPE	0.14 / 32 = 0.004	

SKETCH



LEGEND:
- Stake ⊗
- Station ①
- Photo ①→
- Direction of Flow ←→

AQUATIC SAMPLING SUMMARY

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

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

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

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

COMMENTS

Narrow leaf cottonwood + plains cottonwood
caddis larvae, Fish observed
Upland Rabbitbrush, prairie Sage wart, ? mustard

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Redstone	CROSS-SECTION NO.: 2	DATE: 11.42	SHEET ___ OF ___

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME:

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Obser-vation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
OS	0		4.45								
BF	2.6		4.7								
WL	3.6		5.45	0					0		
	4		5.55	0.1					0		
	5		5.85	0.4					0.12		
	6		5.8	0.3					0.84		
	7		6.05	0.6					0.27		
	8		6.1	0.6					0.93		
	9		6.1	0.6					0.88		
	10		6.0	0.6					0.80		
	11		5.9	0.4					1.29		
	12		5.9	0.5					1.31		
	13		5.95	0.5					1.37		
	14		5.95	0.5					1.73		
	15		6	0.6					1.70		
	16		6.05	0.7					2.42		
	17		6.1	0.7					1.80		
	18		6.15	0.7					1.22		
	19		6.15	0.7					1.77		
	20		6.1	0.7					0.47		
	21		5.9	0.4					0.61		
	22		5.65	0.2					0.11		
WL	22.9		5.47	0					0		
	24.8		5.2								
	25.5		4.95								
BF	27.1		4.7								
S	29.9		3.9								
TOTALS:											

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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Redstone Creek						CROSS-SECTION NO.: 3
CROSS-SECTION LOCATION: UTM 13T 482386 4486287						
DATE: 4/29/20	OBSERVERS: Birch Filby Fields-Sommers					
LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:	
COUNTY: Larimer	WATERSHED: South Platte	WATER DIVISION: 1	DOW WATER CODE:			
MAP(S):	USGS:					
	USFS:					

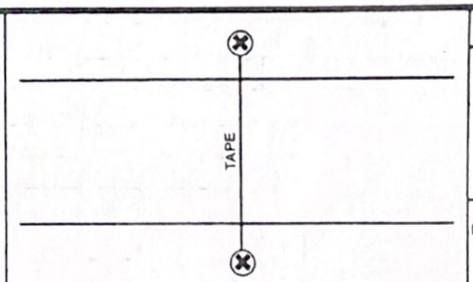
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / (NO)	METER TYPE: FlowTracker 2 by Fields-Sommers @ Staff gage			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: ____ lbs/foot	TAPE TENSION: ____ lbs
CHANNEL BED MATERIAL SIZE RANGE:	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS:		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	X
⊗ Tape @ Stake RB	0.0	X
① WS @ Tape LB/RB	0.0	5.33 / 5.34
② WS Upstream	4.6	> 48.1
③ WS Downstream	5.47	
SLOPE	0.87 / 48.1 = 0.018	

SKETCH



LEGEND:
- Stake ⊗
- Station ①
- Photo ◇
- Direction of Flow

AQUATIC SAMPLING SUMMARY

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

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

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

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

COMMENTS

Juniper & cottonwood in riparian area Mountain mahagony.
Good habitat but no fish observed. Long runs w/ undercut banks.
Wood jams common creating good-sized pools.
Q = 12.44 cfs & Q = 11.56 cfs Q = 12 cfs (average)

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Redstone Creek | CROSS-SECTION NO.: 3 | DATE: 4/29/20 | SHEET 2 OF 2

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 2:15 pm

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
	0		4.67								
BF	0.7		4.85								
	1.7		4.925								
	3.3		4.95								
	5.0		4.75								
	6.5		4.81								
	7.4		4.95								
	8.1		5.15								
WS	8.6		5.34	Ø							
	9.0		5.43	0.11							
	10		5.51	0.15							
	11		5.6	0.2							
	12		5.75	0.42							
	13		5.9	0.5							
	14		5.9	0.58							
	15		5.9	0.6							
	16		6.0	0.7							
	17		5.95	0.65							
	18		5.95	0.65							
	19		5.95	0.59							
	20		6.0	0.6							
	21		6.0	0.65							
	22		6.05	0.65							
	23		5.825	0.55							
	24		5.85	0.63							
	25		5.82	0.55							
	26		5.5	0.28							
WS	26.3		5.33	Ø							
BF	26.6		4.85								
	26.7		4.45								
	26.9		4.23								
S	28.6		3.25								
TOTALS:											

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

COLORADO
Colorado Water Conservation Board
Department of Natural Resources
1313 Sherman Street, Room 718
Denver, CO 80203

Redstone Creek CWCB Temporary Streamgage

Location: 13N 482374 4486238

Installation Date: 6/6/2019

Equipment: Onset Hobo MX2001 water level logger, staff gage

Description: The streamgage consists of a data logger and pressure transducer protected in a 2 inch PVC pipe, secured to the bank with a t-pot fence post. The pressure transducer measured water level and temperature on 15 minute intervals in a pool formed by a riffle. A co-located staff gage was used as a secondary water level measurement device.

Discharge Measurment Field Visit Data Report *(Filters: Name begins with Redstone Creek; Division = 1;)*

Div	Name	CWCB Case Number	Segment ID	Meas. Date	UTM	Location	Flow Amount (cfs)	Meas #	Rating	Station ID
1	Redstone Creek		20/1/A-001	05/13/2020	UTMx: 482374 UTMy: 4486238	15ft downstream of gage	4.82	5	G	REDSTND1
1	Redstone Creek		20/1/A-001	06/05/2019	UTMx: 482374 UTMy: 4486238	At Redstone Creek Gage	5.66	1	G	REDSTND1
1	Redstone Creek		20/1/A-001	07/15/2019	UTMx: 482374 UTMy: 4486238	At Redstone Creek Gage	1.02	2	F	REDSTND1
1	Redstone Creek		20/1/A-001	04/29/2020	UTMx: 482374 UTMy: 4486238	At Redstone Creek Gage	12.44	3	G	REDSTND1
1	Redstone Creek		20/1/A-001	04/29/2020	UTMx: 482374 UTMy: 4486238	At Redstone Creek Gage	11.56	4	G	REDSTND1

Discharge Measurement Summary

Site name	Redstone Cr
Site number	001
Operator(s)	JEL
File name	Redstone Cr_20190605-133442.ft
Comment	Temp gage

Start time	6/5/2019 1:13 PM
End time	6/5/2019 1:32 PM
Start location latitude	40.527
Start location longitude	-105.208
Calculations engine	FlowTracker2

Sensor type	Top Setting
Handheld serial number	FT2H1747037
Probe serial number	FT2P1747048
Probe firmware	1.23
Handheld software	1.4

# Stations	Avg interval (s)	Total discharge (ft³/s)
19	40	5.662

Total width (ft)	Total area (m²)	Wetted Perimeter (ft)
15.700	0.557	15.931

Mean SNR (dB)	Mean depth (ft)	Mean velocity (m/s)
34.483	0.382	0.288

Mean temp (°C)	Max depth (ft)	Max velocity (m/s)
16.073	0.510	0.455

Discharge Uncertainty		
Category	**ISO**	**IVE**
Accuracy	1.0%	1.0%
Depth	0.4%	6.9%
Velocity	0.6%	5.3%
Width	0.1%	0.1%
Method	2.0%	
# Stations	2.6%	
Overall	**3.5%**	**8.8%**

Discharge equation	Mid Section
Discharge uncertainty	IVE
Discharge reference	Rated

Data Collection Settings	
Salinity	0.000 PSS-78
Temperature	-
Sound speed	-
Mounting correction	0.000 %

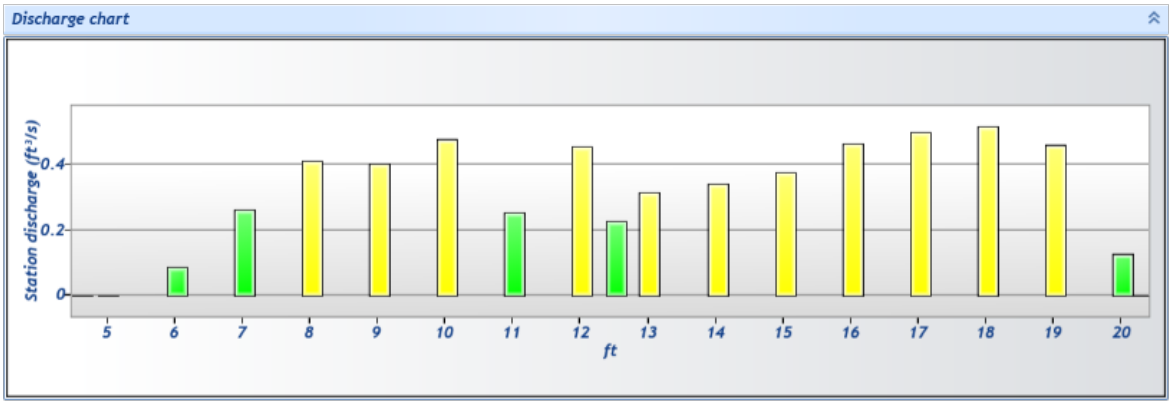
Summary overview

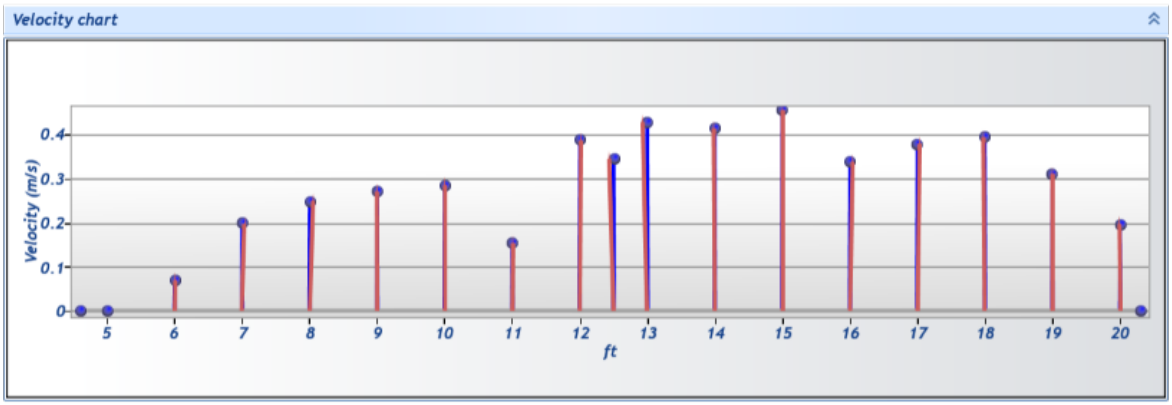
No changes were made to this file
Quality control warnings

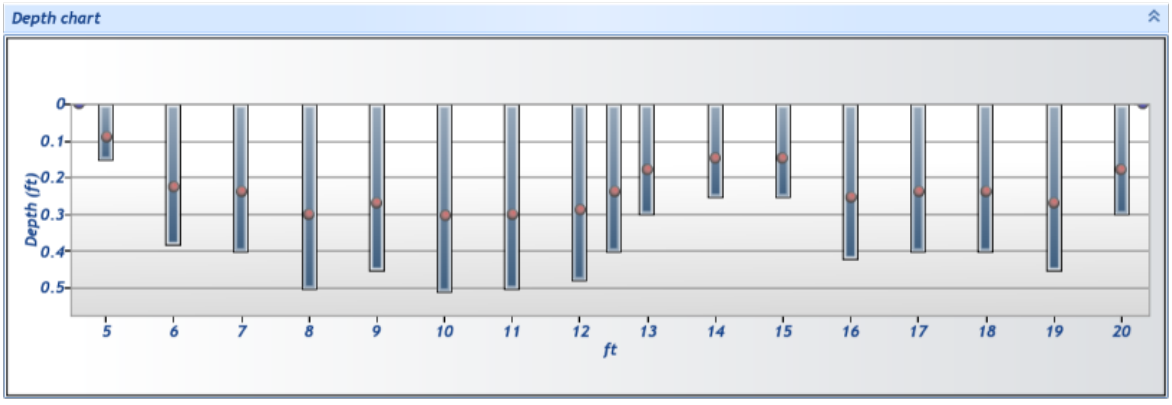
Discharge Measurement Summary

Site name	Redstone Cr
Site number	001
Operator(s)	JEL
File name	Redstone Cr_20190605-133442.ft
Comment	Temp gage

Station Warning Settings	
Station discharge OK	Station discharge < 5.000%
Station discharge caution	5.000% >= Station discharge < 10.000%
Station discharge warning	Station discharge >= 10.000%







Discharge Measurement Summary

Site name	Redstone Cr
Site number	001
Operator(s)	JEL
File name	Redstone Cr_20190605-133442.ft
Comment	Temp gage

Measurement results

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Samples	Velocity (m/s)	Correction	Mean Velocity (m/s)	Area (m²)	Flow (ft³/s)	%Q	
0	1:13 PM	4.600	None	0.000	0.000	0.000	0	0.000	1.000	0.000	0.000	0.000	0.000	✓
1	1:14 PM	5.000	0.6	0.150	0.600	0.090	80	0.000	1.000	0.000	0.010	0.000	-0.001	✓
2	1:15 PM	6.000	0.6	0.380	0.600	0.228	80	0.070	1.000	0.070	0.035	0.087	1.539	✓
3	1:16 PM	7.000	0.6	0.400	0.600	0.240	80	0.198	1.000	0.198	0.037	0.259	4.582	✓
4	1:18 PM	8.000	0.6	0.500	0.600	0.300	80	0.250	1.000	0.250	0.046	0.409	7.230	✓
5	1:19 PM	9.000	0.6	0.450	0.600	0.270	80	0.271	1.000	0.271	0.042	0.400	7.060	✓
6	1:20 PM	10.000	0.6	0.510	0.600	0.306	80	0.285	1.000	0.285	0.047	0.477	8.432	✓
7	1:21 PM	11.000	0.6	0.500	0.600	0.300	80	0.154	1.000	0.154	0.046	0.253	4.461	✓
8	1:22 PM	12.000	0.6	0.480	0.600	0.288	80	0.386	1.000	0.386	0.033	0.456	8.060	✓
9	1:32 PM	12.500	0.6	0.400	0.600	0.240	80	0.345	1.000	0.345	0.019	0.226	3.996	✓
10	1:23 PM	13.000	0.6	0.300	0.600	0.180	80	0.428	1.000	0.428	0.021	0.316	5.580	✓
11	1:24 PM	14.000	0.6	0.250	0.600	0.150	80	0.414	1.000	0.414	0.023	0.339	5.994	✓
12	1:25 PM	15.000	0.6	0.250	0.600	0.150	80	0.455	1.000	0.455	0.023	0.373	6.596	✓
13	1:26 PM	16.000	0.6	0.420	0.600	0.252	80	0.338	1.000	0.338	0.039	0.465	8.214	✓
14	1:28 PM	17.000	0.6	0.400	0.600	0.240	80	0.379	1.000	0.379	0.037	0.498	8.790	✓
15	1:29 PM	18.000	0.6	0.400	0.600	0.240	80	0.394	1.000	0.394	0.037	0.517	9.127	✓
16	1:30 PM	19.000	0.6	0.450	0.600	0.270	80	0.311	1.000	0.311	0.042	0.459	8.108	✓
17	1:31 PM	20.000	0.6	0.300	0.600	0.180	80	0.197	1.000	0.197	0.018	0.126	2.229	✓
18	1:32 PM	20.300	None	0.000	0.000	0.000	0	0.000	1.000	0.197	0.000	0.000	0.000	✓

Discharge Measurement Summary

Site name	Redstone Cr
Site number	001
Operator(s)	JEL
File name	Redstone Cr_20190605-133442.ft
Comment	Temp gage

Quality Control Settings	
Maximum depth change	50.000%
Maximum spacing change	100.000%
SNR threshold	10.000 dB
Standard error threshold	0.010 m/s
Spike threshold	10.000%
Maximum velocity angle	20.000 deg
Maximum tilt angle	5.000 deg

Quality control warnings

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Warnings
1	1:14 PM	5.000	0.6	0.150	0.600	0.090	Beam SNRs Not Similar,SNR Threshold Variation
2	1:15 PM	6.000	0.6	0.380	0.600	0.228	Boundary Interference,Standard Error > QC

Discharge Measurement Summary

Site name	Redstone Cr
Site number	001
Operator(s)	JEL
File name	Redstone Cr_20190605-133442.ft
Comment	Temp gage

Supplemental data summary

Gauge height time	Gauge height (ft)	Rated discharge (ft³/s)	Temperature (°C)	Salinity (PSS-78)	Gauge height comments
6/5/2019 1:33 PM	2.610				

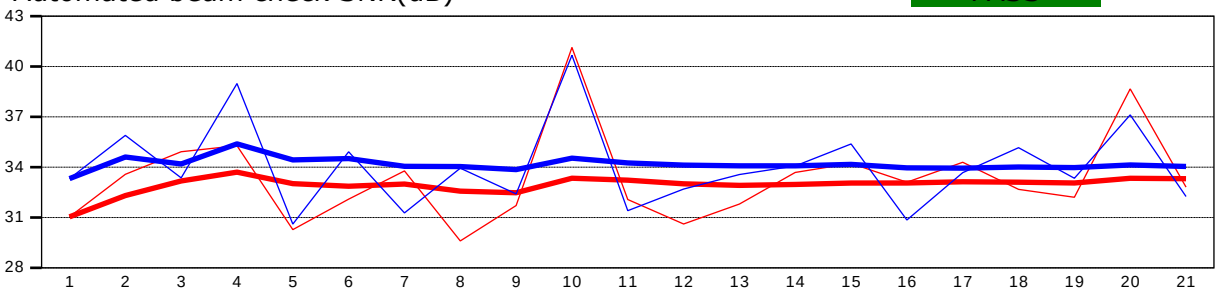
Discharge Measurement Summary

Site name	Redstone Cr
Site number	001
Operator(s)	JEL
File name	Redstone Cr_20190605-133442.ft
Comment	Temp gage

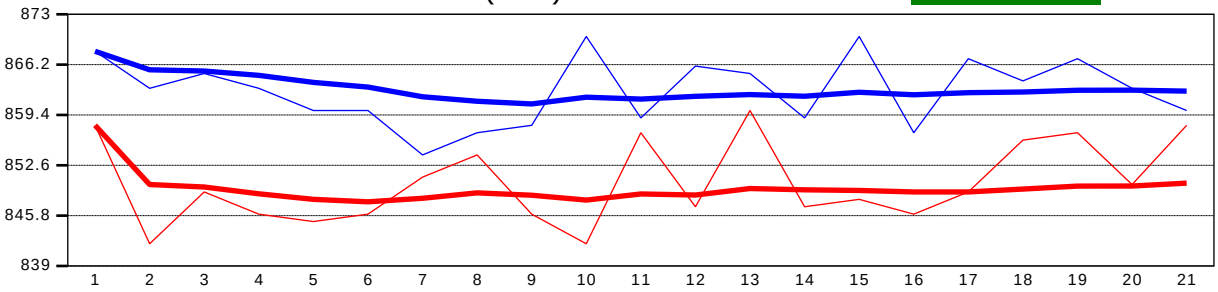
Beam 1	
Beam 2	

Automated beam check Start time 6/5/2019 1:13:20 PM

Automated beam check SNR(dB) PASS



Automated beam check Noise level(cnts) PASS



Automated beam check Quality control warnings

No quality control warnings

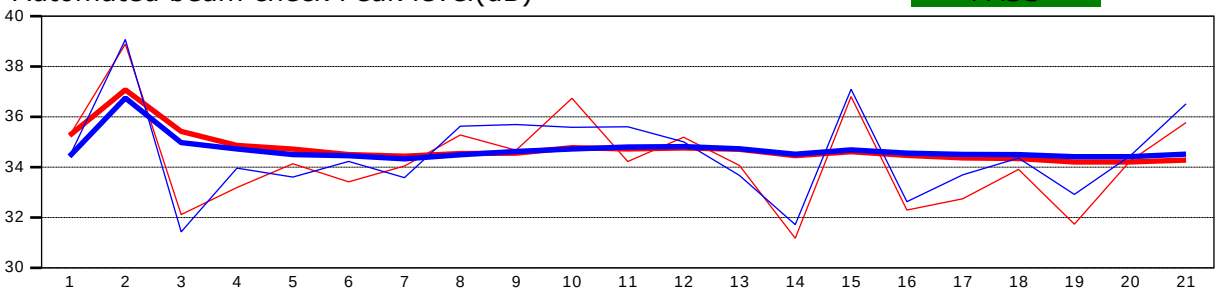
Discharge Measurement Summary

Site name	Redstone Cr
Site number	001
Operator(s)	JEL
File name	Redstone Cr_20190605-133442.ft
Comment	Temp gage

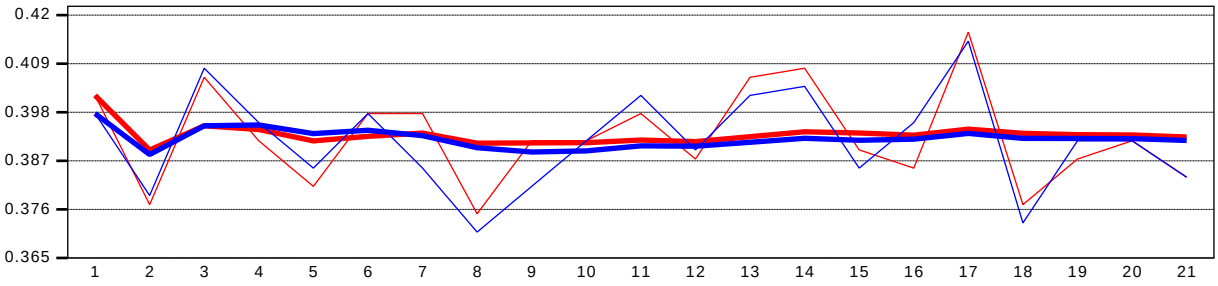
Beam 1	
Beam 2	

Automated beam check Start time 6/5/2019 1:13:20 PM

Automated beam check Peak level(dB) PASS



Automated beam check Peak position(ft) PASS



Automated beam check Quality control warnings

No quality control warnings

Discharge Measurement Summary

Site name	Redstone Creek near Horsetooth Mountain on Larimer
Site number	042920202
Operator(s)	Jack Landers
File name	Redstone Creek near Horsetooth Mountain on Larimer_20200429-145032.ft
Comment	Check

Start time	4/29/2020 2:25 PM
End time	4/29/2020 2:49 PM
Start location latitude	40.527
Start location longitude	-105.208
Calculations engine	FlowTracker2

Sensor type	Top Setting
Handheld serial number	FT2H1747037
Probe serial number	FT2P1747048
Probe firmware	1.23
Handheld software	1.4

# Stations	Avg interval (s)	Total discharge (ft³/s)
19	40	11.564

Total width (ft)	Total area (m²)	Wetted Perimeter (ft)
18.400	1.123	18.635

Mean SNR (dB)	Mean depth (ft)	Mean velocity (m/s)
41.259	0.657	0.291

Mean temp (°C)	Max depth (ft)	Max velocity (m/s)
13.208	1.060	0.419

Discharge Uncertainty		
Category	**ISO**	**IVE**
Accuracy	1.0%	1.0%
Depth	0.3%	3.4%
Velocity	0.4%	1.7%
Width	0.1%	0.1%
Method	1.9%	
# Stations	2.6%	
Overall	**3.5%**	**4.0%**

Discharge equation	Mid Section
Discharge uncertainty	IVE
Discharge reference	Rated

Data Collection Settings	
Salinity	0.000 PSS-78
Temperature	-
Sound speed	-
Mounting correction	0.000 %

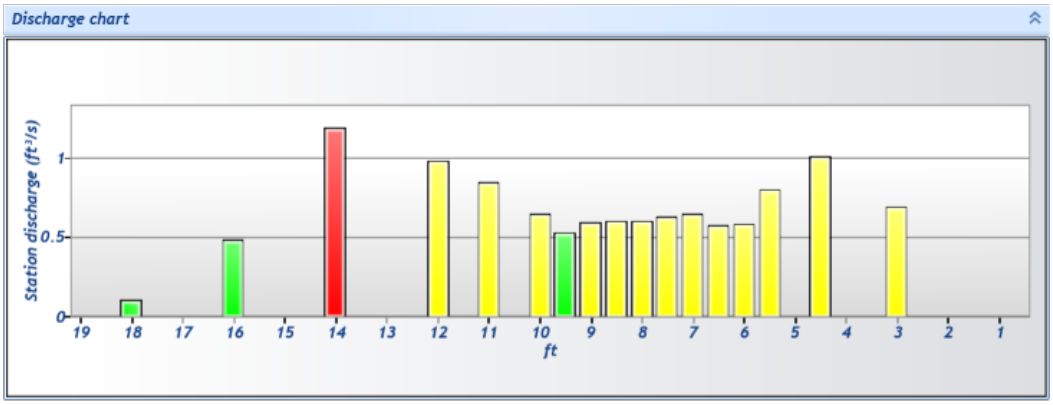
Summary overview

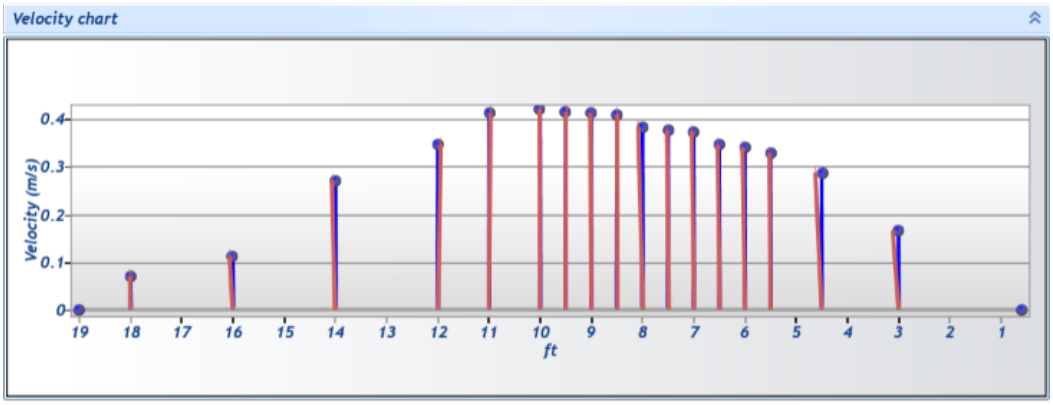
No changes were made to this file
Quality control warnings

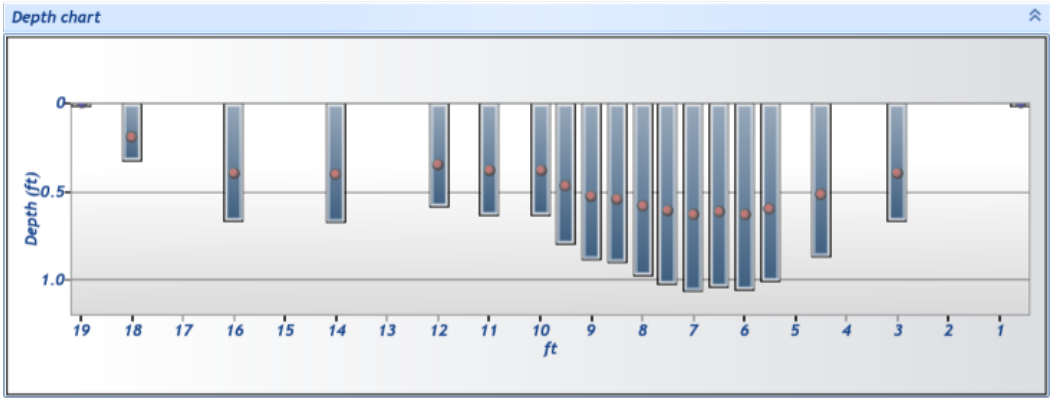
Discharge Measurement Summary

Site name	Redstone Creek near Horsetooth Mountain on Larimer
Site number	042920202
Operator(s)	Jack Landers
File name	Redstone Creek near Horsetooth Mountain on Larimer_20200429-145032.ft
Comment	Check

Station Warning Settings	
Station discharge OK	Station discharge < 5.000%
Station discharge caution	5.000% >= Station discharge < 10.000%
Station discharge warning	Station discharge >= 10.000%







Discharge Measurement Summary

Site name	Redstone Creek near Horsetooth Mountain on Larimer
Site number	042920202
Operator(s)	Jack Landers
File name	Redstone Creek near Horsetooth Mountain on Larimer_20200429-145032.ft
Comment	Check

Measurement results

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Samples	Velocity (m/s)	Correction	Mean Velocity (m/s)	Area (m²)	Flow (ft³/s)	%Q	
18	2:49 PM	0.600	None	0.010	0.000	0.000	0	0.000	0.000	0.000	0.001	0.000	0.000	✓
17	2:47 PM	3.000	0.6	0.660	0.600	0.396	80	0.165	1.000	0.165	0.120	0.697	6.028	✓
16	2:46 PM	4.500	0.6	0.860	0.600	0.516	80	0.286	1.000	0.286	0.100	1.010	8.738	✓
15	2:44 PM	5.500	0.6	1.000	0.600	0.600	80	0.327	1.000	0.327	0.070	0.804	6.951	✓
14	2:43 PM	6.000	0.6	1.050	0.600	0.630	80	0.339	1.000	0.339	0.049	0.585	5.056	✓
13	2:42 PM	6.500	0.6	1.030	0.600	0.618	80	0.344	1.000	0.344	0.048	0.582	5.029	✓
12	2:41 PM	7.000	0.6	1.060	0.600	0.636	80	0.373	1.000	0.373	0.049	0.649	5.615	✓
11	2:40 PM	7.500	0.6	1.020	0.600	0.612	80	0.375	1.000	0.375	0.047	0.627	5.423	✓
10	2:38 PM	8.000	0.6	0.970	0.600	0.582	80	0.382	1.000	0.382	0.045	0.607	5.251	✓
9	2:37 PM	8.500	0.6	0.900	0.600	0.540	80	0.409	1.000	0.409	0.042	0.603	5.216	✓
8	2:35 PM	9.000	0.6	0.880	0.600	0.528	80	0.411	1.000	0.411	0.041	0.593	5.125	✓
7	2:34 PM	9.500	0.6	0.790	0.600	0.474	80	0.413	1.000	0.413	0.037	0.536	4.632	✓
6	2:33 PM	10.000	0.6	0.630	0.600	0.378	80	0.419	1.000	0.419	0.044	0.650	5.623	✓
5	2:32 PM	11.000	0.6	0.630	0.600	0.378	80	0.411	1.000	0.411	0.059	0.850	7.353	✓
4	2:30 PM	12.000	0.6	0.580	0.600	0.348	80	0.345	1.000	0.345	0.081	0.984	8.508	✓
3	2:29 PM	14.000	0.6	0.670	0.600	0.402	80	0.270	1.000	0.270	0.124	1.187	10.269	✓
2	2:27 PM	16.000	0.6	0.660	0.600	0.396	80	0.113	1.000	0.113	0.123	0.488	4.223	✓
1	2:25 PM	18.000	0.6	0.320	0.600	0.192	80	0.071	1.000	0.071	0.045	0.111	0.961	✓
0	2:25 PM	19.000	None	0.010	0.000	0.000	0	0.000	0.000	0.000	0.000	0.000	0.000	✓

Discharge Measurement Summary

Site name	Redstone Creek near Horsetooth Mountain on Larimer
Site number	042920202
Operator(s)	Jack Landers
File name	Redstone Creek near Horsetooth Mountain on Larimer_20200429-145032.ft
Comment	Check

Quality Control Settings	
Maximum depth change	50.000%
Maximum spacing change	100.000%
SNR threshold	10.000 dB
Standard error threshold	0.010 m/s
Spike threshold	10.000%
Maximum velocity angle	20.000 deg
Maximum tilt angle	5.000 deg

Quality control warnings

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Warnings
17	2:47 PM	3.000	0.6	0.660	0.600	0.396	Velocity Angle > QC
16	2:46 PM	4.500	0.6	0.860	0.600	0.516	Velocity Angle > QC
3	2:29 PM	14.000	0.6	0.670	0.600	0.402	High Stn % Discharge
2	2:27 PM	16.000	0.6	0.660	0.600	0.396	Velocity Angle > QC

Discharge Measurement Summary

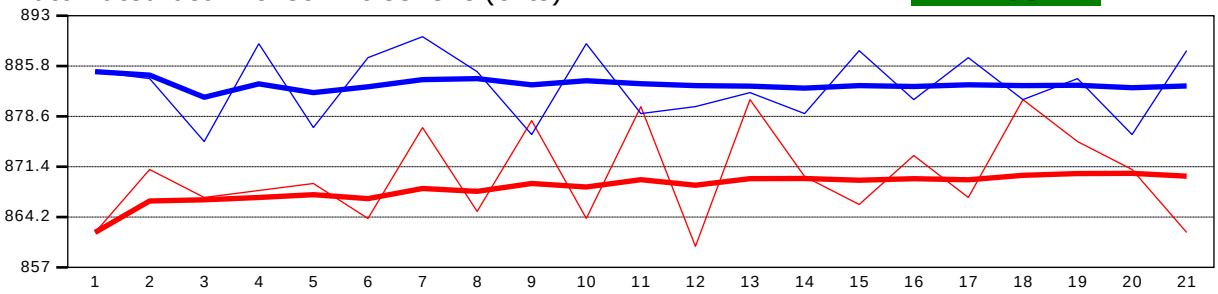
Site name	Redstone Creek near Horsetooth Mountain on Larimer
Site number	042920202
Operator(s)	Jack Landers
File name	Redstone Creek near Horsetooth Mountain on Larimer_20200429-145032.ft
Comment	Check

Beam 1	
Beam 2	

Automated beam check Start time 4/29/2020 2:24:18 PM

Automated beam check SNR(dB) PASS

Automated beam check Noise level(cnts) PASS



Automated beam check Quality control warnings

Peak Location > QC

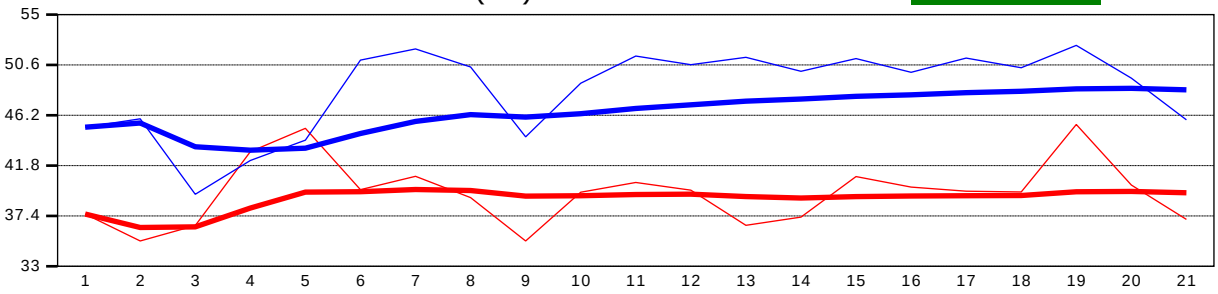
Discharge Measurement Summary

Site name	Redstone Creek near Horsetooth Mountain on Larimer
Site number	042920202
Operator(s)	Jack Landers
File name	Redstone Creek near Horsetooth Mountain on Larimer_20200429-145032.ft
Comment	Check

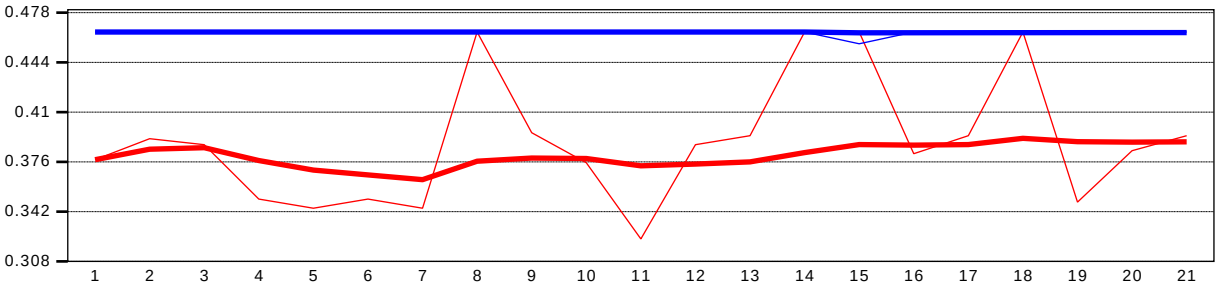
Beam 1	
Beam 2	

Automated beam check Start time 4/29/2020 2:24:18 PM

Automated beam check Peak level(dB) PASS



Automated beam check Peak position(ft) FAIL



Automated beam check Quality control warnings

Peak Location > QC

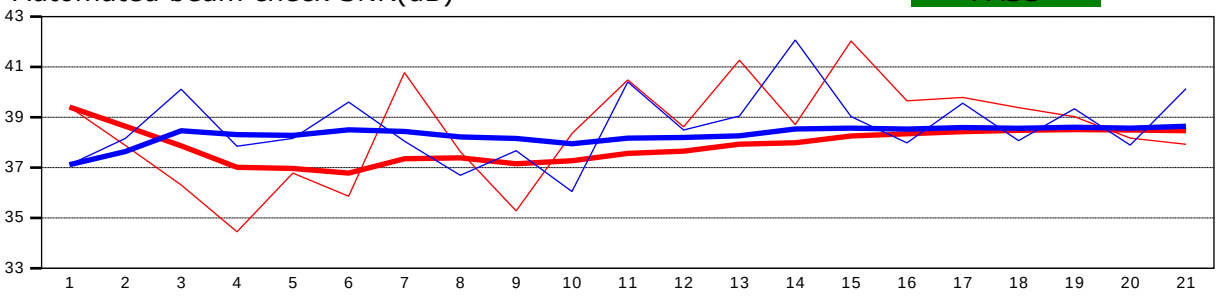
Discharge Measurement Summary

Site name	Redstone Creek near Horsetooth Mountain on Larimer
Site number	042920202
Operator(s)	Jack Landers
File name	Redstone Creek near Horsetooth Mountain on Larimer_20200429-145032.ft
Comment	Check

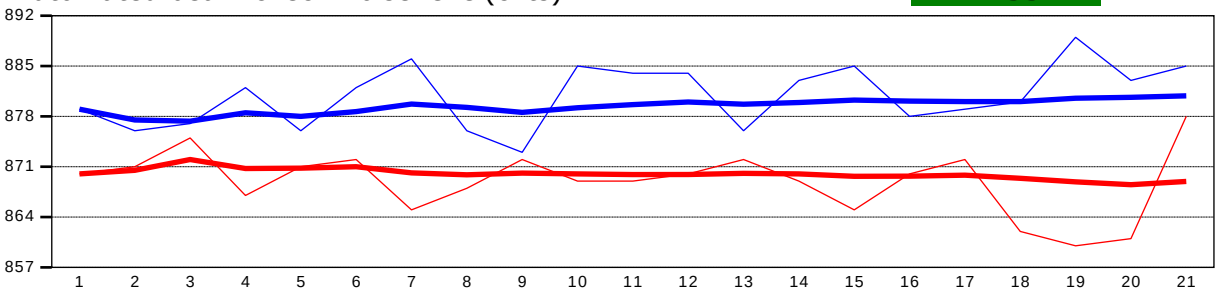
Beam 1	
Beam 2	

Automated beam check Start time 4/29/2020 2:24:55 PM

Automated beam check SNR(dB) PASS



Automated beam check Noise level(cnts) PASS



Automated beam check Quality control warnings

No quality control warnings

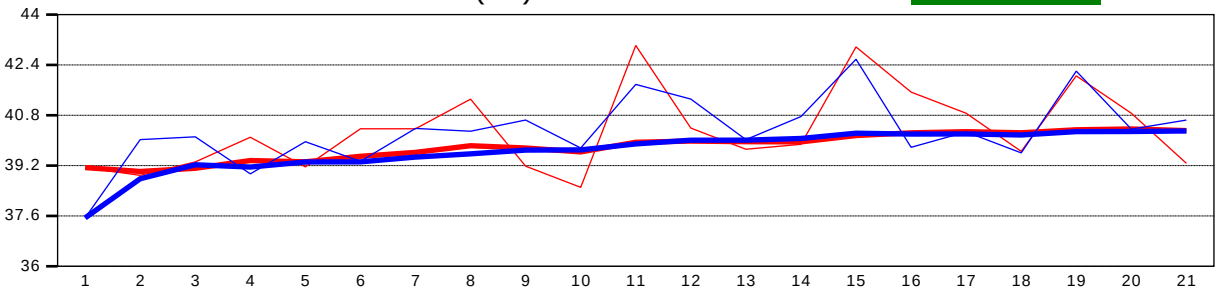
Discharge Measurement Summary

Site name	Redstone Creek near Horsetooth Mountain on Larimer
Site number	042920202
Operator(s)	Jack Landers
File name	Redstone Creek near Horsetooth Mountain on Larimer_20200429-145032.ft
Comment	Check

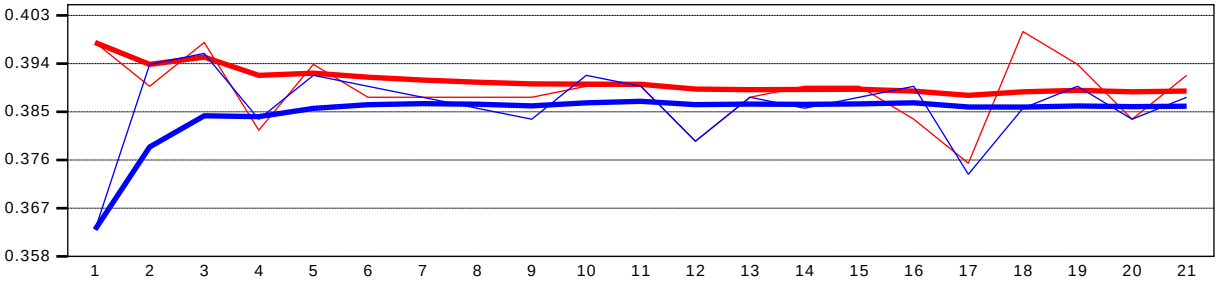
Beam 1	
Beam 2	

Automated beam check Start time 4/29/2020 2:24:55 PM

Automated beam check Peak level(dB) PASS



Automated beam check Peak position(ft) PASS



Automated beam check Quality control warnings

No quality control warnings

Discharge Measurement Summary

Site name	Redstone Creek near Horsetooth Mountain
Site number	4292020
Operator(s)	Jack Landers
File name	Redstone Creek near Horsetooth Mountain_20200429-141654.ft
Comment	

Start time	4/29/2020 1:34 PM
End time	4/29/2020 2:06 PM
Start location latitude	40.527
Start location longitude	-105.208
Calculations engine	FlowTracker2

Sensor type	Top Setting
Handheld serial number	FT2H1747037
Probe serial number	FT2P1747048
Probe firmware	1.23
Handheld software	1.4

# Stations	Avg interval (s)	Total discharge (ft³/s)
26	40	12.443

Total width (ft)	Total area (m²)	Wetted Perimeter (ft)
18.400	1.159	18.599

Mean SNR (dB)	Mean depth (ft)	Mean velocity (m/s)
41.004	0.678	0.304

Mean temp (°C)	Max depth (ft)	Max velocity (m/s)
12.915	1.050	0.414

Discharge Uncertainty		
Category	**ISO**	**IVE**
Accuracy	1.0%	1.0%
Depth	0.3%	2.8%
Velocity	0.3%	0.8%
Width	0.1%	0.1%
Method	1.6%	
# Stations	2.0%	
Overall	**2.8%**	**3.1%**

Discharge equation	Mid Section
Discharge uncertainty	IVE
Discharge reference	Rated

Data Collection Settings	
Salinity	0.000 PSS-78
Temperature	-
Sound speed	-
Mounting correction	0.000 %

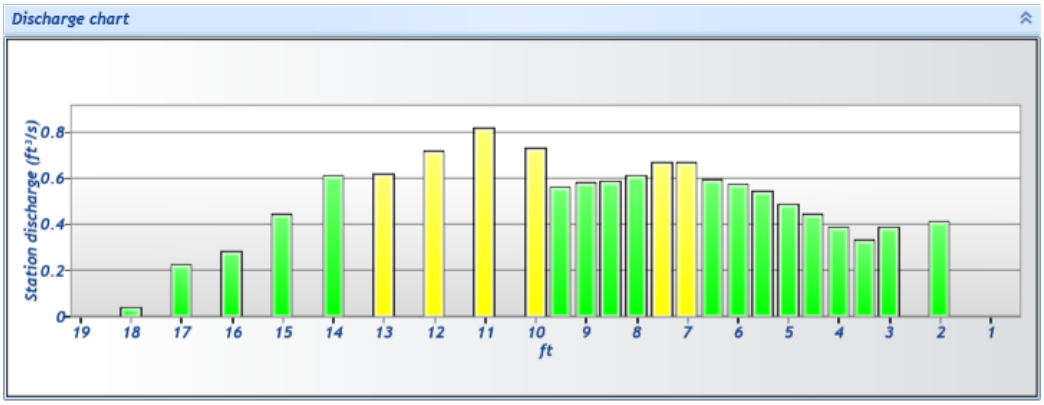
Summary overview

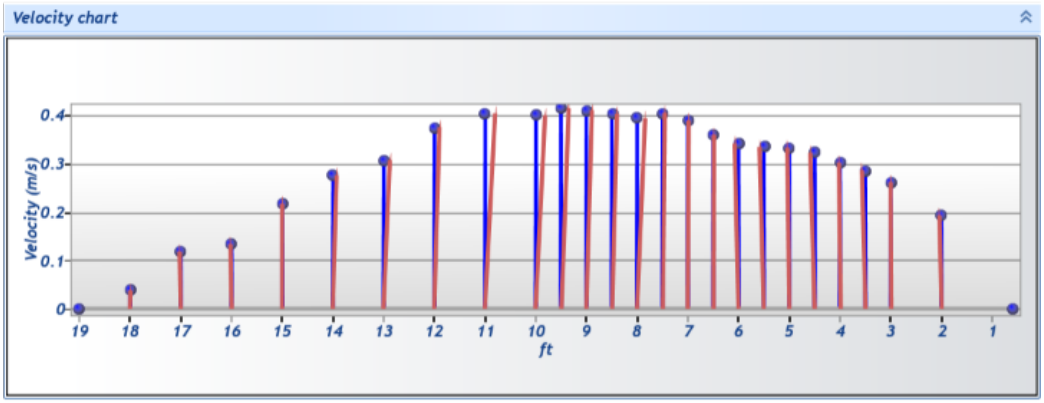
No changes were made to this file
Quality control warnings

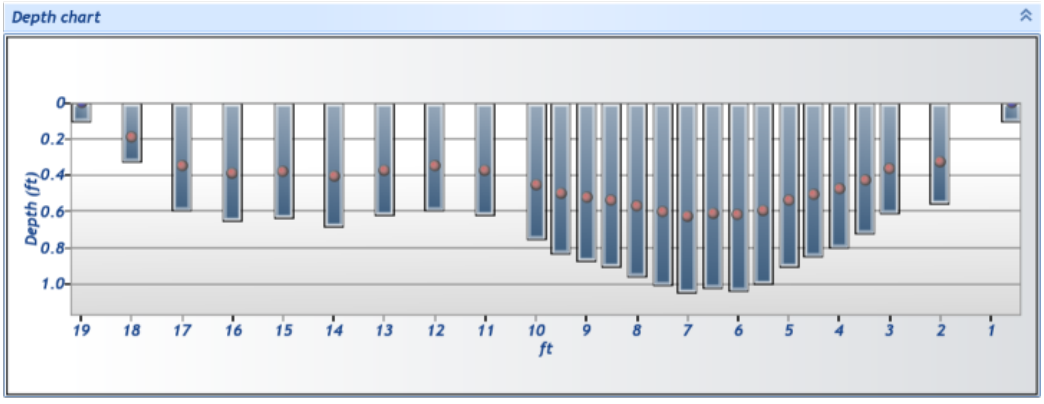
Discharge Measurement Summary

Site name	Redstone Creek near Horsetooth Mountain
Site number	4292020
Operator(s)	Jack Landers
File name	Redstone Creek near Horsetooth Mountain_20200429-141654.ft
Comment	

Station Warning Settings	
Station discharge OK	Station discharge < 5.000%
Station discharge caution	5.000% >= Station discharge < 10.000%
Station discharge warning	Station discharge >= 10.000%







Discharge Measurement Summary

Site name	Redstone Creek near Horsetooth Mountain
Site number	4292020
Operator(s)	Jack Landers
File name	Redstone Creek near Horsetooth Mountain_20200429-141654.ft
Comment	

Measurement results

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Samples	Velocity (m/s)	Correction	Mean Velocity (m/s)	Area (m²)	Flow (ft³/s)	%Q	
0	1:34 PM	0.600	None	0.100	0.000	0.000	0	0.000	0.000	0.000	0.007	0.000	0.000	✓
1	1:34 PM	2.000	0.6	0.550	0.600	0.330	80	0.193	1.000	0.193	0.061	0.419	3.364	✓
2	1:36 PM	3.000	0.6	0.610	0.600	0.366	80	0.261	1.000	0.261	0.043	0.393	3.154	✓
3	1:37 PM	3.500	0.6	0.720	0.600	0.432	80	0.286	1.000	0.286	0.033	0.338	2.717	✓
4	1:39 PM	4.000	0.6	0.800	0.600	0.480	80	0.301	1.000	0.301	0.037	0.395	3.178	✓
5	1:40 PM	4.500	0.6	0.850	0.600	0.510	80	0.322	1.000	0.322	0.039	0.449	3.609	✓
6	1:41 PM	5.000	0.6	0.900	0.600	0.540	80	0.332	1.000	0.332	0.042	0.491	3.942	✓
7	1:43 PM	5.500	0.6	1.000	0.600	0.600	80	0.334	1.000	0.334	0.046	0.548	4.404	✓
8	1:44 PM	6.000	0.6	1.040	0.600	0.624	80	0.341	1.000	0.341	0.048	0.582	4.679	✓
9	1:46 PM	6.500	0.6	1.020	0.600	0.612	80	0.359	1.000	0.359	0.047	0.601	4.833	✓
10	1:47 PM	7.000	0.6	1.050	0.600	0.630	80	0.389	1.000	0.389	0.049	0.670	5.387	✓
11	1:48 PM	7.500	0.6	1.010	0.600	0.606	80	0.405	1.000	0.405	0.047	0.671	5.390	✓
12	1:49 PM	8.000	0.6	0.960	0.600	0.576	80	0.393	1.000	0.393	0.045	0.619	4.978	✓
13	1:51 PM	8.500	0.6	0.900	0.600	0.540	80	0.402	1.000	0.402	0.042	0.594	4.776	✓
14	1:52 PM	9.000	0.6	0.870	0.600	0.522	80	0.410	1.000	0.410	0.040	0.585	4.700	✓
15	1:53 PM	9.500	0.6	0.830	0.600	0.498	80	0.414	1.000	0.414	0.039	0.564	4.533	✓
16	1:55 PM	10.000	0.6	0.750	0.600	0.450	80	0.399	1.000	0.399	0.052	0.737	5.921	✓
17	1:56 PM	11.000	0.6	0.620	0.600	0.372	80	0.403	1.000	0.403	0.058	0.820	6.593	✓
18	1:57 PM	12.000	0.6	0.590	0.600	0.354	80	0.374	1.000	0.374	0.055	0.725	5.825	✓
19	1:59 PM	13.000	0.6	0.620	0.600	0.372	80	0.307	1.000	0.307	0.058	0.625	5.019	✓
20	2:00 PM	14.000	0.6	0.680	0.600	0.408	80	0.275	1.000	0.275	0.063	0.615	4.939	✓
21	2:01 PM	15.000	0.6	0.630	0.600	0.378	80	0.217	1.000	0.217	0.059	0.448	3.601	✓
22	2:02 PM	16.000	0.6	0.650	0.600	0.390	80	0.134	1.000	0.134	0.060	0.285	2.293	✓
23	2:03 PM	17.000	0.6	0.590	0.600	0.354	80	0.118	1.000	0.118	0.055	0.229	1.840	✓
24	2:05 PM	18.000	0.6	0.320	0.600	0.192	80	0.038	1.000	0.038	0.030	0.040	0.324	✓
25	2:06 PM	19.000	None	0.100	0.000	0.000	0	0.000	0.000	0.000	0.005	0.000	0.000	✓

Discharge Measurement Summary

Site name	Redstone Creek near Horsetooth Mountain
Site number	4292020
Operator(s)	Jack Landers
File name	Redstone Creek near Horsetooth Mountain_20200429-141654.ft
Comment	

Quality Control Settings	
Maximum depth change	50.000%
Maximum spacing change	100.000%
SNR threshold	10.000 dB
Standard error threshold	0.010 m/s
Spike threshold	10.000%
Maximum velocity angle	20.000 deg
Maximum tilt angle	5.000 deg

Quality control warnings

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Warnings
12	1:49 PM	8.000	0.6	0.960	0.600	0.576	Velocity Angle > QC
16	1:55 PM	10.000	0.6	0.750	0.600	0.450	Velocity Angle > QC
17	1:56 PM	11.000	0.6	0.620	0.600	0.372	Velocity Angle > QC
19	1:59 PM	13.000	0.6	0.620	0.600	0.372	Velocity Angle > QC

Discharge Measurement Summary

Site name	
Site number	
Operator(s)	LFS
File name	RED51320.FlowTracker2.ft
Comment	Measured with Flowtracker1 and recalculated with Flowtracker2 algorithms

Start time	5/13/2020 9:08 AM
End time	5/13/2020 10:12 AM
Start location latitude	-
Start location longitude	-
Calculations engine	FlowTracker2

Sensor type	Unknown
Handheld serial number	n/a
Probe serial number	P2355
Probe firmware	3.90
Handheld software	n/a

# Stations	Avg interval (s)	Total discharge (ft³/s)
32	40	4.8213

Total width (ft)	Total area (ft²)	Wetted Perimeter (ft)
19.100	9.8053	19.420

Mean SNR (dB)	Mean depth (ft)	Mean velocity (ft/s)
22	0.513	0.4917

Mean temp (°F)	Max depth (ft)	Max velocity (ft/s)
47.865	0.940	0.7423

Discharge Uncertainty		
Category	**ISO**	**IVE**
Accuracy	1.0%	1.0%
Depth	0.3%	2.1%
Velocity	0.5%	1.6%
Width	0.1%	0.1%
Method	1.5%	
# Stations	1.6%	
Overall	**2.5%**	**2.8%**

Discharge equation	Mid Section
Discharge uncertainty	ISO
Discharge reference	Measured

Data Collection Settings	
Salinity	0.000 PSS-78
Temperature	-
Sound speed	-
Mounting correction	0.000 %

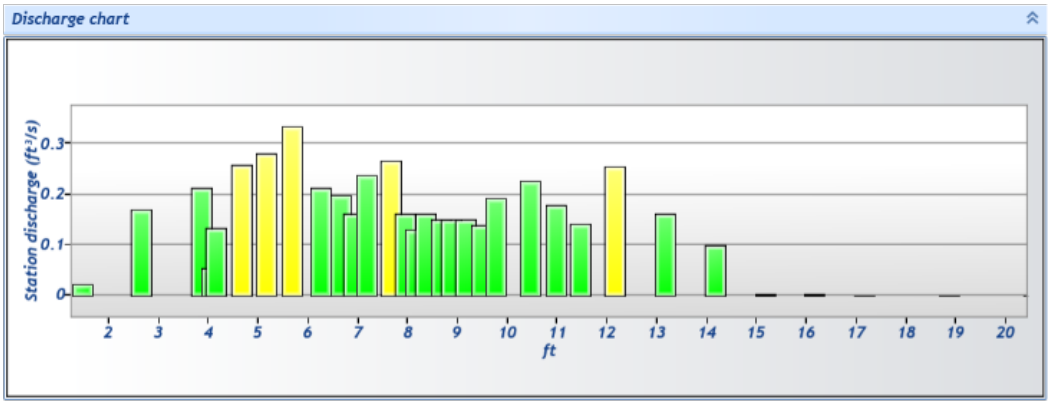
Summary overview

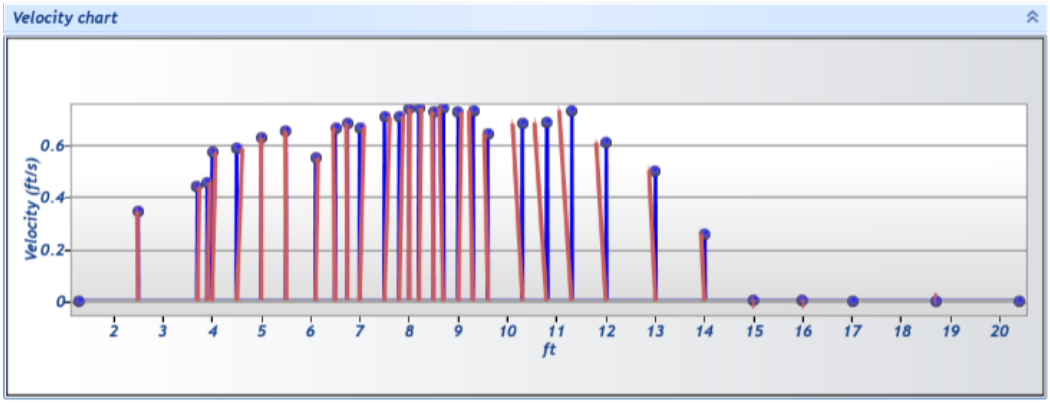
No changes were made to this file
Quality control warnings

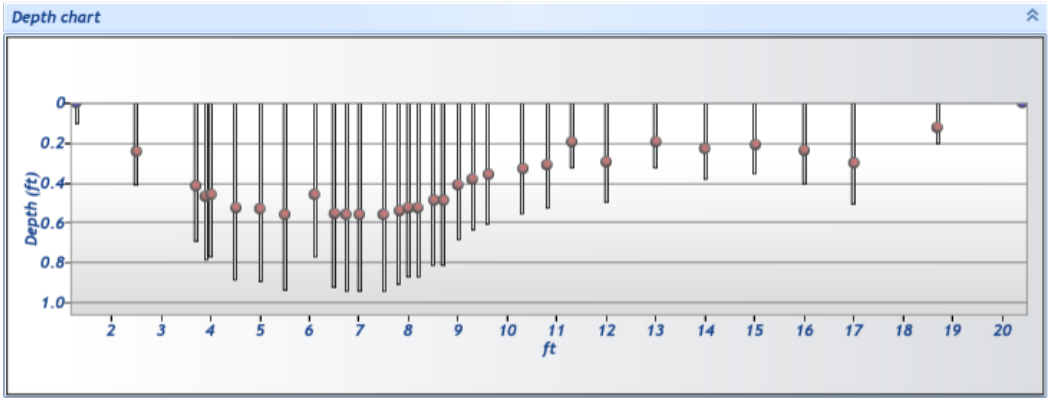
Discharge Measurement Summary

Site name	
Site number	
Operator(s)	LFS
File name	RED51320.FlowTracker2.ft
Comment	

Station Warning Settings		
Station discharge OK	Station discharge < 5.00%	
Station discharge caution	5.00% >= Station discharge < 10.00%	
Station discharge warning	Station discharge >= 10.00%	







Discharge Measurement Summary

Site name	
Site number	
Operator(s)	LFS
File name	RED51320.FlowTracker2.ft
Comment	

Measurement results

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Samples	Velocity (ft/s)	Correction	Mean Velocity (ft/s)	Area (ft²)	Flow (ft³/s)	%Q	
0	9:08 AM	1.300	None	0.100	0.0000	0.000	0	0.0000	1.0000	0.3460	0.0600	0.0208	0.43	✓
1	9:14 AM	2.500	0.6	0.410	0.6000	0.246	40	0.3460	1.0000	0.3460	0.4922	0.1703	3.53	✓
2	9:16 AM	3.700	0.6	0.690	0.6000	0.414	40	0.4389	1.0000	0.4389	0.4829	0.2120	4.40	✓
3	9:18 AM	3.900	0.6	0.780	0.6000	0.468	40	0.4562	1.0000	0.4562	0.1169	0.0533	1.11	✓
4	9:21 AM	4.000	0.6	0.770	0.6000	0.462	40	0.5716	1.0000	0.5716	0.2310	0.1321	2.74	✓
5	9:22 AM	4.500	0.6	0.880	0.6000	0.528	40	0.5866	1.0000	0.5866	0.4400	0.2581	5.35	✓
6	9:24 AM	5.000	0.6	0.890	0.6000	0.534	40	0.6276	1.0000	0.6276	0.4450	0.2793	5.79	✓
7	9:26 AM	5.500	0.6	0.930	0.6000	0.558	40	0.6534	1.0000	0.6534	0.5117	0.3344	6.94	✓
8	9:19 AM	6.100	0.6	0.770	0.6000	0.462	40	0.5509	1.0000	0.5509	0.3850	0.2121	4.40	✓
9	9:32 AM	6.500	0.6	0.920	0.6000	0.552	40	0.6653	1.0000	0.6653	0.2988	0.1988	4.12	✓
10	9:35 AM	6.750	0.6	0.940	0.6000	0.564	40	0.6814	1.0000	0.6814	0.2350	0.1601	3.32	✓
11	9:37 AM	7.000	0.6	0.940	0.6000	0.564	40	0.6689	1.0000	0.6689	0.3525	0.2358	4.89	✓
12	9:38 AM	7.500	0.6	0.940	0.6000	0.564	40	0.7081	1.0000	0.7081	0.3759	0.2662	5.52	✓
13	9:40 AM	7.800	0.6	0.900	0.6000	0.540	40	0.7116	1.0000	0.7116	0.2250	0.1601	3.32	✓
14	9:42 AM	8.000	0.6	0.870	0.6000	0.522	40	0.7394	1.0000	0.7394	0.1741	0.1288	2.67	✓
15	9:43 AM	8.200	0.6	0.870	0.6000	0.522	40	0.7413	1.0000	0.7413	0.2175	0.1613	3.34	✓
16	9:45 AM	8.500	0.6	0.810	0.6000	0.486	40	0.7300	1.0000	0.7300	0.2025	0.1478	3.07	✓
17	9:46 AM	8.700	0.6	0.810	0.6000	0.486	40	0.7423	1.0000	0.7423	0.2025	0.1503	3.12	✓
18	9:47 AM	9.000	0.6	0.680	0.6000	0.408	40	0.7254	1.0000	0.7254	0.2039	0.1479	3.07	✓
19	9:49 AM	9.300	0.6	0.630	0.6000	0.378	40	0.7336	1.0000	0.7336	0.1889	0.1386	2.87	✓
20	9:51 AM	9.600	0.6	0.600	0.6000	0.360	40	0.6431	1.0000	0.6431	0.3000	0.1929	4.00	✓
21	9:53 AM	10.300	0.6	0.550	0.6000	0.330	40	0.6817	1.0000	0.6817	0.3300	0.2249	4.67	✓
22	9:56 AM	10.800	0.6	0.520	0.6000	0.312	40	0.6864	1.0000	0.6864	0.2600	0.1785	3.70	✓
23	9:57 AM	11.300	0.6	0.320	0.6000	0.192	40	0.7337	1.0000	0.7337	0.1920	0.1408	2.92	✓
24	10:00 AM	12.000	0.6	0.490	0.6000	0.294	40	0.6093	1.0000	0.6093	0.4167	0.2539	5.27	✓
25	10:02 AM	13.000	0.6	0.320	0.6000	0.192	40	0.5023	1.0000	0.5023	0.3199	0.1607	3.33	✓
26	10:03 AM	14.000	0.6	0.380	0.6000	0.228	40	0.2594	1.0000	0.2594	0.3799	0.0986	2.04	✓
27	10:05 AM	15.000	0.6	0.350	0.6000	0.210	40	0.0058	1.0000	0.0058	0.3501	0.0020	0.04	✓
28	10:07 AM	16.000	0.6	0.400	0.6000	0.240	40	0.0047	1.0000	0.0047	0.3999	0.0019	0.04	✓
29	10:09 AM	17.000	0.6	0.500	0.6000	0.300	40	-0.0006	1.0000	-0.0006	0.6750	-0.0004	-0.01	✓
30	10:12 AM	18.700	0.6	0.200	0.6000	0.120	40	-0.0012	1.0000	-0.0012	0.3402	-0.0004	-0.01	✓
31	10:12 AM	20.400	None	0.000	0.0000	0.000	0	0.0000	1.0000	-0.0012	0.0000	0.0000	0.00	✓

Discharge Measurement Summary

Site name	
Site number	
Operator(s)	LFS
File name	RED51320.FlowTracker2.ft
Comment	

Quality Control Settings	
Maximum depth change	50.00%
Maximum spacing change	100.00%
SNR threshold	4 dB
Standard error threshold	0.0328 ft/s
Spike threshold	10.00%
Maximum velocity angle	20.0 deg
Maximum tilt angle	5.0 deg

Quality control warnings

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Warnings
3	9:18 AM	3.900	0.6	0.780	0.6000	0.468	Stn Spacing > QC
4	9:21 AM	4.000	0.6	0.770	0.6000	0.462	Stn Spacing > QC
23	9:57 AM	11.300	0.6	0.320	0.6000	0.192	Boundary Interference
24	10:00 AM	12.000	0.6	0.490	0.6000	0.294	SNR Threshold Variation
25	10:02 AM	13.000	0.6	0.320	0.6000	0.192	SNR Threshold Variation
26	10:03 AM	14.000	0.6	0.380	0.6000	0.228	Boundary Interference,Standard Error > QC
27	10:05 AM	15.000	0.6	0.350	0.6000	0.210	SNR Threshold Variation
28	10:07 AM	16.000	0.6	0.400	0.6000	0.240	Large SNR Variation,SNR Threshold Variation
29	10:09 AM	17.000	0.6	0.500	0.6000	0.300	Boundary Interference,SNR Threshold Variation
30	10:12 AM	18.700	0.6	0.200	0.6000	0.120	Boundary Interference,High % Spikes