COLORADO
Colorado Water Conservation Board
Department of Natural Resources

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Denver, CO 80203

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Jared Polis, Governor

Dan Gibbs, DNR Executive Director

Rebecca Mitchell, CWCB Director

TO: Colorado Water Conservation Board Members

FROM: Robert Viehl, Water Resource Specialist
Stream and Lake Protection Section

DATE: November 18-19, 2020

AGENDA ITEM: 21. Final Action on Contested ISF Appropriations:
Trout Creek (Water Division 6)

Staff recommendation

Staff recommends that the Board make the following determinations and take the following actions on the Trout Creek instream flow (ISF) appropriation described in Attachment 1, based on the information contained in this memo, associated attachments, and the information presented by staff both in writing and orally at the January 29, 2019 Board meeting:

(1) Determine, pursuant to section 37-92-102(3), C.R.S. (2020), that for the ISF appropriation on Trout Creek at the flow rates of 1.1 cfs (11/01-03/31), 5.7 cfs (04/01-06/30), and 5.0 cfs (07/01-10/31):

(a) There is a natural environment that can be preserved to a reasonable degree with the recommended water rights, if granted;

(b) The natural environment will be preserved to a reasonable degree by the water available for the recommended appropriations; and

(c) Such natural environment can exist without material injury to water rights.

(2) Pursuant to ISF Rule 5f., establish January 29, 2019 as the appropriation date for this water right.

(3) Accept the terms and conditions in the Stipulation and Agreement with Knott Land and Livestock Company, Inc. (KLL) (Attachment 2), and with Twentymile Coal, LLC (Twentymile) (Attachment 3).

(4) Direct staff to request the Attorney General's Office to file the necessary water right application for this ISF appropriation and to include the terms and conditions agreed upon with Twentymile in the water court application and resulting decree.

Background:
The CWCB appropriated an ISF water right on Trout Creek recommended by Colorado Parks and Wildlife (CPW) and decreed in Case No. 77W1338 with a flow rate of 5 cfs (1/1-12/31) and appropriation date of 9/23/1977.

In 2018, the Bureau of Land Management (BLM) recommended a sub-section of the original appropriation for an increased flow rate and inclusion into the CWCB's Instream Flow and Natural Lake Level Program:

Waterbody	Watershed	County	Upper Terminus	Lower Terminus	Length (miles)
Trout Creek	Upper Yampa	Routt	confluence unnamed tributary	Koll Ditch headgate	6.64

On January 29, 2019, the CWCB formed its intent to appropriate an ISF water right on a segment of Trout Creek in Water Division 6.

On March 29, 2019, KLL filed a Notice to Contest this ISF appropriation.

On April 29, 2019, Twentymile filed a Notice of Party Status.

No other party filed a Notice to Contest or Notice of Party Status and the hearing was set to be held in conjunction with the CWCB's September 17-19, 2019 meeting.

On October 17, 2019, the Parties agreed to continue the hearing until November 2020. As part of this agreement, CWCB Staff and the BLM agreed to take additional measurements on Trout Creek in 2020 on lands owned by KLL.

On July 9, 2020, CWCB Staff, CPW Staff, BLM, and representatives from KLL and Twentymile mutually selected three cross-sections for R2Cross analysis on lands owned by KLL. R2Cross field measurements were completed with all parties in attendance.

On July 23, 2020, CPW conducted a fish survey in the lower end of the recommended reach on Trout Creek.

On August 25, 2020, CWCB Staff, BLM, and Tyler Knott collected a second R2Cross data set at the same three cross-sections measured on July 8, 2020.

On October 19, 2020, CWCB staff executed stipulations with KLL and Twentymile containing terms and conditions to resolve issues related to the proposed ISF on Trout Creek. Upon final action by the CWCB on this appropriation that includes this stipulated language, KLL and Twentymile will not further oppose the Trout Creek ISF in these administrative proceedings. In the event the CWCB declines to adopt CWCB staff's recommendation to include these terms and conditions in its final action on the Trout Creek ISF, the stipulation will be void and the KLL Notice to Contest and the Twentymile Notice of Party Status shall remain in full force and effect. The parties shall also seek to reschedule the hearing and the associated deadlines for prehearing statements and a prehearing conference.

Technical Investigations
The Board was provided detailed information regarding all originally collected field data, studies, and analyses for this stream segment at its January 29, 2019 Board meeting. A summary of this data as well as the additional R2Cross and fish survey data collected in 2020 is included below.

Natural Environment Studies
BLM conducted field surveys on this stream and found a natural environment that can be preserved to a reasonable degree. The BLM based its original description of the Trout Creek fishery on fish surveys completed in 1993 and 2007 as documented in CPW's database. The July 23, 2020 fish survey confirmed that the Trout Creek fishery consists of native species (mottled sculpin, speckled dace, and mountain sucker), as well as brown trout and brook trout. Fisheries biologists observed young of the year brook and brown trout and multiple age classes, which indicates self-sustaining trout populations.

To evaluate instream flow requirements, BLM collected hydraulic data, and the CWCB staff reviewed and analyzed this data. The additional R2Cross data collected in 2020 was analyzed and results were averaged with the data used to formulate the original recommendation. The final R2Cross analysis resulted in reduced flow rates. All parties agreed to reduce the recommended flow rates of the Trout Creek ISF and to change the dates for two of the flow rate periods.

Water Availability Studies
The CWCB staff conducted a water availability analysis for the recommended segment of Trout Creek. To determine the amount of water physically available for the Board's appropriations, staff analyzed available streamgage records, flow measurements, and diversion records using appropriate standard methods to develop a hydrograph for this recommendation. Based upon its analysis, staff has determined that water is available for appropriation on Trout Creek to preserve the natural environment to a reasonable degree without limiting or foreclosing the exercise of existing water rights.

Relevant Instream Flow Rules
5f. Date of Appropriation. The Board may select an appropriation date that may be no earlier than the date the Board declares its intent to appropriate. The Board may declare its intent to appropriate when it concludes that it has received sufficient information that reasonably supports the findings required in Rule 5i.

5h. Final Board Action on an ISF Recommendation. The Board may take final action on any uncontested Staff Recommendation(s) at the May Board meeting or any Board meeting thereafter. If a Notice to Contest has been filed, the Board shall proceed under Rule 5j-5q.

5i. Required Findings. Before initiating a water right filing to confirm its appropriation, the Board must make the following determinations:

(1) Natural Environment. That there is a natural environment that can be preserved to a reasonable degree with the Board's water right if granted.

(2) Water Availability. That the natural environment will be preserved to a reasonable degree by the water available for the appropriation to be made.

(3) Material Injury. That such environment can exist without material injury to water rights.

These determinations shall be subject to judicial review in the water court application and decree proceedings initiated by the Board, based on the Board's administrative record and utilizing the criteria of section 24-4-106(6) and (7), C.R.S. (2020).

Attachments

Attachment 1) Tabulation of Trout Creek ISF Appropriation

Attachment 2) Knott Land and Livestock Company, Inc. Stipulation and Agreement

Attachment 3) Twentymile Coal, LLC Stipulation and Agreement

Attachment 4) R2Cross summary table and field sheets output for data collected in 2020

Attachment 1

Colorado Water Conservation Board
Instream Flow Tabulation - Streams
Water Division 6

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Water Court Div.	Case Number	Stream	Watershed	County	Upper Terminus (UTM)	Lower Terminus (UTM)	Length (miles)	Amount(dates) (CFS)	Approp Date
6	(increase)	Trout Creek	Upper Yampa	Routt	confl unnamed tributary at E: 323578.92 N: 4457645.23	Koll Ditch hdgt at E: 329133.88 N: 4464276.41	6.64	1.1(11/01 - 03/31) 5.7 (04/01 - 06/30) 5.0 (07/01 - 10/31)	01/29/2019

Totals for Water Division 6

Total # Appropriations = 1
Total # Appropriation Stream Miles = 6.6

BEFORE THE COLORADO WATER CONSERVATION BOARD
STATE OF COLORADO

IN THE MATTER OF PROPOSED INSTREAM FLOW APPROPRIATION IN WATER DIVISION NO. 6:

TROUT CREEK
(Increase)

ROUTT COUNTY, COLORADO

STIPULATION AND AGREEMENT BETWEEN THE STAFF OF THE COLORADO WATER CONSERVATION BOARD AND KNOTT LAND AND LIVESTOCK COMPANY

Staff for the Colorado Water Conservation Board ("Staff") and Knott Land and Livestock Company, Inc., ("KLL"), by and through their respective counsel, hereby stipulate and agree as follows:

1. In 2019, Staff recommended an instream flow water right appropriation for Trout Creek ("Trout Creek ISF"), which is an increase to the existing instream flow water right on Trout Creek decreed in Case No. 77W1338, in the amounts of 2.0 cfs (11/01 – 03/31), 8.0 cfs (04/01 – 07/31), and 7.0 cfs (08/01 – 10/31) with an upper terminus located at the confluence with an unnamed tributary at UTM North: 4457645.23, UTM East: 323578.92 and with a lower terminus at the Koll Ditch headgate, at UTM North: 4464276. 41, UTM East: 329133.88.

2. The Colorado Water Conservation Board ("CWCB") declared its intent to appropriate the Trout Creek ISF at its meeting in January 2019.

3. KLL filed a Notice to Contest the ISF appropriation, and Twentymile Coal Company, LLC filed a Notice of Party Status.

4. KLL owns a total of 2,394 acres in Routt County, Colorado, located approximately 10 miles south and west of Oak Creek, Colorado. KLL possesses a number of water rights including rights associated with the following structures: Male Moore and Company Ditch, David M. Chapman Ditch, David M. Chapman Ditch No. 2, Knott Ditch, Knott Ponds 1 – 4, Knott Springs 1 – 6, Slough Ditch, Knott Wastewater Ditch, Orno Ditch, and Alex Ditch.

5. Both the United States Bureau of Land Management ("BLM"), who recommended the Trout Creek ISF, and Staff agree to reduce the recommended flow rates of the Trout Creek ISF and to change the dates for two of the flow rate periods. All published notices for the Trout Creek ISF reflect appropriation of the flow rates stated in paragraph 1, above, however BLM and Staff

now agree to the following reduced flow rates and flow rate periods: 1.1 cfs (11/01 – 03/31), 5.7 cfs (04/01 – 06/30), and 5.0 cfs (07/01 – 10/31).

6. Staff hereby agrees to include in its recommendation to the CWCB for final action on the Trout Creek ISF at the November 2020 CWCB meeting, that the final action include the flow rates and flow rate periods described in paragraph 5, above, the terms and conditions set forth in Exhibit A to this Stipulation and Agreement, and the terms and conditions set forth in paragraphs 7-10, below.

7. The CWCB will not install any measurement structures for the administration of the instream flow water right, or any other purpose, on property owned by KLL or any of its successors absent permission by KLL its successors, or assigns.

8. The CWCB shall install, operate, and maintain such measuring devices and keep such records as the Division Engineer may require for administration of the Trout Creek ISF.

9. Any calls placed by the CWCB for the Trout Creek ISF will be based on measurements by a stream gage or other physical/mechanical measurement consistent with the Division Engineer's practices that demonstrates that the flow of the stream within the decreed instream flow reach has fallen below the instream flow rates confirmed in any decree for the Trout Creek ISF.

10. Any releases from Sheriff Reservoir in Trout Creek at the point of measurement for the Trout Creek ISF shall be included in the streamflow for determination of whether the streamflow has fallen below the flow rates confirmed in any decree for the Trout Creek ISF.

11. In consideration of the mutual promises contained herein, KLL agrees not to further oppose the Trout Creek ISF in these proceedings or in any Water Court proceeding to adjudicate the Trout Creek ISF. Provided, however, KLL reserves the right to file a statement of opposition in any such Water Court adjudication for the sole purpose of ensuring that any decree entered is consistent with the terms of this Stipulation and Agreement.

12 In the event the CWCB Board declines to adopt Staff's recommendation to adopt the terms and conditions of this Stipulation and Agreement, this Stipulation and Agreement is void and KLL's Notice to Contest shall remain in full force and effect. If the Board declines to adopt Staff's recommendations at its November 2020 meeting, the parties shall also seek to reschedule the hearing and the associated deadlines for prehearing statements and a prehearing conference.

13. This Stipulation and Agreement shall be binding upon and inure to the benefit of the parties and their successors and assigns.

14. The parties shall each bear their own costs and attorneys' fees associated with this matter.

15. This stipulation is entered into by way of compromise and settlement of this matter. Any agreements or terms and conditions herein are due solely to the unique circumstances of this case and the resulting stipulation. This stipulation shall not establish any precedent or be used in any other administrative or legal proceeding except as explicitly provided herein.

16. This Stipulation and Agreement may be executed in counterparts, each of which shall be deemed to be an original, but all of which, taken together, shall constitute one and the same agreement.

17. Nothing in this Stipulation and Agreement affects or changes the timing or flow rates of the instream flow water right on Trout Creek decreed in Case No. 77W1338.

Stipulated and agreed to this 19th day of October, 2020.

OFFICE OF THE COLORADO ATTORNEY GENERAL
Counsel for Staff of the Colorado Water Conservation Board

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HOLSINGER LAW, LLC
Counsel for Knott Land and Livestock Company

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1800 Glenarm Place, Suite 500
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EXHIBIT A to STIPULATION

1. **Previously decreed Knott Land and Livestock water rights.** CWCB will acknowledge that the following Trout Creek water rights are senior to the 2020 Trout Creek instream flow water right and not subject to a call by the 2020 ISF:

Water Structure / Water Feature	Amount	Priority Number	Adjudication Date	Appropriation Date	Source	Case No. (if applicable)
Male Moore and Company Ditch	4.83 cfs	87AA	6/19/1914	10/7/1909	Trout Creek	6/19/1914
	2.08 cfs	189	7/12/1948	6/1/1930	Trout Creek	7/12/1948
David M. Chapman Ditch	1.83 cfs	28	9/22/1892	5/11/1888	Trout Creek	W1223-77
	2.66 cfs	56	9/15/1902	6/1/1891	Trout Creek	9/15/1902
	0.58 cfs	83B	6/19/1914	6/17/1908	Trout Creek	W1223-77
	2.66 cfs	190	7/12/1948	5/1/1936	Trout Creek	7/12/1948
	4.00 cfs		12/31/1995	6/1/1944	Purington Draw	95CW0065
David M. Chapman Ditch 2	1.83 cfs	28	9/22/1892	5/11/1888	Trout Creek	W1223-77
	0.58 cfs	83B	6/19/1914	6/17/1908	Trout Creek	W1223-77
	0.66 cfs	88	7/2/1912	5/1/1910	Trout Creek	CA3463
						95CW0065
	1.28 cfs	186	7/12/1948	5/5/1910	Trout Creek	95CW0065
	1.50 cfs	A-9	11/15/1962	6/1/1932	Trout Creek	CA3081
						95CW0065
Knott Ditch	2.00 cfs		12/31/1979	8/1/1938	Trout Creek	79CW0148
Knott Pond 1	1.44 AF		12/31/1979	10/11/1979	Trout Creek	79CW0148
Knott Pond 2	1.75 AF		12/31/1979	10/11/1979	Trout Creek	79CW0148
Knott Pond 3	2.2 AF		12/31/1979	10/11/1979	Trout Creek	79CW0148
Knott Pond 4	5.13 AF		12/31/1979	10/11/1979	Trout Creek	79CW0148
Knott Spring 1	0.06 cfs		12/31/1979	10/11/1979	Yampa River	W-506-77
Knott Spring 2	0.10 cfs		12/31/1973	7/1/1940	Yampa River	W-506-77
						82CW0027
Knott Spring 3	0.20 cfs		12/31/1973	6/1/1932	Yampa River	W-506-77
Knott Spring 4	0.10 cfs		12/31/1973	8/1/1948	Yampa River	W-506-77
						82CW0027
Knott Spring 5	0.30 cfs		12/31/1973	7/15/1952	Yampa River	W-506-77
Knott Spring 6	0.10 cfs		12/31/1973	7/1/1940	Yampa River	W-506-77
						82CW0027
Slough Ditch	1.28 cfs	89	6/19/1914	5/5/1910	Trout Creek /	6/19/1914
					Purington Draw	
	1.28 cfs	186	7/12/1948	5/5/1910	Trout Creek /	7/12/1948
					Purington Draw	
Knott Wastewater Ditch	8.00 cfs	96CW14	8/26/1996	6/1/1944	Trout Creek	96CW0014
Orno Ditch	1.83 cfs	28	9/22/1892	5/11/1888	Trout Creek	09/22/1892
	0.58 cfs	83B	6/19/1914	6/17/1908	Trout Creek	6/19/1914
	3.6 cfs	A-13	11/15/1962	5/5/1946	Trout Creek	CA3081
	2.30 cfs	95CW64	12/31/1995	1/1/1944	Trout Creek	95CW0064
Alex Ditch	1.28 cfs	186	7/12/1948	5/5/1910	Trout Creek	95CW0065

2. **Knott Land and Livestock 2020 application for change of water rights.** If filed in 2020, CWCB agrees not to object to KLL's anticipated application for the following changes to the senior priority of the Slough Ditch on the basis of injury to the 2020 ISF:

   a. Change of point of diversion to the Orno Ditch headgate
   b. Alternate point of diversion at the David M. Chapman Ditch 2 headgate
   c. Alternate point of diversion at the Alex Ditch
   d. Change in place of use to include alternate KLL lands for irrigation
   e. Change in type of use to include livestock watering

   CWCB reserves the right to object to the change application for the protection of the 1977 Trout Creek ISF.

   KLL reserves the right to argue that the proposed change is a pre-existing practice to which the 1977 ISF is subject pursuant to C.R.S. 37-92-102(3)(b).

3. **KLL uses and practices entitled to protection under C.R.S. 37-92-102(3)(b).** CWCB acknowledges that it is the historical practice of KLL to move water between its decreed points of diversion for certain ditches referenced in the above table. CWCB agrees that the instream flow water right decreed herein is subject to the uses made pursuant to this historical practice, described and limited as follows:

   a. Diversions under this provision to which the CWCB's 2020 Trout Creek ISF water right is subject under C.R.S. 37-92-102(3)(b) shall be limited to the maximum flow rate limits for the following structures as follows:

      i. Male Moore and Company Ditch: 8.12 c.f.s.
      ii. David M. Chapman Ditch: 9.17 c.f.s.
      iii. David M. Chapman Ditch – Purington Draw: 4.11 c.f.s.
      iv. Knott Ditch: 2.50 c.f.s.
      v. Knott Wastewater Ditch: 10.60 c.f.s
      vi. Orno Ditch: 9.14 c.f.s.
      vii. Alex Ditch: 3.50 c.f.s.

   b. Total diversions to which the CWCB's 2020 Trout Creek ISF water right is subject under C.R.S. 37-92-102(3)(b) at the structures listed in subparagraph a. shall be limited to the cumulative total decreed to said structures of 38.23 c.f.s., however, diversion rates at each structure shall not exceed the rates set forth in subparagraph a.

   These claims are supported by the affidavit of Bernard C. Knott, attached hereto as Appendix 1, and the affidavit of Tyler L. Knott, attached hereto as Appendix 2.

   CWCB further agrees that for purposes of administration under C.R.S. 37-92-502(2)(c), said practices were in existence on the date of appropriation of the 2020 ISF.

AFFIDAVIT OF BERNARD C. KNOTT

I, Bernard C. Knott, being first duly sworn, depose and state under oath, as follows:

1. I am over the age of eighteen years and have personal knowledge of the matters set forth in this affidavit.

2. Knott Land and Livestock Company, Inc. (hereinafter "Knott") was established in August 1973 as a business entity for Dan Knott, Doris Knott, and myself, Bernard Knott, whom previously conducted business and their ranching operations under their personal names located at 18300 CR 29, Oak Creek, Colorado 80467 since 1936, located on Trout Creek, a tributary to the Yampa River, in Routt and Rio Blanco Counties.

3. I have resided at this location since 1947 and have had intimate knowledge of said operations since. I am a current shareholder, director, and officer of Knott.

4. Knott is the owner and operator of numerous water rights located in the Trout Creek drainage, including those for irrigation, fish propagation, domestic, and livestock watering.

5. Knott controls, by ownership and/or lease, a significant portion of decreed direct flow water rights in the upper Trout Creek valley (upstream of the Koll Ditch) as shown on the attached table.

6. Knott manages their ranching operations and water use for the benefit of the whole operation, including but not limited to livestock production, hay and forage production, wildlife habitat, ecosystem services, etc.

7. Through this management system, Knott uses physically and legally available water to sustainably maximize its operations. This includes diverting and using water at various points and locations in varying amounts throughout the year. For example, Knott may reduce or discontinue diverting and irrigating with the Male Moore and Company Ditch to reallocate that physically available water to the David M Chapman Ditches, in any given year, and especially during drought and low flow conditions.

8. Knott manages the limited resource of water available to it, which flows down Trout Creek, as it deems to provide the most beneficial use.

9. It is the current practice and has been the historical practice of Knott since prior to the date of appropriation of the increased instream flow water right on Trout Creek to move water between its decreed points of diversion, with the following maximum flow rates for the following ditches:

    i. Male Moore and Company Ditch: 8.12 c.f.s.
    ii. David M. Chapman Ditch: 9.17 c.f.s.
    iii. David M. Chapman Ditch – Purington Draw: 4.11 c.f.s.

APPENDIX 1

iv. Knott Ditch: 2.50 c.f.s.
v. Knott Wastewater Ditch: 10.60 c.f.s
vi. Orno Ditch: 9.14 c.f.s.
vii. Alex Ditch: 3.50 c.f.s.

10. Diversions at the structures listed in paragraph 9 have historically been limited to the cumulative total decreed to said structures of 38.23 c.f.s. and the rates set forth in paragraph 9.

11. Any downstream administration of water rights through the Colorado Division of Water Resources, affects the flexibility and overall beneficial use to Knott of the limitedly available water.

I, Bernard C. Knott, hereby certify that the foregoing is true and complete to the best of my knowledge, information, and belief.

Executed in Oak Creek (*town or city*), Colorado on October 14th, 2020.

Bernard C. Knott
Bernard C. Knott

STATE OF COLORADO)
) ss.
COUNTY OF Routt)

The foregoing instrument was subscribed and sworn to before me this 14th day of October, 2020, by Bernard C. Knott.

AMBER NICHOLE TEXTER
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID #20184039966
My Commission Expires October 10, 2022

Witness my hand and official seal.
Amber Texter
Notary Public
My commission expires: 10·10·2022

APPENDIX 1

AFFIDAVIT OF TYLER L. KNOTT

I, Tyler L. Knott, being first duly sworn, depose and state under oath, as follows:

1. I am over the age of eighteen years and have personal knowledge of the matters set forth in this affidavit.

2. Knott Land and Livestock Company, Inc. (hereinafter "Knott") was established in August 1973 as a business entity for Dan Knott, Doris Knott, and Bernard Knott, whom previously conducted business and their ranching operations under their personal names located at 18300 CR 29, Oak Creek, Colorado 80467 since 1936, located on Trout Creek, a tributary to the Yampa River, in Routt and Rio Blanco Counties.

3. I am a direct heir of the initial shareholders of Knott.

4. I have resided at this location since 1983 and have had intimate knowledge of said operations since. I am a current shareholder, director, and officer of Knott.

5. Knott is the owner and operator of numerous water rights located in the Trout Creek drainage, including those for irrigation, fish propagation, domestic, and livestock watering.

6. Knott controls, by ownership and/or lease, a significant portion of decreed direct flow water rights in the upper Trout Creek valley (upstream of the Koll Ditch) as shown on the attached table.

7. Knott manages their ranching operations and water use for the benefit of the whole operation, including but not limited to livestock production, hay and forage production, wildlife habitat, ecosystem services, etc.

8. Through this management system, Knott uses physically and legally available water to sustainably maximize its operations. This includes diverting and using water at various points and locations in varying amounts throughout the year. For example, Knott may reduce or discontinue diverting and irrigating with the Male Moore and Company Ditch to reallocate that physically available water to the David M Chapman Ditches, in any given year, and especially during drought and low flow conditions.

9. Knott manages the limited resource of water available to it, which flows down Trout Creek, as it deems to provide the most beneficial use.

10. It is the current practice and has been the historical practice of Knott since prior to the date of appropriation of the increased instream flow water right on Trout Creek to move water between its decreed points of diversion, with the following maximum flow rates for the following ditches:

    i. Male Moore and Company Ditch: 8.12 c.f.s.

APPENDIX 2

ii. David M. Chapman Ditch: 9.17 c.f.s.
iii. David M. Chapman Ditch – Purington Draw: 4.11 c.f.s.
iv. Knott Ditch: 2.50 c.f.s.
v. Knott Wastewater Ditch: 10.60 c.f.s
vi. Orno Ditch: 9.14 c.f.s.
vii. Alex Ditch: 3.50 c.f.s.

11. Diversions at the structures listed in paragraph 10 have historically been limited to the cumulative total decreed to said structures of 38.23 c.f.s. and the rates set forth in paragraph 10.

12. Any downstream administration of water rights through the Colorado Division of Water Resources, affects the flexibility and overall beneficial use to Knott of the limitedly available water.

I, Tyler L. Knott, hereby certify that the foregoing is true and complete to the best of my knowledge, information, and belief.

Executed in Oak Creek (*town or city*), Colorado on October 14th, 2020.

Tyler L Knott
Tyler L. Knott

STATE OF COLORADO)
) ss.
COUNTY OF Routt)

The foregoing instrument was subscribed and sworn to before me this 14th day of October, 2020, by Bernard C. Knott.

AMBER NICHOLE TEXTER
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID #20184039966
My Commission Expires October 10, 2022

Witness my hand and official seal.
Amber Texter
Notary Public
My commission expires: 10·10·2022

APPENDIX 2

BEFORE THE COLORADO WATER CONSERVATION BOARD
STATE OF COLORADO

IN THE MATTER OF PROPOSED INSTREAM FLOW APPROPRIATION IN WATER DIVISION NO. 6:

TROUT CREEK
(Increase)

ROUTT COUNTY, COLORADO

STIPULATION AND AGREEMENT BETWEEN THE STAFF OF THE COLORADO WATER CONSERVATION BOARD AND TWENTYMILE COAL COMPANY

Staff for the Colorado Water Conservation Board ("Staff") and Twentymile Coal, LLC ("Twentymile"), by and through their respective counsel, hereby stipulate and agree as follows:

1. In 2019, Staff recommended an instream flow water right appropriation for Trout Creek ("Trout Creek ISF"), which is an increase to the existing instream flow water right on Trout Creek decreed in Case No. 77CW1338, in the amounts of 2.0 cfs (11/01 – 03/31), 8.0 cfs (04/01 – 07/31), and 7.0 cfs (08/01 – 10/31) with an upper terminus located at the confluence with an unnamed tributary at UTM North: 4457645.23, UTM East: 323578.92 and with a lower terminus at the Koll Ditch headgate, at UTM North: 4464276. 41, UTM East: 329133.88.

2. The CWCB declared its intent to appropriate the Trout Creek ISF at its meeting in January 2019.

3. Knott Land and Livestock Company, Inc., filed a Notice to Contest the ISF appropriation, and Twentymile filed a Notice of Party Status.

4. Twentymile owns and operates the Foidel Creek Mine, which is located in the Trout Creek watershed, and owns a number of water rights that are decreed for diversion from Trout Creek and its tributaries. Twentymile's water rights include underground water rights, direct flow surface rights and water storage rights, as well as appropriative rights of exchange. Additionally, Twentymile has a plan for augmentation that was decreed in Case No. W-1502-78 and amended in Case No. 90CW99.

5. Both the United States Bureau of Land Management ("BLM"), who recommended the Trout Creek ISF, and Staff agree to reduce the recommended flow rates for the Trout Creek ISF and to change the dates for two of the flow rate periods. All published notices for the Trout Creek ISF reflect appropriation of the flow rates stated in paragraph 1, above, however BLM and Staff now agree to the following reduced flow rates and flow rate periods: 1.1 cfs (11/01 – 03/31), 5.7 cfs (04/01 – 06/30), and 5.0 cfs (07/01 – 10/31).

6. Staff hereby agrees to include in its recommendation to the CWCB for final action on the Trout Creek ISF at the November 2020 CWCB meeting, that the final action include the flow rates and flow rate periods described in paragraph 5, above, the terms and conditions described in paragraph 7-9, below, and that any decree entered by the water court for the Trout Creek ISF include the following terms and conditions:

A. The CWCB acknowledges that the following water rights are senior to the 2020 Trout Creek Instream Flow Water Right and not subject to a call by the 2020 Instream Flow Water Right:

Water Structure/Water Feature	Amount	Twentymile Amount	Adjudication Date	Appropriation Date	Source	Case No.
Last Chance Ditch	4.5 cfs	1.5 cfs	6/9/1913	8/7/1906	Trout Creek	--
Last Chance Ditch Enlargement	9.0 cfs	1.0 cfs	11/15/1962	10/1/1954	Trout Creek	W-3081

B. The CWCB acknowledges that, pursuant to Twentymile's decree in Case No. W-1502-78, as amended in Case No. 90CW99, Water Division 6, Twentymile's Last Chance Ditch water rights may be used for irrigation, or may be converted for use for mining, reclamation, irrigation, electric generation, fish propagation, and all other beneficial uses, either directly, or by exchange and/or after storage. The CWCB agrees that the instream flow water right decreed herein is subject to the uses made or authorized pursuant to these decrees.

7. The CWCB shall install, operate, and maintain such measuring devices and keep such records as the Division Engineer may require for administration of the Trout Creek ISF.

8. Any calls placed by the CWCB for the Trout Creek ISF will be based on measurements by a stream gage or other physical/mechanical measurement consistent with the Division Engineer's practices that demonstrates that the flow of the stream within the decreed instream flow reach has fallen below the instream flow rates confirmed in any decree for the Trout Creek ISF.

9. Any releases from Sheriff Reservoir in Trout Creek at the point of measurement for the Trout Creek ISF shall be included in the streamflow for determination of whether the streamflow has fallen below the flow rates confirmed in any decree for the Trout Creek ISF.

10. In consideration of the mutual promises contained herein, Twentymile agrees not to further oppose the Trout Creek ISF in these proceedings or in any Water Court proceeding to adjudicate the Trout Creek ISF. Provided, however, Twentymile reserves the right to file a statement of opposition in any such Water Court adjudication for the sole purpose of ensuring that any decree entered is consistent with the terms of this Stipulation and Agreement.

11. In the event the CWCB Board declines to adopt Staff's recommendation to include the terms and conditions referenced above in paragraph 6 in its final action on the Trout Creek ISF, this Stipulation is void and Twentymile's party status shall remain in full force and effect. If the Board declines to adopt Staff's recommendation at its November 2020 meeting, the parties shall also seek to reschedule the hearing and the associated deadlines for prehearing statements and a prehearing conference.

12. This Stipulation and Agreement shall be binding upon and inure to the benefit of the parties and their successors and assigns.

13. The parties shall each bear their own costs and attorneys' fees associated with this matter.

14. This Stipulation and Agreement may be executed in counterparts, each of which shall be deemed to be an original, but all of which, taken together, shall constitute one and the same agreement.

15. Nothing in this Stipulation and Agreement affects or changes the timing or flow rates of the instream flow water right on Trout Creek decreed in Case No. 77CW1338.

Stipulated and agreed to this 19th day of October, 2020.

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Summary of R2Cross transect measurements and results for Trout Creek.

Date, Xsec #	Top Width (feet)	Streamflow (cfs)	Accuracy Range (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
07/09/2020, 1	29.48	4.14	1.66 - 10.35	3.94	
08/25/2020, 1	29.44	12.84	5.14 - 32.10		8.18
			Xsec Average	3.94	8.18
07/09/2020, 2	39.30	7.34	2.94 - 18.35	8.32	14.19
08/25/2020, 2	39.00	11.93	4.77 - 29.83	6.31	16.48
			Xsec Average	7.32	15.34
07/09/2020, 3	27.39	6.92	2.77 - 17.30	5.70	6.19
08/25/2020, 3	27.38	12.26	4.90 - 30.65		6.32
			Xsec Average	5.70	6.26
08/12/2017, 1	39.42	9.43	3.77 - 23.58	9.27	13.28
08/12/2017, 2	35.17	8.58	3.43 - 21.45	5.79	12.80
			Xsec Average	7.53	13.04
			Overall Average	**6.12**	**10.70**

R2Cross data from 2020 was collected at 3 locations, with each location surveyed twice and the two measurements averaged together to get the cross-section average. The BLM cross-sections collected in 2017 were collected in close proximity at a fourth location near the lower terminus, this data was averaged together to evenly weight the results. The average cross-section results from all 4 locations were averaged together to obtain the overall average.

Attachment 4

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: TROUT CREEK					CROSS-SECTION NO.: 1	
CROSS-SECTION LOCATION: UPPER END OF REACH						
GPS: 40.25901 107.06898						
DATE: 7/9/2020	OBSERVERS: Roy Smith, K. Birch, L Fields-Summers, B. Logan					
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 5	TOWNSHIP: 3 (N/S)	RANGE: 86 (E/W)	PM: 6th	
COUNTY: ROUTT	WATERSHED: Yampa River	WATER DIVISION: 6	DOW WATER CODE: 23535			
MAP(S):	USGS:					
	USFS:					

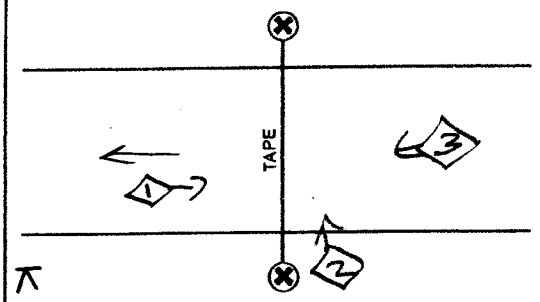
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO	METER TYPE: Marsh - McBirney			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: GRAVEL TO LARGE COBBLES	PHOTOGRAPHS TAKEN: (YES) NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	5.55
⊗ Tape @ Stake RB	0.0	4.62
① WS @ Tape LB/RB	0.0	6.5/6.5
② WS Upstream	44.75	5.68
③ WS Downstream	22.75	6.84
SLOPE	1.16/ 67.5 = 0.017	

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

pH 7.97, TEMP 19.5°C, CONDUCTIVITY 253, SALINITY 0.1 PPT

CFSR 1-95

Bench Mark Rock 6.20
6.20

DISCHARGE/CROSS SECTION NOTES

Attachment 4

STREAM NAME: TROUT CREEK	CROSS-SECTION NO.: 1	DATE: 7/8/2020	SHEET 1 OF 2
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: ____ ft	TIME: 12:45 PM / 1:50 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/BF	0		5.55								
	1.0		5.76								
	2.8		5.79								
	4.0		5.86								
	4.4		6.00								
	4.6		6.22								
W(R)	5.0		6.50	Ø				Ø			
	6.0		6.7	0.2				0.0			
	7.0		6.9	0.4				0.35			
	7.5		6.9	0.4				0.15			
	8.0		6.8	0.3				0.79			
	8.5		6.75	0.45				0.38			
	9.0		6.75	0.25				0.91			
	9.5		6.7	0.40				0.94			
	10.0		6.8	0.30				1.00			
	10.5		6.8	0.30				1.35			
	11.0		6.9	0.40				1.14			
	11.5		6.8	0.30				1.17			
	12.0		6.9	0.40				1.54			
	12.5		6.95	0.45				1.05			
	13.0		6.75	0.25				0.93			
	13.5		6.65	0.15				0.51			
	14.0		6.9	0.40				0.16			
	14.5		7.05	0.55				0.11			
	15.0		7.0	0.50				0.28			
	15.5		7.0	0.50				0.62			
	16.0		6.95	0.45				0.60			
	16.5		6.85	0.35				0.59			
	17.0		6.95	0.45				1.18			
SEE SHEET 2	FOR INFO BETWEEN	17.0	and	27.9							
W(L)	27.9		6.50	Ø				Ø			
	28.8		6.26								
	29.4		6.02								
BF	29.5		5.42								
	29.9		5.06								
	30.2		4.81								
STAKE	30.7		4.62								
TOTALS:											

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

DISCHARGE/CROSS SECTION NOTES

Attachment 4

STREAM NAME: TROUT CREEK	CROSS-SECTION NO.: 1	DATE: 7/9/2020	SHEET 2 OF 2

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 Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
CONTINUED FROM SHEET 1											
	17.5		6.85	0.35				0.98			
	18.0		6.85	0.35				0.44			
	18.5		6.90	0.40				0.24			
	19.0		6.85	0.35				0.56			
	19.5		6.90	0.40				0.53			
	20.0		7.0	0.5				0.72			
	20.5		6.85	0.35				0.54			
	21.0		6.90	0.40				0.88			
	21.5		6.90	0.40				0.12			
	22.0		7.0	0.50				0.49			
	23.0		6.65	0.15				0.54			
	24.0		6.65	0.15				0.11			
	25.0		6.60	0.1				—			
TOTALS:											

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

Attachment 4

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: TROUT CREEK - MIDDLE CROSS-SECTION						CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: GPS: 40.27074 107.05762 W						
DATE: 7/9/2020	OBSERVERS: R. SMITH, E. BIRCH, L. FIELDS-SOUMA, B. LOGAN, J. M.					
LEGAL DESCRIPTION	¼ SECTION: SE	SECTION: 32	TOWNSHIP: 4 N/S	RANGE: 86 E/W	PM: 6th	
COUNTY: ROUTT	WATERSHED: Yampa River	WATER DIVISION: 6	DOW WATER CODE: 03533			
MAP(S):	USGS:					
	USFS:					

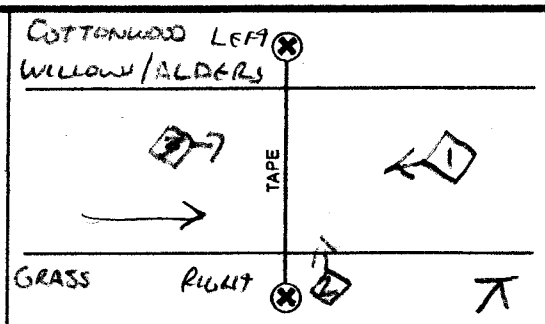
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES/NO	METER TYPE: Marsh - McBirney			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: GRAVEL TO LARGE COBBLE		PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS: 3	

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	7.2
⊗ Tape @ Stake RB	0.0	6.36
① WS @ Tape LB/RB	0.0	8.2 / 8.2
② WS Upstream	31.3	7.62
③ WS Downstream	24.2	8.56
SLOPE	0.94 / 55.5 = 0.01695	

SKETCH



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

PH 8.4, Water Temp 21.2°C, Conductivity 284, Salinity 0.1 ppt

CFSD 1-95

DISCHARGE/CROSS SECTION NOTES

Attachment 4

STREAM NAME: TROUT CREEK	CROSS-SECTION NO.: 2	DATE: 7/9/2020	SHEET 1 OF 2
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 2:50

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)
STAKE(E)	0.0		6.36								
	1.0		6.60								
BF	1.3		7.20								
	2.0		7.66								
	2.8		7.92								
	3.5		8.06								
R WS	4.7		8.20	0				0			
	6.0		8.30	0.1				0.6			
	7.0		8.35	0.05				0.0			
	8.0		8.40	0.20				0.03			
	9.0		8.35	0.15				0.64			
	10.0		8.30	0.10				0.79			
	11.0		8.40	0.10				0.20			
	12.0		8.45	0.25				0.20			
	13.0		8.55	0.25				1.13			
	13.5		8.50	0.30				0.94			
	14.0		8.50	0.30				1.05			
	14.5		8.65	0.15				0.56			
	15.0		8.50	0.30				0.57			
	15.5		8.65	0.15				1.00			
	16.0		8.70	0.00				1.20			
	16.50		8.70	0.00				1.42			
	17.0		8.65	0.15				2.26			
	17.5		8.70	0.00				1.26			
	18.0		8.75	0.05				1.59			
	18.5		8.85	0.15				1.40			
	19.0		8.70	0.00				2.29			
	19.5		8.75	0.05				1.32			
	20.0		8.65	0.15				1.39			
	20.5		8.60	0.10				0.68			
	21.0		8.65	0.15				0.61			
	21.5		8.55	0.35				1.49			
	22.0		8.55	0.35				1.10			
SEE SHEET 2	FOR	MEASUREMENTS		BETWEEN	22	AND	32.5				
L WS	32.5		8.20	0				0			
	33.2		8.08								
	34.2		7.78								
	35.4		7.78								
	36.2		7.77								
	37.3		7.42								
	39.3		7.30								
BF/STAKE	40.6		7.20								
TOTALS:											

End of Measurement	Time: 3:32	Gage Reading: _____ ft	CALCULATIONS PERFORMED BY:	CALCULATIONS CHECKED BY:

DISCHARGE/CROSS SECTION NOTES

Attachment 1

STREAM NAME: TROUT CREEK	CROSS-SECTION NO.: 2	DATE: 7/9/2020	SHEET 2 OF 2

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 2:50

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)
CONTINUED FROM SHEET 1											
	22.5		8.6	0.4				1.12			
	23.0		8.45	0.25				1.24			
	24.0		8.45	0.25				1.66			
	25.0		8.5	0.3				0.59			
	26.0		8.55	0.35				0.01			
	27.0		8.5	0.3				1.35			
	28.0		8.5	0.3				0.13			
	29.0		8.25	0.05				0.0			
	30.0		8.35	0.15				0.35			
	31.0		8.40	0.2				0.58			
TOTALS:											

End of Measurement	Time: 3:32	Gage Reading: _____ ft	CALCULATIONS PERFORMED BY:	CALCULATIONS CHECKED BY:

Attachment 4

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: TROUT CREEK					CROSS-SECTION NO.: 3	
CROSS-SECTION LOCATION: LOWER CROSS-SECTION						
GPS: 40.28929 N 107.04348 W						
DATE: 7/9/2020	OBSERVERS: R SMITH, K. BIRCH, L. FIELDS-SOMMA, L. LOGAN, JOHN, MIRANDA TYLER KNOTT					
LEGAL DESCRIPTION	¼ SECTION: SE	SECTION: 28	TOWNSHIP: 4 (N/S)	RANGE: 86 E(W)	PM: 6th	
COUNTY: ROUTT	WATERSHED: Yampa R.	WATER DIVISION: 6	DOW WATER CODE: 23533			
MAP(S):	USGS:					
	USFS:					

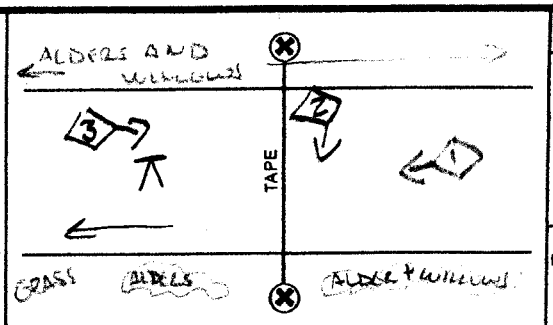
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO	METER TYPE: MARSH - MCBIRNEY			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: GRAVELS TO MED 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	2.28
(X) Tape @ Stake RB	0.0	2.49
(1) WS @ Tape LB/RB	0.0	4.01 / 4.0
(2) WS Upstream	50.3	3.30
(3) WS Downstream	7.0	4.09
SLOPE	0.79/57.3 = 0.0138	

SKETCH



AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: YES/(NO)	DISTANCE ELECTROFISHED: NA 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

PH 8.33 TEMP 21.5 SALINITY 0.1 PPT

CONDUCTIVITY 292

DISCHARGE CROSS SECTION NOTES

Attachment 4

STREAM NAME: TROUT CREEK	CROSS-SECTION NO.: 3	DATE: 7/9/2020	SHEET 1 OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (LEFT) / RIGHT (0.0 AT STAKE)	Gage Reading: ____ ft	TIME: 4:15

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)
R STAKE	29.5		2.28								
	28.7		2.60								
R BF	28.2		2.88								
	28.0		3.40								
	27.3		3.87								
	26.3		3.92								
R WS	24.5		4.0	0				0			
★ SEE	SHEET 2 FOR MEASUREMENTS BETWEEN 24.5 and 20.5										
	20.5		4.35	0.35				1.31			
	20.0		4.30	0.30				1.56			
	19.5		4.50	0.50				0.63			
	19.0		4.35	0.35				1.40			
	18.5		4.35	0.35				1.94			
	18.0		4.30	0.30				1.50			
	17.5		4.25	0.25				1.64			
	17.0		4.25	0.25				1.18			
	16.5		4.20	0.20				1.33			
	16.0		4.40	0.40				1.33			
	15.5		4.40	0.40				0.20			
	15.0		4.45	0.45				1.97			
	14.5		4.50	0.50				1.88			
	14.0		4.45	0.45				1.85			
	13.5		4.35	0.35				1.59			
	13.0		4.45	0.45				1.96			
	12.5		4.35	0.35				1.73			
	12.0		4.45	0.45				1.44			
	11.5		4.45	0.45				0.90			
	11.0		4.50	0.50				0.45			
	10.5		4.35	0.35				1.26			
	10.0		4.25	0.25				1.15			
	9.0		4.25	0.25				0.59			
	8.0		4.35	0.35				0.80			
	7.0		4.25	0.25				0.04			
	6.0		4.30	0.30				0.58			
	5.0		4.35	0.35				0.23			
	4.0		4.10	0.10				0.24			
	3.0		4.05	0.05				0.0			
L WS	2.9		4.01	0				0			
	2.1		3.62								
	1.5		3.34								
L BF	0.8		2.87								
L STAKE	0.0		2.49								
TOTALS:											

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

DISCHARGE CROSS-SECTION NOTES

STREAM NAME: TROUT CREEK	CROSS-SECTION NO.: 3	DATE: 7/9/2020	SHEET 2 OF 2
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (LEFT) / RIGHT (0.0 AT STAKE)	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 Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
CONTINUED FROM SHEET 1											
	21.0		4.4	0.4				1.28			
	22.0		4.3	0.3				0.56			
	23.0		4.15	0.15				0			
	24.0		4.1	0.1				0			
TOTALS:											

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

Data Input & Proofing

STREAM NAME:	Trout Creek near Steamboat
XS LOCATION:	40.25901 N -107.06898 W
XS NUMBER:	1
DATE:	7/9/2020
OBSERVERS:	R. Smith, K. Birch, B. Logan
1/4 SEC:	SW
SECTION:	5
TWP:	3N
RANGE:	86W
PM:	Sixth
COUNTY:	Routt
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	23533
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.017 ft / ft

CHECKED BY:.....DATE.....

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

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
			Total Data Points = 49					
1	RS & BF	0.00	5.55			0.00	0.00	0.00
		1.00	5.76			0.00	0.00	0.00
		2.80	5.79			0.00	0.00	0.00
		4.00	5.86			0.00	0.00	0.00
		4.40	6.00			0.00	0.00	0.00
		4.60	6.22			0.00	0.00	0.00
	RW	5.00	6.50	0.00	0.00	0.00	0.00	0.00
		6.00	6.70	0.20	0.00	0.20	0.00	6.50
		7.00	6.90	0.40	0.35	0.30	0.11	6.50
		7.50	6.90	0.40	0.15	0.20	0.03	6.50
		8.00	6.80	0.30	0.79	0.15	0.12	6.50
		8.50	6.95	0.45	0.38	0.23	0.09	6.50
		9.00	6.75	0.25	0.91	0.13	0.11	6.50
		9.50	6.90	0.40	0.94	0.20	0.19	6.50
		10.00	6.80	0.30	1.00	0.15	0.15	6.50
		10.50	6.80	0.30	1.35	0.15	0.20	6.50
		11.00	6.90	0.40	1.14	0.20	0.23	6.50
		11.50	6.80	0.30	1.17	0.15	0.18	6.50
		12.00	6.90	0.40	1.54	0.20	0.31	6.50
		12.50	6.95	0.45	1.05	0.23	0.24	6.50
		13.00	6.75	0.25	0.93	0.13	0.12	6.50
		13.50	6.65	0.15	0.51	0.08	0.04	6.50
		14.00	6.90	0.40	0.16	0.20	0.03	6.50
		14.50	7.05	0.55	0.11	0.28	0.03	6.50
		15.00	7.00	0.50	0.28	0.25	0.07	6.50
		15.50	7.00	0.50	0.62	0.25	0.16	6.50
		16.00	6.95	0.45	0.60	0.23	0.14	6.50
		16.50	6.85	0.35	0.59	0.18	0.10	6.50
		17.00	6.95	0.45	1.18	0.23	0.27	6.50
		17.50	6.85	0.35	0.98	0.18	0.17	6.50
		18.00	6.85	0.35	0.44	0.18	0.08	6.50
		18.50	6.90	0.40	0.24	0.20	0.05	6.50
		19.00	6.85	0.35	0.56	0.18	0.10	6.50
		19.50	6.90	0.40	0.53	0.20	0.11	6.50
		20.00	7.00	0.50	0.72	0.25	0.18	6.50
		20.50	6.85	0.35	0.54	0.18	0.09	6.50
		21.00	6.90	0.40	0.88	0.20	0.18	6.50
		21.50	6.90	0.40	0.12	0.20	0.02	6.50
		22.00	7.00	0.50	0.49	0.38	0.18	6.50
		23.00	6.65	0.15	0.54	0.15	0.08	6.50
		24.00	6.65	0.15	0.11	0.15	0.02	6.50
		25.00	6.60	0.10	0.00	0.20	0.00	6.50
	LW	27.90	6.50	0.00	0.00	0.00	0.00	0.00
		28.80	6.26			0.00	0.00	0.00
		29.40	6.02			0.00	0.00	0.00
1	BF	29.50	5.42			0.00	0.00	0.00
		29.90	5.08			0.00	0.00	0.00
		30.20	4.81			0.00	0.00	0.00
	LS	30.70	4.62			0.00	0.00	0.00
					Totals	6.90	4.14	

Attachment 4

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

LOCATION INFORMATION

STREAM NAME:	Trout Creek near Steamboat
XS LOCATION:	40.25901 N -107.06898 W
XS NUMBER:	1
DATE:	9-Jul-20
OBSERVERS:	R. Smith, K. Birch, B. Logan
1/4 SEC:	SW
SECTION:	5
TWP:	3N
RANGE:	86W
PM:	Sixth
COUNTY:	Routt
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	23533
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

SLOPE:	0.017

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

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

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.25901 N -107.06898 W
XS NUMBER: 1

DATA POINTS= 49

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
1 RS & BF	0.00	5.55			0.00		0.00	0.00	0.0%
	1.00	5.76			0.00		0.00	0.00	0.0%
	2.80	5.79			0.00		0.00	0.00	0.0%
	4.00	5.86			0.00		0.00	0.00	0.0%
	4.40	6.00			0.00		0.00	0.00	0.0%
	4.60	6.22			0.00		0.00	0.00	0.0%
RW	5.00	6.50	0.00	0.00	0.00		0.00	0.00	0.0%
	6.00	6.70	0.20	0.00	1.02	0.20	0.20	0.00	0.0%
	7.00	6.90	0.40	0.35	1.02	0.40	0.30	0.11	2.5%
	7.50	6.90	0.40	0.15	0.50	0.40	0.20	0.03	0.7%
	8.00	6.80	0.30	0.79	0.51	0.30	0.15	0.12	2.9%
	8.50	6.95	0.45	0.38	0.52	0.45	0.23	0.09	2.1%
	9.00	6.75	0.25	0.91	0.54	0.25	0.13	0.11	2.7%
	9.50	6.90	0.40	0.94	0.52	0.40	0.20	0.19	4.5%
	10.00	6.80	0.30	1.00	0.51	0.30	0.15	0.15	3.6%
	10.50	6.80	0.30	1.35	0.50	0.30	0.15	0.20	4.9%
	11.00	6.90	0.40	1.14	0.51	0.40	0.20	0.23	5.5%
	11.50	6.80	0.30	1.17	0.51	0.30	0.15	0.18	4.2%
	12.00	6.90	0.40	1.54	0.51	0.40	0.20	0.31	7.4%
	12.50	6.95	0.45	1.05	0.50	0.45	0.23	0.24	5.7%
	13.00	6.75	0.25	0.93	0.54	0.25	0.13	0.12	2.8%
	13.50	6.65	0.15	0.51	0.51	0.15	0.08	0.04	0.9%
	14.00	6.90	0.40	0.16	0.56	0.40	0.20	0.03	0.8%
	14.50	7.05	0.55	0.11	0.52	0.55	0.28	0.03	0.7%
	15.00	7.00	0.50	0.28	0.50	0.50	0.25	0.07	1.7%
	15.50	7.00	0.50	0.62	0.50	0.50	0.25	0.16	3.7%
	16.00	6.95	0.45	0.60	0.50	0.45	0.23	0.14	3.3%
	16.50	6.85	0.35	0.59	0.51	0.35	0.18	0.10	2.5%
	17.00	6.95	0.45	1.18	0.51	0.45	0.23	0.27	6.4%
	17.50	6.85	0.35	0.98	0.51	0.35	0.18	0.17	4.1%
	18.00	6.85	0.35	0.44	0.50	0.35	0.18	0.08	1.9%
	18.50	6.90	0.40	0.24	0.50	0.40	0.20	0.05	1.2%
	19.00	6.85	0.35	0.56	0.50	0.35	0.18	0.10	2.4%
	19.50	6.90	0.40	0.53	0.50	0.40	0.20	0.11	2.6%
	20.00	7.00	0.50	0.72	0.51	0.50	0.25	0.18	4.3%
	20.50	6.85	0.35	0.54	0.52	0.35	0.18	0.09	2.3%
	21.00	6.90	0.40	0.88	0.50	0.40	0.20	0.18	4.2%
	21.50	6.90	0.40	0.12	0.50	0.40	0.20	0.02	0.6%
	22.00	7.00	0.50	0.49	0.51	0.50	0.38	0.18	4.4%
	23.00	6.65	0.15	0.54	1.06	0.15	0.15	0.08	2.0%
	24.00	6.65	0.15	0.11	1.00	0.15	0.15	0.02	0.4%
	25.00	6.60	0.10	0.00	1.00	0.10	0.20	0.00	0.0%
LW	27.90	6.50	0.00	0.00	2.90		0.00	0.00	0.0%
	28.80	6.26			0.00		0.00	0.00	0.0%
	29.40	6.02			0.00		0.00	0.00	0.0%
1 BF	29.50	5.42			0.00		0.00	0.00	0.0%
	29.90	5.08			0.00		0.00	0.00	0.0%
	30.20	4.81			0.00		0.00	0.00	0.0%
LS	30.70	4.62			0.00		0.00	0.00	0.0%
TOTALS ----------					23.35	0.55 (Max.)	6.90	4.14	100.0%

Manning's n = 0.1430
Hydraulic Radius= 0.295256824

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.25901 N -107.06898 W
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	6.90	6.90	0.0%
6.25	6.90	12.78	85.4%
6.27	6.90	12.30	78.4%
6.29	6.90	11.82	71.4%
6.31	6.90	11.34	64.5%
6.33	6.90	10.86	57.5%
6.35	6.90	10.39	50.7%
6.37	6.90	9.92	43.8%
6.39	6.90	9.45	37.0%
6.41	6.90	8.98	30.2%
6.43	6.90	8.51	23.4%
6.45	6.90	8.05	16.7%
6.46	6.90	7.82	13.3%
6.47	6.90	7.58	10.0%
6.48	6.90	7.35	6.7%
6.49	6.90	7.12	3.3%
6.50	6.90	6.90	0.0%
6.51	6.90	6.67	-3.3%
6.52	6.90	6.44	-6.5%
6.53	6.90	6.22	-9.7%
6.54	6.90	6.01	-12.9%
6.55	6.90	5.79	-16.0%
6.57	6.90	5.38	-22.0%
6.59	6.90	4.97	-27.9%
6.61	6.90	4.58	-33.6%
6.63	6.90	4.20	-39.1%
6.65	6.90	3.83	-44.4%
6.67	6.90	3.49	-49.4%
6.69	6.90	3.15	-54.3%
6.71	6.90	2.82	-59.1%
6.73	6.90	2.50	-63.8%
6.75	6.90	2.18	-68.4%

WATERLINE AT ZERO
AREA ERROR = 6.500

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.25901 N -107.06898 W
XS NUMBER: 1

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.55	29.48	1.06	1.50	31.20	30.64	100.0%	1.02	42.79	1.37
	5.55	29.48	1.06	1.50	31.20	30.64	100.0%	1.02	42.79	1.37
	5.60	29.23	1.02	1.45	29.73	30.35	99.0%	0.98	39.74	1.34
	5.65	28.99	0.98	1.40	28.27	30.05	98.1%	0.94	36.79	1.30
	5.70	28.74	0.93	1.35	26.83	29.76	97.1%	0.90	33.93	1.26
	5.75	28.49	0.89	1.30	25.40	29.46	96.2%	0.86	31.18	1.23
	5.80	26.47	0.91	1.25	24.02	27.39	89.4%	0.88	29.83	1.24
	5.85	25.60	0.89	1.20	22.72	26.48	86.4%	0.86	27.80	1.22
	5.90	25.31	0.85	1.15	21.45	26.14	85.3%	0.82	25.48	1.19
	5.95	25.15	0.80	1.10	20.19	25.94	84.7%	0.78	23.15	1.15
	6.00	25.00	0.76	1.05	18.94	25.74	84.0%	0.74	20.92	1.10
	6.05	24.88	0.71	1.00	17.69	25.57	83.4%	0.69	18.75	1.06
	6.10	24.71	0.67	0.95	16.45	25.37	82.8%	0.65	16.70	1.02
	6.15	24.54	0.62	0.90	15.22	25.16	82.1%	0.60	14.75	0.97
	6.20	24.37	0.57	0.85	14.00	24.96	81.5%	0.56	12.90	0.92
	6.25	24.18	0.53	0.80	12.78	24.75	80.8%	0.52	11.15	0.87
	6.30	23.94	0.48	0.75	11.58	24.48	79.9%	0.47	9.53	0.82
	6.35	23.68	0.44	0.70	10.39	24.20	79.0%	0.43	8.01	0.77
	6.40	23.42	0.39	0.65	9.21	23.92	78.1%	0.39	6.61	0.72
	6.45	23.16	0.35	0.60	8.05	23.63	77.1%	0.34	5.32	0.66
WL	6.50	22.90	0.30	0.55	6.89	23.35	76.2%	0.30	4.14	0.60
	6.55	21.20	0.27	0.50	5.79	21.65	70.6%	0.27	3.26	0.56
	6.60	19.50	0.24	0.45	4.78	19.94	65.1%	0.24	2.50	0.52
	6.65	17.25	0.22	0.40	3.83	17.68	57.7%	0.22	1.87	0.49
	6.70	16.51	0.18	0.35	2.99	16.91	55.2%	0.18	1.27	0.43
	6.75	15.76	0.14	0.30	2.18	16.14	52.7%	0.14	0.78	0.36
	6.80	14.35	0.10	0.25	1.42	14.68	47.9%	0.10	0.40	0.28
	6.85	11.53	0.07	0.20	0.76	11.77	38.4%	0.06	0.16	0.22
	6.90	5.29	0.06	0.15	0.31	5.41	17.7%	0.06	0.06	0.20
	6.95	2.64	0.04	0.10	0.11	2.69	8.8%	0.04	0.02	0.16
	7.00	0.67	0.03	0.05	0.02	0.68	2.2%	0.02	0.00	0.11
	7.05	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.25901 N -107.06898 W
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	4.14	cfs
CALCULATED FLOW (Qc)=	4.14	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	6.50	ft
CALCULATED WATERLINE (WLc)=	6.50	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.55	ft
MAX CALCULATED DEPTH (Dc)=	0.55	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	0.60	ft/sec
MANNING'S N=	0.143	
SLOPE=	0.017	ft/ft
.4 * Qm =	1.7	cfs
2.5 * Qm=	10.4	cfs

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

FLOW (CFS)	PERIOD
___________________	___________________
___________________	___________________
___________________	___________________
___________________	___________________

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

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RECOMMENDATION BY: ……………………………………………… AGENCY…………………………………………… DATE:………………………

CWCB REVIEW BY: ……………………………………………………………………………………………… DATE:………………………

Attachment 4

Data Input & Proofing

STREAM NAME:	Trout Creek near Steamboat
XS LOCATION:	40.27074 N -107.05762 W
XS NUMBER:	2
DATE:	7/9/2020
OBSERVERS:	R. Smith, K. Birch, B. Logan
1/4 SEC:	SE
SECTION:	32
TWP:	4N
RANGE:	86W
PM:	Sixth
COUNTY:	Routt
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	23533
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.01695 ft / ft

CHECKED BY:.....DATE.....

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

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
			Total Data Points = 51					
	RS	0.00	6.36			0.00	0.00	0.00
		1.00	6.60			0.00	0.00	0.00
1	BF	1.30	7.20			0.00	0.00	0.00
		2.00	7.66			0.00	0.00	0.00
		2.80	7.92			0.00	0.00	0.00
		3.50	8.06			0.00	0.00	0.00
	RW	4.70	8.20	0.00	0.00	0.00	0.00	0.00
		6.00	8.30	0.10	0.00	0.12	0.00	8.20
		7.00	8.25	0.05	0.00	0.05	0.00	8.20
		8.00	8.40	0.20	0.03	0.20	0.01	8.20
		9.00	8.35	0.15	0.64	0.15	0.10	8.20
		10.00	8.30	0.10	0.79	0.10	0.08	8.20
		11.00	8.40	0.20	0.20	0.20	0.04	8.20
		12.00	8.45	0.25	0.20	0.25	0.05	8.20
		13.00	8.55	0.35	1.13	0.26	0.30	8.20
		13.50	8.50	0.30	0.94	0.15	0.14	8.20
		14.00	8.50	0.30	1.05	0.15	0.16	8.20
		14.50	8.65	0.45	0.56	0.23	0.13	8.20
		15.00	8.50	0.30	0.57	0.15	0.09	8.20
		15.50	8.65	0.45	1.00	0.23	0.23	8.20
		16.00	8.70	0.50	1.20	0.25	0.30	8.20
		16.50	8.70	0.50	1.42	0.25	0.36	8.20
		17.00	8.65	0.45	2.26	0.23	0.51	8.20
		17.50	8.70	0.50	1.26	0.25	0.32	8.20
		18.00	8.75	0.55	1.59	0.28	0.44	8.20
		18.50	8.85	0.65	1.40	0.33	0.46	8.20
		19.00	8.70	0.50	2.29	0.25	0.57	8.20
		19.50	8.75	0.55	1.32	0.28	0.36	8.20
		20.00	8.65	0.45	1.39	0.23	0.31	8.20
		20.50	8.60	0.40	0.68	0.20	0.14	8.20
		21.00	8.65	0.45	0.61	0.23	0.14	8.20
		21.50	8.55	0.35	1.49	0.18	0.26	8.20
		22.00	8.55	0.35	1.10	0.18	0.19	8.20
		22.50	8.60	0.40	1.12	0.20	0.22	8.20
		23.00	8.45	0.25	1.24	0.19	0.23	8.20
		24.00	8.45	0.25	1.66	0.25	0.42	8.20
		25.00	8.50	0.30	0.59	0.30	0.18	8.20
		26.00	8.55	0.35	0.01	0.35	0.00	8.20
		27.00	8.50	0.30	1.35	0.30	0.41	8.20
		28.00	8.50	0.30	0.13	0.30	0.04	8.20
		29.00	8.25	0.05	0.00	0.05	0.00	8.20
		30.00	8.35	0.15	0.35	0.15	0.05	8.20
		31.00	8.40	0.20	0.58	0.25	0.15	8.20
	LW	32.50	8.20	0.00	0.00	0.00	0.00	0.00
		33.20	8.08			0.00	0.00	0.00
		34.20	7.78			0.00	0.00	0.00
		35.40	7.78			0.00	0.00	0.00
		36.20	7.77			0.00	0.00	0.00
		37.30	7.42			0.00	0.00	0.00
		39.30	7.30			0.00	0.00	0.00
1	LS & BF	40.60	7.20			0.00	0.00	0.00
					Totals	7.67	7.34	

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

LOCATION INFORMATION

STREAM NAME:	Trout Creek near Steamboat
XS LOCATION:	40.27074 N -107.05762 W
XS NUMBER:	2
DATE:	9-Jul-20
OBSERVERS:	R. Smith, K. Birch, B. Logan
1/4 SEC:	SE
SECTION:	32
TWP:	4N
RANGE:	86W
PM:	Sixth
COUNTY:	Routt
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	23533
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

SLOPE:	0.01695

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

ASSIGNED TO: ….....……….....DATE.....

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.27074 N -107.05762 W
XS NUMBER: 2

DATA POINTS= 51

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
RS	0.00	6.36			0.00		0.00	0.00	0.0%
	1.00	6.60			0.00		0.00	0.00	0.0%
1 BF	1.30	7.20			0.00		0.00	0.00	0.0%
	2.00	7.66			0.00		0.00	0.00	0.0%
	2.80	7.92			0.00		0.00	0.00	0.0%
	3.50	8.06			0.00		0.00	0.00	0.0%
RW	4.70	8.20	0.00	0.00	0.00		0.00	0.00	0.0%
	6.00	8.30	0.10	0.00	1.30	0.10	0.12	0.00	0.0%
	7.00	8.25	0.05	0.00	1.00	0.05	0.05	0.00	0.0%
	8.00	8.40	0.20	0.03	1.01	0.20	0.20	0.01	0.1%
	9.00	8.35	0.15	0.64	1.00	0.15	0.15	0.10	1.3%
	10.00	8.30	0.10	0.79	1.00	0.10	0.10	0.08	1.1%
	11.00	8.40	0.20	0.20	1.00	0.20	0.20	0.04	0.5%
	12.00	8.45	0.25	0.20	1.00	0.25	0.25	0.05	0.7%
	13.00	8.55	0.35	1.13	1.00	0.35	0.26	0.30	4.0%
	13.50	8.50	0.30	0.94	0.50	0.30	0.15	0.14	1.9%
	14.00	8.50	0.30	1.05	0.50	0.30	0.15	0.16	2.1%
	14.50	8.65	0.45	0.56	0.52	0.45	0.23	0.13	1.7%
	15.00	8.50	0.30	0.57	0.52	0.30	0.15	0.09	1.2%
	15.50	8.65	0.45	1.00	0.52	0.45	0.23	0.23	3.1%
	16.00	8.70	0.50	1.20	0.50	0.50	0.25	0.30	4.1%
	16.50	8.70	0.50	1.42	0.50	0.50	0.25	0.36	4.8%
	17.00	8.65	0.45	2.26	0.50	0.45	0.23	0.51	6.9%
	17.50	8.70	0.50	1.26	0.50	0.50	0.25	0.32	4.3%
	18.00	8.75	0.55	1.59	0.50	0.55	0.28	0.44	6.0%
	18.50	8.85	0.65	1.40	0.51	0.65	0.33	0.46	6.2%
	19.00	8.70	0.50	2.29	0.52	0.50	0.25	0.57	7.8%
	19.50	8.75	0.55	1.32	0.50	0.55	0.28	0.36	4.9%
	20.00	8.65	0.45	1.39	0.51	0.45	0.23	0.31	4.3%
	20.50	8.60	0.40	0.68	0.50	0.40	0.20	0.14	1.9%
	21.00	8.65	0.45	0.61	0.50	0.45	0.23	0.14	1.9%
	21.50	8.55	0.35	1.49	0.51	0.35	0.18	0.26	3.6%
	22.00	8.55	0.35	1.10	0.50	0.35	0.18	0.19	2.6%
	22.50	8.60	0.40	1.12	0.50	0.40	0.20	0.22	3.1%
	23.00	8.45	0.25	1.24	0.52	0.25	0.19	0.23	3.2%
	24.00	8.45	0.25	1.66	1.00	0.25	0.25	0.42	5.7%
	25.00	8.50	0.30	0.59	1.00	0.30	0.30	0.18	2.4%
	26.00	8.55	0.35	0.01	1.00	0.35	0.35	0.00	0.0%
	27.00	8.50	0.30	1.35	1.00	0.30	0.30	0.41	5.5%
	28.00	8.50	0.30	0.13	1.00	0.30	0.30	0.04	0.5%
	29.00	8.25	0.05	0.00	1.03	0.05	0.05	0.00	0.0%
	30.00	8.35	0.15	0.35	1.00	0.15	0.15	0.05	0.7%
	31.00	8.40	0.20	0.58	1.00	0.20	0.25	0.15	2.0%
LW	32.50	8.20	0.00	0.00	1.51		0.00	0.00	0.0%
	33.20	8.08			0.00		0.00	0.00	0.0%
	34.20	7.78			0.00		0.00	0.00	0.0%
	35.40	7.78			0.00		0.00	0.00	0.0%
	36.20	7.77			0.00		0.00	0.00	0.0%
	37.30	7.42			0.00		0.00	0.00	0.0%
	39.30	7.30			0.00		0.00	0.00	0.0%
1 LS & BF	40.60	7.20			0.00		0.00	0.00	0.0%
TOTALS ----------					28.05	0.65 (Max.)	7.67	7.34	100.0%

Manning's n = 0.0851
Hydraulic Radius= 0.273298454

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.27074 N -107.05762 W
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	7.67	7.67	0.0%
7.95	7.67	15.02	96.0%
7.97	7.67	14.41	88.0%
7.99	7.67	13.80	80.1%
8.01	7.67	13.20	72.2%
8.03	7.67	12.59	64.3%
8.05	7.67	12.00	56.5%
8.07	7.67	11.40	48.7%
8.09	7.67	10.81	41.0%
8.11	7.67	10.23	33.4%
8.13	7.67	9.65	25.9%
8.15	7.67	9.07	18.4%
8.16	7.67	8.79	14.7%
8.17	7.67	8.51	11.0%
8.18	7.67	8.22	7.3%
8.19	7.67	7.94	3.6%
8.20	7.67	7.67	0.0%
8.21	7.67	7.39	-3.6%
8.22	7.67	7.11	-7.2%
8.23	7.67	6.84	-10.8%
8.24	7.67	6.57	-14.3%
8.25	7.67	6.30	-17.8%
8.27	7.67	5.78	-24.6%
8.29	7.67	5.28	-31.1%
8.31	7.67	4.80	-37.3%
8.33	7.67	4.35	-43.2%
8.35	7.67	3.93	-48.8%
8.37	7.67	3.52	-54.0%
8.39	7.67	3.15	-58.9%
8.41	7.67	2.80	-63.5%
8.43	7.67	2.46	-67.9%
8.45	7.67	2.13	-72.2%

WATERLINE AT ZERO
AREA ERROR = 8.200

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.27074 N -107.05762 W
XS NUMBER: 2

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	7.20	39.30	1.05	1.65	41.13	39.86	100.0%	1.03	95.52	2.32
	7.20	39.30	1.05	1.65	41.13	39.86	100.0%	1.03	95.52	2.32
	7.25	38.57	1.02	1.60	39.18	39.12	98.1%	1.00	89.22	2.28
	7.30	37.85	0.98	1.55	37.27	38.38	96.3%	0.97	83.14	2.23
	7.35	36.94	0.96	1.50	35.40	37.45	93.9%	0.95	77.56	2.19
	7.40	36.03	0.93	1.45	33.58	36.53	91.6%	0.92	72.21	2.15
	7.45	35.53	0.89	1.40	31.79	36.00	90.3%	0.88	66.56	2.09
	7.50	35.29	0.85	1.35	30.02	35.75	89.7%	0.84	60.79	2.02
	7.55	35.06	0.81	1.30	28.27	35.49	89.0%	0.80	55.24	1.95
	7.60	34.83	0.76	1.25	26.52	35.23	88.4%	0.75	49.90	1.88
	7.65	34.59	0.72	1.20	24.78	34.98	87.7%	0.71	44.80	1.81
	7.70	34.30	0.67	1.15	23.06	34.67	87.0%	0.67	39.97	1.73
	7.75	33.99	0.63	1.10	21.35	34.34	86.1%	0.62	35.38	1.66
	7.80	31.70	0.62	1.05	19.70	32.04	80.4%	0.61	32.41	1.64
	7.85	31.38	0.58	1.00	18.13	31.71	79.5%	0.57	28.40	1.57
	7.90	31.06	0.53	0.95	16.57	31.37	78.7%	0.53	24.62	1.49
	7.95	30.68	0.49	0.90	15.02	30.98	77.7%	0.48	21.09	1.40
	8.00	30.27	0.45	0.85	13.50	30.55	76.6%	0.44	17.81	1.32
	8.05	29.85	0.40	0.80	12.00	30.12	75.6%	0.40	14.77	1.23
	8.10	29.24	0.36	0.75	10.52	29.50	74.0%	0.36	12.03	1.14
	8.15	28.52	0.32	0.70	9.07	28.77	72.2%	0.32	9.56	1.05
WL	8.20	27.80	0.28	0.65	7.66	28.05	70.4%	0.27	7.34	0.96
	8.25	26.77	0.24	0.60	6.30	27.02	67.8%	0.23	5.43	0.86
	8.30	23.72	0.21	0.55	5.04	23.94	60.1%	0.21	4.05	0.80
	8.35	20.81	0.19	0.50	3.93	21.01	52.7%	0.19	2.92	0.74
	8.40	17.40	0.17	0.45	2.97	17.58	44.1%	0.17	2.06	0.69
	8.45	15.20	0.14	0.40	2.13	15.38	38.6%	0.14	1.30	0.61
	8.50	11.83	0.12	0.35	1.42	11.99	30.1%	0.12	0.78	0.55
	8.55	7.67	0.12	0.30	0.92	7.79	19.5%	0.12	0.50	0.55
	8.60	6.25	0.09	0.25	0.57	6.34	15.9%	0.09	0.26	0.46
	8.65	4.50	0.07	0.20	0.30	4.55	11.4%	0.07	0.11	0.37
	8.70	2.25	0.05	0.15	0.12	2.29	5.7%	0.05	0.04	0.32
	8.75	0.83	0.05	0.10	0.04	0.86	2.2%	0.05	0.01	0.30
	8.80	0.42	0.03	0.05	0.01	0.43	1.1%	0.02	0.00	0.19
	8.85	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.27074 N -107.05762 W
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	7.34	cfs
CALCULATED FLOW (Qc)=	7.34	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	8.20	ft
CALCULATED WATERLINE (WLc)=	8.20	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.65	ft
MAX CALCULATED DEPTH (Dc)=	0.65	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	0.96	ft/sec
MANNING'S N=	0.085	
SLOPE=	0.01695	ft/ft
.4 * Qm =	2.9	cfs
2.5 * Qm=	18.4	cfs

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

FLOW (CFS)	PERIOD
===========	========
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

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

RECOMMENDATION BY: ……………………………………………… AGENCY……………………………………………… DATE:………………………

CWCB REVIEW BY: …………………………………………………………………………………………………… DATE:………………………

Attachment 4

Data Input & Proofing

STREAM NAME:	Trout Creek near Steamboat
XS LOCATION:	40.28929 N -107.04348 W
XS NUMBER:	3
DATE:	7/9/2020
OBSERVERS:	R. Smith, K. Birch, B. Logan
1/4 SEC:	SE
SECTION:	28
TWP:	4N
RANGE:	86W
PM:	Sixth
COUNTY:	Routt
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	23533
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.0138 ft / ft

CHECKED BY:.....DATE.....

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

Total Data Points = 45

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
	LS	0.00	2.49			0.00	0.00	0.00
1	BF	0.80	2.87			0.00	0.00	0.00
		1.50	3.34			0.00	0.00	0.00
		2.10	3.62			0.00	0.00	0.00
	LW	2.90	4.01	0.00	0.00	0.00	0.00	0.00
		3.00	4.05	0.05	0.00	0.03	0.00	4.00
		4.00	4.10	0.10	0.24	0.10	0.02	4.00
		5.00	4.35	0.35	0.23	0.35	0.08	4.00
		6.00	4.30	0.30	0.58	0.30	0.17	4.00
		7.00	4.25	0.25	0.04	0.25	0.01	4.00
		8.00	4.35	0.35	0.80	0.35	0.28	4.00
		9.00	4.25	0.25	0.59	0.25	0.15	4.00
		10.00	4.25	0.25	1.15	0.19	0.22	4.00
		10.50	4.35	0.35	1.26	0.18	0.22	4.00
		11.00	4.50	0.50	0.45	0.25	0.11	4.00
		11.50	4.45	0.45	0.90	0.23	0.20	4.00
		12.00	4.45	0.45	1.44	0.23	0.32	4.00
		12.50	4.35	0.35	1.73	0.18	0.30	4.00
		13.00	4.45	0.45	1.96	0.23	0.44	4.00
		13.50	4.35	0.35	1.59	0.18	0.28	4.00
		14.00	4.45	0.45	1.85	0.23	0.42	4.00
		14.50	4.50	0.50	1.88	0.25	0.47	4.00
		15.00	4.45	0.45	1.97	0.23	0.44	4.00
		15.50	4.40	0.40	0.20	0.20	0.04	4.00
		16.00	4.40	0.40	1.33	0.20	0.27	4.00
		16.50	4.20	0.20	1.33	0.10	0.13	4.00
		17.00	4.25	0.25	1.18	0.13	0.15	4.00
		17.50	4.25	0.25	1.64	0.13	0.21	4.00
		18.00	4.30	0.30	1.50	0.15	0.23	4.00
		18.50	4.35	0.35	1.94	0.18	0.34	4.00
		19.00	4.35	0.35	1.40	0.18	0.25	4.00
		19.50	4.50	0.50	0.63	0.25	0.16	4.00
		20.00	4.30	0.30	1.56	0.15	0.23	4.00
		20.50	4.35	0.35	1.31	0.18	0.23	4.00
		21.00	4.40	0.40	1.28	0.30	0.38	4.00
		22.00	4.30	0.30	0.56	0.30	0.17	4.00
		23.00	4.15	0.15	0.00	0.15	0.00	4.00
		24.00	4.10	0.10	0.00	0.08	0.00	4.00
	RW	24.50	4.00	0.00	0.00	0.00	0.00	0.00
		26.30	3.92			0.00	0.00	0.00
		27.30	3.87			0.00	0.00	0.00
		28.00	3.40			0.00	0.00	0.00
1	BF	28.20	2.88			0.00	0.00	0.00
		28.70	2.60			0.00	0.00	0.00
	RS	29.50	2.28			0.00	0.00	0.00
					Totals	6.62	6.92	

Attachment 4

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

LOCATION INFORMATION

STREAM NAME:	Trout Creek near Steamboat
XS LOCATION:	40.28929 N -107.04348 W
XS NUMBER:	3
DATE:	9-Jul-20
OBSERVERS:	R. Smith, K. Birch, B. Logan
1/4 SEC:	SE
SECTION:	28
TWP:	4N
RANGE:	86W
PM:	Sixth
COUNTY:	Routt
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	23533
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

SLOPE:	0.0138

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

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

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.28929 N -107.04348 W
XS NUMBER: 3

DATA POINTS= 45

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
LS	0.00	2.49			0.00		0.00	0.00	0.0%
1 BF	0.80	2.87			0.00		0.00	0.00	0.0%
	1.50	3.34			0.00		0.00	0.00	0.0%
	2.10	3.62			0.00		0.00	0.00	0.0%
LW	2.90	4.01	0.00	0.00	0.00		0.00	0.00	0.0%
	3.00	4.05	0.05	0.00	0.11	0.05	0.03	0.00	0.0%
	4.00	4.10	0.10	0.24	1.00	0.10	0.10	0.02	0.3%
	5.00	4.35	0.35	0.23	1.03	0.35	0.35	0.08	1.2%
	6.00	4.30	0.30	0.58	1.00	0.30	0.30	0.17	2.5%
	7.00	4.25	0.25	0.04	1.00	0.25	0.25	0.01	0.1%
	8.00	4.35	0.35	0.80	1.00	0.35	0.35	0.28	4.0%
	9.00	4.25	0.25	0.59	1.00	0.25	0.25	0.15	2.1%
	10.00	4.25	0.25	1.15	1.00	0.25	0.19	0.22	3.1%
	10.50	4.35	0.35	1.26	0.51	0.35	0.18	0.22	3.2%
	11.00	4.50	0.50	0.45	0.52	0.50	0.25	0.11	1.6%
	11.50	4.45	0.45	0.90	0.50	0.45	0.23	0.20	2.9%
	12.00	4.45	0.45	1.44	0.50	0.45	0.23	0.32	4.7%
	12.50	4.35	0.35	1.73	0.51	0.35	0.18	0.30	4.4%
	13.00	4.45	0.45	1.96	0.51	0.45	0.23	0.44	6.4%
	13.50	4.35	0.35	1.59	0.51	0.35	0.18	0.28	4.0%
	14.00	4.45	0.45	1.85	0.51	0.45	0.23	0.42	6.0%
	14.50	4.50	0.50	1.88	0.50	0.50	0.25	0.47	6.8%
	15.00	4.45	0.45	1.97	0.50	0.45	0.23	0.44	6.4%
	15.50	4.40	0.40	0.20	0.50	0.40	0.20	0.04	0.6%
	16.00	4.40	0.40	1.33	0.50	0.40	0.20	0.27	3.8%
	16.50	4.20	0.20	1.33	0.54	0.20	0.10	0.13	1.9%
	17.00	4.25	0.25	1.18	0.50	0.25	0.13	0.15	2.1%
	17.50	4.25	0.25	1.64	0.50	0.25	0.13	0.21	3.0%
	18.00	4.30	0.30	1.50	0.50	0.30	0.15	0.23	3.3%
	18.50	4.35	0.35	1.94	0.50	0.35	0.18	0.34	4.9%
	19.00	4.35	0.35	1.40	0.50	0.35	0.18	0.25	3.5%
	19.50	4.50	0.50	0.63	0.52	0.50	0.25	0.16	2.3%
	20.00	4.30	0.30	1.56	0.54	0.30	0.15	0.23	3.4%
	20.50	4.35	0.35	1.31	0.50	0.35	0.18	0.23	3.3%
	21.00	4.40	0.40	1.28	0.50	0.40	0.30	0.38	5.6%
	22.00	4.30	0.30	0.56	1.00	0.30	0.30	0.17	2.4%
	23.00	4.15	0.15	0.00	1.01	0.15	0.15	0.00	0.0%
	24.00	4.10	0.10	0.00	1.00	0.10	0.08	0.00	0.0%
RW	24.50	4.00	0.00	0.00	0.51		0.00	0.00	0.0%
	26.30	3.92			0.00		0.00	0.00	0.0%
	27.30	3.87			0.00		0.00	0.00	0.0%
	28.00	3.40			0.00		0.00	0.00	0.0%
1 BF	28.20	2.88			0.00		0.00	0.00	0.0%
	28.70	2.60			0.00		0.00	0.00	0.0%
RS	29.50	2.28			0.00		0.00	0.00	0.0%
TOTALS ----------					21.87	0.5 (Max.)	6.62	6.92	100.0%

Manning's n = 0.0752
Hydraulic Radius= 0.302433927

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.28929 N -107.04348 W
XS NUMBER: 3

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	6.62	6.51	-1.6%
3.76	6.62	12.49	88.9%
3.78	6.62	11.99	81.3%
3.80	6.62	11.49	73.7%
3.82	6.62	10.99	66.2%
3.84	6.62	10.50	58.7%
3.86	6.62	10.00	51.2%
3.88	6.62	9.51	43.7%
3.90	6.62	9.02	36.4%
3.92	6.62	8.54	29.1%
3.94	6.62	8.07	22.0%
3.96	6.62	7.61	15.1%
3.97	6.62	7.39	11.7%
3.98	6.62	7.16	8.3%
3.99	6.62	6.94	5.0%
4.00	6.62	6.72	1.6%
4.01	6.62	6.51	-1.6%
4.02	6.62	6.29	-4.9%
4.03	6.62	6.08	-8.1%
4.04	6.62	5.86	-11.4%
4.05	6.62	5.65	-14.6%
4.06	6.62	5.44	-17.8%
4.08	6.62	5.02	-24.1%
4.10	6.62	4.61	-30.3%
4.12	6.62	4.22	-36.3%
4.14	6.62	3.83	-42.1%
4.16	6.62	3.45	-47.9%
4.18	6.62	3.08	-53.5%
4.20	6.62	2.71	-59.1%
4.22	6.62	2.34	-64.6%
4.24	6.62	1.99	-69.9%
4.26	6.62	1.65	-75.0%

WATERLINE AT ZERO
AREA ERROR = 4.000

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.28929 N -107.04348 W
XS NUMBER: 3

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	2.88	27.39	1.30	1.62	35.61	28.45	100.0%	1.25	95.99	2.70
	3.00	27.16	1.19	1.50	32.34	28.11	98.8%	1.15	82.40	2.55
	3.05	27.07	1.14	1.45	30.98	27.97	98.3%	1.11	76.98	2.48
	3.10	26.97	1.10	1.40	29.63	27.82	97.8%	1.07	71.72	2.42
	3.15	26.88	1.05	1.35	28.29	27.68	97.3%	1.02	66.60	2.35
	3.20	26.79	1.01	1.30	26.94	27.54	96.8%	0.98	61.63	2.29
	3.25	26.69	0.96	1.25	25.61	27.39	96.3%	0.93	56.81	2.22
	3.30	26.60	0.91	1.20	24.28	27.25	95.8%	0.89	52.16	2.15
	3.35	26.50	0.87	1.15	22.95	27.10	95.2%	0.85	47.66	2.08
	3.40	26.37	0.82	1.10	21.63	26.93	94.6%	0.80	43.36	2.00
	3.45	26.19	0.78	1.05	20.31	26.72	93.9%	0.76	39.26	1.93
	3.50	26.01	0.73	1.00	19.01	26.51	93.2%	0.72	35.33	1.86
	3.55	25.83	0.69	0.95	17.71	26.30	92.5%	0.67	31.57	1.78
	3.60	25.64	0.64	0.90	16.42	26.10	91.7%	0.63	27.99	1.70
	3.65	25.47	0.59	0.85	15.15	25.89	91.0%	0.58	24.59	1.62
	3.70	25.29	0.55	0.80	13.88	25.69	90.3%	0.54	21.36	1.54
	3.75	25.11	0.50	0.75	12.62	25.48	89.6%	0.50	18.33	1.45
	3.80	24.93	0.46	0.70	11.37	25.28	88.8%	0.45	15.48	1.36
	3.85	24.76	0.41	0.65	10.12	25.08	88.1%	0.40	12.83	1.27
	3.90	24.02	0.37	0.60	8.90	24.32	85.5%	0.37	10.56	1.19
	3.95	22.85	0.34	0.55	7.73	23.13	81.3%	0.33	8.63	1.12
WL	4.00	21.62	0.31	0.50	6.61	21.90	77.0%	0.30	6.91	1.04
	4.05	21.25	0.26	0.45	5.54	21.51	75.6%	0.26	5.21	0.94
	4.10	20.00	0.23	0.40	4.51	20.25	71.2%	0.22	3.85	0.85
	4.15	18.80	0.19	0.35	3.54	19.05	66.9%	0.19	2.68	0.76
	4.20	18.27	0.14	0.30	2.62	18.50	65.0%	0.14	1.65	0.63
	4.25	15.61	0.11	0.25	1.73	15.82	55.6%	0.11	0.92	0.53
	4.30	12.20	0.08	0.20	1.04	12.38	43.5%	0.08	0.46	0.44
	4.35	7.50	0.07	0.15	0.53	7.64	26.8%	0.07	0.21	0.39
	4.40	4.42	0.05	0.10	0.22	4.49	15.8%	0.05	0.07	0.31
	4.45	1.96	0.02	0.05	0.05	1.99	7.0%	0.02	0.01	0.20

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.28929 N -107.04348 W
XS NUMBER: 3

SUMMARY SHEET

MEASURED FLOW (Qm)=	6.92	cfs
CALCULATED FLOW (Qc)=	6.91	cfs
(Qm-Qc)/Qm * 100 =	0.1	%
MEASURED WATERLINE (WLm)=	4.01	ft
CALCULATED WATERLINE (WLc)=	4.00	ft
(WLm-WLc)/WLm * 100 =	0.1	%
MAX MEASURED DEPTH (Dm)=	0.50	ft
MAX CALCULATED DEPTH (Dc)=	0.50	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.04	ft/sec
MANNING'S N=	0.075	
SLOPE=	0.0138	ft/ft
.4 * Qm =	2.8	cfs
2.5 * Qm=	17.3	cfs

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

FLOW (CFS)	PERIOD
___________________	___________________
___________________	___________________
___________________	___________________
___________________	___________________

RATIONALE FOR RECOMMENDATION:
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RECOMMENDATION BY: ………………………………………….................................. AGENCY……………………………………………………...... DATE:……………………………

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

Attachment 4

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Trout Creek - Knott Ranch - UPPER XS					CROSS-SECTION NO: 1
CROSS-SECTION LOCATION: 40.25908 -107.06898 ±15ft					
DATE: 8-25-20	OBSERVERS: R. Smith, B. Logan, K. Schoel, T. Knott				
LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY: ROUTT	WATERSHED: Yampa River		WATER DIVISION: 6		DOW WATER CODE: 23535
MAP(S):	USGS:				
	USFS:				

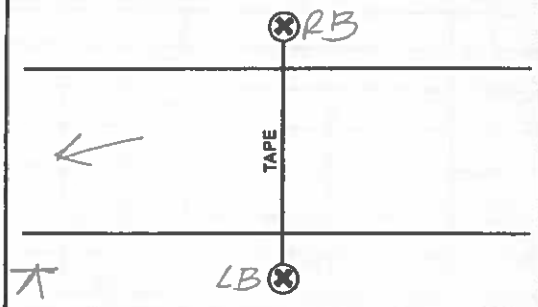
SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	4.82
⊗ Tape @ Stake RB	0.0	5.80
① WS @ Tape LB/RB	0.0	6.58 / 6.62
② WS Upstream	22.1	6.35
③ WS Downstream	18.1	6.86
SLOPE	.51 / 40.2 = .0127	

SKETCH



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

Alt: 26.1 7.02 Slope = 0.0139

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

Attachment 4

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: TROUT CREEK	CROSS-SECTION NO: 7	DATE: 8/25	SHEET 1 OF 2

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 Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
R PIN	0.6		5.80								
BF	0.75		5.80								
	1.4		5.89								
	2.0		6.04								
	3.5		6.03								
	4.7		6.06								
REU	5.45		6.62								
	6.0			0.2				0.04			
	7.0			0.35				0.02			
	8.0			0.55				0.91			
	8.5			0.50				1.68			
	9.0			0.65				1.34			
	9.5			0.4				1.82			
	10.0			0.5				1.89			
	10.5			0.5				1.53			
	11.0			0.8				2.03			
	11.5			0.5				1.82			
	12.0			0.4				2.52			
	12.5			0.6				2.63			
	13.0			0.5				1.83			
	13.5			0.55				1.22			
	14.0			0.60				1.38			
	15.0			0.7				0.92			
	16.0			0.65				0.92			
	16.5			0.7				1.21			
	17.0			0.7				0.15			
	17.5			0.7				0.87			
	18.0			0.4				1.77			
	18.5			0.55				1.14			
	19.0			0.5				0.87			
	19.5			0.4				1.33			
	20.0			0.6				1.27			
	20.5			0.65				1.72			
	21.0			0.7				0.68			
	21.5			0.65				1.69			
	22.0			0.6				1.49			
	22.5			0.65	→ cont. on 2nd sheet			0.66			
LEW	29.0		6.58								
	30.1		6.40								
RF	30.2		5.70								
	30.9		5.07								
L PIN	31.4		4.82								
TOTALS:											

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

Attachment 4

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: TROUT CREEK					CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION:					
DATE: 8/15/20	OBSERVERS:				
LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY:	WATERSHED:		WATER DIVISION:		DOW WATER CODE:
MAP(S):	USGS:				
	USFS:				

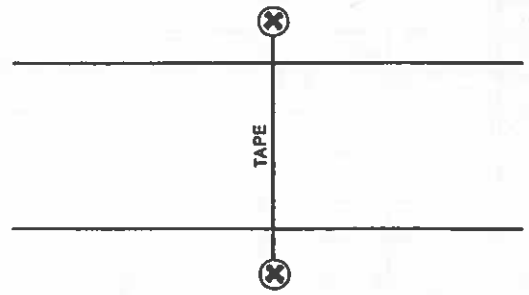
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO	METER TYPE: MARSH			
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		
③ WS Downstream		
SLOPE		

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)	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

CSFR 1-86

DISCHARGE/CROSS-SECTION NOTES

STREAM NAME: TROUT CREEK	CROSS-SECTION NO.: 1	DATE: 8/25	SHEET 2 OF 2
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 Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
continued from 1st sheet	23.0			0.6				1.08			
	24.0			0.35				0.85			
	25.0			0.3				0.48			
	26.0			0.2				0.0			
	27.0			0.2				0.32			
	28.0			0.1				0.0			
TOTALS:											

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

Attachment 4

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: TROUT CREEK - middle XS					CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: 40.27077 -107.05760					
DATE: 8/25/22	OBSERVERS: R. SMITH, T KNOTT, K. SCHEEL, B. LOGAN				
LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY: ROUTT	WATERSHED: Yampa River		WATER DIVISION: 6		DOW WATER CODE: 23535
MAP(S):	USGS:				
	USFS:				

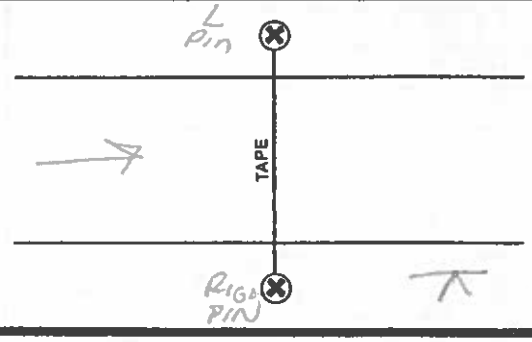
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO	METER TYPE: MARSH			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: SURVEYED ____ lbs/foot	TAPE TENSION: surveyed ____ 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	7.20
⊗ Tape @ Stake RB	0.0	6.52
① WS @ Tape LB/RB	0.0	8.30 / 8.30
② WS Upstream	31.3	7.66
③ WS Downstream	24.2	8.74
SLOPE	1.08 / 55.5 = 0.0195	

SKETCH



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

WATER QUAL
TEMP 16.4°C, CONDUCTIVITY 1600 Salinity .1 PPT
DO - NA

FEB 1 85

DISCHARGE/CROSS-SECTION NOTES

Attachment 4

STREAM NAME: TROUT CREEK	CROSS-SECTION NO.: 2	DATE: 8/25	SHEET 1 OF 2
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: ____ ft	TIME: 11:57

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)
R PIN	0.6		6.52								
	1.0		6.56								
	1.5		6.72								
	1.8		6.94								
RF	1.9		7.42								
	2.6		7.64								
	3.2		7.95								
	3.6		8.05								
	3.8		8.24								
REW	4.6		8.30								
	5.5			0.05				0.37			
	6.5			0.2				0.08			
	7.5			0.2				0.0			
	8.5			0.2				0.07			
	9.5			0.25				1.75			
	10.5			0.2				1.2			
	11.5			0.15				1.08			
	12.5			0.35				0.11			
	13.5			0.3				1.22			
	14.5			0.21				1.02			
	15.0			0.5				1.03			
	15.5			0.3				0.58			
	16.0			0.6				1.72			
	16.5			0.5				1.81			
	17.0			0.5				1.69			
	17.5			0.5				1.46			
	18.0			0.65				1.26			
	18.5			0.6				2.38			
	19.0			0.55				2.40			
	19.5			0.55				1.92			
		CONTINUED ON 2nd PAGE									
LEW	33.4		8.30								
	34.1		8.13								
	34.7		7.97								
	35.9		7.81								
	36.4		8.03								
	37.0		7.80								
*	35.0		7.51		* STA	35 IS AN ERROR, THE CORRECT VALUE IS 38 (note added on 8/31/20)					
	40.0		7.51								
BF	41.1		7.40								
	42.4		7.24								
L PIN	44.4		7.20								
TOTALS:											

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

RC TOP WIDTH 29.7

Attachment 4

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: TROUT CREEK					CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION:					
DATE: 8/25/20	OBSERVERS:				
LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY:	WATERSHED:		WATER DIVISION:		DOW WATER CODE:
MAP(S): USGS:					
USFS:					

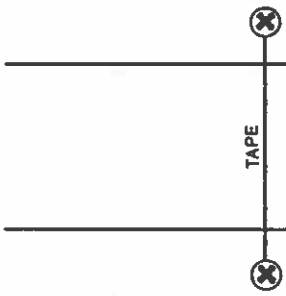
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO	METER TYPE:			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: Surveyed ____ lbs/foot	TAPE TENSION: Surveyed ____ 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		
③ WS Downstream		
SLOPE		

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

FEB 1 86

Attachment 4

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: TROUT CREEK | CROSS SECTION NO.: 2 | DATE: 8/25 | SHEET 2 OF 2

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 Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
continued from 1st page	20		0.6					2.15			
	20.5		0.55					2.21			
	21.0		0.5					1.20			
	21.5		0.4					1.78			
	22.0		0.35					2.28			
	23.0		0.45					1.82			
	24.0		0.35					1.32			
	25.0		0.3					1.78			
	26.0		0.3					0.77			
	27.0		0.3					1.05			
	28.0		0.35					0.78			
	29.0		0.35					0.17			
	30.0		0.3					0.68			
	31.0		0.3					1.24			
	32.0		0.3					0.41			
TOTALS:											

End of Measurement | Time: 12:49 | Gage Reading: _____ ft | CALCULATIONS PERFORMED BY: | CALCULATIONS CHECKED BY:

Attachment 4

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO · DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: TROUT CREEK - LOWER XS					CROSS-SECTION NO.: 3
CROSS-SECTION LOCATION: 40.28930 -107.04340 ± 14 ft					
DATE: 8/25/20	OBSERVERS: R. SMITH, T. KNOTT K. C B. LOG				
LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY: ROUTT	WATERSHED: Yampa River		WATER DIVISION: 6		DOW WATER CODE: 23535
MAP(S):	USGS:				
	USFS:				

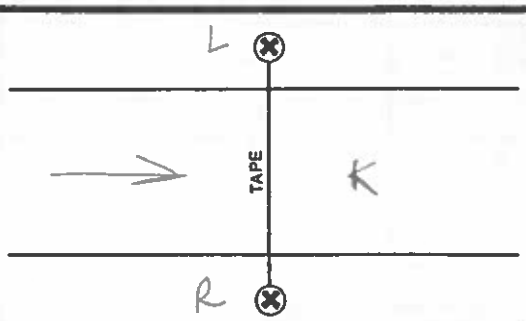
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES/NO	METER TYPE: MARSH			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: Surveyed ____ lbs/foot	TAPE TENSION: Surveyed ____ 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	2.62
⊗ Tape @ Stake RB	0.0	2.34
① WS @ Tape LB/RB	0.0	4.05 / 4.04
② WS Upstream	~~50.3~~	3.34
③ WS Downstream	7.0	4.12
SLOPE	.78 / 57.3 = 0.0136	

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

Attachment 4

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: TROUT CREEK | CROSS-SECTION NO: 3 | DATE: 8/25 | SHEET 1 OF 2

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 1:30

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RPIN	1.0		2.34								
	1.5		2.68								
	2.0		2.72								
BF	2.3		2.99								
	3.3		3.94								
RFW	5.5		4.04								
	6.5				0.2			0.05			
	7.5				0.25			1.11			
	8.5				0.5			1.09			
	9.0				0.25			1.66			
	9.5				0.55			1.64			
	10.0				0.5			1.95			
	10.5				0.5			1.76			
	11.0				0.5			2.07			
	11.5				0.5			2.65			
	12.0				0.35			1.74			
	12.5				0.45			1.70			
	13.0				0.4			2.05			
	13.5				0.45			1.02			
	14.0				0.5			2.02			
	14.5				0.45			1.62			
	15.0				0.6			1.24			
	15.5				0.65			2.06			
	16.0				0.6			2.14			
	16.5				0.6			2.42			
	17.0				0.5			2.02			
	17.5				0.55			1.77			
	18.0				0.45			1.91			
	18.5				0.5			1.97			
	19.0				0.5			0.75			
	20.0				0.5			1.33			
	21.0				0.35			1.27			
	22.0				0.3			0.81			
	23.0				0.4			0.49			
	24.0				0.4			0.59			
	25.0				0.35			0.08			
	—	SEE	PAGE 2								
LFW	28.0		4.05								
	28.5		3.72								
	29.0		3.44								
BF	29.7		2.98								
LPIN	30.5		2.62								
TOTALS:											

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

Attachment 4

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: TROUT CREEK - LOWER XS					CROSS-SECTION NO.: 3
CROSS-SECTION LOCATION: LOWEST XS MEASURED IN 2000					
DATE: 8/25/25	OBSERVERS:				
LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY:	WATERSHED:	WATER DIVISION:	DOW WATER CODE:		
MAP(S): USGS:					
USFS:					

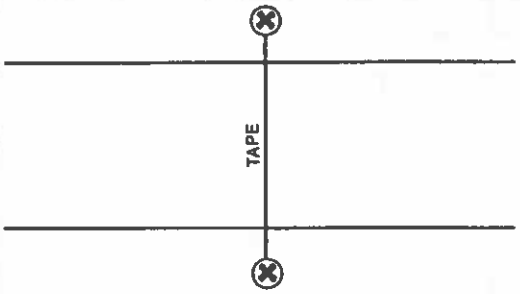
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO	METER TYPE:			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: Surveyed ____ lbs/foot	TAPE TENSION: Surveyed ____ 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		
③ WS Downstream		
SLOPE		

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

FEB 1-95

Attachment 4

DISCHARGE/CROSS-SECTION NOTES

STREAM NAME: TROUT CREEK	CROSS-SECTION NO.: 3	DATE: 7/25	SHEET 2 OF 7

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.	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)
continued from Page 1											
	26			0.2				0.90			
	27			0.15				0.05			
TOTALS:											

End of Measurement	Time: 2:10	Gage Reading _____ ft	CALCULATIONS PERFORMED BY:	CALCULATIONS CHECKED BY:

Attachment 4

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

LOCATION INFORMATION

STREAM NAME:	Trout Creek near Steamboat
XS LOCATION:	40.25908 N -107.068998 W
XS NUMBER:	1
DATE:	25-Aug-20
OBSERVERS:	R Smith, B Logan, K Scheel, T Knott
1/4 SEC:	SW
SECTION:	5
TWP:	3N
RANGE:	86W
PM:	Sixth
COUNTY:	Routt
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	0
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

SLOPE:	0.01268657

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

ASSIGNED TO: ….....…….....DATE.....

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.25908 N -107.068998 W
XS NUMBER: 1

DATA POINTS= 48

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
S	0.60	5.80			0.00		0.00	0.00	0.0%
1 BF	0.75	5.80			0.00		0.00	0.00	0.0%
	1.40	5.89			0.00		0.00	0.00	0.0%
	2.00	6.04			0.00		0.00	0.00	0.0%
	3.50	6.03			0.00		0.00	0.00	0.0%
	4.70	6.06			0.00		0.00	0.00	0.0%
REW	5.45	6.62			0.00		0.00	0.00	0.0%
	6.00	6.80	0.20	0.04	0.58	0.20	0.16	0.01	0.0%
	7.00	6.95	0.35	0.02	1.01	0.35	0.35	0.01	0.1%
	8.00	7.15	0.55	0.91	1.02	0.55	0.41	0.38	2.9%
	8.50	7.10	0.50	1.68	0.50	0.50	0.25	0.42	3.3%
	9.00	7.25	0.65	1.34	0.52	0.65	0.33	0.44	3.4%
	9.50	7.00	0.40	1.82	0.56	0.40	0.20	0.36	2.8%
	10.00	7.10	0.50	1.89	0.51	0.50	0.25	0.47	3.7%
	10.50	7.10	0.50	1.53	0.50	0.50	0.25	0.38	3.0%
	11.00	7.40	0.80	2.03	0.58	0.80	0.40	0.81	6.3%
	11.50	7.10	0.50	1.82	0.58	0.50	0.25	0.46	3.5%
	12.00	7.00	0.40	2.52	0.51	0.40	0.20	0.50	3.9%
	12.50	7.20	0.60	2.63	0.54	0.60	0.30	0.79	6.1%
	13.00	7.10	0.50	1.83	0.51	0.50	0.25	0.46	3.6%
	13.50	7.15	0.55	1.22	0.50	0.55	0.28	0.34	2.6%
	14.00	7.20	0.60	1.38	0.50	0.60	0.45	0.62	4.8%
	15.00	7.30	0.70	0.92	1.00	0.70	0.70	0.64	5.0%
	16.00	7.25	0.65	0.92	1.00	0.65	0.49	0.45	3.5%
	16.50	7.30	0.70	1.21	0.50	0.70	0.35	0.42	3.3%
	17.00	7.30	0.70	0.15	0.50	0.70	0.35	0.05	0.4%
	17.50	7.30	0.70	0.87	0.50	0.70	0.35	0.30	2.4%
	18.00	7.00	0.40	1.77	0.58	0.40	0.20	0.35	2.8%
	18.50	7.15	0.55	1.14	0.52	0.55	0.28	0.31	2.4%
	19.00	7.10	0.50	0.87	0.50	0.50	0.25	0.22	1.7%
	19.50	7.00	0.40	1.33	0.51	0.40	0.20	0.27	2.1%
	20.00	7.20	0.60	1.27	0.54	0.60	0.30	0.38	3.0%
	20.50	7.25	0.65	1.72	0.50	0.65	0.33	0.56	4.4%
	21.00	7.30	0.70	0.68	0.50	0.70	0.35	0.24	1.9%
	21.50	7.25	0.65	1.69	0.50	0.65	0.33	0.55	4.3%
	22.00	7.20	0.60	1.49	0.50	0.60	0.30	0.45	3.5%
	22.50	7.25	0.65	0.66	0.50	0.65	0.33	0.21	1.7%
	23.00	7.20	0.60	1.08	0.50	0.60	0.45	0.49	3.8%
	24.00	6.95	0.35	0.85	1.03	0.35	0.35	0.30	2.3%
	25.00	6.90	0.30	0.48	1.00	0.30	0.30	0.14	1.1%
	26.00	6.80	0.20	0.00	1.00	0.20	0.20	0.00	0.0%
	27.00	6.80	0.20	0.32	1.00	0.20	0.20	0.06	0.5%
	28.00	6.70	0.10	0.00	1.00	0.10	0.10	0.00	0.0%
LEW	29.00	6.58			1.01		0.00	0.00	0.0%
	30.10	6.40			0.00		0.00	0.00	0.0%
1 BF	30.20	5.70			0.00		0.00	0.00	0.0%
	30.90	5.07			0.00		0.00	0.00	0.0%
S	31.40	4.82			0.00		0.00	0.00	0.0%
TOTALS ----------					24.16	0.8 (Max.)	11.01	12.84	100.0%

Manning's n = 0.0849
Hydraulic Radius= 0.455476421

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.25908 N -107.068998 W
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	11.01	11.00	0.0%
6.35	11.01	17.09	55.3%
6.37	11.01	16.59	50.8%
6.39	11.01	16.09	46.2%
6.41	11.01	15.59	41.7%
6.43	11.01	15.10	37.2%
6.45	11.01	14.60	32.7%
6.47	11.01	14.11	28.3%
6.49	11.01	13.63	23.8%
6.51	11.01	13.14	19.4%
6.53	11.01	12.66	15.1%
6.55	11.01	12.18	10.7%
6.56	11.01	11.95	8.6%
6.57	11.01	11.71	6.4%
6.58	11.01	11.47	4.2%
6.59	11.01	11.24	2.1%
6.60	11.01	11.00	0.0%
6.61	11.01	10.77	-2.1%
6.62	11.01	10.54	-4.3%
6.63	11.01	10.30	-6.4%
6.64	11.01	10.07	-8.5%
6.65	11.01	9.84	-10.5%
6.67	11.01	9.39	-14.7%
6.69	11.01	8.94	-18.8%
6.71	11.01	8.49	-22.8%
6.73	11.01	8.05	-26.8%
6.75	11.01	7.62	-30.8%
6.77	11.01	7.19	-34.7%
6.79	11.01	6.76	-38.6%
6.81	11.01	6.35	-42.3%
6.83	11.01	5.96	-45.9%
6.85	11.01	5.57	-49.4%

WATERLINE AT ZERO
AREA ERROR = 6.600

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.25908 N -107.068998 W
XS NUMBER: 1

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.80	29.44	1.08	1.60	31.81	30.79	100.0%	1.03	64.06	2.01
	5.85	29.07	1.04	1.55	30.35	30.38	98.7%	1.00	59.77	1.97
	5.90	28.73	1.01	1.50	28.90	30.00	97.4%	0.96	55.57	1.92
	5.95	28.52	0.96	1.45	27.47	29.74	96.6%	0.92	51.36	1.87
	6.00	28.32	0.92	1.40	26.05	29.48	95.7%	0.88	47.28	1.81
	6.05	25.85	0.95	1.35	24.67	26.97	87.6%	0.91	45.82	1.86
	6.10	25.39	0.92	1.30	23.39	26.45	85.9%	0.88	42.49	1.82
	6.15	25.32	0.87	1.25	22.13	26.31	85.5%	0.84	38.86	1.76
	6.20	25.24	0.83	1.20	20.86	26.18	85.0%	0.80	35.35	1.69
	6.25	25.17	0.78	1.15	19.60	26.05	84.6%	0.75	31.97	1.63
	6.30	25.09	0.73	1.10	18.35	25.91	84.1%	0.71	28.73	1.57
	6.35	25.02	0.68	1.05	17.09	25.78	83.7%	0.66	25.62	1.50
	6.40	24.95	0.64	1.00	15.84	25.64	83.3%	0.62	22.66	1.43
	6.45	24.57	0.59	0.95	14.61	25.25	82.0%	0.58	19.99	1.37
	6.50	24.20	0.55	0.90	13.39	24.86	80.7%	0.54	17.47	1.30
	6.55	23.83	0.51	0.85	12.19	24.47	79.4%	0.50	15.09	1.24
WL	6.60	23.41	0.47	0.80	11.00	24.03	78.0%	0.46	12.89	1.17
	6.65	22.88	0.43	0.75	9.85	23.48	76.2%	0.42	10.88	1.10
	6.70	22.31	0.39	0.70	8.72	22.90	74.4%	0.38	9.03	1.04
	6.75	21.65	0.35	0.65	7.62	22.24	72.2%	0.34	7.35	0.97
	6.80	20.00	0.33	0.60	6.55	20.57	66.8%	0.32	6.02	0.92
	6.85	19.17	0.29	0.55	5.57	19.73	64.1%	0.28	4.73	0.85
	6.90	18.34	0.25	0.50	4.64	18.89	61.4%	0.25	3.58	0.77
	6.95	17.00	0.22	0.45	3.75	17.55	57.0%	0.21	2.64	0.70
	7.00	16.55	0.18	0.40	2.91	17.10	55.5%	0.17	1.76	0.61
	7.05	14.75	0.14	0.35	2.13	15.22	49.4%	0.14	1.13	0.53
	7.10	12.46	0.12	0.30	1.44	12.84	41.7%	0.11	0.66	0.46
	7.15	9.32	0.10	0.25	0.89	9.60	31.2%	0.09	0.36	0.40
	7.20	7.61	0.06	0.20	0.47	7.79	25.3%	0.06	0.14	0.30
	7.25	4.59	0.04	0.15	0.17	4.70	15.3%	0.04	0.03	0.21
	7.30	0.33	0.05	0.10	0.02	0.39	1.3%	0.04	0.00	0.24
	7.35	0.17	0.03	0.05	0.00	0.19	0.6%	0.02	0.00	0.15
	7.40	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.25908 N -107.068998 W
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	12.84	cfs
CALCULATED FLOW (Qc)=	12.89	cfs
(Qm-Qc)/Qm * 100 =	-0.4	%
MEASURED WATERLINE (WLm)=	6.60	ft
CALCULATED WATERLINE (WLc)=	6.60	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.80	ft
MAX CALCULATED DEPTH (Dc)=	0.80	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.17	ft/sec
MANNING'S N=	0.085	
SLOPE=	0.01268657	ft/ft
.4 * Qm =	5.1	cfs
2.5 * Qm=	32.1	cfs

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

FLOW (CFS)	PERIOD
___________________	___________________
___________________	___________________
___________________	___________________
___________________	___________________

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

RECOMMENDATION BY: ……………………………………………… AGENCY……………………………………………… DATE:………………………

CWCB REVIEW BY: …………………………………………………………………………………………………… DATE:………………………

Attachment 4

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

LOCATION INFORMATION

STREAM NAME:	Trout Creek near Steamboat
XS LOCATION:	40.27077 N -107.05760 W
XS NUMBER:	2
DATE:	25-Aug-20
OBSERVERS:	R Smith, B Logan, K Scheel, T Knott
1/4 SEC:	SW
SECTION:	5
TWP:	3N
RANGE:	86W
PM:	Sixth
COUNTY:	Routt
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	0
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

SLOPE:	0.01945946

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

ASSIGNED TO: ….....……….....DATE.....

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.27077 N -107.05760 W
XS NUMBER: 2

DATA POINTS= 56

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
S	0.60	6.52			0.00		0.00	0.00	0.0%
	1.00	6.56			0.00		0.00	0.00	0.0%
	1.50	6.72			0.00		0.00	0.00	0.0%
	1.80	6.94			0.00		0.00	0.00	0.0%
1 BF	1.90	7.42			0.00		0.00	0.00	0.0%
	2.60	7.64			0.00		0.00	0.00	0.0%
	3.20	7.95			0.00		0.00	0.00	0.0%
	3.60	8.05			0.00		0.00	0.00	0.0%
	3.80	8.24			0.00		0.00	0.00	0.0%
REW	4.60	8.30			0.00		0.00	0.00	0.0%
	5.50	8.35	0.05	0.37	0.90	0.05	0.05	0.02	0.1%
	6.50	8.50	0.20	0.08	1.01	0.20	0.20	0.02	0.1%
	7.50	8.50	0.20	0.00	1.00	0.20	0.20	0.00	0.0%
	8.50	8.50	0.20	0.07	1.00	0.20	0.20	0.01	0.1%
	9.50	8.55	0.25	1.75	1.00	0.25	0.25	0.44	3.7%
	10.50	8.50	0.20	1.20	1.00	0.20	0.20	0.24	2.0%
	11.50	8.45	0.15	1.08	1.00	0.15	0.15	0.16	1.4%
	12.50	8.65	0.35	0.11	1.02	0.35	0.35	0.04	0.3%
	13.50	8.60	0.30	1.22	1.00	0.30	0.30	0.37	3.1%
	14.50	8.70	0.40	1.02	1.00	0.40	0.30	0.31	2.6%
	15.00	8.80	0.50	1.03	0.51	0.50	0.25	0.26	2.2%
	15.50	8.60	0.30	0.58	0.54	0.30	0.15	0.09	0.7%
	16.00	8.90	0.60	1.72	0.58	0.60	0.30	0.52	4.3%
	16.50	8.80	0.50	1.81	0.51	0.50	0.25	0.45	3.8%
	17.00	8.80	0.50	1.69	0.50	0.50	0.25	0.42	3.5%
	17.50	8.80	0.50	1.46	0.50	0.50	0.25	0.37	3.1%
	18.00	8.95	0.65	1.26	0.52	0.65	0.33	0.41	3.4%
	18.50	8.90	0.60	2.38	0.50	0.60	0.30	0.71	6.0%
	19.00	8.85	0.55	2.40	0.50	0.55	0.28	0.66	5.5%
	19.50	8.85	0.55	1.92	0.50	0.55	0.28	0.53	4.4%
	20.00	8.90	0.60	2.15	0.50	0.60	0.30	0.65	5.4%
	20.50	8.85	0.55	2.21	0.50	0.55	0.28	0.61	5.1%
	21.00	8.80	0.50	1.20	0.50	0.50	0.25	0.30	2.5%
	21.50	8.70	0.40	1.78	0.51	0.40	0.20	0.36	3.0%
	22.00	8.65	0.35	2.28	0.50	0.35	0.26	0.60	5.0%
	23.00	8.75	0.45	1.82	1.00	0.45	0.45	0.82	6.9%
	24.00	8.65	0.35	1.32	1.00	0.35	0.35	0.46	3.9%
	25.00	8.60	0.30	1.78	1.00	0.30	0.30	0.53	4.5%
	26.00	8.60	0.30	0.77	1.00	0.30	0.30	0.23	1.9%
	27.00	8.60	0.30	1.05	1.00	0.30	0.30	0.32	2.6%
	28.00	8.65	0.35	0.78	1.00	0.35	0.35	0.27	2.3%
	29.00	8.65	0.35	0.17	1.00	0.35	0.35	0.06	0.5%
	30.00	8.60	0.30	0.68	1.00	0.30	0.30	0.20	1.7%
	31.00	8.60	0.30	1.24	1.00	0.30	0.30	0.37	3.1%
	32.00	8.60	0.30	0.41	1.00	0.30	0.36	0.15	1.2%
LEW	33.40	8.30			1.43		0.00	0.00	0.0%
	34.10	8.13			0.00		0.00	0.00	0.0%
	34.70	7.97			0.00		0.00	0.00	0.0%
	35.90	7.81			0.00		0.00	0.00	0.0%
	36.40	8.03			0.00		0.00	0.00	0.0%
	37.00	7.80			0.00		0.00	0.00	0.0%
	38.00	7.51			0.00		0.00	0.00	0.0%
	40.00	7.51			0.00		0.00	0.00	0.0%
1 BF	41.10	7.40			0.00		0.00	0.00	0.0%
	42.40	7.24			0.00		0.00	0.00	0.0%
S	44.40	7.20			0.00		0.00	0.00	0.0%
TOTALS ----------					29.08	0.65 (Max.)	9.47	11.93	100.0%

Manning's n = 0.0779
Hydraulic Radius= 0.325696333

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.27077 N -107.05760 W
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	9.47	9.47	0.0%
8.05	9.47	16.99	79.4%
8.07	9.47	16.38	72.9%
8.09	9.47	15.76	66.5%
8.11	9.47	15.15	60.0%
8.13	9.47	14.54	53.6%
8.15	9.47	13.94	47.2%
8.17	9.47	13.33	40.8%
8.19	9.47	12.73	34.4%
8.21	9.47	12.13	28.1%
8.23	9.47	11.53	21.7%
8.25	9.47	10.93	15.4%
8.26	9.47	10.64	12.3%
8.27	9.47	10.34	9.2%
8.28	9.47	10.05	6.1%
8.29	9.47	9.76	3.1%
8.30	9.47	9.47	0.0%
8.31	9.47	9.18	-3.0%
8.32	9.47	8.90	-6.0%
8.33	9.47	8.62	-9.0%
8.34	9.47	8.34	-12.0%
8.35	9.47	8.06	-14.9%
8.37	9.47	7.51	-20.7%
8.39	9.47	6.96	-26.5%
8.41	9.47	6.42	-32.2%
8.43	9.47	5.88	-37.9%
8.45	9.47	5.35	-43.5%
8.47	9.47	4.83	-49.0%
8.49	9.47	4.32	-54.4%
8.51	9.47	3.84	-59.4%
8.53	9.47	3.41	-64.0%
8.55	9.47	2.99	-68.4%

WATERLINE AT ZERO
AREA ERROR = 8.300

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.27077 N -107.05760 W
XS NUMBER: 2

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	7.42	39.00	0.99	1.53	38.67	39.66	100.0%	0.98	101.24	2.62
	7.45	38.60	0.97	1.50	37.51	39.26	99.0%	0.96	96.87	2.58
	7.50	37.95	0.94	1.45	35.60	38.59	97.3%	0.92	89.79	2.52
	7.55	35.55	0.95	1.40	33.79	36.18	91.2%	0.93	85.95	2.54
	7.60	35.22	0.91	1.35	32.02	35.83	90.3%	0.89	79.09	2.47
	7.65	34.90	0.87	1.30	30.27	35.50	89.5%	0.85	72.46	2.39
	7.70	34.63	0.82	1.25	28.53	35.21	88.8%	0.81	66.01	2.31
	7.75	34.36	0.78	1.20	26.81	34.92	88.0%	0.77	59.82	2.23
	7.80	34.09	0.74	1.15	25.09	34.63	87.3%	0.72	53.89	2.15
	7.85	33.47	0.70	1.10	23.40	33.98	85.7%	0.69	48.59	2.08
	7.90	32.76	0.66	1.05	21.75	33.23	83.8%	0.65	43.64	2.01
	7.95	32.04	0.63	1.00	20.13	32.48	81.9%	0.62	38.95	1.93
	8.00	31.33	0.59	0.95	18.54	31.74	80.0%	0.58	34.50	1.86
	8.05	30.80	0.55	0.90	16.99	31.19	78.6%	0.54	30.18	1.78
	8.10	30.56	0.51	0.85	15.46	30.92	78.0%	0.50	25.92	1.68
	8.15	30.31	0.46	0.80	13.94	30.64	77.3%	0.45	21.94	1.57
	8.20	30.05	0.41	0.75	12.43	30.36	76.5%	0.41	18.24	1.47
	8.25	29.67	0.37	0.70	10.93	29.96	75.5%	0.36	14.86	1.36
WL	8.30	28.80	0.33	0.65	9.47	29.08	73.3%	0.33	11.93	1.26
	8.35	27.67	0.29	0.60	8.06	27.94	70.4%	0.29	9.37	1.16
	8.40	27.10	0.25	0.55	6.69	27.36	69.0%	0.24	6.96	1.04
	8.45	26.53	0.20	0.50	5.35	26.78	67.5%	0.20	4.86	0.91
	8.50	22.72	0.18	0.45	4.07	22.95	57.9%	0.18	3.42	0.84
	8.55	20.23	0.15	0.40	2.99	20.46	51.6%	0.15	2.21	0.74
	8.60	15.75	0.13	0.35	1.99	15.96	40.2%	0.12	1.33	0.67
	8.65	9.79	0.14	0.30	1.33	9.97	25.1%	0.13	0.92	0.70
	8.70	7.58	0.12	0.25	0.90	7.73	19.5%	0.12	0.57	0.63
	8.75	5.88	0.10	0.20	0.56	5.98	15.1%	0.09	0.31	0.55
	8.80	4.17	0.07	0.15	0.28	4.24	10.7%	0.07	0.12	0.44
	8.85	2.67	0.04	0.10	0.10	2.71	6.8%	0.04	0.03	0.30
	8.90	0.67	0.03	0.05	0.02	0.68	1.7%	0.02	0.00	0.23
	8.95	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.27077 N -107.05760 W
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	11.93	cfs
CALCULATED FLOW (Qc)=	11.93	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	8.30	ft
CALCULATED WATERLINE (WLc)=	8.30	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.65	ft
MAX CALCULATED DEPTH (Dc)=	0.65	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.26	ft/sec
MANNING'S N=	0.078	
SLOPE=	0.01945946	ft/ft
.4 * Qm =	4.8	cfs
2.5 * Qm=	29.8	cfs

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

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

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

RECOMMENDATION BY: …… AGENCY…… DATE:……

CWCB REVIEW BY: …… DATE:……

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

LOCATION INFORMATION

STREAM NAME:	Trout Creek near Steamboat
XS LOCATION:	40.28930 N -107.04340 W
XS NUMBER:	3
DATE:	25-Aug-20
OBSERVERS:	R Smith, B Logan, K Scheel, T Knott
1/4 SEC:	SW
SECTION:	5
TWP:	3N
RANGE:	86W
PM:	Sixth
COUNTY:	Routt
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	0
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

SLOPE:	0.01361257

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

ASSIGNED TO: ….....……….....DATE.....

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.28930 N -107.04340 W
XS NUMBER: 3

DATA POINTS= 43

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	S	1.00	2.34			0.00		0.00	0.00	0.0%
		1.50	2.68			0.00		0.00	0.00	0.0%
		2.00	2.72			0.00		0.00	0.00	0.0%
1	BF	2.30	2.99			0.00		0.00	0.00	0.0%
		3.30	3.94			0.00		0.00	0.00	0.0%
	REW	5.50	4.04			0.00		0.00	0.00	0.0%
		6.50	4.24	0.20	0.05	1.02	0.20	0.20	0.01	0.1%
		7.50	4.29	0.25	1.11	1.00	0.25	0.25	0.28	2.3%
		8.50	4.54	0.50	1.09	1.03	0.50	0.38	0.41	3.3%
		9.00	4.29	0.25	1.66	0.56	0.25	0.13	0.21	1.7%
		9.50	4.59	0.55	1.64	0.58	0.55	0.28	0.45	3.7%
		10.00	4.54	0.50	1.95	0.50	0.50	0.25	0.49	4.0%
		10.50	4.54	0.50	1.76	0.50	0.50	0.25	0.44	3.6%
		11.00	4.54	0.50	2.07	0.50	0.50	0.25	0.52	4.2%
		11.50	4.54	0.50	2.65	0.50	0.50	0.25	0.66	5.4%
		12.00	4.39	0.35	1.74	0.52	0.35	0.18	0.30	2.5%
		12.50	4.49	0.45	1.70	0.51	0.45	0.23	0.38	3.1%
		13.00	4.44	0.40	2.05	0.50	0.40	0.20	0.41	3.3%
		13.50	4.49	0.45	1.02	0.50	0.45	0.23	0.23	1.9%
		14.00	4.54	0.50	2.02	0.50	0.50	0.25	0.51	4.1%
		14.50	4.49	0.45	1.62	0.50	0.45	0.23	0.36	3.0%
		15.00	4.64	0.60	1.24	0.52	0.60	0.30	0.37	3.0%
		15.50	4.69	0.65	2.06	0.50	0.65	0.33	0.67	5.5%
		16.00	4.64	0.60	2.14	0.50	0.60	0.30	0.64	5.2%
		16.50	4.64	0.60	2.42	0.50	0.60	0.30	0.73	5.9%
		17.00	4.54	0.50	2.02	0.51	0.50	0.25	0.51	4.1%
		17.50	4.59	0.55	1.77	0.50	0.55	0.28	0.49	4.0%
		18.00	4.49	0.45	1.91	0.51	0.45	0.23	0.43	3.5%
		18.50	4.54	0.50	1.97	0.50	0.50	0.25	0.49	4.0%
		19.00	4.54	0.50	0.75	0.50	0.50	0.38	0.28	2.3%
		20.00	4.54	0.50	1.33	1.00	0.50	0.50	0.67	5.4%
		21.00	4.39	0.35	1.27	1.01	0.35	0.35	0.44	3.6%
		22.00	4.34	0.30	0.81	1.00	0.30	0.30	0.24	2.0%
		23.00	4.44	0.40	0.49	1.00	0.40	0.40	0.20	1.6%
		24.00	4.44	0.40	0.59	1.00	0.40	0.40	0.24	1.9%
		25.00	4.39	0.35	0.08	1.00	0.35	0.35	0.03	0.2%
		26.00	4.24	0.20	0.90	1.01	0.20	0.20	0.18	1.5%
		27.00	4.19	0.15	0.05	1.00	0.15	0.15	0.01	0.1%
	LEW	28.00	4.05			1.01		0.00	0.00	0.0%
		28.50	3.72			0.00		0.00	0.00	0.0%
		29.00	3.44			0.00		0.00	0.00	0.0%
1	BF	29.70	2.98			0.00		0.00	0.00	0.0%
	S	30.50	2.62			0.00		0.00	0.00	0.0%
	TOTALS ----------					22.83	0.65 (Max.)	8.78	12.26	100.0%

Manning's n = 0.0656
Hydraulic Radius= 0.384346102

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.28930 N -107.04340 W
XS NUMBER: 3

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	8.78	8.67	-1.2%
3.80	8.78	14.78	68.5%
3.82	8.78	14.28	62.7%
3.84	8.78	13.77	57.0%
3.86	8.78	13.27	51.3%
3.88	8.78	12.77	45.5%
3.90	8.78	12.27	39.8%
3.92	8.78	11.77	34.2%
3.94	8.78	11.27	28.5%
3.96	8.78	10.78	22.8%
3.98	8.78	10.29	17.3%
4.00	8.78	9.82	11.9%
4.01	8.78	9.58	9.2%
4.02	8.78	9.35	6.6%
4.03	8.78	9.12	3.9%
4.04	8.78	8.89	1.3%
4.05	8.78	8.67	-1.2%
4.06	8.78	8.44	-3.8%
4.07	8.78	8.22	-6.3%
4.08	8.78	8.00	-8.9%
4.09	8.78	7.78	-11.4%
4.10	8.78	7.56	-13.9%
4.12	8.78	7.12	-18.8%
4.14	8.78	6.69	-23.7%
4.16	8.78	6.27	-28.6%
4.18	8.78	5.84	-33.4%
4.20	8.78	5.43	-38.1%
4.22	8.78	5.02	-42.8%
4.24	8.78	4.62	-47.3%
4.26	8.78	4.24	-51.7%
4.28	8.78	3.86	-56.0%
4.30	8.78	3.49	-60.2%

WATERLINE AT ZERO
AREA ERROR = 4.040

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.28930 N -107.04340 W
XS NUMBER: 3

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	2.99	27.38	1.31	1.70	35.98	28.40	100.0%	1.27	111.34	3.09
	3.04	27.26	1.27	1.65	34.60	28.24	99.4%	1.23	104.76	3.03
	3.09	27.13	1.23	1.60	33.24	28.08	98.8%	1.18	98.37	2.96
	3.14	27.00	1.18	1.55	31.89	27.91	98.3%	1.14	92.15	2.89
	3.19	26.87	1.14	1.50	30.54	27.75	97.7%	1.10	86.09	2.82
	3.24	26.74	1.09	1.45	29.20	27.59	97.1%	1.06	80.20	2.75
	3.29	26.61	1.05	1.40	27.87	27.42	96.5%	1.02	74.49	2.67
	3.34	26.48	1.00	1.35	26.54	27.26	96.0%	0.97	68.94	2.60
	3.39	26.35	0.96	1.30	25.22	27.09	95.4%	0.93	63.57	2.52
	3.44	26.23	0.91	1.25	23.91	26.93	94.8%	0.89	58.38	2.44
	3.49	26.08	0.87	1.20	22.60	26.76	94.2%	0.84	53.39	2.36
	3.54	25.94	0.82	1.15	21.30	26.58	93.6%	0.80	48.58	2.28
	3.59	25.80	0.78	1.10	20.01	26.41	93.0%	0.76	43.96	2.20
	3.64	25.66	0.73	1.05	18.72	26.23	92.3%	0.71	39.52	2.11
	3.69	25.52	0.68	1.00	17.44	26.06	91.7%	0.67	35.28	2.02
	3.74	25.38	0.64	0.95	16.17	25.89	91.1%	0.62	31.23	1.93
	3.79	25.25	0.59	0.90	14.90	25.72	90.6%	0.58	27.38	1.84
	3.84	25.12	0.54	0.85	13.64	25.56	90.0%	0.53	23.73	1.74
	3.89	24.99	0.50	0.80	12.39	25.40	89.4%	0.49	20.30	1.64
	3.94	24.86	0.45	0.75	11.14	25.23	88.8%	0.44	17.09	1.53
	3.99	23.69	0.42	0.70	9.93	24.04	84.6%	0.41	14.56	1.47
WL	4.04	22.51	0.39	0.65	8.77	22.85	80.4%	0.38	12.26	1.40
	4.09	21.96	0.35	0.60	7.66	22.28	78.5%	0.34	9.94	1.30
	4.14	21.35	0.31	0.55	6.58	21.67	76.3%	0.30	7.86	1.19
	4.19	20.74	0.27	0.50	5.53	21.05	74.1%	0.26	5.99	1.08
	4.24	19.49	0.23	0.45	4.52	19.79	69.7%	0.23	4.46	0.99
	4.29	18.16	0.20	0.40	3.58	18.46	65.0%	0.19	3.17	0.89
	4.34	17.44	0.15	0.35	2.69	17.70	62.3%	0.15	2.02	0.75
	4.39	15.22	0.12	0.30	1.87	15.44	54.4%	0.12	1.21	0.65
	4.44	11.59	0.10	0.25	1.18	11.76	41.4%	0.10	0.67	0.57
	4.49	9.45	0.07	0.20	0.65	9.57	33.7%	0.07	0.29	0.44
	4.54	3.66	0.07	0.15	0.25	3.71	13.1%	0.07	0.11	0.44
	4.59	1.91	0.06	0.10	0.11	1.93	6.8%	0.06	0.04	0.39
	4.64	1.00	0.02	0.05	0.02	1.00	3.5%	0.02	0.01	0.22

Attachment 4

STREAM NAME: Trout Creek near Steamboat
XS LOCATION: 40.28930 N -107.04340 W
XS NUMBER: 3

SUMMARY SHEET

MEASURED FLOW (Qm)=	12.26	cfs
CALCULATED FLOW (Qc)=	12.26	cfs
(Qm-Qc)/Qm * 100 =	0.1	%
MEASURED WATERLINE (WLm)=	4.05	ft
CALCULATED WATERLINE (WLc)=	4.04	ft
(WLm-WLc)/WLm * 100 =	0.1	%
MAX MEASURED DEPTH (Dm)=	0.65	ft
MAX CALCULATED DEPTH (Dc)=	0.65	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.40	ft/sec
MANNING'S N=	0.066	
SLOPE=	0.01361257	ft/ft
.4 * Qm =	4.9	cfs
2.5 * Qm=	30.7	cfs

RECOMMENDED INSTREAM FLOW:
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FLOW (CFS)	PERIOD

RATIONALE FOR RECOMMENDATION:
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RECOMMENDATION BY: ……………….......................... AGENCY.. DATE:..............................

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