<u>Stream:</u> Brewery Creek

Executive Summary

Water Division: 3
Water District: 25
CDOW#: 38554
CWCB ID: 12/3/A-003

Segment: US Forest Service Boundary to Confluence with Kerber Creek
Upper Terminus: USFS BOUNDARY
(Latitude 38° 17’ 24.3”N) (Longitude 106° 10’ 29.02”W)

Lower Terminus: CONFLUENCE KERBER CREEK
(Latitude 38° 16’ 37.53”N) (Longitude 105° 08’ 59.61”W)

Watershed: San Luis (HUC#: 13010003)
Counties: Saguache
Length: 1.79 miles
USGS Quad(s): Bonanza
Flow Recommendation: 2.85 cfs (April 1 – July 31)
2.10 cfs (August 1 – November 15)
1.60 cfs (November 16 – March 31)

Staff Analysis and Recommendation

Summary

The information contained in this report and the associated supporting data and analyses (located on the enclosed CD) forms the basis for staff's instream flow recommendation to be considered by the Board. It is staff's opinion that the information contained in this report is sufficient to support the findings required in Rule 5.40.

Colorado's Instream Flow Program was created in 1973 when the Colorado State Legislature recognized "the need to correlate the activities of mankind with some reasonable preservation of the natural environment" (see 37-92-102 (3) C.R.S.). The statute vests the CWCB with the exclusive authority to appropriate and acquire instream flow and natural lake level water rights. In order to encourage other entities to participate in Colorado's Instream Flow Program, the statute directs the CWCB to request instream flow recommendations from other state and federal agencies. The Bureau of Land Management (BLM) recommended this segment of Brewery Creek to the CWCB for inclusion into the Instream Flow Program. Brewery Creek is being considered for inclusion into the Instream Flow Program because it has a natural environment that can be preserved to a reasonable degree with an instream flow water right.

Brewery Creek is approximately 3.6 miles long. Brewery Creek originates on the east flank of Sheep Mountain at an elevation of 11,850 feet and flows generally southeasterly through the Rio Grande National Forest as it drops to an elevation of 9,400 feet at its confluence with Kerber Creek. Approximately 91.5 percent of the land on the 1.79 mile segment addressed by this report is privately owned. Brewery Creek is located within Saguache County and the total drainage area of the creek is approximately 10.64 square miles.

The subject of this report is a segment of Brewery Creek beginning at the USFS Boundary and extending downstream to the confluence with Kerber Creek. The proposed segment is located approximately 14.5 miles west of Villa Grove. Staff has received one recommendation for this segment, from the BLM. The recommendation for this segment is discussed below.

Instream Flow Recommendation

The BLM recommended 2.85 cfs (April 1 – July 31), 2.10 cfs (August 1 – November 15) and 1.60 cfs (November 16 – March 31) based on its October 7, 2010 data collection efforts and staff's water availability analyses.

Land Status Review

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
USFS Boundary	Confluence with Kerber Creek	1.79	91.5%	8.5%

100% of the public lands are managed by the BLM.

Biological Data

Brewery Creek is considered to be a cold-water stream in an alpine environment, a moderate gradient stream (1.2 % average slope), and has well-developed and functional floodplains and several active beaver dams. Brewery Creek is one of the few perennial streams in the Bonanza Mining District that has not been impacted by mining activities.

Fish surveys show that Brewery Creek supports a naturally reproducing brook trout population. Macroinvertebrate surveys have revealed various species of mayfly, stonefly, and caddisfly.

The riparian community is comprised primarily of willow, alder, aspen, and sedge species, with coyote willow and alder being the most dominant shrubs. The healthy riparian community has resulted in normal width-to-depth ratios, sinuosity, and bank stability.

Field Survey Data

BLM staff used the R2Cross methodology to quantify the amount of water required to preserve the natural environment to a reasonable degree. The R2Cross method requires that stream discharge and channel profile data be collected in a riffle stream habitat type. Riffles are most easily visualized, as the stream habitat types that would dry up first should streamflow cease. This type of hydraulic data collection consists of setting up a transect, surveying the stream channel geometry, and measuring the stream discharge.

Biological Flow Recommendation

The CWCB staff relied upon the biological expertise of the BLM to interpret output from the R2Cross data collected to develop the initial, biologic instream flow recommendation. This initial recommendation is designed to address the unique biologic requirements of each stream without regard to water availability. Three instream flow hydraulic parameters, average depth, percent wetted perimeter, and average velocity are used to develop biologic instream flow recommendations. Colorado Parks and Wildlife has determined that maintaining these three hydraulic parameters at adequate levels across riffle habitat types, aquatic habitat in pools and runs will also be maintained for most life stages of fish and aquatic invertebrates (Nehring 1979; Espegren 1996).

For this segment of stream, two data sets were collected with the results shown in Table 1 below. Table 1 shows who collected the data (Party), the date the data was collected (Date), the measured discharge at the time of the survey (Q), the accuracy range of the predicted flows based on Manning's Equation (240% and 40% of Q), the summer flow recommendation based on meeting 3 of 3 hydraulic criteria and the winter flow recommendation based upon meeting 2 of 3 hydraulic criteria. Recommendations that fall outside of the accuracy range of the model (over 250% of the measured discharge or under 40% of the measured discharge) may not give an accurate estimate of the necessary instream flow required.

Table 1: Data

Party	Date	Q	250%-40%	Summer (3/3)	Winter (2/3)
BLM	10/7/2010	1.44	3.6 – 0.6	1.34	2.10
BLM	10/7/2010	1.59	4.0 – 0.6	1.89	3.59
			Averages	1.62	2.85

The summer flow recommendation, which meets 3 of 3 criteria and is within the accuracy range of the R2CROSS model, is 2.85 cfs. The winter flow recommendation which meets 2 of 3 criteria and is within the accuracy range of the R2CROSS model is 1.6 cfs.

Hydrologic Data and Analysis

After receiving the BLM biological evaluation and recommended flow regime, the CWCB staff conducted an evaluation of the stream hydrology to determine if water was physically available for an instream flow appropriation in the amounts recommended. This evaluation was done through a computation that is, in essence, an accounting exercise referred to as a water balance. In its most rigorous form, the water balance parses precipitation into all the avenues water pursues after it is deposited as rain, snow, or ice. In other words, given a specified amount of water deposition (input), water depletions (losses) are accounted until inputs and losses balance one with the other. The water losses that can be tracked include depletions due to evaporation and transpiration, deliveries into ground water storage, temporary surface storage, incorporations into plant and animal tissue and so forth. When these losses are individually or collectively subtracted from the input, any of the original input not balanced by loss is anticipated to be found in stream runoff as represented by the discharge measured at intercepting stream gages.

In its analysis, CWCB staff has used this approach of balancing inputs and losses to determine if water is available for the recommended instream flow appropriation. Of course, this analysis must be a practical exercise rather than a lengthy and costly scientific investigation. As a result, staff has simplified the process by lumping together some variables and employing certain rational and scientifically supportable assumptions. The following describes the steps used to complete the evaluation for this particular stream.

The first step required to determine water availability is a determination of the hydrologic regime at the Lower Terminus (LT) of the recommended ISF reach. In the best case, this means looking at the data from a gage at the LT. Further, this data, again in the best case, has been collected for a long period of time (the longer the better) including wet and dry periods. In the case of Brewery Creek**,** there is no gage on the stream. However**,** there is a USGS & DWR gage record of discharge on Kerber Creek whose data encompasses Brewery Creek. Discharge measured at the Kerber Creek gage includes the discharge emanating from Brewery Creek. The gage is KERBER CR ABV LITTLE KERBER CR NR VILLA GROVE, CO (USGS 08224500/DWR KERVILCO); it has a 61 year period of record (POR) collected between 1923 and 2010. The gage is at an elevation of 8,640 ft above mean sea level (amsl) and has a drainage area of 45.4 mi^2. The hydrograph (plot of discharge over time) produced from this

gage includes the consumptive uses of several diversions in the basin above the gage. However, the existence of these diversions is not a major limitation upon the use of the data from the gage. To make the measured data transferable to Brewery Creek above the LT, the consumptive portions of these diversions were added back to the measured hydrograph. The resulting "adjusted" hydrograph could then be used on Brewery Creek above the LT by multiplying the "adjusted" hydrograph by an area ratio; specifically, the area of Brewery Creek above the LT (10.64 mi^2 above the LT) to Kerber Creek above the gage (41.21 mi^2 above the gage). Next, the resulting proportioned "adjusted" hydrograph would itself be "adjusted" (decreased) to reflect the existing depletions on Brewery Creek above the LT resulting from upstream consumptive irrigation uses. The final hydrograph would thus represent a distribution of flow over time that has been reduced to reflect existing human uses.

{The following discussion is based upon the US Geological Survey's *Techniques of Water-Resources Investigations* Series, *Book 4: Hydrologic Analysis and Interpretation, Chapter A3: Statistical Methods in Water Resources* (Chapter 3: Describing Uncertainty) by D.R. Helsel and R. M. Hirsch. This technical reference provides the scientific background and guidance important to the systematic interpretation of hydrologic data. The document is available online and is a valuable aid to understanding and interpreting the analyses described here.}

The next step in producing a representation of the discharge at Brewery Creek above the LT is to compute the Geometric Mean of the area-prorated "adjusted" data values from the Kerber Cr above Little Kerber Cr nr Villa Grove, CO hydrograph. This step is of value because of the inherent statistical weaknesses found in any collection of data intended to measure natural stream discharge. Without getting into the details of statistical theory, it is worth noting that a set of discharge measurements is inherently inaccurate, no matter how well collected, due to the difficulties attendant to data collection, especially hydrologic data. In this particular case, the short period of record lends even greater merit to the use of this statistical tool. To give deference to this fact and to increase the value of the hydrograph product of this analysis, the Geometric Means of the data were computed and plotted along with the 95% Confidence Intervals about the data. The resultant hydrograph, including recommended instream flow values, is displayed in Figure 1.

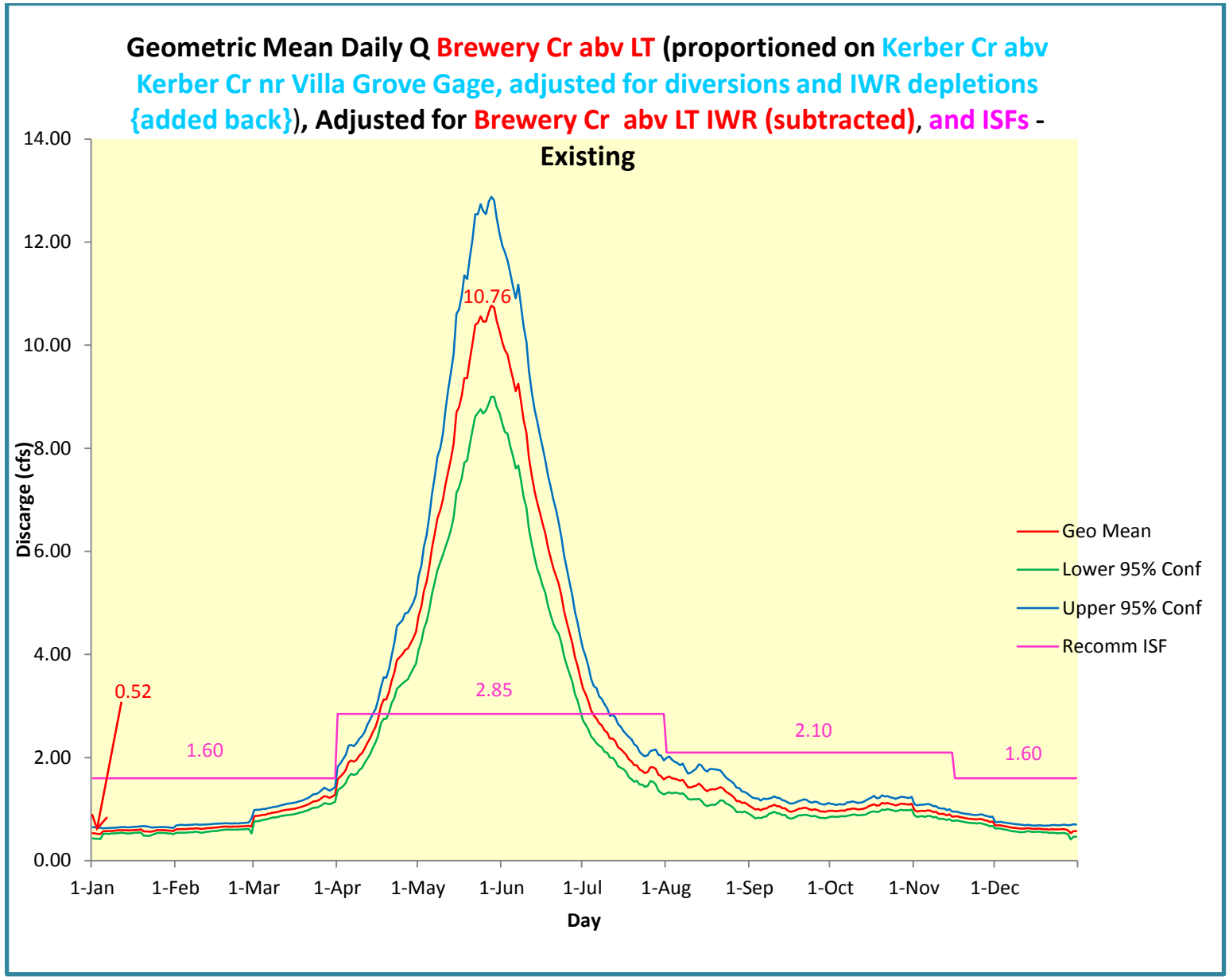
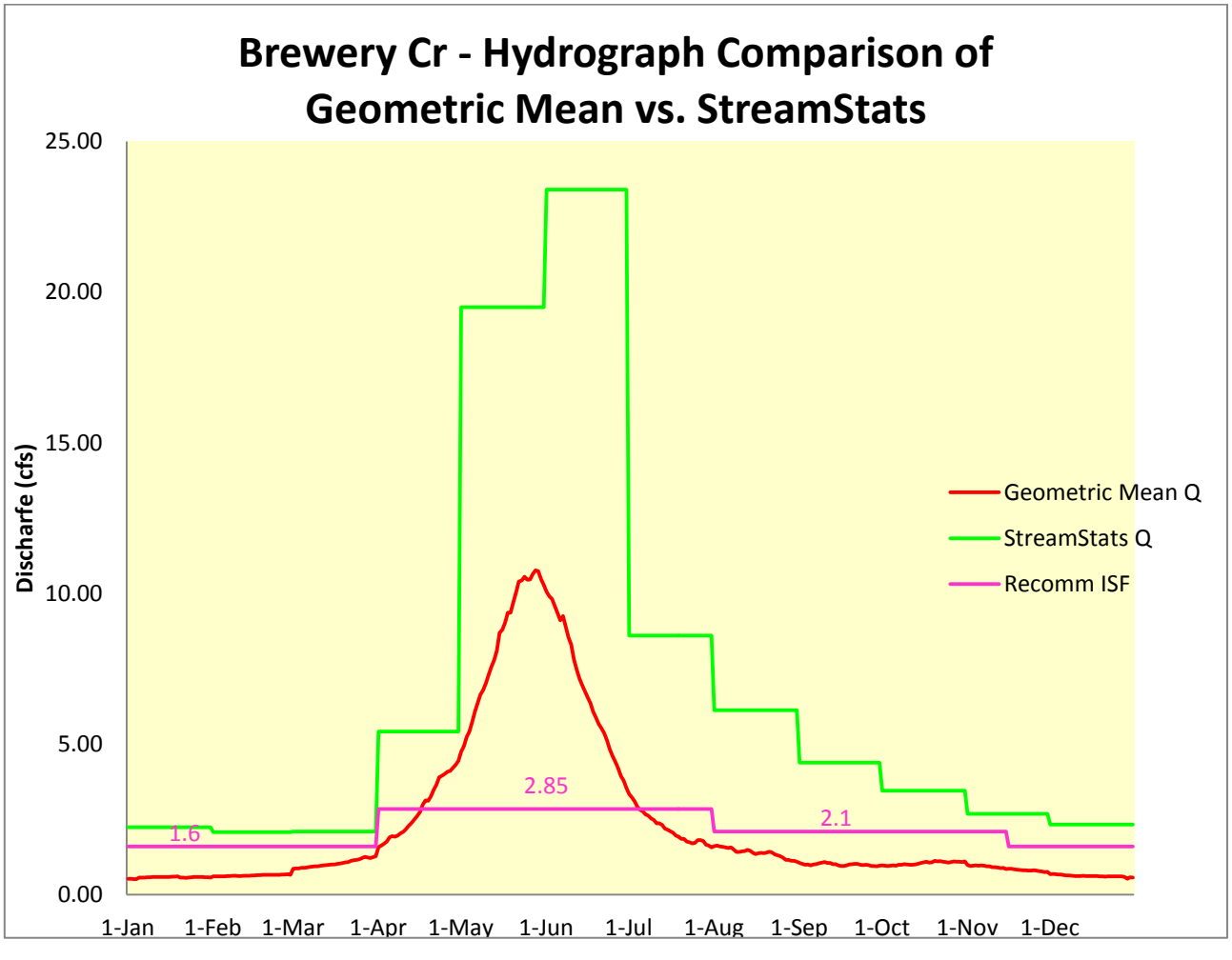

Geometric Mean Daily Q Brewery Cr abv LT (proportioned on Kerber Cr abv Kerber Cr nr Villa Grove Gage, adjusted for diversions and IWR depletions {added back}), Adjusted for Brewery Cr abv LT IWR (subtracted), and ISFs - Existing
Discarge (cfs)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
10.76
0.52
1.60
2.85
2.10
1.60
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Day
Geo Mean
Lower 95% Conf
Upper 95% Conf
Recomm ISF

Figure 1

The result of the foregoing analysis displays a significant difference between the projected discharge data using the geometric mean analysis and the estimated flow values (and recommendation) generated by the R2-Cross analysis. This and on-the-ground observations have led the BLM and CWCB Staff to question the validity of the results of analysis in this specific case. It appears that unmeasured factors that have the effect of under-predicting the discharge in Brewery Creek are at work in this geometric mean analysis. The fact that this drainage is located at elevations higher than much of the Kerber Creek basin has led Staff to conclude that the per-acre water yield of Brewery Creek basin is more than that of the basin overall. Staff concluded in this instance that the USGS StreamStats methodology would be appropriate for this basin because the StreamStats regression equations give greater recognition to the role of basin elevation in water yield. The results of the StreamStats analysis are displayed in the hydrograph below.



Geometric Mean Existing Cond (IWR or div subtracted) Elkhorn Gulch abv LT Prop on Kerber Cr abv Gage Baseline Cond (with Kerber Cr abv Gage IWR consumption added back)				
	GM (abv LT) Prorated by 23.44%	Lower 95% Conf Prorated by 23.44%	Upper 95% Conf Prorated by 23.44%	Recommended ISFs
1-Jan	0.53	0.43	0.65	1.60
2-Jan	0.53	0.43	0.65	1.60
3-Jan	0.52	0.42	0.64	1.60
4-Jan	0.52	0.42	0.64	1.60
5-Jan	0.57	0.52	0.63	1.60
6-Jan	0.57	0.52	0.63	1.60
7-Jan	0.57	0.52	0.63	1.60
8-Jan	0.58	0.53	0.64	1.60
9-Jan	0.58	0.53	0.64	1.60
10-Jan	0.59	0.54	0.64	1.60
11-Jan	0.59	0.54	0.65	1.60
12-Jan	0.59	0.54	0.65	1.60
13-Jan	0.59	0.53	0.65	1.60
14-Jan	0.59	0.53	0.65	1.60
15-Jan	0.59	0.53	0.65	1.60
16-Jan	0.59	0.54	0.66	1.60
17-Jan	0.60	0.54	0.66	1.60
18-Jan	0.60	0.54	0.66	1.60
19-Jan	0.61	0.55	0.67	1.60
20-Jan	0.57	0.48	0.67	1.60
21-Jan	0.57	0.48	0.66	1.60
22-Jan	0.56	0.48	0.66	1.60
23-Jan	0.56	0.50	0.64	1.60
24-Jan	0.58	0.52	0.65	1.60
25-Jan	0.59	0.54	0.65	1.60
26-Jan	0.59	0.54	0.65	1.60
27-Jan	0.59	0.54	0.65	1.60
28-Jan	0.59	0.54	0.65	1.60
29-Jan	0.58	0.53	0.65	1.60
30-Jan	0.58	0.53	0.64	1.60
31-Jan	0.57	0.52	0.63	1.60
1-Feb	0.61	0.54	0.68	1.60
2-Feb	0.61	0.55	0.69	1.60
3-Feb	0.61	0.54	0.69	1.60
4-Feb	0.61	0.54	0.69	1.60
5-Feb	0.61	0.54	0.69	1.60
6-Feb	0.62	0.56	0.70	1.60
7-Feb	0.62	0.55	0.70	1.60
8-Feb	0.63	0.56	0.71	1.60
9-Feb	0.63	0.56	0.70	1.60
10-Feb	0.62	0.55	0.70	1.60
11-Feb	0.62	0.54	0.70	1.60
12-Feb	0.63	0.56	0.70	1.60
13-Feb	0.63	0.56	0.71	1.60
14-Feb	0.63	0.57	0.71	1.60
15-Feb	0.64	0.58	0.72	1.60
16-Feb	0.64	0.57	0.71	1.60
17-Feb	0.65	0.59	0.72	1.60
18-Feb	0.65	0.59	0.72	1.60
19-Feb	0.66	0.60	0.72	1.60

20-Feb	0.66	0.60	0.73	1.60
21-Feb	0.66	0.60	0.72	1.60
22-Feb	0.66	0.60	0.72	1.60
23-Feb	0.66	0.60	0.72	1.60
24-Feb	0.66	0.60	0.72	1.60
25-Feb	0.67	0.61	0.73	1.60
26-Feb	0.67	0.61	0.73	1.60
27-Feb	0.67	0.61	0.74	1.60
28-Feb	0.68	0.62	0.74	1.60
29-Feb	0.66	0.53	0.82	1.60
1-Mar	0.86	0.76	0.98	1.60
2-Mar	0.87	0.76	0.99	1.60
3-Mar	0.87	0.77	0.99	1.60
4-Mar	0.89	0.79	1.00	1.60
5-Mar	0.89	0.79	1.00	1.60
6-Mar	0.91	0.81	1.01	1.60
7-Mar	0.92	0.82	1.02	1.60
8-Mar	0.93	0.84	1.04	1.60
9-Mar	0.94	0.84	1.05	1.60
10-Mar	0.95	0.85	1.06	1.60
11-Mar	0.97	0.87	1.08	1.60
12-Mar	0.98	0.88	1.09	1.60
13-Mar	0.99	0.89	1.10	1.60
14-Mar	0.99	0.89	1.11	1.60
15-Mar	1.00	0.90	1.12	1.60
16-Mar	1.01	0.90	1.13	1.60
17-Mar	1.02	0.92	1.14	1.60
18-Mar	1.04	0.93	1.15	1.60
19-Mar	1.05	0.94	1.17	1.60
20-Mar	1.07	0.97	1.19	1.60
21-Mar	1.09	0.98	1.21	1.60
22-Mar	1.12	1.01	1.25	1.60
23-Mar	1.15	1.03	1.29	1.60
24-Mar	1.15	1.03	1.29	1.60
25-Mar	1.18	1.05	1.32	1.60
26-Mar	1.21	1.08	1.37	1.60
27-Mar	1.26	1.11	1.41	1.60
28-Mar	1.24	1.11	1.38	1.60
29-Mar	1.22	1.09	1.36	1.60
30-Mar	1.24	1.11	1.39	1.60
31-Mar	1.28	1.14	1.43	1.60
1-Apr	1.58	1.37	1.82	2.85
2-Apr	1.63	1.41	1.89	2.85
3-Apr	1.69	1.45	1.97	2.85
4-Apr	1.76	1.51	2.05	2.85
5-Apr	1.91	1.63	2.23	2.85
6-Apr	1.94	1.68	2.24	2.85
7-Apr	1.92	1.66	2.22	2.85
8-Apr	1.96	1.68	2.29	2.85
9-Apr	2.04	1.76	2.37	2.85
10-Apr	2.09	1.80	2.42	2.85
11-Apr	2.18	1.89	2.50	2.85
12-Apr	2.29	1.98	2.64	2.85
13-Apr	2.38	2.07	2.74	2.85
14-Apr	2.49	2.19	2.85	2.85

15-Apr	2.60	2.30	2.94	2.85
16-Apr	2.75	2.42	3.12	2.85
17-Apr	2.99	2.66	3.36	2.85
18-Apr	3.13	2.75	3.56	2.85
19-Apr	3.12	2.75	3.55	2.85
20-Apr	3.27	2.88	3.72	2.85
21-Apr	3.48	3.06	3.97	2.85
22-Apr	3.65	3.16	4.23	2.85
23-Apr	3.89	3.34	4.55	2.85
24-Apr	3.95	3.38	4.61	2.85
25-Apr	4.01	3.44	4.67	2.85
26-Apr	4.08	3.48	4.79	2.85
27-Apr	4.11	3.52	4.81	2.85
28-Apr	4.21	3.62	4.90	2.85
29-Apr	4.31	3.72	5.00	2.85
30-Apr	4.44	3.83	5.15	2.85
1-May	4.75	4.09	5.52	2.85
2-May	4.93	4.26	5.72	2.85
3-May	5.23	4.50	6.09	2.85
4-May	5.42	4.64	6.32	2.85
5-May	5.73	4.90	6.71	2.85
6-May	6.07	5.18	7.11	2.85
7-May	6.35	5.41	7.46	2.85
8-May	6.64	5.63	7.83	2.85
9-May	6.80	5.78	7.99	2.85
10-May	7.01	5.94	8.29	2.85
11-May	7.30	6.09	8.75	2.85
12-May	7.56	6.25	9.15	2.85
13-May	7.79	6.41	9.46	2.85
14-May	8.09	6.66	9.84	2.85
15-May	8.70	7.14	10.61	2.85
16-May	8.80	7.24	10.69	2.85
17-May	9.02	7.43	10.97	2.85
18-May	9.36	7.72	11.35	2.85
19-May	9.36	7.77	11.28	2.85
20-May	9.70	8.06	11.68	2.85
21-May	10.03	8.35	12.05	2.85
22-May	10.39	8.62	12.54	2.85
23-May	10.43	8.68	12.54	2.85
24-May	10.56	8.76	12.73	2.85
25-May	10.45	8.67	12.60	2.85
26-May	10.46	8.73	12.54	2.85
27-May	10.64	8.87	12.79	2.85
28-May	10.76	9.00	12.88	2.85
29-May	10.73	9.00	12.81	2.85
30-May	10.47	8.80	12.47	2.85
31-May	10.28	8.69	12.17	2.85
1-Jun	10.06	8.48	11.94	2.85
2-Jun	9.91	8.32	11.81	2.85
3-Jun	9.81	8.28	11.64	2.85
4-Jun	9.58	8.05	11.41	2.85
5-Jun	9.35	7.85	11.14	2.85
6-Jun	9.11	7.61	10.91	2.85
7-Jun	9.25	7.67	11.17	2.85
8-Jun	8.90	7.37	10.75	2.85

9-Jun	8.54	7.05	10.36	2.85
10-Jun	8.30	6.85	10.06	2.85
11-Jun	7.81	6.42	9.50	2.85
12-Jun	7.47	6.15	9.09	2.85
13-Jun	7.17	5.88	8.75	2.85
14-Jun	6.95	5.67	8.53	2.85
15-Jun	6.75	5.52	8.25	2.85
16-Jun	6.55	5.35	8.03	2.85
17-Jun	6.35	5.20	7.77	2.85
18-Jun	6.07	4.94	7.47	2.85
19-Jun	5.88	4.77	7.26	2.85
20-Jun	5.67	4.60	7.00	2.85
21-Jun	5.52	4.49	6.81	2.85
22-Jun	5.37	4.40	6.56	2.85
23-Jun	5.13	4.21	6.26	2.85
24-Jun	4.84	3.97	5.92	2.85
25-Jun	4.62	3.78	5.65	2.85
26-Jun	4.43	3.63	5.41	2.85
27-Jun	4.23	3.47	5.15	2.85
28-Jun	3.94	3.23	4.82	2.85
29-Jun	3.78	3.10	4.62	2.85
30-Jun	3.54	2.90	4.34	2.85
1-Jul	3.34	2.73	4.11	2.85
2-Jul	3.23	2.63	3.96	2.85
3-Jul	3.10	2.55	3.78	2.85
4-Jul	2.91	2.41	3.53	2.85
5-Jul	2.82	2.35	3.39	2.85
6-Jul	2.76	2.28	3.35	2.85
7-Jul	2.66	2.23	3.19	2.85
8-Jul	2.63	2.20	3.14	2.85
9-Jul	2.53	2.11	3.04	2.85
10-Jul	2.48	2.09	2.95	2.85
11-Jul	2.37	2.00	2.81	2.85
12-Jul	2.37	1.99	2.83	2.85
13-Jul	2.32	1.94	2.78	2.85
14-Jul	2.20	1.83	2.65	2.85
15-Jul	2.16	1.80	2.60	2.85
16-Jul	2.11	1.77	2.52	2.85
17-Jul	2.05	1.72	2.45	2.85
18-Jul	1.97	1.62	2.40	2.85
19-Jul	1.93	1.58	2.36	2.85
20-Jul	1.85	1.53	2.25	2.85
21-Jul	1.85	1.55	2.22	2.85
22-Jul	1.76	1.48	2.11	2.85
23-Jul	1.74	1.48	2.06	2.85
24-Jul	1.70	1.43	2.02	2.85
25-Jul	1.72	1.45	2.05	2.85
26-Jul	1.81	1.55	2.13	2.85
27-Jul	1.81	1.53	2.14	2.85
28-Jul	1.78	1.48	2.15	2.85
29-Jul	1.67	1.36	2.05	2.85
30-Jul	1.64	1.32	2.04	2.85
31-Jul	1.58	1.28	1.95	2.85
1-Aug	1.61	1.31	1.99	2.10
2-Aug	1.63	1.33	2.02	2.10

3-Aug	1.60	1.31	1.96	2.10
4-Aug	1.59	1.32	1.92	2.10
5-Aug	1.57	1.31	1.90	2.10
6-Aug	1.55	1.30	1.85	2.10
7-Aug	1.57	1.31	1.89	2.10
8-Aug	1.50	1.27	1.78	2.10
9-Aug	1.42	1.20	1.69	2.10
10-Aug	1.42	1.19	1.71	2.10
11-Aug	1.44	1.19	1.75	2.10
12-Aug	1.45	1.19	1.79	2.10
13-Aug	1.49	1.20	1.87	2.10
14-Aug	1.46	1.16	1.85	2.10
15-Aug	1.38	1.09	1.77	2.10
16-Aug	1.35	1.06	1.73	2.10
17-Aug	1.38	1.07	1.78	2.10
18-Aug	1.39	1.09	1.78	2.10
19-Aug	1.38	1.08	1.77	2.10
20-Aug	1.40	1.12	1.76	2.10
21-Aug	1.43	1.17	1.75	2.10
22-Aug	1.40	1.17	1.68	2.10
23-Aug	1.34	1.11	1.62	2.10
24-Aug	1.31	1.09	1.57	2.10
25-Aug	1.27	1.06	1.54	2.10
26-Aug	1.23	1.01	1.49	2.10
27-Aug	1.15	0.94	1.42	2.10
28-Aug	1.15	0.95	1.41	2.10
29-Aug	1.12	0.94	1.34	2.10
30-Aug	1.13	0.95	1.33	2.10
31-Aug	1.10	0.93	1.30	2.10
1-Sep	1.06	0.90	1.26	2.10
2-Sep	1.02	0.86	1.22	2.10
3-Sep	0.99	0.82	1.21	2.10
4-Sep	1.00	0.84	1.20	2.10
5-Sep	0.98	0.82	1.17	2.10
6-Sep	1.01	0.85	1.21	2.10
7-Sep	1.01	0.86	1.20	2.10
8-Sep	1.05	0.91	1.21	2.10
9-Sep	1.06	0.93	1.22	2.10
10-Sep	1.09	0.95	1.25	2.10
11-Sep	1.06	0.92	1.22	2.10
12-Sep	1.05	0.92	1.22	2.10
13-Sep	1.02	0.88	1.18	2.10
14-Sep	1.02	0.89	1.16	2.10
15-Sep	0.97	0.84	1.13	2.10
16-Sep	0.95	0.82	1.11	2.10
17-Sep	0.96	0.83	1.11	2.10
18-Sep	0.98	0.85	1.13	2.10
19-Sep	1.01	0.88	1.16	2.10
20-Sep	1.01	0.88	1.17	2.10
21-Sep	1.03	0.89	1.19	2.10
22-Sep	1.02	0.89	1.18	2.10
23-Sep	1.00	0.88	1.14	2.10
24-Sep	0.98	0.86	1.13	2.10
25-Sep	1.00	0.87	1.14	2.10
26-Sep	0.98	0.85	1.14	2.10

27-Sep	0.96	0.83	1.10	2.10
28-Sep	0.95	0.83	1.09	2.10
29-Sep	0.95	0.82	1.09	2.10
30-Sep	0.97	0.84	1.12	2.10
1-Oct	0.97	0.85	1.10	2.10
2-Oct	0.97	0.85	1.10	2.10
3-Oct	0.96	0.85	1.08	2.10
4-Oct	0.97	0.86	1.09	2.10
5-Oct	0.97	0.87	1.09	2.10
6-Oct	0.97	0.86	1.09	2.10
7-Oct	0.99	0.87	1.13	2.10
8-Oct	1.00	0.88	1.14	2.10
9-Oct	1.01	0.89	1.15	2.10
10-Oct	1.01	0.89	1.14	2.10
11-Oct	0.99	0.88	1.12	2.10
12-Oct	1.00	0.88	1.13	2.10
13-Oct	1.00	0.89	1.14	2.10
14-Oct	1.02	0.90	1.17	2.10
15-Oct	1.05	0.93	1.20	2.10
16-Oct	1.08	0.95	1.22	2.10
17-Oct	1.10	0.96	1.26	2.10
18-Oct	1.07	0.94	1.21	2.10
19-Oct	1.08	0.95	1.22	2.10
20-Oct	1.12	0.99	1.27	2.10
21-Oct	1.11	0.98	1.24	2.10
22-Oct	1.12	1.00	1.25	2.10
23-Oct	1.10	0.99	1.23	2.10
24-Oct	1.09	0.98	1.22	2.10
25-Oct	1.07	0.96	1.20	2.10
26-Oct	1.09	0.97	1.22	2.10
27-Oct	1.10	0.99	1.24	2.10
28-Oct	1.10	0.98	1.23	2.10
29-Oct	1.10	0.98	1.22	2.10
30-Oct	1.09	0.98	1.21	2.10
31-Oct	1.11	0.99	1.24	2.10
1-Nov	0.98	0.88	1.10	2.10
2-Nov	0.95	0.85	1.07	2.10
3-Nov	0.96	0.86	1.08	2.10
4-Nov	0.97	0.86	1.09	2.10
5-Nov	0.96	0.85	1.09	2.10
6-Nov	0.98	0.87	1.10	2.10
7-Nov	0.97	0.86	1.09	2.10
8-Nov	0.94	0.84	1.06	2.10
9-Nov	0.95	0.85	1.06	2.10
10-Nov	0.91	0.81	1.02	2.10
11-Nov	0.91	0.82	1.01	2.10
12-Nov	0.90	0.80	1.01	2.10
13-Nov	0.88	0.79	0.98	2.10
14-Nov	0.90	0.81	1.00	2.10
15-Nov	0.86	0.77	0.95	2.10
16-Nov	0.86	0.77	0.95	1.60
17-Nov	0.86	0.78	0.95	1.60
18-Nov	0.84	0.77	0.93	1.60
19-Nov	0.83	0.76	0.92	1.60
20-Nov	0.83	0.75	0.91	1.60

21-Nov	0.82	0.74	0.90	1.60
22-Nov	0.81	0.73	0.89	1.60
23-Nov	0.81	0.73	0.89	1.60
24-Nov	0.80	0.72	0.88	1.60
25-Nov	0.81	0.73	0.90	1.60
26-Nov	0.80	0.72	0.90	1.60
27-Nov	0.79	0.70	0.88	1.60
28-Nov	0.77	0.69	0.86	1.60
29-Nov	0.75	0.67	0.85	1.60
30-Nov	0.76	0.68	0.85	1.60
1-Dec	0.68	0.62	0.75	1.60
2-Dec	0.69	0.63	0.75	1.60
3-Dec	0.69	0.62	0.75	1.60
4-Dec	0.67	0.61	0.74	1.60
5-Dec	0.67	0.60	0.74	1.60
6-Dec	0.65	0.59	0.73	1.60
7-Dec	0.64	0.57	0.72	1.60
8-Dec	0.64	0.57	0.71	1.60
9-Dec	0.63	0.56	0.71	1.60
10-Dec	0.62	0.55	0.70	1.60
11-Dec	0.62	0.56	0.70	1.60
12-Dec	0.62	0.56	0.69	1.60
13-Dec	0.63	0.57	0.70	1.60
14-Dec	0.62	0.56	0.69	1.60
15-Dec	0.62	0.56	0.68	1.60
16-Dec	0.62	0.56	0.68	1.60
17-Dec	0.62	0.56	0.69	1.60
18-Dec	0.62	0.56	0.69	1.60
19-Dec	0.61	0.55	0.68	1.60
20-Dec	0.61	0.55	0.68	1.60
21-Dec	0.60	0.54	0.68	1.60
22-Dec	0.61	0.54	0.69	1.60
23-Dec	0.61	0.54	0.69	1.60
24-Dec	0.61	0.53	0.69	1.60
25-Dec	0.61	0.53	0.69	1.60
26-Dec	0.61	0.54	0.69	1.60
27-Dec	0.61	0.53	0.70	1.60
28-Dec	0.59	0.51	0.69	1.60
29-Dec	0.53	0.41	0.69	1.60
30-Dec	0.57	0.47	0.71	1.60
31-Dec	0.57	0.46	0.70	1.60

Existing Water Right Information

Staff has analyzed the water rights tabulation and contacted the Division Engineer Office (DEO) to identify any potential water availability problems. There are no decreed surface diversions within this reach of stream. Staff has determined that water is available for appropriation on Brewery Creek between the USFS Boundary and the confluence with Kerber Creek, to preserve the natural environment to a reasonable degree without limiting or foreclosing the exercise of valid existing water rights.

CWCB Staff's Instream Flow Recommendation

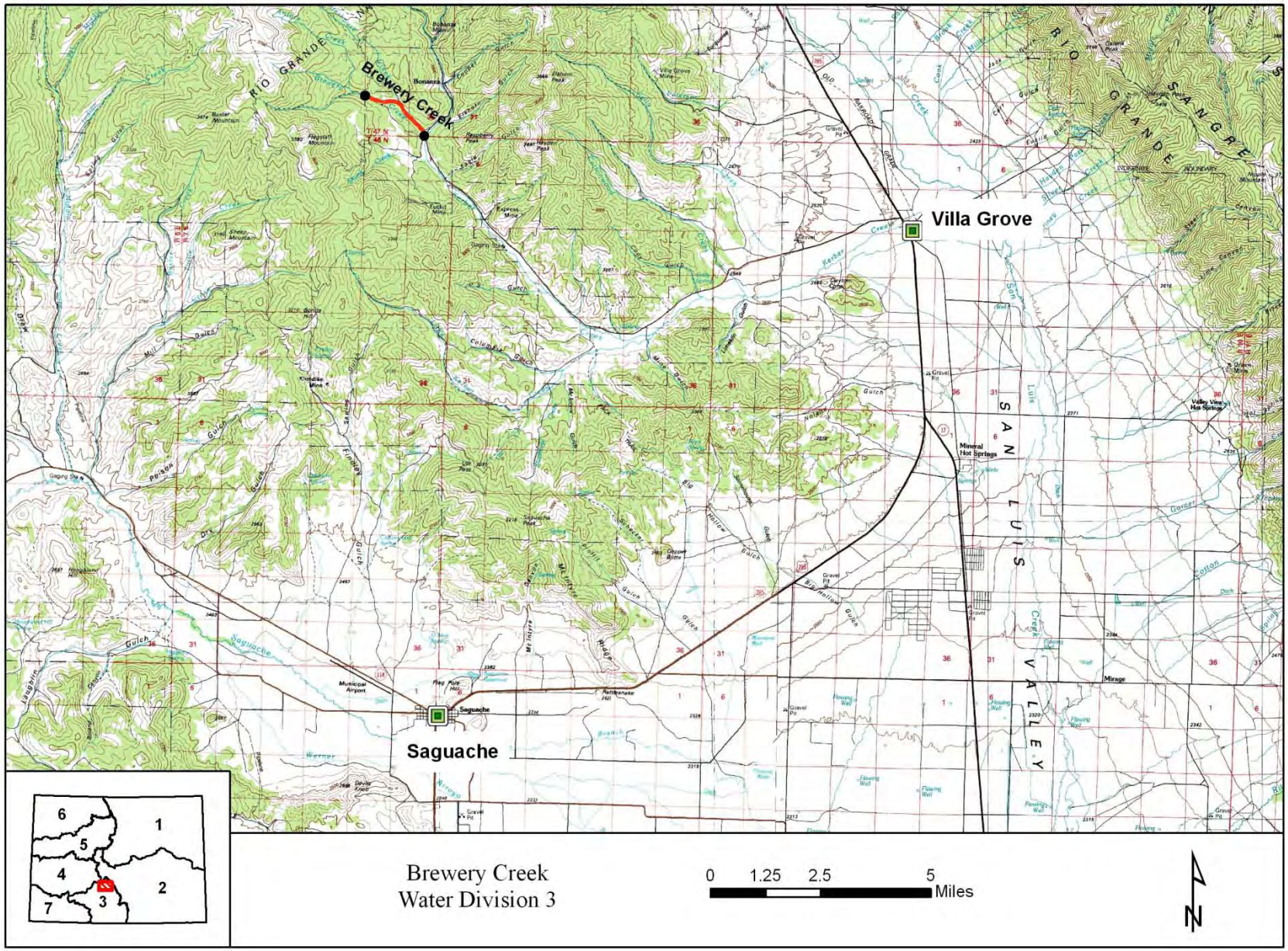
Staff recommends the Board form its intent to appropriate on the following stream reach:

Segment: US Forest Service Boundary to Confluence with Kerber Creek
Upper Terminus: USFS BOUNDARY
(Latitude 38° 17' 24.3"N) (Longitude 106° 10' 29.02"W)
UTM North: 4238653.95 UTM East: 397267.96
NW NW Section 35, Township 47 North, Range 7 East NMPM
9' East of the West Section Line; 533' South of the North Section Line

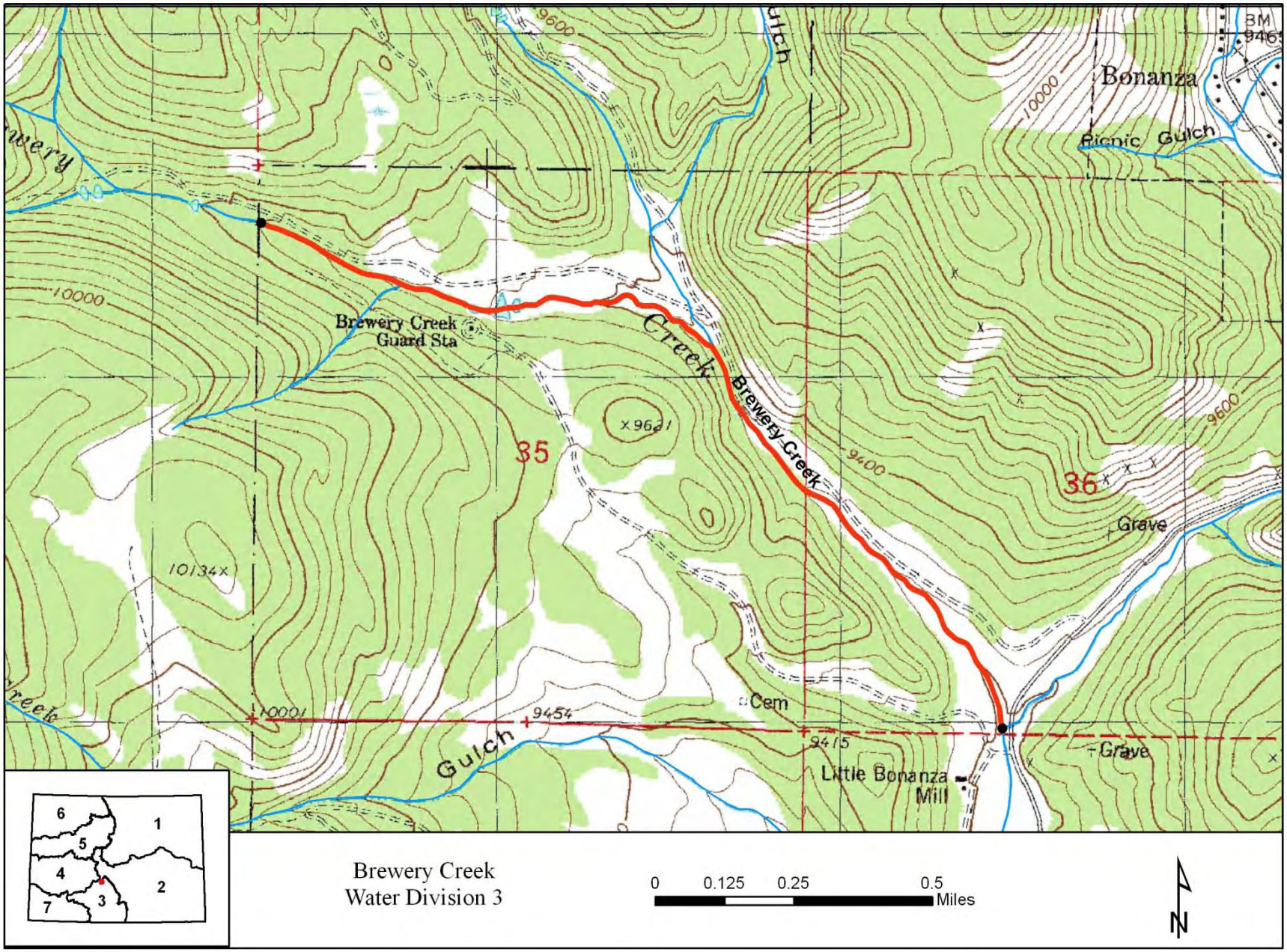
Lower Terminus: CONFLUENCE KERBER CREEK
(Latitude 38° 16' 37.53"N) (Longitude 105° 08' 59.61"W)
UTM North: 4237184.91 UTM East: 399422.13
SE SW Section 36, Township 47 North, Range 7 East NMPM
1851' East of the West Section Line; 85' North of the South Section Line

Watershed: San Luis (HUC#: 13010003)
Counties: Saguache
Length: 1.79 miles
USGS Quad(s): Bonanza
Flow Recommendation: 2.85 cfs (April 1 – July 31)
2.10 cfs (August 1 – November 15)
1.60 cfs (November 16 – March 31)

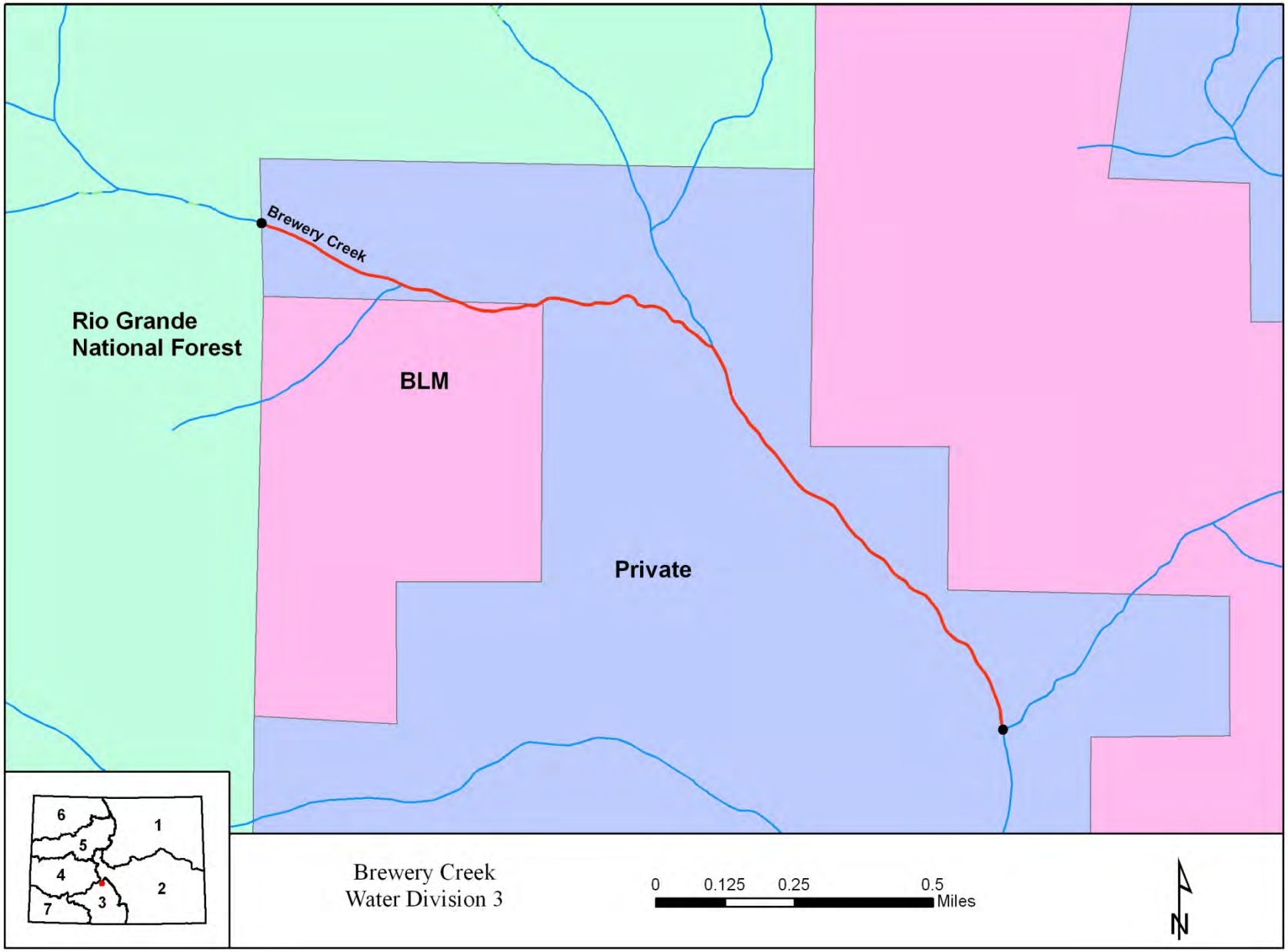
Vicinity Map



Water Rights Map



Land Use Map


Brewery Creek
Rio Grande
National Forest
BLM
Private
6
1
5
4
2
3
7
Brewery Creek
Water Division 3
0
0.125
0.25
0.5
Miles
N