United States Department of the Interior
BUREAU OF LAND MANAGEMENT

Colorado State Office
Denver Federal Center, Building 40
Lakewood, Colorado 80225
www.blm.gov/colorado

In Reply Refer To:
CO-932 (7250)

Mr. Rob Viehl
Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, Colorado 80203

Dear Mr. Viehl:

The Bureau of Land Management (BLM) is writing this letter to formally communicate its instream flow recommendation for Vermillion Creek, located in Water Division 6.

Location and Land Status. Vermillion Creek is tributary to the Green River in Brown's Park. This recommendation covers two stream reaches on Vermillion Creek as follows:

> Reach #1 - Confluence with Talamantes Creek to Ink Springs Stream Flow Gage (Colorado Division of Water Resources Gage VERINKCO; U.S. Geological Survey Gage 09235450) – This reach is approximately 18.6 miles in length. BLM manages 15.7 miles of this reach while the Colorado State Land Board manages 2.6 miles.
>
> Reach #2 - Ink Springs Stream Flow Gage to Headgate of Vermillion Ditch – This reach is approximately 10.1 miles in length. BLM manages 7.5 miles of this reach, the Colorado State Land Board manages 1.0 miles, and 1.9 miles are in private ownership.

Biological Summary. The biological and physical characteristics of each reach is described below:

> Reach #1 - Confluence with Talamantes Creek to Ink Springs Stream Flow Gage – Overall, this reach has high sinuosity, low gradient, and generally small substrate size. Riffles are limited and high percentage of the habitat is comprised of runs. An exception to this character occurs in Vermillion Canyon, where the creek is confined by bedrock, has higher gradient, and contains more riffle habitat. The riparian community includes cottonwood, willow, Russian olive and Phragmites. Cattle usage of the creek is evident, but the banks and riparian area appear to be stable. Water temperatures and conductivity are close to the upper range of tolerance for native fishes. Fishery surveys indicate a self-sustaining population of native mountain suckers.
>
> Reach #2 - Ink Springs Stream Flow Gage to Headgate of Vermillion Ditch – This reach flows through a canyon that ranges from ¼ to ½ mile in width. The stream has low

gradient and small to medium substrate size. Riffles are limited and high percentage of the habitat is comprised of runs. The riparian community includes cottonwood, willow, Russian olive and Phragmites. Cattle usage of the creek is evident, but the banks and riparian area appear to be stable. Water temperatures and conductivity are well within the ranges tolerated by native fishes. Fishery surveys indicate a self-sustaining population of mottled sculpin, speckled dace, and mountain suckers.

R2Cross Analysis. This section summarizes the data that BLM collected from each stream reach on Vermillion Creek and provides BLM's recommended flow rates for an instream flow appropriation.

Reach 1 - Confluence with Talamantes Creek to Ink Springs Stream Flow Gage

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (meets 3 of 3 hydraulic criteria)
4/01/2021 #2	0.86 cfs	17.25 feet	1.00 cfs	4.23 cfs
5/13/2021 #1	0.63 cfs	8.70 feet	0.98 cfs	0.99 cfs
		Averages:	**0.99 cfs**	**2.61 cfs**

BLM's data analysis indicates that the following flows are needed to protect the fishery and natural environment to a reasonable degree:

2.60 cubic feet per second is recommended during the warm portion of the year, from April 16 to September 30. This period covers spawning activities by native fishes. The recommended flow rate is driven by the average velocity criteria. Protecting average velocity for spawning habitat is important because many portions of this reach that have very low velocities. Without suitable velocity, the limited riffles may be unsuitable for spawning.

1.0 cubic feet per second is recommended from October 1 to April 15, the base flow period during the cold portion of the year. This recommendation is driven by the average depth criteria and wetted perimeter criteria. During low flow periods, it is important that the fish population be able to move between pools, and during winter, this flow rate should prevent pools from freezing.

Reach 2 - Ink Springs Stream Flow Gage to Headgate of Vermillion Ditch

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (meets 3 of 3 hydraulic criteria)
6/14/2018 #1	0.96 cfs	14.00 feet	1.52 cfs	2.67 cfs
6/14/2018 #2	0.78 cfs	15.06 feet	1.91 cfs	2.21 cfs
4/01/2021 #1	2.76 cfs	9.28 feet	0.75 cfs	2.19 cfs
		Averages:	**1.39 cfs**	**2.36 cfs**

BLM's data analysis indicates that the following flows are needed to protect the fishery and natural environment to a reasonable degree:

> 2.4 cubic feet per second is recommended from May 1 to July 31. This period covers spawning activities by native fishes. The recommended flow rate is driven by the average velocity criteria. Protecting average velocity for spawning habitat is important because many portions of this reach that have very low velocities. Without suitable velocity, the limited riffles may be unsuitable for spawning.
>
> 1.40 cubic feet per second is recommended from August 1 to April 30, the base flow period. This recommendation is driven by the average depth criteria. BLM believes that maintaining 1.60 cfs will prevent stress on the fish population during high temperature periods during late summer, and 1.60 cfs should keep pools sufficiently free of ice to allow overwintering of fish.

Water Availability. Vermillion Creek has three hydrologic variables that must be considered in any water availability analysis:

- Reach #1 receives flows from multiple tributaries to Vermillion Creek, including Talamantes Creek, Canyon Creek and Shell Creek. Flow in Talamantes Creek is heavily diverted, but even when existing water rights sweep Talamantes Creek, BLM has observed irrigation returns flow reaching Vermillion Creek. Water does not appear to be diverted from Canyon Creek or Shell Creek within Colorado, but there are numerous water rights in upstream location in Wyoming.

- Multiple springs in the vicinity of Ink Springs contribute substantial flow to Reach #1 and Reach #2. In early April 2021, before irrigation season began, BLM measured flows in Vermillion Creek slightly above Ink Springs and at the Highway 318 crossing below Ink Springs. The additional flow that accrued to the creek between these two points was 1.90 cfs, and BLM believes almost all of that increase is attributable to spring discharge.

- Vermillion Ditch can sweep the creek during much of the irrigation season.

When calculating water availability, BLM is aware of four data sources that may be useful:

- USGS Gage 09235490 (Vermillion Creek below Douglas Draw) operated for a short period in 1994 and 1995. The gage was located upstream from Vermillion Ditch.

- USGS Gage 09235450 (Vermillion Creek at Ink Springs Ranch) was operated from 1977 through 1981. This gage was located downstream from the springs described above in and upstream from Vermillion Ditch.

- Vermillion Ditch (WDID 5601180) has a long history of diversion records from 1989 through 2024.

- Upper Buffham Ditch (WDID 5600528) and Middle Buffham Ditch (WDID 5600527) have a long history of diversion records from 1970 through 2024, but there are many years in which diversion data was not collected.

BLM is aware of the following rights within the two reaches:

Reach #1:

Upper Buffham Ditch – 3.0 cfs, absolute

Reach #2:

Middle Buffham Ditch – 1.0 cfs, absolute
Moffat County Pump Diversion – 2.0 cfs, absolute

Relationship to Management Plans. The Little Snake Resource Management Plan identifies management of streams supporting native fish species as a priority for BLM. The plan specifies that BLM will work to improve aquatic conditions in these streams and will also work to prevent surface disturbances close to them. In addition, the plan specifies that BLM will work with the Colorado Water Conservation Board to appropriate instream flow water rights to protect these fisheries. Vermillion Creek also represents a major riparian habitat resource in an extremely arid area. BLM's plan specifies that BLM will take actions to stabilize and improve riparian habitat. Appropriation of an instream flow water right would assist BLM in meeting its aquatic and riparian management objectives.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2022. BLM thanks both Colorado Parks and Wildlife and the CWCB for their cooperation in this effort.

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

Sincerely,

ALAN BITTNER

Digitally signed by ALAN BITTNER
Date: 2025.02.18 09:28:50 -07'00'

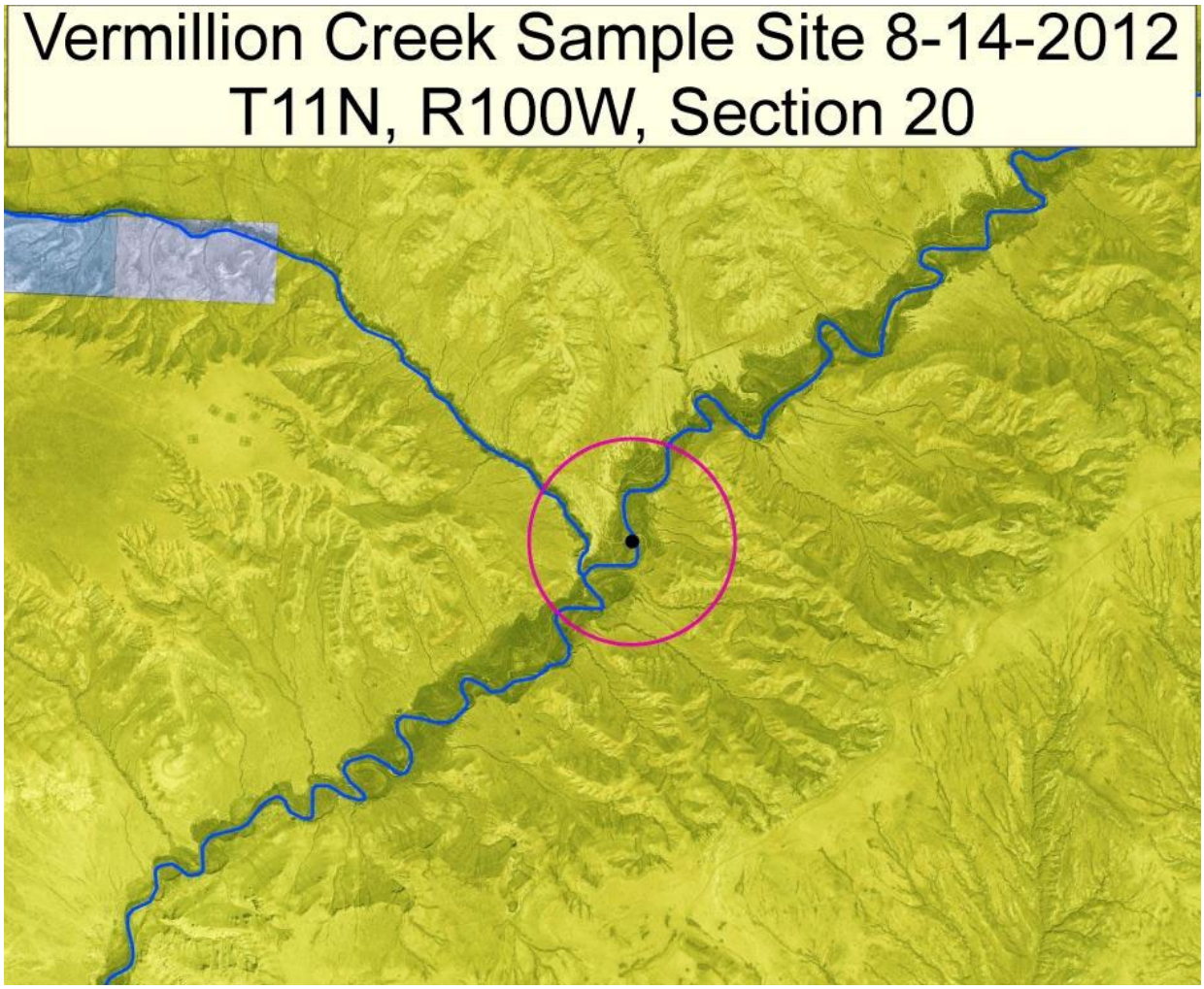
Alan Bittner
Deputy State Director
Resources

cc: Kymm Gresset, Little Snake Field Office
Eric Scherff, Little Snake Field Office
District Manager, Northwest District Office

Little Snake Field Office Stream Surveys
August 2012

Vermillion Creek - Water Code #21503

Vermillion Creek, located northwest of Maybell, Colorado on BLM lands managed by the Little Snake Field Office was sampled on August 14, 2012. Vermillion Creek is tributary to the Green River. Work was initiated to look at road stream crossings along the creek but a brief netting effort was conducted in an isolated pool at one of the crossings and two fish were collected. The sample was done just upstream of the confluence with Talamantes Creek. Personnel present were Tom Fresques, and Andrea Sponseller, BLM.



Road Crossing looking upstream into isolated pool

Close-up of isolated pool habitat

Small Bluehead sucker


Close-up of small Bluehead sucker mouth

Slightly larger Bluehead sucker

Close-up of larger Bluehead sucker mouth

Discussion:
The upper portions of Vermillion Creek and portions of the larger tributaries (Canyon Creek, Shell Creek, Talamantes Creek) were all very low and contained no flowing water at the time of the visit. This was a dry year but these systems typically get low. By late summer Vermillion Creek is a series of isolated pools that appear to persist throughout much of its length. The pool we sampled contained fish and what visually appeared to be two bluehead suckers were collected.

Riparian vegetation consisted of primarily willow and common reedgrass. The stream at the time of the visit was a series of unconnected isolated pools. This particular pool was nearly 3+ feet deep at the deepest point and approximately 60 feet long. Substrate was silt over a gravel and cobble bottom. Water was relatively cool considering the lack of flow and time of year. Good vegetative cover is shading this particular pool.

Recommendations:

- Sample more of these isolated pools within the watershed to determine fish species composition and relative abundance – seine hauls, minnow traps, backpack shockers, or hoop nets

- Collect some water quality data at sampled pools

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Vermillion Creek					CROSS-SECTION NO.: 2	
CROSS-SECTION LOCATION: 0.5 mile upstream from Ink Springs Ranch						
DATE: 4-1-21	OBSERVERS: N. Smith, E. Schorr					
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 2	TOWNSHIP: 9 (N)/S	RANGE: 101 E/(W)	PM: 6th	
COUNTY: Moffat	WATERSHED: Green	WATER DIVISION: 6	DOW WATER CODE:			
MAP(S): USGS:	Zone 12 692555					
USFS:	4515575					

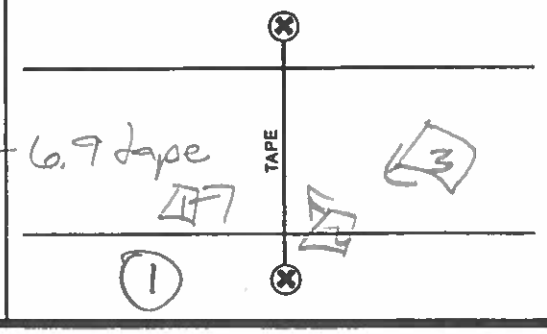
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE/RANGE: silt to 18" boulders	PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(X) Tape @ Stake LB	0.0	surveyed
(X) Tape @ Stake RB	0.0	surveyed
(1) WS @ Tape LB/RB	0.0 15.0	7.80 / 7.80
(2) WS Upstream	17.2	7.74
(3) WS Downstream	11.5	7.96
SLOPE	0.18/28.7 = 0.006	

SKETCH



LEGEND: Stake (X), 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

Riparian = willow, russian olive, cottonwood, phragmites

DISCHARGE/CROSS SECTION NOTES

STREAM NAME:	CROSS-SECTION NO.:	DATE:	SHEET ___ OF ___
Vermillion Creek		4-1-21	

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)
RS	0.0		4.91								
BF	3.7		6.72								
	5.1		7.00								
RW	6.9		7.80								
	7.5		8.0	0.20				0			
	8.0		8.1	0.3				0.18			
	8.3		8.1	0.3				0.44			
	8.6		8.05	0.25				0.55			
	8.9		8.1	0.3				0.56			
	9.2		8.15	0.35				0.72			
	9.5		8.1	0.3				0.42			
	9.8		8.15	0.35				0.00			
	10.1		8.05	0.25				0.17			
	10.4		8.10	0.3				1.38			
	10.7		8.0	0.2				1.11			
	11.0		8.0	0.2				Ø			
	11.3		8.05	0.25				0.97			
	11.6		8.0	0.2				0.70			
	11.9		8.0	0.2				0.95			
	12.2		8.0	0.2				Ø			
	12.5		7.85	0.05				0.13			
	12.8		8.0	0.2				0.36			
	13.1		8.05	0.25				1.20			
	13.4		8.0	0.2				0.52			
	13.7		8.0	0.2				0.57			
	14.0		7.95	0.15				0.51			
	14.5		7.9	0.1				0.20			
LW	15.0		7.80								
	17.7		7.70								
	20.0		7.30								
BF	21.0		6.69								
LS	23.5		5.09								
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: Vermillion Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: Approx. 800 ft. downstream from confluence w/ Talamantes Creek						
DATE: 5-13-21	OBSERVERS: R. Smith, E. Scharff					
LEGAL DESCRIPTION	¼ SECTION: SW SW	SECTION: 20	TOWNSHIP: 11 (N)/S	RANGE: 100 E/(W)	PM: 6th	
COUNTY: Moffat	WATERSHED: Green River	WATER DIVISION:	DOW WATER CODE:			
MAP(S): USGS:	Zone 12N 696535					
USFS:	4529470					

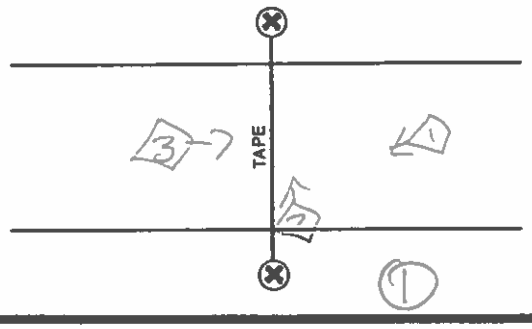
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: silt to 2" cobbles	PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(X) Tape @ Stake LB	0.0	surveyed
(X) Tape @ Stake RB	0.0	surveyed
(1) WS @ Tape LB/RB	0.0	4.75 | 4.75
(2) WS Upstream	3.2	4.74
(3) WS Downstream	16.0	4.85
SLOPE	0.11 | 19.2 = .006	

SKETCH



LEGEND:
Stake (X)
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:

caddisfly, water skipper, annelids

COMMENTS

pH = 8.06
temp = 15.6°C
Salinity = 1.7 ppt
Cond = 2016

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Vermillion Creek | CROSS-SECTION NO.: 1 | DATE: 5-13-21 | SHEET ___ OF ___

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

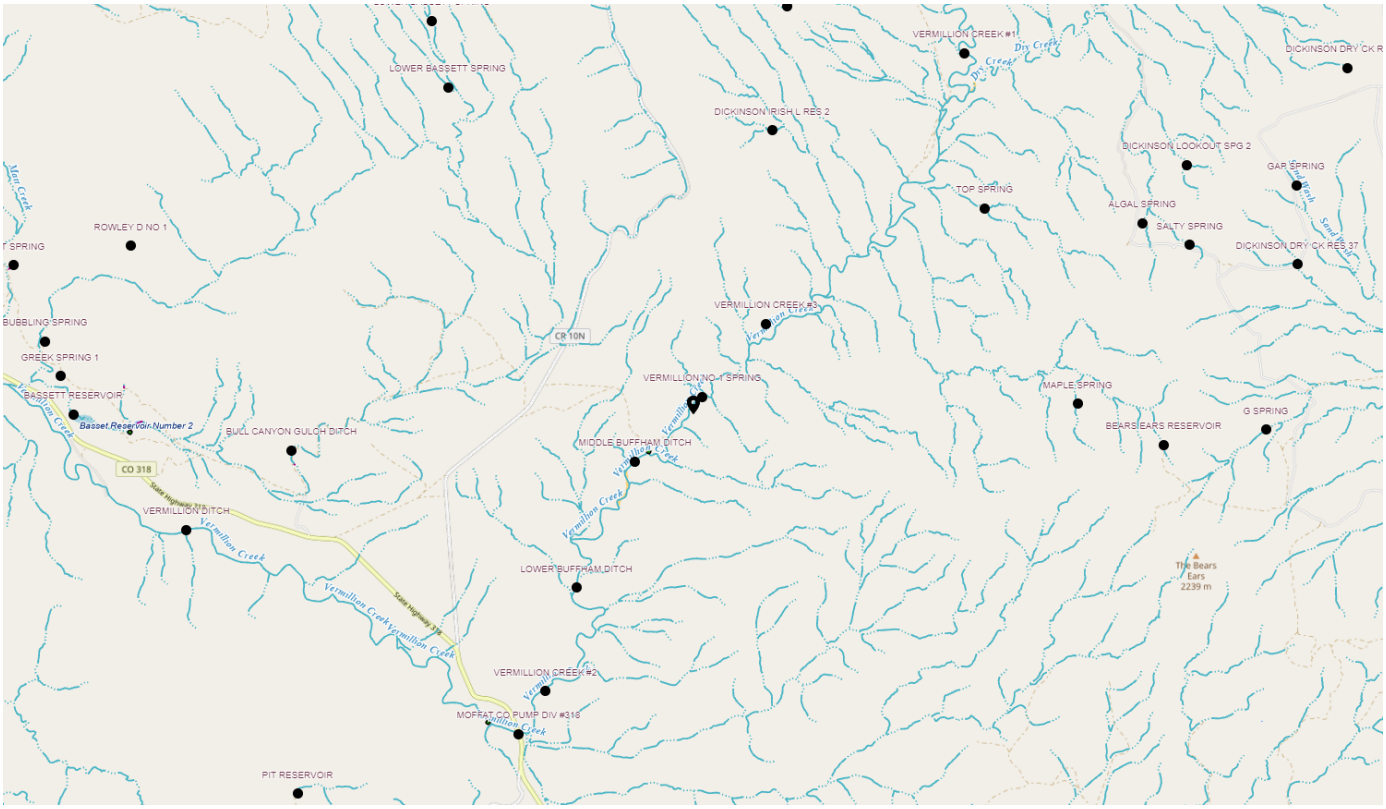
Features (Stake (S), Grassline (G), Waterline (W), Rock (R))	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	0.0		3.76								
BF	0.1		3.86								
	0.3		4.00								
	0.5		4.36								
	1.5		4.62								
RW	2.1		4.75								
	2.6		4.8	0.05				0.11			
	2.8		4.85	0.10				0.22			
	3.0		4.95	0.20				0.40			
	3.2		4.95	0.20				0.50			
	3.4		4.9	0.15				0.68			
	3.6		4.95	0.20				0.86			
	3.8		4.95	0.20				0.67			
	4.0		5.0	0.25				0.82			
	4.2		5.0	0.25				1.08			
	4.4		5.0	0.25				1.20			
	4.6		5.0	0.25				1.42			
	4.8		5.05	0.30				1.17			
	5.0		5.05	0.30				0.88			
	5.2		4.95	0.20				1.18			
	5.4		4.95	0.20				1.24			
	5.6		4.95	0.20				0.84			
	5.8		4.95	0.20				0.66			
	6.0		4.9	0.15				0.10			
	6.2		4.85	0.10				0			
LW	6.6		4.75								
	7.8		4.46								
	8.6		4.32								
BF	9.8		3.86								
LS	9.1		3.76								
TOTALS:											

End of Measurement | Time: 12:34 | Gage Reading: _____ ft | CALCULATIONS PERFORMED BY: | CALCULATIONS CHECKED BY:

R2Cross RESULTS

Stream Name: Vermillion Creek
Stream Locations: 0.5 mile upstream from Ink Springs Ranch boundary
Fieldwork Date: 04/01/2021
Cross-section: 2
Observers: R Smith, E Scherff
Coordinate System: UTM Zone 12
X (easting): 692555
Y (northing): 4515575
Date Processed: 07/11/2024
Slope: 0.0077
Discharge: R2Cross data file: 0.86 (cfs)
Computation method: Ferguson VPE
R2Cross data filename: Vermillion Creek 4-1-21 #2 Ferguson.xlsx
R2Cross version: 2.0.2

LOCATION



ANALYSIS RESULTS

Habitat Criteria Results

Bankfull top width (ft) = 17.25

	Habitat Criteria	Discharge (cfs) Meeting Criteria
Mean Depth (ft)	0.2	0.76
Percent Wetted Perimeter (%)	50.0	1.0
Mean Velocity (ft/s)	1.0	4.23

STAGING TABLE

Feature	Distance to Water (ft)	Top Width (ft)	Mean Depth (ft)	Maximum Depth (ft)	Area (sq ft)	Wetted Perimeter (ft)	Percent Wetted Perimeter	Hydraulic Radius (ft)	Manning's n	Mean Velocity (ft/s)	Discharge (cfs)
Bankfull	6.72	17.25	0.97	1.43	16.72	17.85	100.0	0.94	0.04	3.18	53.16
	6.75	17.05	0.95	1.4	16.21	17.64	98.82	0.92	0.04	3.12	50.56
	6.8	16.72	0.92	1.35	15.36	17.29	96.85	0.89	0.04	3.02	46.37
	6.85	16.39	0.89	1.3	14.54	16.94	94.89	0.86	0.04	2.92	42.38
	6.9	16.06	0.85	1.25	13.73	16.59	92.92	0.83	0.04	2.81	38.57
	6.95	15.72	0.82	1.2	12.93	16.24	90.96	0.8	0.04	2.7	34.95
	7.0	15.39	0.79	1.15	12.15	15.89	88.99	0.77	0.04	2.59	31.51
	7.05	15.2	0.75	1.1	11.39	15.67	87.76	0.73	0.04	2.46	27.99
	7.1	15.0	0.71	1.05	10.63	15.45	86.53	0.69	0.04	2.32	24.66
	7.15	14.81	0.67	1.0	9.89	15.23	85.31	0.65	0.04	2.18	21.52
	7.2	14.61	0.63	0.95	9.15	15.01	84.08	0.61	0.05	2.03	18.58
	7.25	14.42	0.58	0.9	8.43	14.79	82.85	0.57	0.05	1.88	15.84
	7.3	14.22	0.54	0.85	7.71	14.57	81.62	0.53	0.05	1.73	13.31
	7.35	13.82	0.51	0.8	7.01	14.16	79.3	0.5	0.05	1.6	11.19
	7.4	13.42	0.47	0.75	6.33	13.74	76.98	0.46	0.05	1.46	9.26
	7.45	13.02	0.44	0.7	5.67	13.33	74.65	0.43	0.06	1.33	7.52
	7.5	12.62	0.4	0.65	5.03	12.91	72.33	0.39	0.06	1.19	5.97
	7.55	12.22	0.36	0.6	4.4	12.5	70.0	0.35	0.06	1.05	4.61
	7.6	11.82	0.32	0.55	3.8	12.08	67.68	0.31	0.07	0.9	3.44
	7.65	11.42	0.28	0.5	3.22	11.67	65.35	0.28	0.07	0.76	2.45
	7.7	11.02	0.24	0.45	2.66	11.25	63.03	0.24	0.08	0.61	1.64
	7.75	9.56	0.22	0.4	2.15	9.78	54.77	0.22	0.09	0.55	1.19
Waterline	7.8	8.1	0.21	0.35	1.7	8.3	46.51	0.21	0.09	0.51	0.86
	7.85	7.7	0.17	0.3	1.31	7.89	44.2	0.17	0.11	0.37	0.49
	7.9	7.1	0.13	0.25	0.94	7.25	40.63	0.13	0.13	0.26	0.25

	7.95	6.25	0.1	0.2	0.61	6.37	35.68	0.1	0.16	0.17	0.1
	8.0	4.4	0.07	0.15	0.31	4.48	25.11	0.07	0.21	0.1	0.03
	8.05	2.8	0.05	0.1	0.13	2.85	15.99	0.05	0.3	0.06	0.01
	8.1	1.05	0.02	0.05	0.03	1.07	6.0	0.02	0.5	0.02	0.0
	8.13	0.32	0.01	0.02	0.0	0.32	1.8	0.01	1.35	0.0	0.0

This Manning's roughness coefficient was calculated based on velocity estimates from the Ferguson VPE method

MODEL SUMMARY

Measured Flow (Qm) =	0.86	(cfs)
Calculated Flow (Qc) =	0.86	(cfs)
(Qm-Qc)/Qm * 100 =	0.01%	
Measured Waterline (WLm) =	7.8	(ft)
Calculated Waterline (WLc) =	7.8	(ft)
(WLm-WLc)/WLm * 100 =	-0.00%	
Max Measured Depth (Dm) =	0.35	(ft)
Max Calculated Depth (Dc) =	0.35	(ft)
(Dm-Dc)/Dm * 100 =	0.00%	
Mean Velocity =	0.51	(ft/s)
Manning's n =	0.09	
0.4 * Qm =	0.34	(cfs)
2.5 * Qm =	2.15	(cfs)

FIELD DATA

Feature	Station (ft)	Rod Height (ft)	Water depth (ft)	Velocity (ft/s)
	0	4.91		
Bankfull	3.7	6.72		
	5.1	7		
Waterline	6.9	7.8	0	0
	7.5	8	0.2	0
	8	8.1	0.3	0.18
	8.3	8.1	0.3	0.44
	8.6	8.05	0.25	0.55
	8.9	8.1	0.3	0.56
	9.2	8.15	0.35	0.72
	9.5	8.1	0.3	0.42
	9.8	8.15	0.35	0
	10.1	8.05	0.25	0.17
	10.4	8.1	0.3	1.38
	10.7	8	0.2	1.11
	11	8	0.2	0
	11.3	8.05	0.25	0.97
	11.6	8	0.2	0.7
	11.9	8	0.2	0.95
	12.2	8	0.2	0
	12.5	7.85	0.05	0.13
	12.8	8	0.2	0.36
	13.1	8.05	0.25	1.2
	13.4	8	0.2	0.52
	13.7	8	0.2	0.57
	14	7.95	0.15	0.51
	14.5	7.9	0.1	0.2
Waterline	15	7.8	0	0
	17.7	7.7		
	20	7.3		

Bankfull	21	6.69	
	23.5	5.09	

COMPUTED FROM MEASURED FIELD DATA

Wetted Perimeter (ft)	Water Depth (ft)	Area (ft^2)	Discharge (cfs)	Percent Discharge
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0.63	0.2	0.11	0	0
0.51	0.3	0.12	0.02	2.51
0.3	0.3	0.09	0.04	4.6
0.3	0.25	0.07	0.04	4.79
0.3	0.3	0.09	0.05	5.85
0.3	0.35	0.1	0.08	8.78
0.3	0.3	0.09	0.04	4.39
0.3	0.35	0.1	0	0
0.32	0.25	0.07	0.01	1.48
0.3	0.3	0.09	0.12	14.42
0.32	0.2	0.06	0.07	7.73
0.3	0.2	0.06	0	0
0.3	0.25	0.07	0.07	8.45
0.3	0.2	0.06	0.04	4.88
0.3	0.2	0.06	0.06	6.62
0.3	0.2	0.06	0	0
0.34	0.05	0.01	0	0.23
0.34	0.2	0.06	0.02	2.51
0.3	0.25	0.07	0.09	10.45
0.3	0.2	0.06	0.03	3.62
0.3	0.2	0.06	0.03	3.97
0.3	0.15	0.06	0.03	3.55
0.5	0.1	0.05	0.01	1.16
0.51	0	0	0	0
0	0	0	0	0
0	0	0	0	0

0	0	0	0	0
0	0	0	0	0

DISCLAIMER

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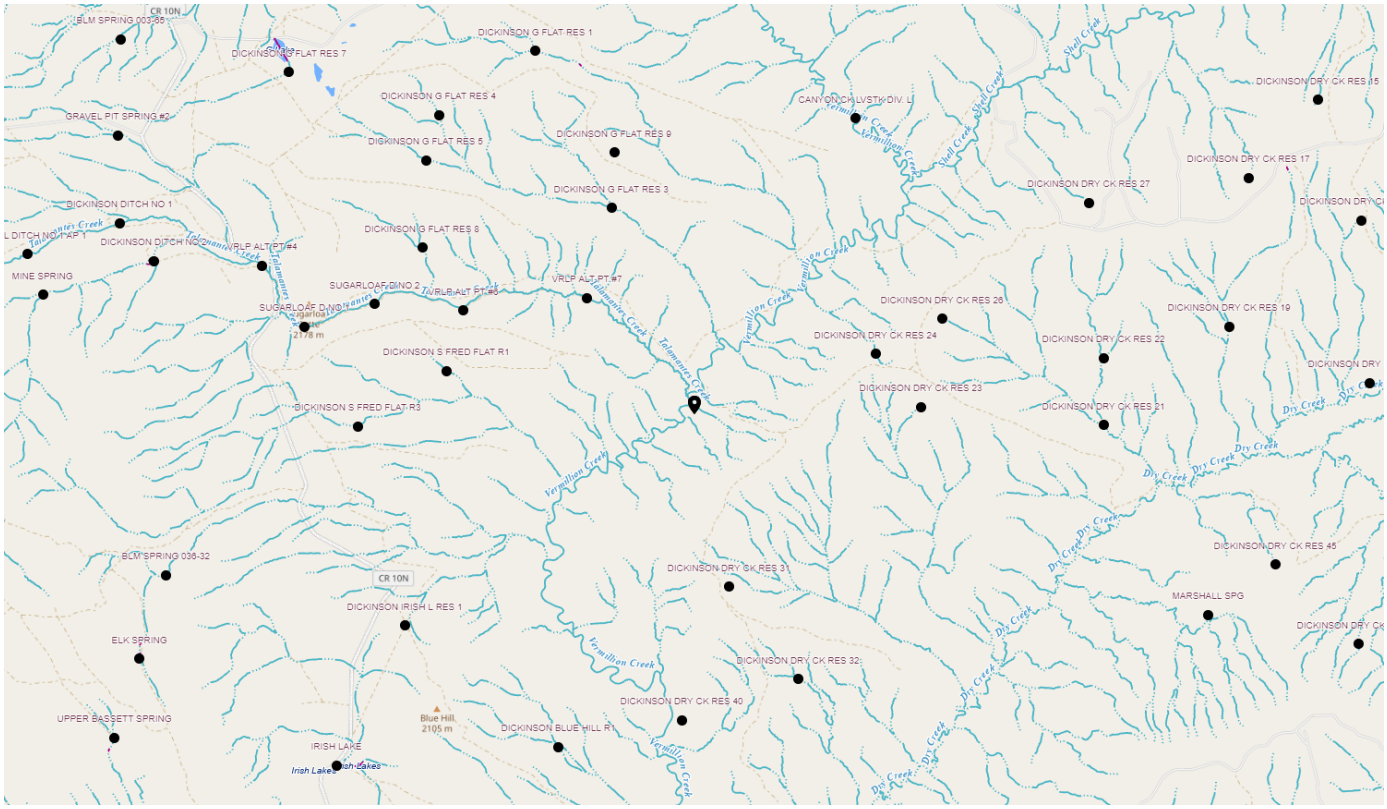
R2Cross RESULTS

Stream Name: Vermillion Creek
Stream Locations: Approx 800 ft downstream from confluence with Talamantes Creek
Fieldwork Date: 05/13/2021
Cross-section: 1
Observers: R Smith, E Scherff
Coordinate System: UTM Zone 12
X (easting): 696535
Y (northing): 4529470
Date Processed: 07/11/2024
Slope: 0.006
Discharge: R2Cross data file: 0.63 (cfs)
Computation method: Ferguson VPE
R2Cross data filename: Vermillion Creek 5-13-21 #1 Ferguson.xlsx
R2Cross version: 2.0.2

LOCATION



ANALYSIS RESULTS

Habitat Criteria Results

Bankfull top width (ft) = 8.7

	Habitat Criteria	Discharge (cfs) Meeting Criteria
Mean Depth (ft)	0.2	0.98
Percent Wetted Perimeter (%)	50.0	0.74
Mean Velocity (ft/s)	1.0	0.99

STAGING TABLE

Feature	Distance to Water (ft)	Top Width (ft)	Mean Depth (ft)	Maximum Depth (ft)	Area (sq ft)	Wetted Perimeter (ft)	Percent Wetted Perimeter	Hydraulic Radius (ft)	Manning's n	Mean Velocity (ft/s)	Discharge (cfs)
Bankfull	3.86	8.7	0.84	1.19	7.34	9.46	100.0	0.78	0.03	3.52	25.87
	3.9	8.63	0.81	1.15	6.99	9.34	98.8	0.75	0.03	3.43	23.97
	3.95	8.53	0.77	1.1	6.56	9.2	97.3	0.71	0.03	3.3	21.69
	4.0	8.44	0.73	1.05	6.14	9.06	95.8	0.68	0.03	3.17	19.49
	4.05	8.39	0.68	1.0	5.72	8.95	94.62	0.64	0.03	3.03	17.34
	4.1	8.34	0.64	0.95	5.3	8.84	93.44	0.6	0.03	2.88	15.28
	4.15	8.29	0.59	0.9	4.89	8.72	92.26	0.56	0.03	2.73	13.32
	4.2	8.24	0.54	0.85	4.47	8.61	91.08	0.52	0.03	2.56	11.45
	4.25	8.19	0.5	0.8	4.06	8.5	89.9	0.48	0.03	2.39	9.7
	4.3	8.14	0.45	0.75	3.65	8.39	88.72	0.44	0.03	2.2	8.05
	4.35	7.93	0.41	0.7	3.25	8.14	86.04	0.4	0.03	2.04	6.63
	4.4	7.49	0.38	0.65	2.86	7.68	81.17	0.37	0.03	1.92	5.49
	4.45	7.01	0.36	0.6	2.5	7.19	76.0	0.35	0.03	1.8	4.5
	4.5	6.6	0.33	0.55	2.16	6.76	71.49	0.32	0.03	1.66	3.59
	4.55	6.2	0.3	0.5	1.84	6.35	67.13	0.29	0.03	1.51	2.78
	4.6	5.8	0.27	0.45	1.54	5.94	62.78	0.26	0.03	1.35	2.08
	4.65	5.38	0.23	0.4	1.26	5.5	58.19	0.23	0.04	1.18	1.49
	4.7	4.94	0.2	0.35	1.0	5.05	53.45	0.2	0.04	1.01	1.01
Waterline	4.75	4.5	0.17	0.3	0.77	4.61	48.7	0.17	0.04	0.82	0.63
	4.8	3.8	0.15	0.25	0.56	3.9	41.2	0.14	0.05	0.69	0.39
	4.85	3.4	0.11	0.2	0.38	3.48	36.84	0.11	0.05	0.49	0.18
	4.9	3.1	0.07	0.15	0.22	3.17	33.48	0.07	0.07	0.26	0.06
	4.95	1.4	0.06	0.1	0.08	1.44	15.18	0.06	0.09	0.19	0.02
	5.0	0.5	0.03	0.05	0.02	0.52	5.48	0.03	0.13	0.09	0.0
	5.04	0.29	0.01	0.01	0.0	0.3	3.12	0.01	0.29	0.02	0.0

This Manning's roughness coefficient was calculated based on velocity estimates from the Ferguson VPE method

MODEL SUMMARY

Measured Flow (Qm) =	0.63	(cfs)
Calculated Flow (Qc) =	0.63	(cfs)
(Qm-Qc)/Qm * 100 =	0.00%	
Measured Waterline (WLm) =	4.75	(ft)
Calculated Waterline (WLc) =	4.75	(ft)
(WLm-WLc)/WLm * 100 =	-0.00%	
Max Measured Depth (Dm) =	0.3	(ft)
Max Calculated Depth (Dc) =	0.3	(ft)
(Dm-Dc)/Dm * 100 =	0.00%	
Mean Velocity =	0.82	(ft/s)
Manning's n =	0.042	
0.4 * Qm =	0.25	(cfs)
2.5 * Qm =	1.58	(cfs)

FIELD DATA

Feature	Station (ft)	Rod Height (ft)	Water depth (ft)	Velocity (ft/s)
	0	3.76		
Bankfull	0.1	3.86		
	0.3	4		
	0.5	4.36		
	1.5	4.62		
Waterline	2.1	4.75	0	0
	2.6	4.8	0.05	0.11
	2.8	4.85	0.1	0.22
	3	4.95	0.2	0.4
	3.2	4.95	0.2	0.5
	3.4	4.9	0.15	0.68
	3.6	4.95	0.2	0.86
	3.8	4.95	0.2	0.67
	4	5	0.25	0.82
	4.2	5	0.25	1.08
	4.4	5	0.25	1.2
	4.6	5	0.25	1.42
	4.8	5.05	0.3	1.17
	5	5.05	0.3	0.88
	5.2	4.95	0.2	1.18
	5.4	4.95	0.2	1.24
	5.6	4.95	0.2	0.84
	5.8	4.95	0.2	0.66
	6	4.9	0.15	0.1
	6.2	4.85	0.1	0
Waterline	6.6	4.75	0	
	7.8	4.46		
	8.6	4.32		
Bankfull	8.8	3.86		
	9.1	3.76		

COMPUTED FROM MEASURED FIELD DATA

Wetted Perimeter (ft)	Water Depth (ft)	Area (ft^2)	Discharge (cfs)	Percent Discharge
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0.5	0.05	0.02	0	0.3
0.21	0.1	0.02	0	0.7
0.22	0.2	0.04	0.02	2.53
0.2	0.2	0.04	0.02	3.16
0.21	0.15	0.03	0.02	3.22
0.21	0.2	0.04	0.03	5.44
0.2	0.2	0.04	0.03	4.24
0.21	0.25	0.05	0.04	6.48
0.2	0.25	0.05	0.05	8.54
0.2	0.25	0.05	0.06	9.48
0.2	0.25	0.05	0.07	11.22
0.21	0.3	0.06	0.07	11.09
0.2	0.3	0.06	0.05	8.35
0.22	0.2	0.04	0.05	7.46
0.2	0.2	0.04	0.05	7.84
0.2	0.2	0.04	0.03	5.31
0.2	0.2	0.04	0.03	4.17
0.21	0.15	0.03	0	0.47
0.21	0.1	0.03	0	0
0.41	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

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Discharge Measurment Field Visit Data Report *(Filters: Name begins with Vermillion; Division = 6;)*

Div	Name	CWCB Case Number	Segment ID	Meas. Date	UTM	Location	Flow Amount (cfs)	Meas #	Rating	Station ID
6	Vermillion Creek		23/6/A-003	11/09/2023	UTMx: 692703 UTMy: 4514734	below canyon	2.37	1		
6	Vermillion Creek		23/6/A-003	03/26/2024	UTMx: 691915 UTMy: 4515824	below canyon	15.38	2		
6	Vermillion Creek		23/6/A-003	05/15/2024	UTMx: 069247 UTMy: 4515355	below canyon	3.92	3		
6	Vermillion Creek		23/6/A-003	06/27/2024	UTMx: 069247 UTMy: 4515355	below canyon	0.74	4		

Discharge Measurement Summary

Site name	VermillionCreekUpper
Site number	11092023
Operator(s)	SC
File name	VermillionCreekUpper_20231109-114717.ft
Comment	

Start time	11/9/2023 11:06 AM
End time	11/9/2023 11:45 AM
Start location latitude	40.761
Start location longitude	-108.717
Calculations engine	FlowTracker2

Sensor type	Top Setting
Handheld serial number	FT2H2322005
Probe serial number	FT2P2317010
Probe firmware	1.30
Handheld software	1.7

# Stations	Avg interval (s)	Total discharge (ft³/s)
24	40	2.3658

Total width (ft)	Total area (ft²)	Wetted Perimeter (ft)
11.600	10.2590	12.499

Mean SNR (dB)	Mean depth (ft)	Mean velocity (ft/s)
28	0.884	0.2306

Mean temp (°F)	Max depth (ft)	Max velocity (ft/s)
38.252	1.250	0.6912

Discharge Uncertainty		
Category	**ISO**	**IVE**
Accuracy	1.0%	1.0%
Depth	0.4%	3.2%
Velocity	1.1%	6.4%
Width	0.1%	0.1%
Method	2.0%	
# Stations	2.1%	
Overall	**3.3%**	**7.3%**

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 %

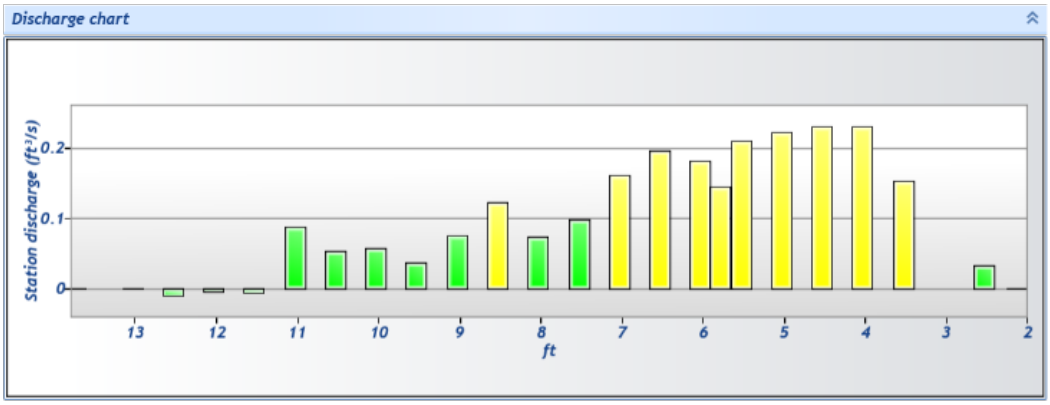
Summary overview

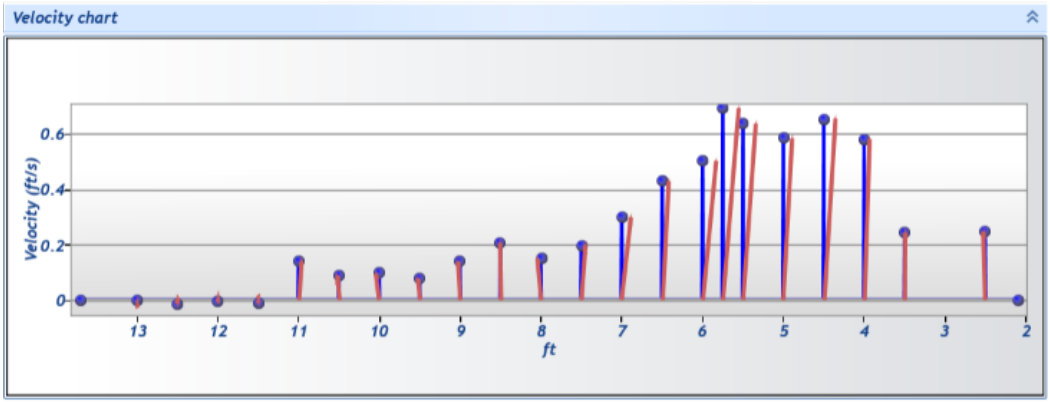
No changes were made to this file
Quality control warnings

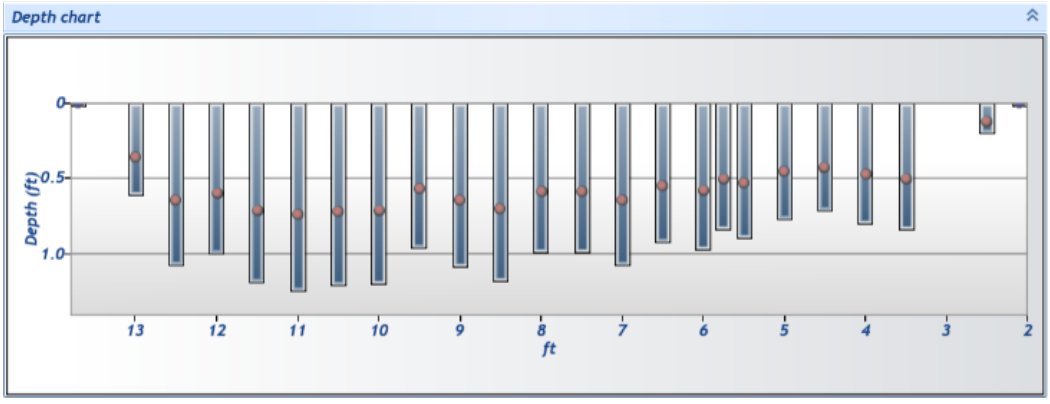
Discharge Measurement Summary

Site name	VermillionCreekUpper
Site number	11092023
Operator(s)	SC
File name	VermillionCreekUpper_20231109-114717.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	VermillionCreekUpper
Site number	11092023
Operator(s)	SC
File name	VermillionCreekUpper_20231109-114717.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	11:06 AM	2.100	None	0.010	0.0000	0.000	0	0.0000	1.0000	0.2472	0.0020	0.0005	0.02	✓
1	11:07 AM	2.500	0.6	0.200	0.6000	0.120	80	0.2472	1.0000	0.2472	0.1400	0.0346	1.46	✓
2	11:11 AM	3.500	0.6	0.840	0.6000	0.504	65	0.2449	1.0000	0.2449	0.6300	0.1543	6.52	✓
3	11:12 AM	4.000	0.6	0.800	0.6000	0.480	46	0.5792	1.0000	0.5792	0.4000	0.2317	9.79	✓
4	11:14 AM	4.500	0.6	0.710	0.6000	0.426	55	0.6535	1.0000	0.6535	0.3550	0.2320	9.81	✓
5	11:15 AM	5.000	0.6	0.770	0.6000	0.462	56	0.5817	1.0000	0.5817	0.3850	0.2240	9.47	✓
6	11:17 AM	5.500	0.6	0.890	0.6000	0.534	53	0.6350	1.0000	0.6350	0.3338	0.2119	8.96	✓
7	11:45 AM	5.750	0.6	0.840	0.6000	0.504	57	0.6912	1.0000	0.6912	0.2100	0.1451	6.14	✓
8	11:18 AM	6.000	0.6	0.970	0.6000	0.582	56	0.5013	1.0000	0.5013	0.3638	0.1823	7.71	✓
9	11:20 AM	6.500	0.6	0.920	0.6000	0.552	54	0.4273	1.0000	0.4273	0.4600	0.1965	8.31	✓
10	11:21 AM	7.000	0.6	1.080	0.6000	0.648	57	0.2984	1.0000	0.2984	0.5400	0.1611	6.81	✓
11	11:22 AM	7.500	0.6	0.990	0.6000	0.594	57	0.1986	1.0000	0.1986	0.4950	0.0983	4.16	✓
12	11:25 AM	8.000	0.6	0.990	0.6000	0.594	64	0.1496	1.0000	0.1496	0.4950	0.0740	3.13	✓
13	11:27 AM	8.500	0.6	1.180	0.6000	0.708	47	0.2074	1.0000	0.2074	0.5900	0.1223	5.17	✓
14	11:28 AM	9.000	0.6	1.090	0.6000	0.654	52	0.1396	1.0000	0.1396	0.5450	0.0761	3.22	✓
15	11:30 AM	9.500	0.6	0.960	0.6000	0.576	47	0.0788	1.0000	0.0788	0.4800	0.0378	1.60	✓
16	11:32 AM	10.000	0.6	1.200	0.6000	0.720	67	0.0962	1.0000	0.0962	0.6000	0.0577	2.44	✓
17	11:33 AM	10.500	0.6	1.210	0.6000	0.726	57	0.0894	1.0000	0.0894	0.6050	0.0541	2.29	✓
18	11:35 AM	11.000	0.6	1.250	0.6000	0.750	49	0.1411	1.0000	0.1411	0.6250	0.0882	3.73	✓
19	11:36 AM	11.500	0.6	1.190	0.6000	0.714	50	-0.0100	1.0000	-0.0100	0.5950	-0.0059	-0.25	✓
20	11:37 AM	12.000	0.6	1.000	0.6000	0.600	48	-0.0057	1.0000	-0.0057	0.5000	-0.0029	-0.12	✓
21	11:39 AM	12.500	0.6	1.080	0.6000	0.648	47	-0.0160	1.0000	-0.0160	0.5400	-0.0086	-0.37	✓
22	11:40 AM	13.000	0.6	0.610	0.6000	0.366	46	0.0012	1.0000	0.0012	0.3660	0.0004	0.02	✓
23	11:42 AM	13.700	None	0.010	0.0000	0.000	0	0.0000	1.0000	0.0012	0.0035	0.0000	0.00	✓

Discharge Measurement Summary

Site name	VermillionCreekUpper
Site number	11092023
Operator(s)	SC
File name	VermillionCreekUpper_20231109-114717.ft
Comment	

Quality Control Settings	
Maximum depth change	50.00%
Maximum spacing change	100.00%
SNR threshold	10 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
1	11:07 AM	2.500	0.6	0.200	0.6000	0.120	Beam SNRs Not Similar
6	11:17 AM	5.500	0.6	0.890	0.6000	0.534	High % Spikes
10	11:21 AM	7.000	0.6	1.080	0.6000	0.648	Velocity Angle > QC
15	11:30 AM	9.500	0.6	0.960	0.6000	0.576	Velocity Angle > QC
16	11:32 AM	10.000	0.6	1.200	0.6000	0.720	Velocity Angle > QC
21	11:39 AM	12.500	0.6	1.080	0.6000	0.648	SNR Threshold Variation
22	11:40 AM	13.000	0.6	0.610	0.6000	0.366	Boundary Interference,SNR Threshold Variation

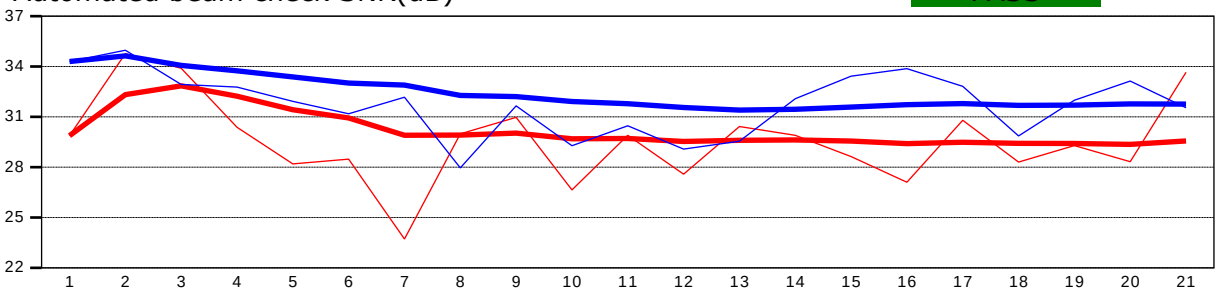
Discharge Measurement Summary

Site name	VermillionCreekUpper
Site number	11092023
Operator(s)	SC
File name	VermillionCreekUpper_20231109-114717.ft
Comment	

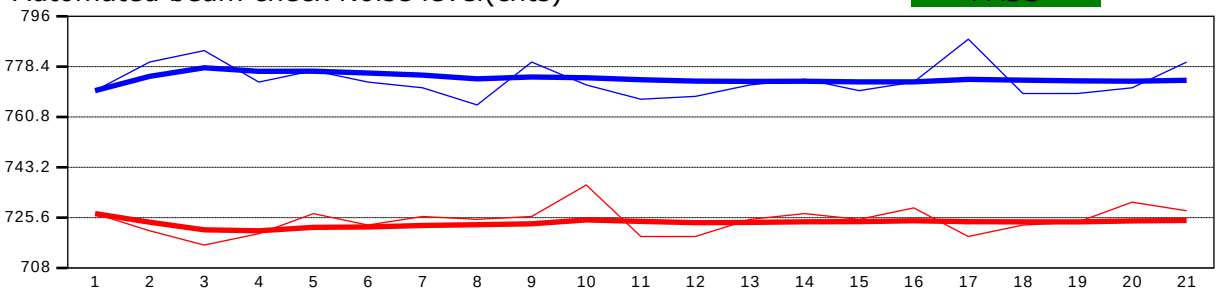
Beam 1	
Beam 2	

Automated beam check Start time 11/9/2023 11:06:29 AM

Automated beam check SNR(dB) PASS



Automated beam check Noise level(cnts) PASS



Automated beam check Quality control warnings

No quality control warnings

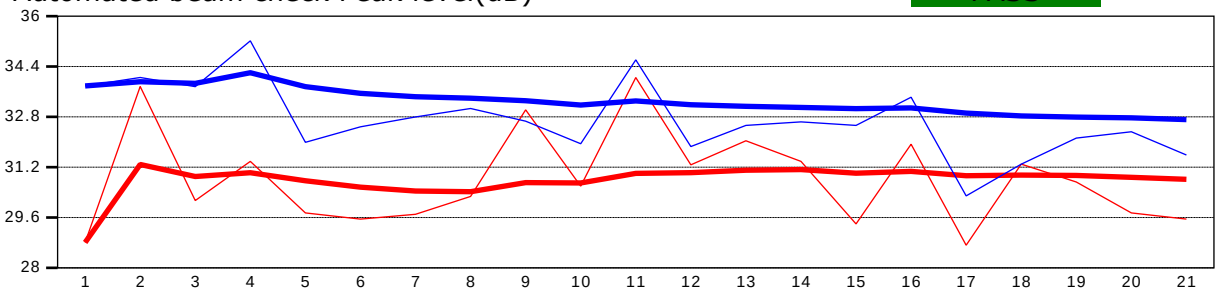
Discharge Measurement Summary

Site name	VermillionCreekUpper
Site number	11092023
Operator(s)	SC
File name	VermillionCreekUpper_20231109-114717.ft
Comment	

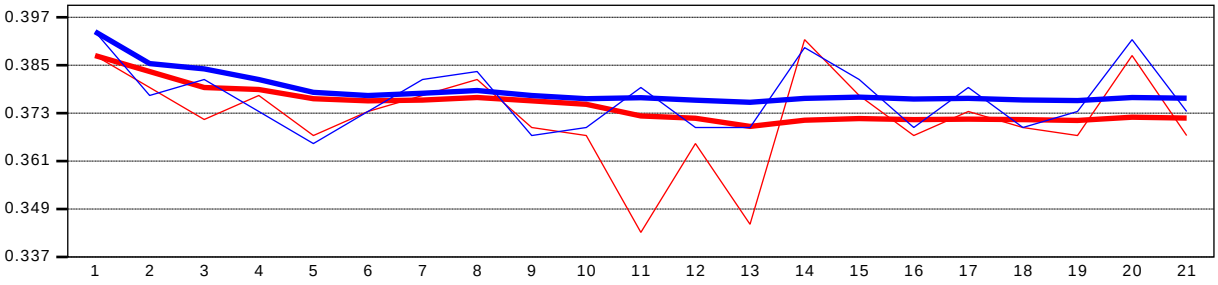
Beam 1	
Beam 2	

Automated beam check Start time 11/9/2023 11:06:29 AM

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	VermillionUp
Site number	05152024
Operator(s)	SC
File name	VermillionUp_20240515-105856.ft
Comment	

Start time	5/15/2024 10:21 AM
End time	5/15/2024 10:56 AM
Start location latitude	40.767
Start location longitude	-108.719
Calculations engine	FlowTracker2

Sensor type	Top Setting
Handheld serial number	FT2H2322005
Probe serial number	FT2P2317010
Probe firmware	1.30
Handheld software	1.7

# Stations	Avg interval (s)	Total discharge (ft³/s)
20	40	3.9181

Total width (ft)	Total area (ft²)	Wetted Perimeter (ft)
16.700	15.4745	17.484

Mean SNR (dB)	Mean depth (ft)	Mean velocity (ft/s)
32	0.927	0.2532

Mean temp (°F)	Max depth (ft)	Max velocity (ft/s)
50.410	1.500	0.4001

Discharge Uncertainty		
Category	**ISO**	**IVE**
Accuracy	1.0%	1.0%
Depth	0.2%	2.5%
Velocity	0.5%	4.3%
Width	0.1%	0.1%
Method	1.9%	
# Stations	2.5%	
Overall	**3.4%**	**5.1%**

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 %

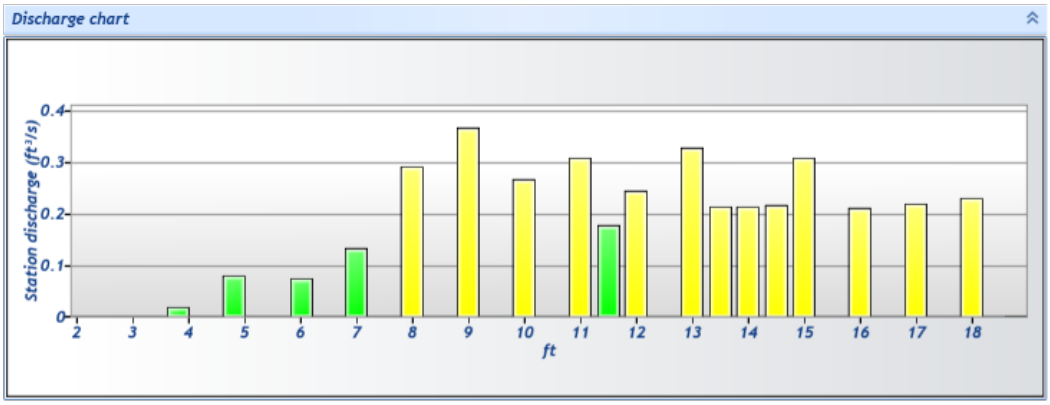
Summary overview

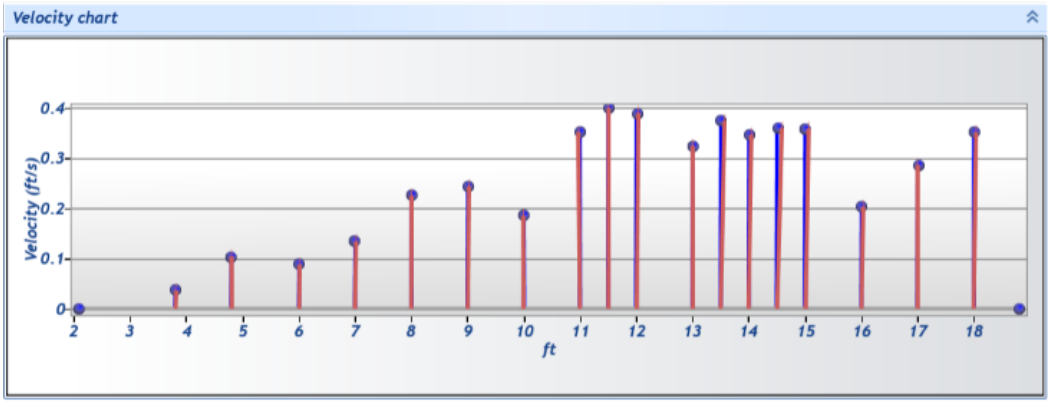
No changes were made to this file
Quality control warnings

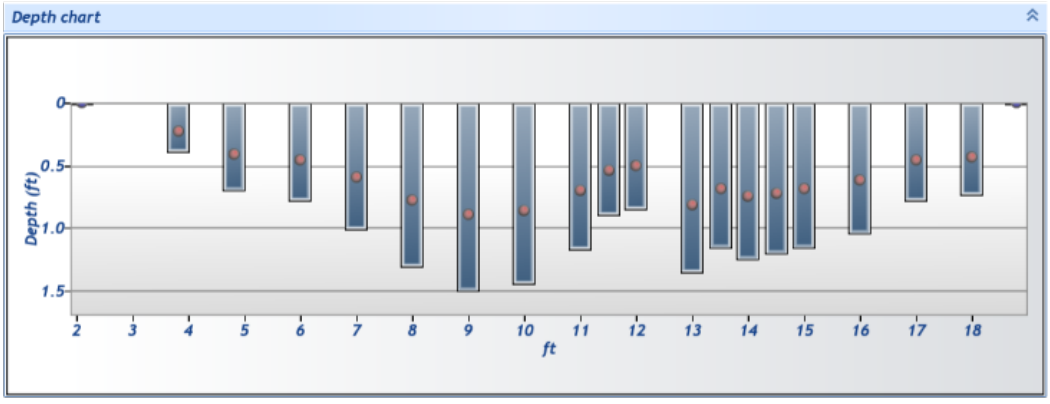
Discharge Measurement Summary

Site name	VermillionUp
Site number	05152024
Operator(s)	SC
File name	VermillionUp_20240515-105856.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	VermillionUp
Site number	05152024
Operator(s)	SC
File name	VermillionUp_20240515-105856.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	
19	10:51 AM	2.100	None	0.010	0.0000	0.000	0	0.0000	1.0000	0.0364	0.0085	0.0003	0.01	✓
18	10:49 AM	3.800	0.6	0.390	0.6000	0.234	55	0.0364	1.0000	0.0364	0.5265	0.0191	0.49	✓
17	10:46 AM	4.800	0.6	0.690	0.6000	0.414	58	0.1047	1.0000	0.1047	0.7590	0.0794	2.03	✓
16	10:43 AM	6.000	0.6	0.770	0.6000	0.462	62	0.0880	1.0000	0.0880	0.8470	0.0746	1.90	✓
15	10:42 AM	7.000	0.6	1.000	0.6000	0.600	56	0.1343	1.0000	0.1343	1.0000	0.1343	3.43	✓
14	10:40 AM	8.000	0.6	1.300	0.6000	0.780	63	0.2253	1.0000	0.2253	1.3000	0.2928	7.47	✓
13	10:38 AM	9.000	0.6	1.500	0.6000	0.900	62	0.2447	1.0000	0.2447	1.5000	0.3670	9.37	✓
12	10:37 AM	10.000	0.6	1.440	0.6000	0.864	55	0.1854	1.0000	0.1854	1.4400	0.2670	6.81	✓
11	10:35 AM	11.000	0.6	1.170	0.6000	0.702	61	0.3524	1.0000	0.3524	0.8775	0.3092	7.89	✓
10	10:56 AM	11.500	0.6	0.890	0.6000	0.534	53	0.4001	1.0000	0.4001	0.4450	0.1780	4.54	✓
9	10:34 AM	12.000	0.6	0.840	0.6000	0.504	53	0.3904	1.0000	0.3904	0.6300	0.2459	6.28	✓
8	10:32 AM	13.000	0.6	1.350	0.6000	0.810	61	0.3247	1.0000	0.3247	1.0125	0.3288	8.39	✓
7	10:53 AM	13.500	0.6	1.150	0.6000	0.690	61	0.3747	1.0000	0.3747	0.5750	0.2155	5.50	✓
6	10:30 AM	14.000	0.6	1.240	0.6000	0.744	57	0.3474	1.0000	0.3474	0.6200	0.2154	5.50	✓
5	10:54 AM	14.500	0.6	1.200	0.6000	0.720	56	0.3601	1.0000	0.3601	0.6000	0.2160	5.51	✓
4	10:29 AM	15.000	0.6	1.150	0.6000	0.690	58	0.3590	1.0000	0.3590	0.8625	0.3096	7.90	✓
3	10:27 AM	16.000	0.6	1.040	0.6000	0.624	61	0.2041	1.0000	0.2041	1.0400	0.2122	5.42	✓
2	10:26 AM	17.000	0.6	0.770	0.6000	0.462	56	0.2866	1.0000	0.2866	0.7700	0.2207	5.63	✓
1	10:22 AM	18.000	0.6	0.730	0.6000	0.438	52	0.3513	1.0000	0.3513	0.6570	0.2308	5.89	✓
0	10:21 AM	18.800	None	0.010	0.0000	0.000	0	0.0000	1.0000	0.3513	0.0040	0.0014	0.04	✓

Discharge Measurement Summary

Site name	VermillionUp
Site number	05152024
Operator(s)	SC
File name	VermillionUp_20240515-105856.ft
Comment	

Quality Control Settings	
Maximum depth change	50.00%
Maximum spacing change	100.00%
SNR threshold	10 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
17	10:46 AM	4.800	0.6	0.690	0.6000	0.414	Boundary Interference
0	10:21 AM	18.800	None	0.010	0.0000	0.000	Water Depth > QC

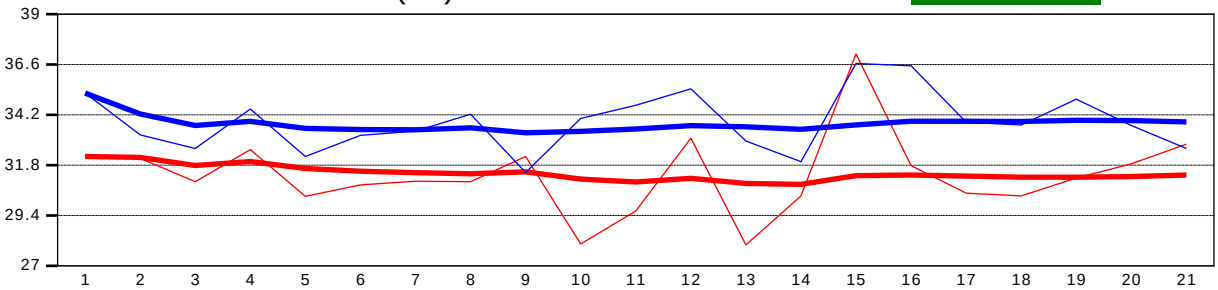
Discharge Measurement Summary

Site name	VermillionUp
Site number	05152024
Operator(s)	SC
File name	VermillionUp_20240515-105856.ft
Comment	

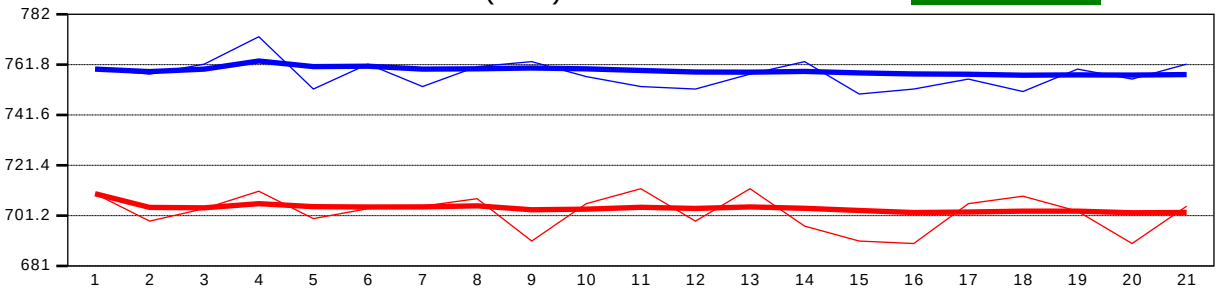
Beam 1	
Beam 2	

Automated beam check Start time 5/15/2024 10:21:13 AM

Automated beam check SNR(dB) PASS



Automated beam check Noise level(cnts) PASS



Automated beam check Quality control warnings

No quality control warnings

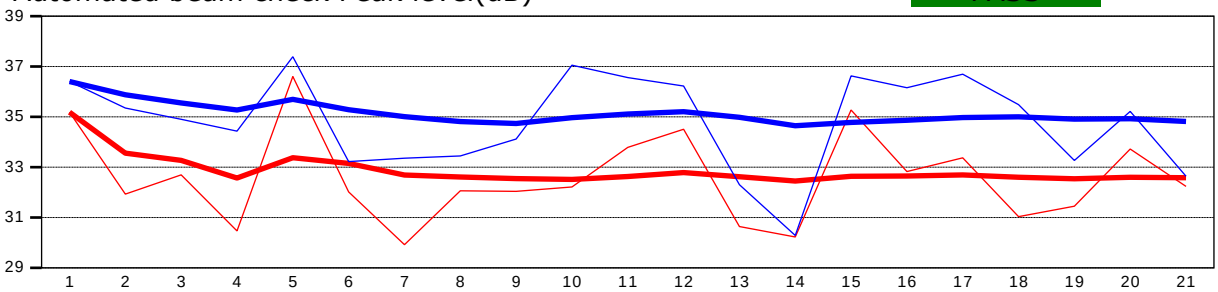
Discharge Measurement Summary

Site name	VermillionUp
Site number	05152024
Operator(s)	SC
File name	VermillionUp_20240515-105856.ft
Comment	

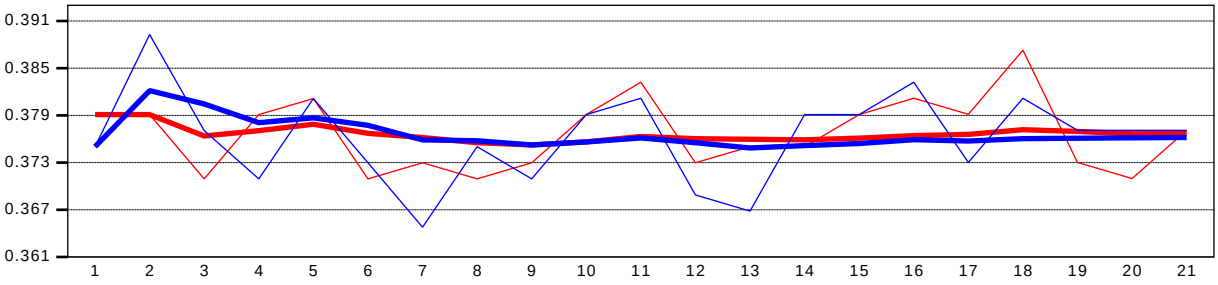
Beam 1	
Beam 2	

Automated beam check Start time 5/15/2024 10:21:13 AM

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	VermillionUp
Site number	03262024
Operator(s)	SC
File name	VermillionUp_20240326-130938.ft
Comment	

Start time	3/26/2024 12:18 PM
End time	3/26/2024 1:08 PM
Start location latitude	40.771
Start location longitude	-108.726
Calculations engine	FlowTracker2

Sensor type	Top Setting
Handheld serial number	FT2H2322005
Probe serial number	FT2P2317010
Probe firmware	1.30
Handheld software	1.7

# Stations	Avg interval (s)	Total discharge (ft³/s)
29	40	15.3818

Total width (ft)	Total area (ft²)	Wetted Perimeter (ft)
14.700	8.0785	15.767

Mean SNR (dB)	Mean depth (ft)	Mean velocity (ft/s)
46	0.550	1.9040

Mean temp (°F)	Max depth (ft)	Max velocity (ft/s)
37.291	1.050	3.9119

Discharge Uncertainty		
Category	**ISO**	**IVE**
Accuracy	1.0%	1.0%
Depth	0.3%	4.6%
Velocity	1.3%	4.5%
Width	0.1%	0.1%
Method	1.6%	
# Stations	1.8%	
Overall	**2.9%**	**6.5%**

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

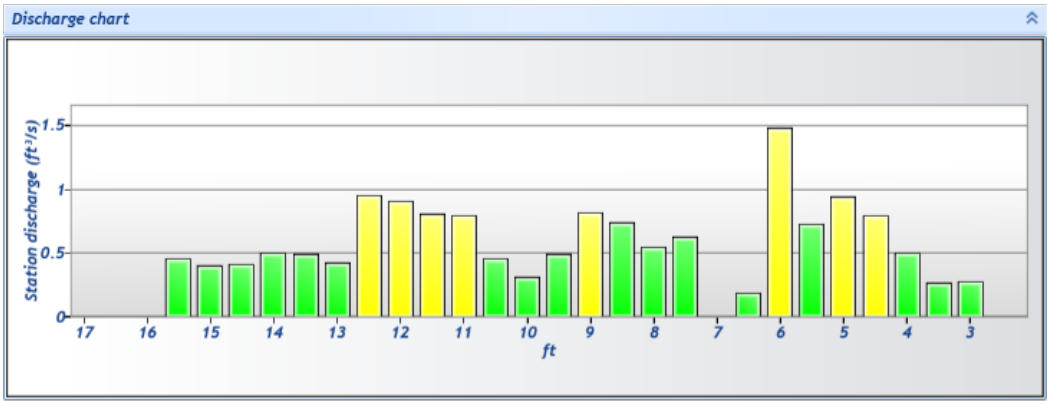
No changes were made to this file
Quality control warnings

Discharge Measurement Summary

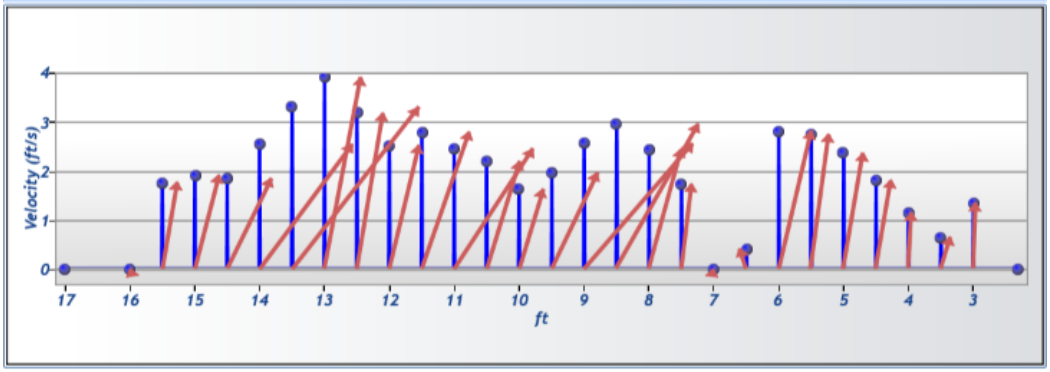
Site name	VermillionUp
Site number	03262024
Operator(s)	SC
File name	VermillionUp_20240326-130938.ft
Comment	

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%	

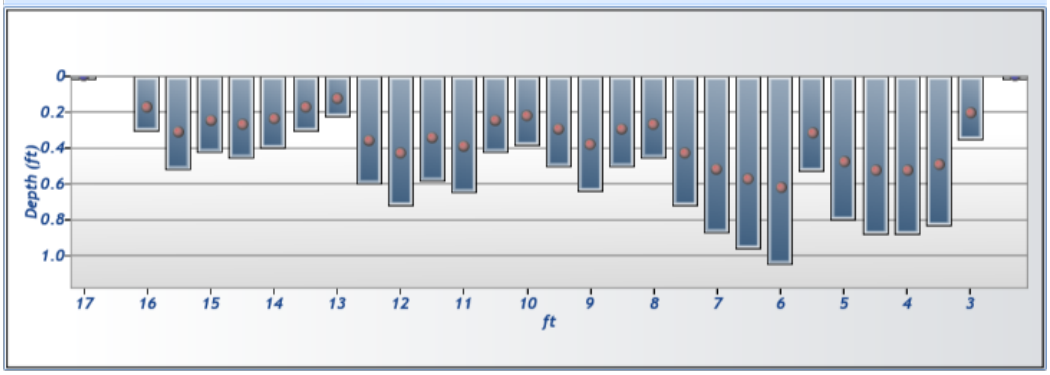
Discharge chart



Velocity chart



Depth chart



Discharge Measurement Summary

Site name	VermillionUp
Site number	03262024
Operator(s)	SC
File name	VermillionUp_20240326-130938.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	12:18 PM	2.300	None	0.010	0.0000	0.000	0	0.0000	1.0000	1.3438	0.0035	0.0047	0.03	✓
1	12:19 PM	3.000	0.6	0.350	0.6000	0.210	65	1.3438	1.0000	1.3438	0.2100	0.2822	1.83	✓
2	12:22 PM	3.500	0.6	0.830	0.6000	0.498	73	0.6480	1.0000	0.6480	0.4150	0.2689	1.75	✓
3	12:24 PM	4.000	0.6	0.880	0.6000	0.528	63	1.1508	1.0000	1.1508	0.4400	0.5063	3.29	✓
4	12:26 PM	4.500	0.6	0.880	0.6000	0.528	62	1.8083	1.0000	1.8083	0.4400	0.7957	5.17	✓
5	12:27 PM	5.000	0.6	0.800	0.6000	0.480	63	2.3699	1.0000	2.3699	0.4000	0.9479	6.16	✓
6	12:29 PM	5.500	0.6	0.530	0.6000	0.318	63	2.7419	1.0000	2.7419	0.2650	0.7266	4.72	✓
7	12:32 PM	6.000	0.6	1.050	0.6000	0.630	63	2.8194	1.0000	2.8194	0.5250	1.4802	9.62	✓
8	12:34 PM	6.500	0.6	0.960	0.6000	0.576	62	0.4083	1.0000	0.4083	0.4800	0.1960	1.27	✓
9	12:36 PM	7.000	0.6	0.870	0.6000	0.522	64	0.0051	1.0000	0.0051	0.4350	0.0022	0.01	✓
10	12:38 PM	7.500	0.6	0.720	0.6000	0.432	62	1.7355	1.0000	1.7355	0.3600	0.6248	4.06	✓
11	12:40 PM	8.000	0.6	0.450	0.6000	0.270	61	2.4362	1.0000	2.4362	0.2250	0.5481	3.56	✓
12	12:42 PM	8.500	0.6	0.500	0.6000	0.300	61	2.9534	1.0000	2.9534	0.2500	0.7384	4.80	✓
13	12:43 PM	9.000	0.6	0.640	0.6000	0.384	62	2.5599	1.0000	2.5599	0.3200	0.8192	5.33	✓
14	12:45 PM	9.500	0.6	0.500	0.6000	0.300	62	1.9567	1.0000	1.9567	0.2500	0.4892	3.18	✓
15	12:46 PM	10.000	0.6	0.380	0.6000	0.228	62	1.6299	1.0000	1.6299	0.1900	0.3097	2.01	✓
16	12:48 PM	10.500	0.6	0.420	0.6000	0.252	62	2.1972	1.0000	2.1972	0.2100	0.4614	3.00	✓
17	12:50 PM	11.000	0.6	0.650	0.6000	0.390	68	2.4547	1.0000	2.4547	0.3250	0.7978	5.19	✓
18	12:52 PM	11.500	0.6	0.580	0.6000	0.348	63	2.7929	1.0000	2.7929	0.2900	0.8099	5.27	✓
19	12:53 PM	12.000	0.6	0.720	0.6000	0.432	62	2.5228	1.0000	2.5228	0.3600	0.9082	5.90	✓
20	12:54 PM	12.500	0.6	0.600	0.6000	0.360	63	3.1811	1.0000	3.1811	0.3000	0.9543	6.20	✓
21	12:56 PM	13.000	0.6	0.220	0.6000	0.132	62	3.9119	1.0000	3.9119	0.1100	0.4303	2.80	✓
22	12:59 PM	13.500	0.6	0.300	0.6000	0.180	62	3.3080	1.0000	3.3080	0.1500	0.4962	3.23	✓
23	1:01 PM	14.000	0.6	0.400	0.6000	0.240	63	2.5385	1.0000	2.5385	0.2000	0.5077	3.30	✓
24	1:02 PM	14.500	0.6	0.450	0.6000	0.270	63	1.8404	1.0000	1.8404	0.2250	0.4141	2.69	✓
25	1:04 PM	15.000	0.6	0.420	0.6000	0.252	62	1.9142	1.0000	1.9142	0.2100	0.4020	2.61	✓
26	1:05 PM	15.500	0.6	0.520	0.6000	0.312	62	1.7667	1.0000	1.7667	0.2600	0.4593	2.99	✓
27	1:07 PM	16.000	0.6	0.300	0.6000	0.180	62	0.0017	1.0000	0.0017	0.2250	0.0004	0.00	✓
28	1:08 PM	17.000	None	0.010	0.0000	0.000	0	0.0000	1.0000	0.0017	0.0050	0.0000	0.00	✓

Discharge Measurement Summary

Site name	VermillionUp
Site number	03262024
Operator(s)	SC
File name	VermillionUp_20240326-130938.ft
Comment	

Quality Control Settings	
Maximum depth change	50.00%
Maximum spacing change	100.00%
SNR threshold	10 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
1	12:19 PM	3.000	0.6	0.350	0.6000	0.210	Standard Error > QC
2	12:22 PM	3.500	0.6	0.830	0.6000	0.498	Standard Error > QC
3	12:24 PM	4.000	0.6	0.880	0.6000	0.528	Standard Error > QC
4	12:26 PM	4.500	0.6	0.880	0.6000	0.528	Standard Error > QC
5	12:27 PM	5.000	0.6	0.800	0.6000	0.480	Standard Error > QC
6	12:29 PM	5.500	0.6	0.530	0.6000	0.318	Standard Error > QC
7	12:32 PM	6.000	0.6	1.050	0.6000	0.630	Standard Error > QC
8	12:34 PM	6.500	0.6	0.960	0.6000	0.576	Standard Error > QC
9	12:36 PM	7.000	0.6	0.870	0.6000	0.522	Beam SNRs Not Similar,SNR Threshold Variation,High % Spikes
10	12:38 PM	7.500	0.6	0.720	0.6000	0.432	Standard Error > QC
11	12:40 PM	8.000	0.6	0.450	0.6000	0.270	Standard Error > QC
12	12:42 PM	8.500	0.6	0.500	0.6000	0.300	Standard Error > QC,Velocity Angle > QC
13	12:43 PM	9.000	0.6	0.640	0.6000	0.384	Standard Error > QC,Velocity Angle > QC
14	12:45 PM	9.500	0.6	0.500	0.6000	0.300	Standard Error > QC
15	12:46 PM	10.000	0.6	0.380	0.6000	0.228	High % Spikes
16	12:48 PM	10.500	0.6	0.420	0.6000	0.252	Standard Error > QC
17	12:50 PM	11.000	0.6	0.650	0.6000	0.390	Standard Error > QC,Velocity Angle > QC
18	12:52 PM	11.500	0.6	0.580	0.6000	0.348	Standard Error > QC
19	12:53 PM	12.000	0.6	0.720	0.6000	0.432	Standard Error > QC
20	12:54 PM	12.500	0.6	0.600	0.6000	0.360	Boundary Interference,Beam SNRs Not Similar,SNR Threshold Variation,Standard Error > QC
21	12:56 PM	13.000	0.6	0.220	0.6000	0.132	Standard Error > QC
22	12:59 PM	13.500	0.6	0.300	0.6000	0.180	Standard Error > QC,Velocity Angle > QC
23	1:01 PM	14.000	0.6	0.400	0.6000	0.240	Standard Error > QC,Velocity Angle > QC
24	1:02 PM	14.500	0.6	0.450	0.6000	0.270	Standard Error > QC,Velocity Angle > QC
25	1:04 PM	15.000	0.6	0.420	0.6000	0.252	Standard Error > QC
26	1:05 PM	15.500	0.6	0.520	0.6000	0.312	Standard Error > QC
27	1:07 PM	16.000	0.6	0.300	0.6000	0.180	SNR Threshold Variation

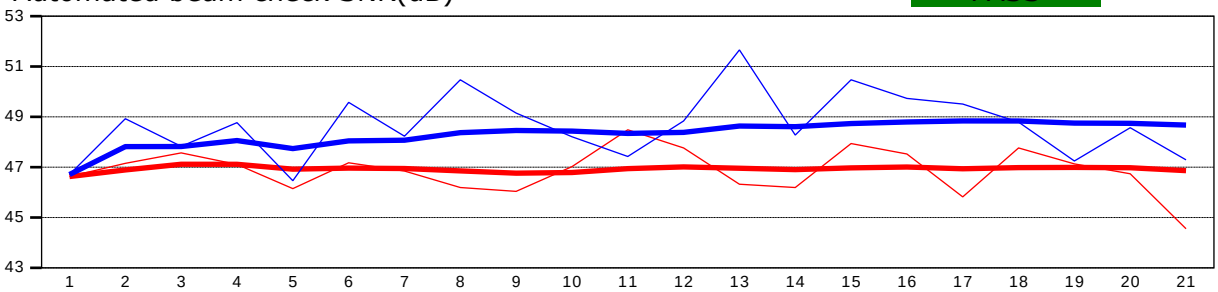
Discharge Measurement Summary

Site name	VermillionUp
Site number	03262024
Operator(s)	SC
File name	VermillionUp_20240326-130938.ft
Comment	

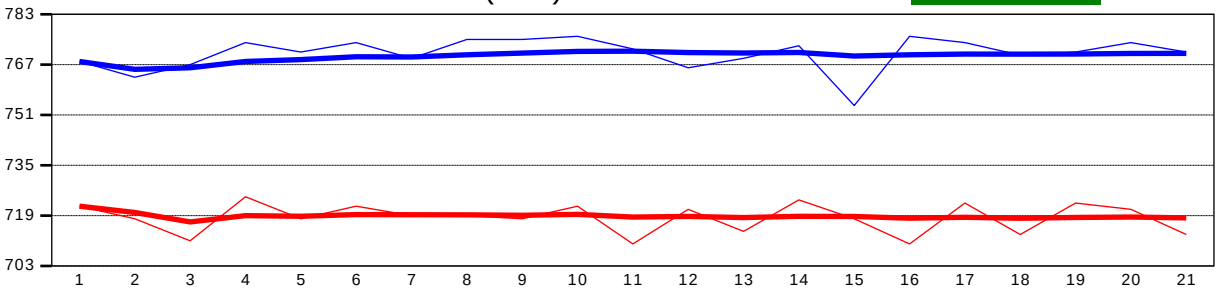
Beam 1	
Beam 2	

Automated beam check Start time 3/26/2024 12:17:47 PM

Automated beam check SNR(dB) PASS



Automated beam check Noise level(cnts) PASS



Automated beam check Quality control warnings

No quality control warnings

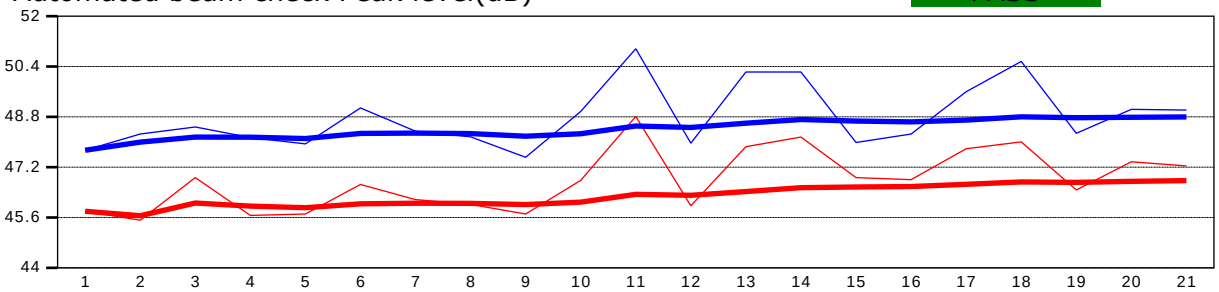
Discharge Measurement Summary

Site name	VermillionUp
Site number	03262024
Operator(s)	SC
File name	VermillionUp_20240326-130938.ft
Comment	

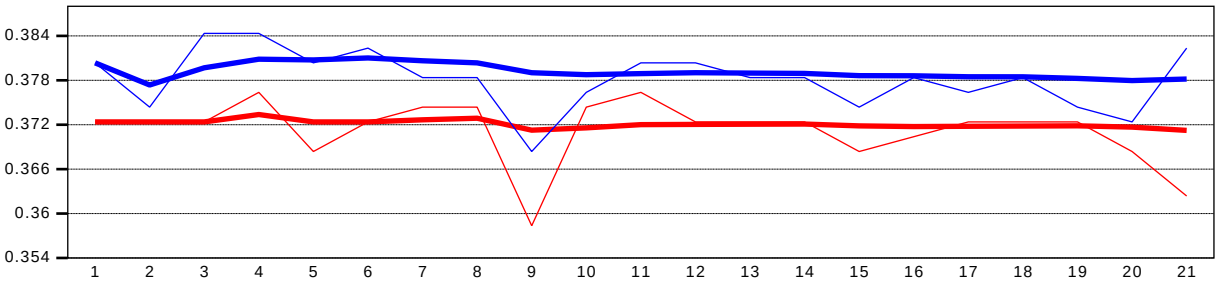
Beam 1	
Beam 2	

Automated beam check Start time 3/26/2024 12:17:47 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	Vermillion upper
Site number	06272024
Operator(s)	Lfsc
File name	20240627-100321_Vermillion upper.ft
Comment	

Start time	6/27/2024 9:54 AM
End time	6/27/2024 10:02 AM
Start location latitude	40.767
Start location longitude	-108.720
Calculations engine	FlowTracker2

Sensor type	Top Setting
Handheld serial number	FT2H2322006
Probe serial number	FT2P2319001
Probe firmware	1.30
Handheld software	1.7

# Stations	Avg interval (s)	Total discharge (ft³/s)
12	40	0.3257

Total width (ft)	Total area (ft²)	Wetted Perimeter (ft)
2.400	0.6810	2.676

Mean SNR (dB)	Mean depth (ft)	Mean velocity (ft/s)
48	0.284	0.4783

Mean temp (°F)	Max depth (ft)	Max velocity (ft/s)
60.162	0.400	1.6027

Discharge Uncertainty		
Category	**ISO**	**IVE**
Accuracy	1.0%	1.0%
Depth	0.7%	18.4%
Velocity	4.7%	23.9%
Width	0.2%	0.2%
Method	3.4%	
# Stations	4.2%	
Overall	**7.3%**	**30.2%**

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 %

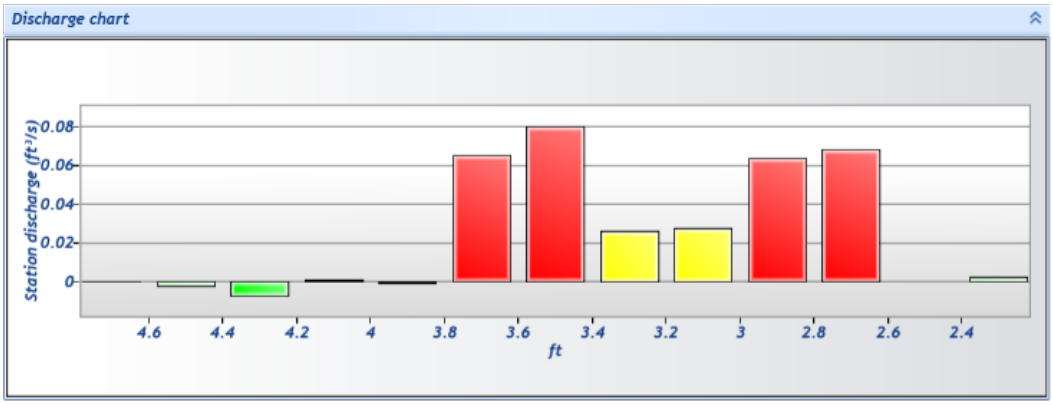
Summary overview

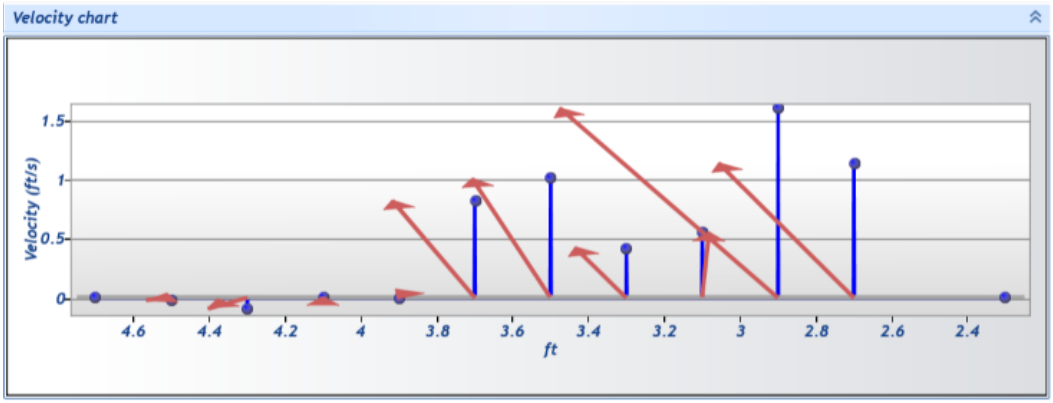
No changes were made to this file
Quality control warnings

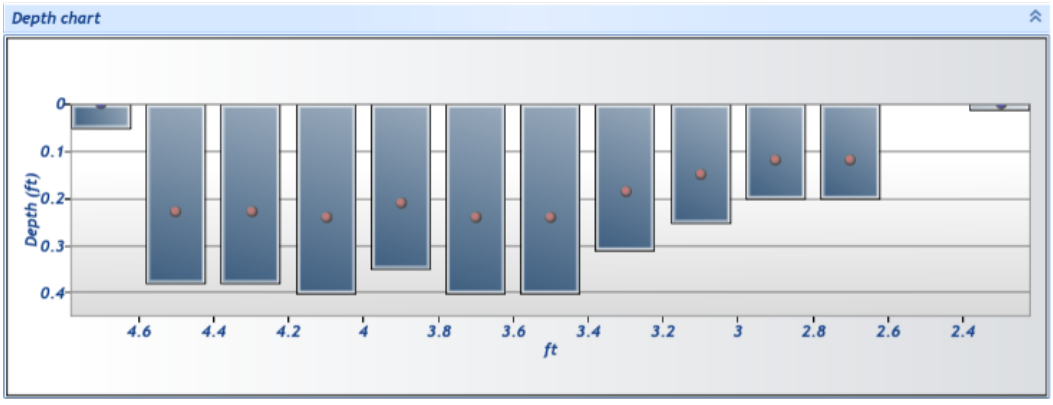
Discharge Measurement Summary

Site name	Vermillion upper
Site number	06272024
Operator(s)	Lfsc
File name	20240627-100321_Vermillion upper.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	Vermillion upper
Site number	06272024
Operator(s)	Lfsc
File name	20240627-100321_Vermillion upper.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	9:54 AM	2.300	None	0.010	0.0000	0.000	0	0.0000	1.0000	1.1363	0.0020	0.0023	0.70	✓
1	9:55 AM	2.700	0.6	0.200	0.6000	0.120	16	1.1363	1.0000	1.1363	0.0600	0.0682	20.93	✓
2	9:56 AM	2.900	0.6	0.200	0.6000	0.120	15	1.6027	1.0000	1.6027	0.0400	0.0641	19.68	✓
3	9:56 AM	3.100	0.6	0.250	0.6000	0.150	17	0.5531	1.0000	0.5531	0.0500	0.0277	8.49	✓
4	9:57 AM	3.300	0.6	0.310	0.6000	0.186	17	0.4238	1.0000	0.4238	0.0620	0.0263	8.07	✓
5	9:58 AM	3.500	0.6	0.400	0.6000	0.240	14	1.0070	1.0000	1.0070	0.0800	0.0806	24.73	✓
6	9:58 AM	3.700	0.6	0.400	0.6000	0.240	12	0.8204	1.0000	0.8204	0.0800	0.0656	20.15	✓
7	9:59 AM	3.900	0.6	0.350	0.6000	0.210	14	-0.0050	1.0000	-0.0050	0.0700	-0.0003	-0.11	✓
8	10:00 AM	4.100	0.6	0.400	0.6000	0.240	20	0.0067	1.0000	0.0067	0.0800	0.0005	0.16	✓
9	10:01 AM	4.300	0.6	0.380	0.6000	0.228	14	-0.0940	1.0000	-0.0940	0.0760	-0.0071	-2.19	✓
10	10:01 AM	4.500	0.6	0.380	0.6000	0.228	12	-0.0243	1.0000	-0.0243	0.0760	-0.0018	-0.57	✓
11	10:02 AM	4.700	None	0.050	0.0000	0.000	0	0.0000	1.0000	-0.0243	0.0050	-0.0001	-0.04	✓

Discharge Measurement Summary

Site name	Vermillion upper
Site number	06272024
Operator(s)	Lfsc
File name	20240627-100321_Vermillion upper.ft
Comment	

Quality Control Settings	
Maximum depth change	50.00%
Maximum spacing change	100.00%
SNR threshold	10 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
1	9:55 AM	2.700	0.6	0.200	0.6000	0.120	Standard Error > QC,High Stn % Discharge
2	9:56 AM	2.900	0.6	0.200	0.6000	0.120	Standard Error > QC,High Stn % Discharge
3	9:56 AM	3.100	0.6	0.250	0.6000	0.150	Standard Error > QC
4	9:57 AM	3.300	0.6	0.310	0.6000	0.186	Standard Error > QC
5	9:58 AM	3.500	0.6	0.400	0.6000	0.240	Standard Error > QC,High Stn % Discharge
6	9:58 AM	3.700	0.6	0.400	0.6000	0.240	Standard Error > QC,High Stn % Discharge
7	9:59 AM	3.900	0.6	0.350	0.6000	0.210	SNR Threshold Variation
8	10:00 AM	4.100	0.6	0.400	0.6000	0.240	Boundary Interference,SNR Threshold Variation
9	10:01 AM	4.300	0.6	0.380	0.6000	0.228	Boundary Interference,SNR Threshold Variation,Standard Error > QC,Velocity Angle > QC

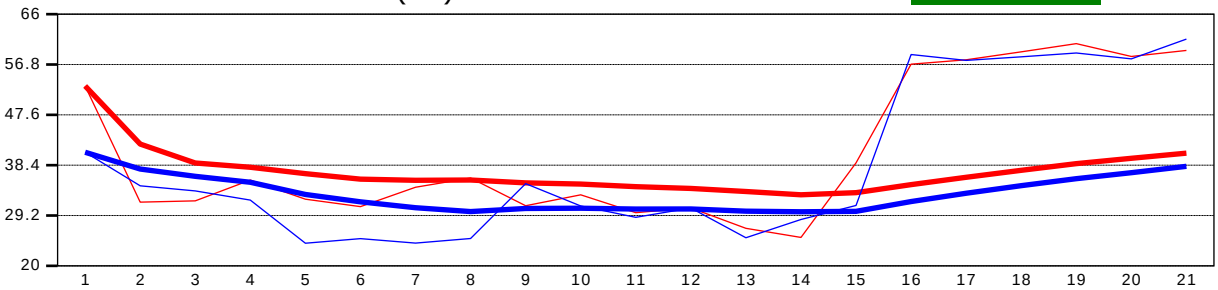
Discharge Measurement Summary

Site name	Vermillion upper
Site number	06272024
Operator(s)	Lfsc
File name	20240627-100321_Vermillion upper.ft
Comment	

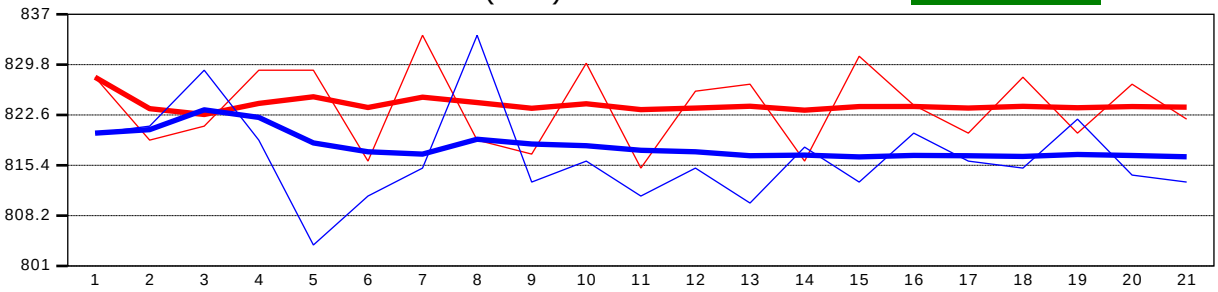
Beam 1	
Beam 2	

Automated beam check Start time 6/27/2024 9:53:48 AM

Automated beam check SNR(dB) PASS



Automated beam check Noise level(cnts) PASS



Automated beam check Quality control warnings

No quality control warnings

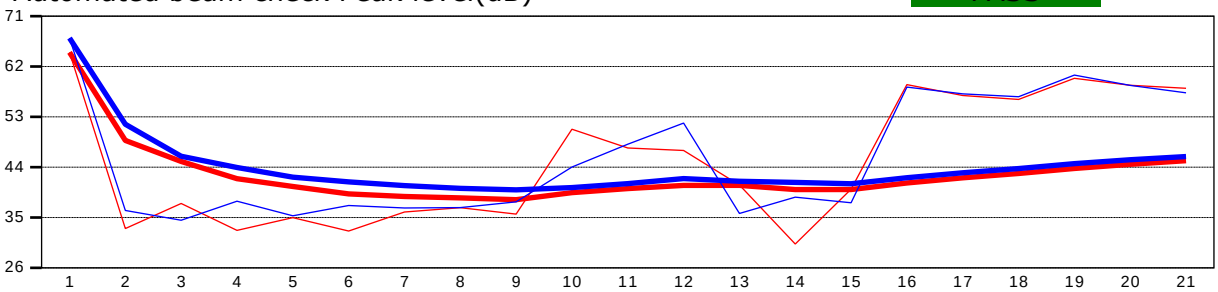
Discharge Measurement Summary

Site name	Vermillion upper
Site number	06272024
Operator(s)	Lfsc
File name	20240627-100321_Vermillion upper.ft
Comment	

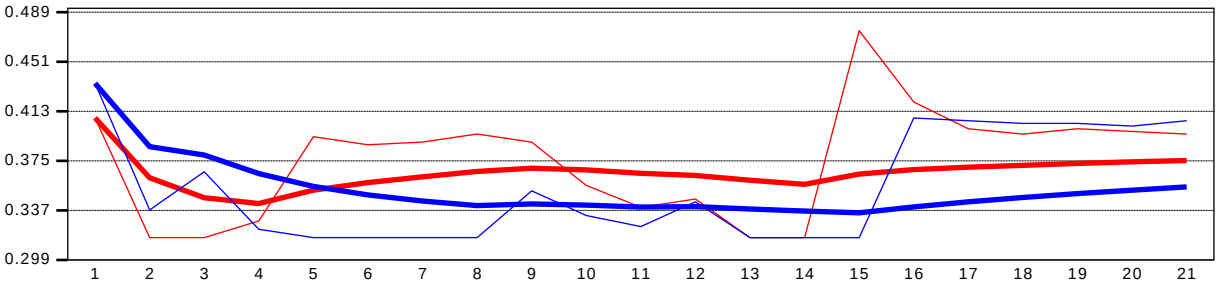
Beam 1	
Beam 2	

Automated beam check Start time 6/27/2024 9:53:48 AM

Automated beam check Peak level(dB) PASS



Automated beam check Peak position(ft) PASS



Automated beam check Quality control warnings

No quality control warnings