Stream: Schafer Gulch

Executive Summary

Water Division:4
Water District: 62
CDOW#: 42228
CWCB ID: 09/4/A-008

Segment: Headwaters to Confluence with Henson Creek

Upper Terminus: HEADATERS IN THE VICINITY OF
(Latitude 37° 57’ 15.5”N) (Longitude 107° 32’ 52.4”W)

Lower Terminus: CONFLUENCE WITH HENSON CREEK
(Latitude 37° 58’ 33.8”N) (Longitude 107° 32’ 28.1”W)

Watershed: Upper Gunnison (HUC#: 14020002)
Counties: Hinsdale
Length: 1.7 miles
USGS Quad(s): Handies Peak
Existing ISF: 4-84CW383, 1 cfs (1/1-12/31)
Flow Recommendation (increase): 1.3 cfs (April 1 to October 31)

Staff Analysis and Recommendation

Summary

The information contained in this report and the associated instream flow file folder 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 Schafer Gulch to the CWCB for an increased water right under the Instream Flow Program. Schafer Gulch is being considered for an increase because it has a natural environment that can be preserved to a reasonable degree with an increased instream flow water right.

Schafer Gulch is approximately 1.8 miles long. It begins on the west flank of Gravel Mountain at an elevation of approximately 12,360 feet and terminates at the confluence with Henson Creek at an elevation of approximately 10,860 feet. Approximately 84% of the land on the 1.8 mile segment addressed by this report is publicly owned. The total drainage area of the creek is approximately 2 square miles. Schafer Gulch is located within Hinsdale County and generally flows in a northeasterly direction.

The subject of this report is a segment of Schafer Gulch beginning at the Headwaters and extending downstream to the confluence with Henson Creek. The proposed segment is located approximately 2 miles east of Engineer Pass. The staff has received only one recommendation for this segment, from the BLM. The recommendation for this segment is discussed below.

Instream Flow Recommendation

BLM recommended and increase of 1.3 cfs (April 1 to October 31), based on its October 10, 2007 & October 10, 2009, data collection efforts. The summer modeling results from this survey effort are within the confidence interval produced by the R2Cross model.

Land Status Review

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
Headwaters	Confluence w/ Henson Creek	1.8	16%	84%

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

Justification for Instream Flow Increase

BLM was prompted to re-examine the instream flow on Schafer Gulch because of BLM water quality management objectives in the Henson Creek and Lake Fork watersheds. Both of these stream systems are affected by historic mining activities, and BLM has begun to initiate projects to treat and minimize acid mine runoff and heavy metals contamination. Within these watersheds, streams that are presently able to support fish are extraordinarily valuable for the habitat they provide and for their ability to dilute runoff originating in more contaminated parts of the watershed. Finally, this creek is located along the very heavily used Alpine Loop backcountry byway. Users of the byway seek opportunities to fish and camp along the uncontaminated streams within these watersheds.

BLM's cross section analysis revealed that the current instream flow rate is not fully protective for several reasons. First, in locations where the stream widens out and is capable of providing significant riffle and physical habitat, the current 1.0 cfs water right provides only 21% wetted perimeter. This means that a very high percentage of the usable habitat would not be watered in a stream where usable habitat is at a premium. In narrower rifles, the current 1.0 cfs right provides much more wetted perimeter, but the velocities are still below the rates preferred by salmonids. BLM's conclusion is that it is prudent to protect a higher flow rate that is capable of making more of the limited physical habitat available for the fish population.

BLM also believes that Schafer Gulch is capable of providing nursery habitat and a source for fish repopulation in Henson Creek. Presently, downstream portions of Henson Creek provide marginal fish habitat, depending on hydrologic conditions. As water quality issues above the confluence with Schafer are addressed, Schafer Gulch can provide important habitat for repopulating this portion of Henson Creek. BLM also notes that lower Schafer Gulch supports extensive beaver activity, which is limited to streams in the watershed that have good water quality.

Biological Data

Overall, Schafer Gulch is a high gradient stream with large substrate size. Near the confluence with Henson Creek, there are extensive willow communities and large beaver ponds. The middle part of the stream provides a step-pool environment, in which small pools and very short riffles are separated by small waterfalls. In this section, the creek flows through a spruce-fir riparian community. The upper part of the creek has lower gradients, and is located in a high-altitude hanging valley. The upper part of the reach supports extensive willow habitat. The creek supports a healthy and diverse aquatic insect community, including caddisfly, stonefly, and mayfly. Fishery surveys indicate that the creek supports a self-sustaining population of brook trout.

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. Appendix B contains copies of field data collected for this proposed segment.

Biological Flow Recommendation

The CWCB staff relied upon the biological expertise of the cooperating agencies 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. The CDOW 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 2 of 3 hydraulic criteria. It is our belief that 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	10/10/2009	2.59	6.5 – 1.0	1.3	Out of range
BLM	10/10/2007	2.73	6.8 – 1.1	3.36	Out of range

BLM = Bureau of Land Management

The summer flow, which meets 3 of 3 criteria and is within the accuracy range of the R2CROSS model is 2.3 cfs. This recommendation was derived by averaging the results of the two data sets. The recommended flow increase of 1.3 cfs, when added to the existing flow of 1.0 cfs is equal to 2.3 cfs.

Hydrologic Data and Analysis

After receiving the cooperating agency's biologic recommendation, the CWCB staff conducted an evaluation of the stream hydrology to determine if water was physically available for an instream flow appropriation. This evaluation was done through a computation that is, in essence, a "water balance". In concept a "water balance" computation can be viewed as an accounting exercise. When done 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), the balance tries to account for all water depletions (losses) until a selected end point is reached. Water losses include depletions due to evaporation and transpiration, deliveries into ground water storage, temporary surface storage, incorporations into plant and animal tissue and so forth. These losses are individually or collectively subtracted

from the input to reveal the net amount of stream runoff as represented by the discharge measured by stream gages. Of course, the measured stream flow need not be the end point of interest; indeed, when looking at issues of water use to extinction stream flow measurements may only describe intermediate steps in the complex accounting process that is a water balance carried out to a net value of zero.

In its analysis, CWCB staff has attempted to use this idea 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 process may be described through the following description of the steps used to complete the evaluation for this particular stream.

The first step required in determining 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, 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 **Schafer Gulch** no such gage is available at the LT. In fact, there is no gage on Schafer Gulch. It is thus necessary to describe the normal flow regime at Schafer Gulch above the LT through a "representative" gage station. The gage station selected for this was MINERAL CREEK ABOVE SILVERTON, CO. (USGS 09358900), a gage with a 7 year period of record (POR) collected between 1968 and 1975. The gage is at an elevation of 9,980 ft above mean sea level (amsl) and has a drainage area of 11.0 mi^2. The hydrograph (plot of discharge over time) produced from this gage includes the effects of two upstream transbasin diversions. These diversions were 100% consumptive to the basin because of their transbasin character. To make the measured data from Mineral Creek transferrable to Schafer Gulch above the LT, these diversions were added back to the measured Mineral Creek hydrograph. The resulting "adjusted" hydrograph could then be used on Schafer Gulch above the LT by multiplying the "adjusted" hydrograph by an area ratio; specifically, the area of Schafer Gulch above the LT (2.01 mi^2 above the LT) to Mineral Creek above Silverton, CO (11.0 mi^2 above the gage). In this instance, due to the absence of existing significant upstream consumptive irrigation uses or transbasin diversions on Schafer Gulch above the LT, the resulting proportioned "adjusted" hydrograph was not further "adjusted" (decreased). Nevertheless, the final hydrograph represents the existing distribution of flow over time.

{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 Schafer Gulch above the LT was to compute the Geometric Mean of the area-prorated "adjusted" data values from the data values from the Mineral Creek above Silverton, 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 with an enlargement displayed in figure 2. The data displayed in this hydrograph follow in Table 1.

Fig. 1. Schafer Gu abv LT GMean Daily Q (prop on Mineral Cr ab Silverton-adjusted for diversions) & ISFs (existing + recommended increased)

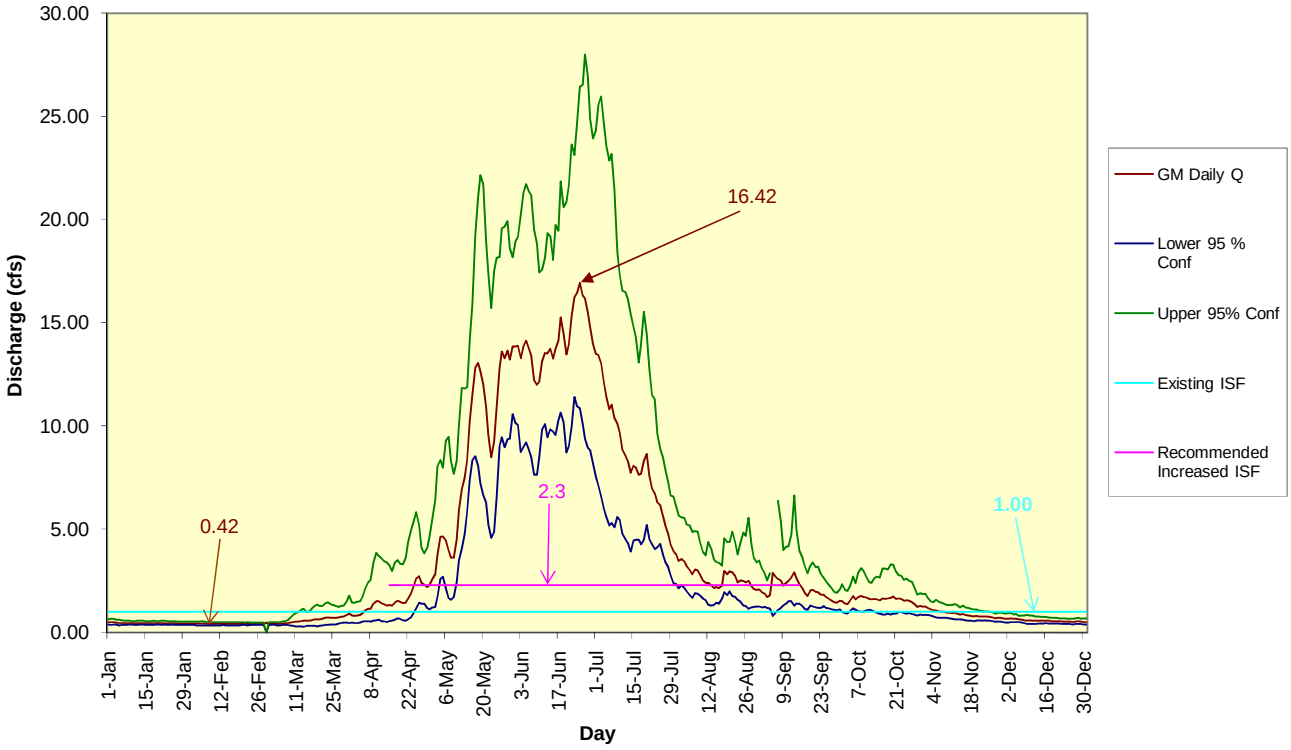


Fig. 2. Schafer Gu abv LT GMean Daily Q (prop on Mineral Cr ab Silverton-adjusted for diversions) & ISFs (existing + recommended increased)

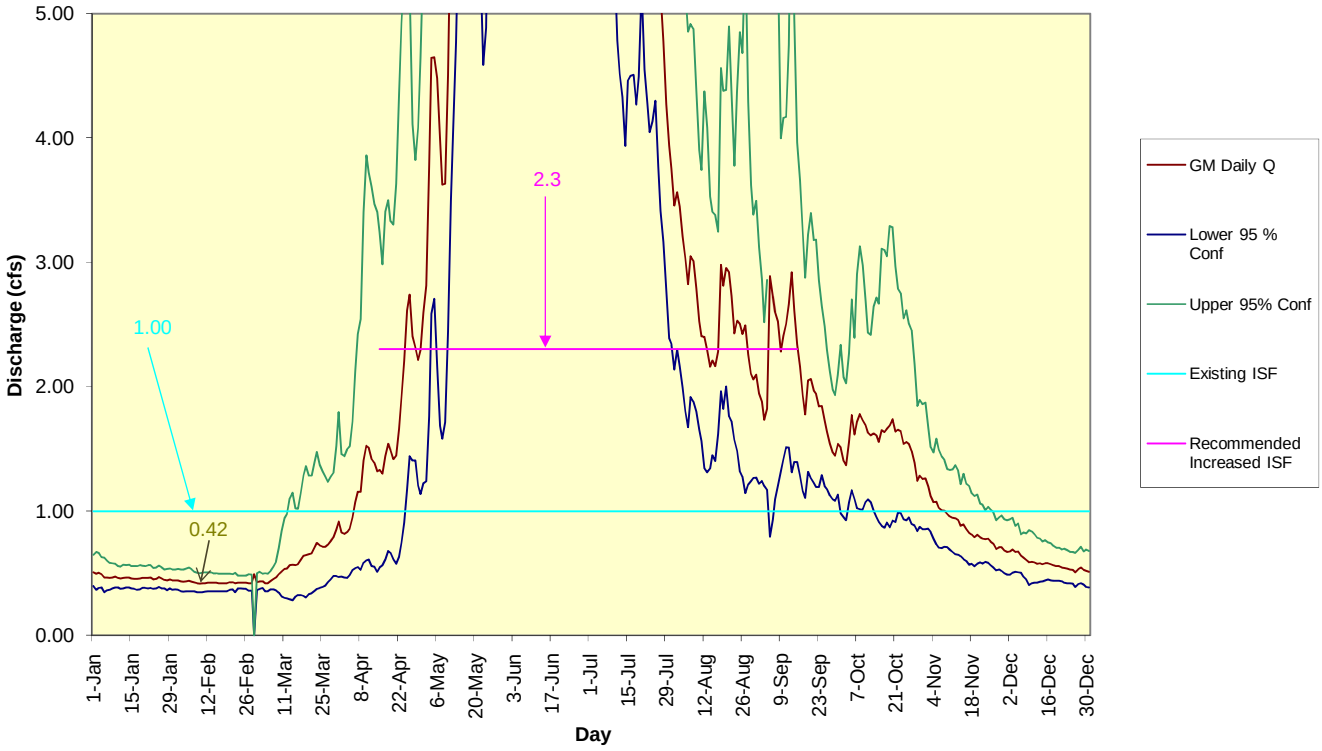


Table 1. Geometric Mean Discharge and Recommended Instream Flows

Date	Existing ISF	Recommended ISF	Proportioned Adjusted GM (abv gage) Adj (-) for Irr & OoB in Schafer Gulch abv LT
1-Jan	1.00		0.51
2-Jan	1.00		0.50
3-Jan	1.00		0.50
4-Jan	1.00		0.49
5-Jan	1.00		0.47
6-Jan	1.00		0.47
7-Jan	1.00		0.46
8-Jan	1.00		0.47
9-Jan	1.00		0.47
10-Jan	1.00		0.46
11-Jan	1.00		0.46
12-Jan	1.00		0.46
13-Jan	1.00		0.47
14-Jan	1.00		0.47
15-Jan	1.00		0.46
16-Jan	1.00		0.46
17-Jan	1.00		0.45

18-Jan	1.00	0.46
19-Jan	1.00	0.46
20-Jan	1.00	0.46
21-Jan	1.00	0.46
22-Jan	1.00	0.46
23-Jan	1.00	0.45
24-Jan	1.00	0.45
25-Jan	1.00	0.47
26-Jan	1.00	0.46
27-Jan	1.00	0.45
28-Jan	1.00	0.44
29-Jan	1.00	0.45
30-Jan	1.00	0.44
31-Jan	1.00	0.44
1-Feb	1.00	0.44
2-Feb	1.00	0.43
3-Feb	1.00	0.43
4-Feb	1.00	0.44
5-Feb	1.00	0.44
6-Feb	1.00	0.43
7-Feb	1.00	0.43
8-Feb	1.00	0.42
9-Feb	1.00	0.42
10-Feb	1.00	0.42
11-Feb	1.00	0.42
12-Feb	1.00	0.42
13-Feb	1.00	0.42
14-Feb	1.00	0.42
15-Feb	1.00	0.42
16-Feb	1.00	0.42
17-Feb	1.00	0.42
18-Feb	1.00	0.42
19-Feb	1.00	0.42
20-Feb	1.00	0.43
21-Feb	1.00	0.43
22-Feb	1.00	0.42
23-Feb	1.00	0.43
24-Feb	1.00	0.42
25-Feb	1.00	0.42
26-Feb	1.00	0.42
27-Feb	1.00	0.42
28-Feb	1.00	0.42
29-Feb	1.00	0.49
1-Mar	1.00	0.43
2-Mar	1.00	0.44
3-Mar	1.00	0.43
4-Mar	1.00	0.42
5-Mar	1.00	0.42
6-Mar	1.00	0.44
7-Mar	1.00	0.45

8-Mar	1.00		0.46
9-Mar	1.00		0.49
10-Mar	1.00		0.51
11-Mar	1.00		0.53
12-Mar	1.00		0.54
13-Mar	1.00		0.56
14-Mar	1.00		0.57
15-Mar	1.00		0.57
16-Mar	1.00		0.57
17-Mar	1.00		0.61
18-Mar	1.00		0.64
19-Mar	1.00		0.64
20-Mar	1.00		0.65
21-Mar	1.00		0.66
22-Mar	1.00		0.71
23-Mar	1.00		0.74
24-Mar	1.00		0.72
25-Mar	1.00		0.71
26-Mar	1.00		0.71
27-Mar	1.00		0.73
28-Mar	1.00		0.76
29-Mar	1.00		0.79
30-Mar	1.00		0.85
31-Mar	1.00		0.92
1-Apr	1.00	2.3	0.83
2-Apr	1.00	2.3	0.82
3-Apr	1.00	2.3	0.83
4-Apr	1.00	2.3	0.86
5-Apr	1.00	2.3	0.95
6-Apr	1.00	2.3	1.07
7-Apr	1.00	2.3	1.16
8-Apr	1.00	2.3	1.15
9-Apr	1.00	2.3	1.41
10-Apr	1.00	2.3	1.52
11-Apr	1.00	2.3	1.51
12-Apr	1.00	2.3	1.42
13-Apr	1.00	2.3	1.39
14-Apr	1.00	2.3	1.32
15-Apr	1.00	2.3	1.33
16-Apr	1.00	2.3	1.30
17-Apr	1.00	2.3	1.44
18-Apr	1.00	2.3	1.54
19-Apr	1.00	2.3	1.49
20-Apr	1.00	2.3	1.42
21-Apr	1.00	2.3	1.44
22-Apr	1.00	2.3	1.66
23-Apr	1.00	2.3	1.91
24-Apr	1.00	2.3	2.20
25-Apr	1.00	2.3	2.61
26-Apr	1.00	2.3	2.74

27-Apr	1.00	2.3	2.41
28-Apr	1.00	2.3	2.32
29-Apr	1.00	2.3	2.22
30-Apr	1.00	2.3	2.30
1-May	1.00	2.3	2.59
2-May	1.00	2.3	2.81
3-May	1.00	2.3	3.77
4-May	1.00	2.3	4.65
5-May	1.00	2.3	4.65
6-May	1.00	2.3	4.48
7-May	1.00	2.3	3.99
8-May	1.00	2.3	3.62
9-May	1.00	2.3	3.63
10-May	1.00	2.3	4.51
11-May	1.00	2.3	5.92
12-May	1.00	2.3	6.93
13-May	1.00	2.3	7.50
14-May	1.00	2.3	8.34
15-May	1.00	2.3	10.27
16-May	1.00	2.3	11.50
17-May	1.00	2.3	12.79
18-May	1.00	2.3	13.05
19-May	1.00	2.3	12.66
20-May	1.00	2.3	12.01
21-May	1.00	2.3	10.92
22-May	1.00	2.3	9.54
23-May	1.00	2.3	8.49
24-May	1.00	2.3	9.25
25-May	1.00	2.3	10.91
26-May	1.00	2.3	12.79
27-May	1.00	2.3	13.60
28-May	1.00	2.3	13.27
29-May	1.00	2.3	13.65
30-May	1.00	2.3	13.21
31-May	1.00	2.3	13.86
1-Jun	1.00	2.3	13.86
2-Jun	1.00	2.3	13.87
3-Jun	1.00	2.3	13.28
4-Jun	1.00	2.3	13.87
5-Jun	1.00	2.3	14.12
6-Jun	1.00	2.3	13.75
7-Jun	1.00	2.3	13.40
8-Jun	1.00	2.3	12.20
9-Jun	1.00	2.3	11.99
10-Jun	1.00	2.3	12.17
11-Jun	1.00	2.3	13.15
12-Jun	1.00	2.3	13.54
13-Jun	1.00	2.3	13.52
14-Jun	1.00	2.3	13.74
15-Jun	1.00	2.3	13.25

16-Jun	1.00	2.3	13.73
17-Jun	1.00	2.3	14.14
18-Jun	1.00	2.3	15.25
19-Jun	1.00	2.3	14.48
20-Jun	1.00	2.3	13.47
21-Jun	1.00	2.3	13.96
22-Jun	1.00	2.3	15.31
23-Jun	1.00	2.3	16.23
24-Jun	1.00	2.3	16.42
25-Jun	1.00	2.3	16.93
26-Jun	1.00	2.3	16.34
27-Jun	1.00	2.3	16.17
28-Jun	1.00	2.3	15.47
29-Jun	1.00	2.3	14.80
30-Jun	1.00	2.3	13.97
1-Jul	1.00	2.3	13.49
2-Jul	1.00	2.3	13.44
3-Jul	1.00	2.3	13.02
4-Jul	1.00	2.3	12.06
5-Jul	1.00	2.3	11.39
6-Jul	1.00	2.3	10.81
7-Jul	1.00	2.3	11.02
8-Jul	1.00	2.3	10.38
9-Jul	1.00	2.3	10.11
10-Jul	1.00	2.3	9.67
11-Jul	1.00	2.3	8.83
12-Jul	1.00	2.3	8.57
13-Jul	1.00	2.3	8.30
14-Jul	1.00	2.3	7.73
15-Jul	1.00	2.3	8.08
16-Jul	1.00	2.3	7.98
17-Jul	1.00	2.3	7.65
18-Jul	1.00	2.3	7.68
19-Jul	1.00	2.3	8.30
20-Jul	1.00	2.3	8.65
21-Jul	1.00	2.3	7.59
22-Jul	1.00	2.3	6.98
23-Jul	1.00	2.3	6.73
24-Jul	1.00	2.3	6.30
25-Jul	1.00	2.3	6.18
26-Jul	1.00	2.3	5.63
27-Jul	1.00	2.3	5.18
28-Jul	1.00	2.3	4.78
29-Jul	1.00	2.3	4.27
30-Jul	1.00	2.3	3.94
31-Jul	1.00	2.3	3.76
1-Aug	1.00	2.3	3.46
2-Aug	1.00	2.3	3.56
3-Aug	1.00	2.3	3.45
4-Aug	1.00	2.3	3.21

5-Aug	1.00	2.3	3.03
6-Aug	1.00	2.3	2.82
7-Aug	1.00	2.3	3.05
8-Aug	1.00	2.3	3.01
9-Aug	1.00	2.3	2.79
10-Aug	1.00	2.3	2.53
11-Aug	1.00	2.3	2.41
12-Aug	1.00	2.3	2.40
13-Aug	1.00	2.3	2.29
14-Aug	1.00	2.3	2.16
15-Aug	1.00	2.3	2.21
16-Aug	1.00	2.3	2.16
17-Aug	1.00	2.3	2.28
18-Aug	1.00	2.3	2.98
19-Aug	1.00	2.3	2.81
20-Aug	1.00	2.3	2.95
21-Aug	1.00	2.3	2.92
22-Aug	1.00	2.3	2.73
23-Aug	1.00	2.3	2.43
24-Aug	1.00	2.3	2.53
25-Aug	1.00	2.3	2.50
26-Aug	1.00	2.3	2.42
27-Aug	1.00	2.3	2.49
28-Aug	1.00	2.3	2.26
29-Aug	1.00	2.3	2.10
30-Aug	1.00	2.3	2.06
31-Aug	1.00	2.3	2.10
1-Sep	1.00	2.3	1.94
2-Sep	1.00	2.3	1.88
3-Sep	1.00	2.3	1.73
4-Sep	1.00	2.3	1.82
5-Sep	1.00	2.3	2.89
6-Sep	1.00	2.3	2.73
7-Sep	1.00	2.3	2.60
8-Sep	1.00	2.3	2.52
9-Sep	1.00	2.3	2.28
10-Sep	1.00	2.3	2.41
11-Sep	1.00	2.3	2.50
12-Sep	1.00	2.3	2.66
13-Sep	1.00	2.3	2.92
14-Sep	1.00	2.3	2.61
15-Sep	1.00	2.3	2.34
16-Sep	1.00	2.3	2.16
17-Sep	1.00	2.3	1.93
18-Sep	1.00	2.3	1.78
19-Sep	1.00	2.3	2.05
20-Sep	1.00	2.3	2.06
21-Sep	1.00	2.3	1.97
22-Sep	1.00	2.3	1.94
23-Sep	1.00	2.3	1.84

24-Sep	1.00	2.3	1.84
25-Sep	1.00	2.3	1.72
26-Sep	1.00	2.3	1.64
27-Sep	1.00	2.3	1.54
28-Sep	1.00	2.3	1.47
29-Sep	1.00	2.3	1.44
30-Sep	1.00	2.3	1.54
1-Oct	1.00	2.3	1.51
2-Oct	1.00	2.3	1.40
3-Oct	1.00	2.3	1.37
4-Oct	1.00	2.3	1.55
5-Oct	1.00	2.3	1.77
6-Oct	1.00	2.3	1.62
7-Oct	1.00	2.3	1.72
8-Oct	1.00	2.3	1.78
9-Oct	1.00	2.3	1.73
10-Oct	1.00	2.3	1.69
11-Oct	1.00	2.3	1.63
12-Oct	1.00	2.3	1.61
13-Oct	1.00	2.3	1.62
14-Oct	1.00	2.3	1.61
15-Oct	1.00	2.3	1.56
16-Oct	1.00	2.3	1.65
17-Oct	1.00	2.3	1.63
18-Oct	1.00	2.3	1.66
19-Oct	1.00	2.3	1.69
20-Oct	1.00	2.3	1.74
21-Oct	1.00	2.3	1.64
22-Oct	1.00	2.3	1.66
23-Oct	1.00	2.3	1.64
24-Oct	1.00	2.3	1.54
25-Oct	1.00	2.3	1.55
26-Oct	1.00	2.3	1.54
27-Oct	1.00	2.3	1.48
28-Oct	1.00	2.3	1.39
29-Oct	1.00	2.3	1.24
30-Oct	1.00	2.3	1.29
31-Oct	1.00	2.3	1.26
1-Nov	1.00		1.26
2-Nov	1.00		1.20
3-Nov	1.00		1.12
4-Nov	1.00		1.07
5-Nov	1.00		1.08
6-Nov	1.00		1.03
7-Nov	1.00		1.01
8-Nov	1.00		1.00
9-Nov	1.00		0.97
10-Nov	1.00		0.96
11-Nov	1.00		0.95
12-Nov	1.00		0.94

13-Nov	1.00	0.93
14-Nov	1.00	0.88
15-Nov	1.00	0.89
16-Nov	1.00	0.85
17-Nov	1.00	0.82
18-Nov	1.00	0.81
19-Nov	1.00	0.79
20-Nov	1.00	0.81
21-Nov	1.00	0.79
22-Nov	1.00	0.78
23-Nov	1.00	0.77
24-Nov	1.00	0.78
25-Nov	1.00	0.76
26-Nov	1.00	0.74
27-Nov	1.00	0.69
28-Nov	1.00	0.71
29-Nov	1.00	0.71
30-Nov	1.00	0.68
1-Dec	1.00	0.67
2-Dec	1.00	0.68
3-Dec	1.00	0.69
4-Dec	1.00	0.67
5-Dec	1.00	0.67
6-Dec	1.00	0.64
7-Dec	1.00	0.63
8-Dec	1.00	0.61
9-Dec	1.00	0.59
10-Dec	1.00	0.59
11-Dec	1.00	0.59
12-Dec	1.00	0.58
13-Dec	1.00	0.58
14-Dec	1.00	0.57
15-Dec	1.00	0.58
16-Dec	1.00	0.58
17-Dec	1.00	0.57
18-Dec	1.00	0.56
19-Dec	1.00	0.56
20-Dec	1.00	0.56
21-Dec	1.00	0.55
22-Dec	1.00	0.54
23-Dec	1.00	0.54
24-Dec	1.00	0.53
25-Dec	1.00	0.53
26-Dec	1.00	0.51
27-Dec	1.00	0.53
28-Dec	1.00	0.55
29-Dec	1.00	0.53
30-Dec	1.00	0.52
31-Dec	1.00	0.51

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 an appropriation increase on Schafer Gulch, from the headwaters to the confluence with Henson 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:

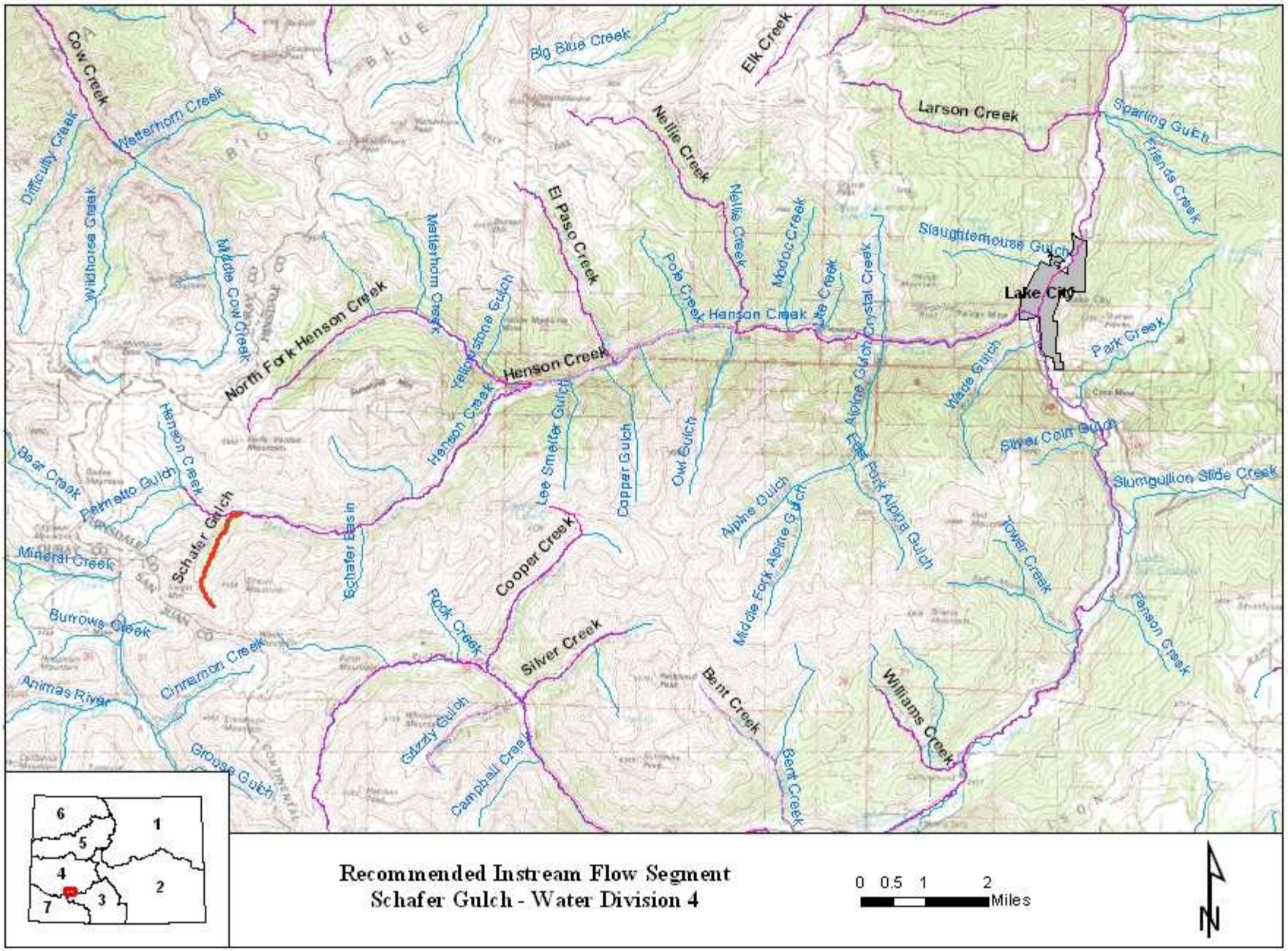
Segment: Headwaters to Confluence with Henson Creek

Upper Terminus: HEADATERS IN THE VICINITY OF
(Latitude 37° 57' 15.5"N) (Longitude 107° 32' 52.4"W)
UTM North: 4203808.5 UTM East: 276144.5
S29 T43N R6W NMPM
1867' West of the East Section Line; 2100' North of the South Section Line

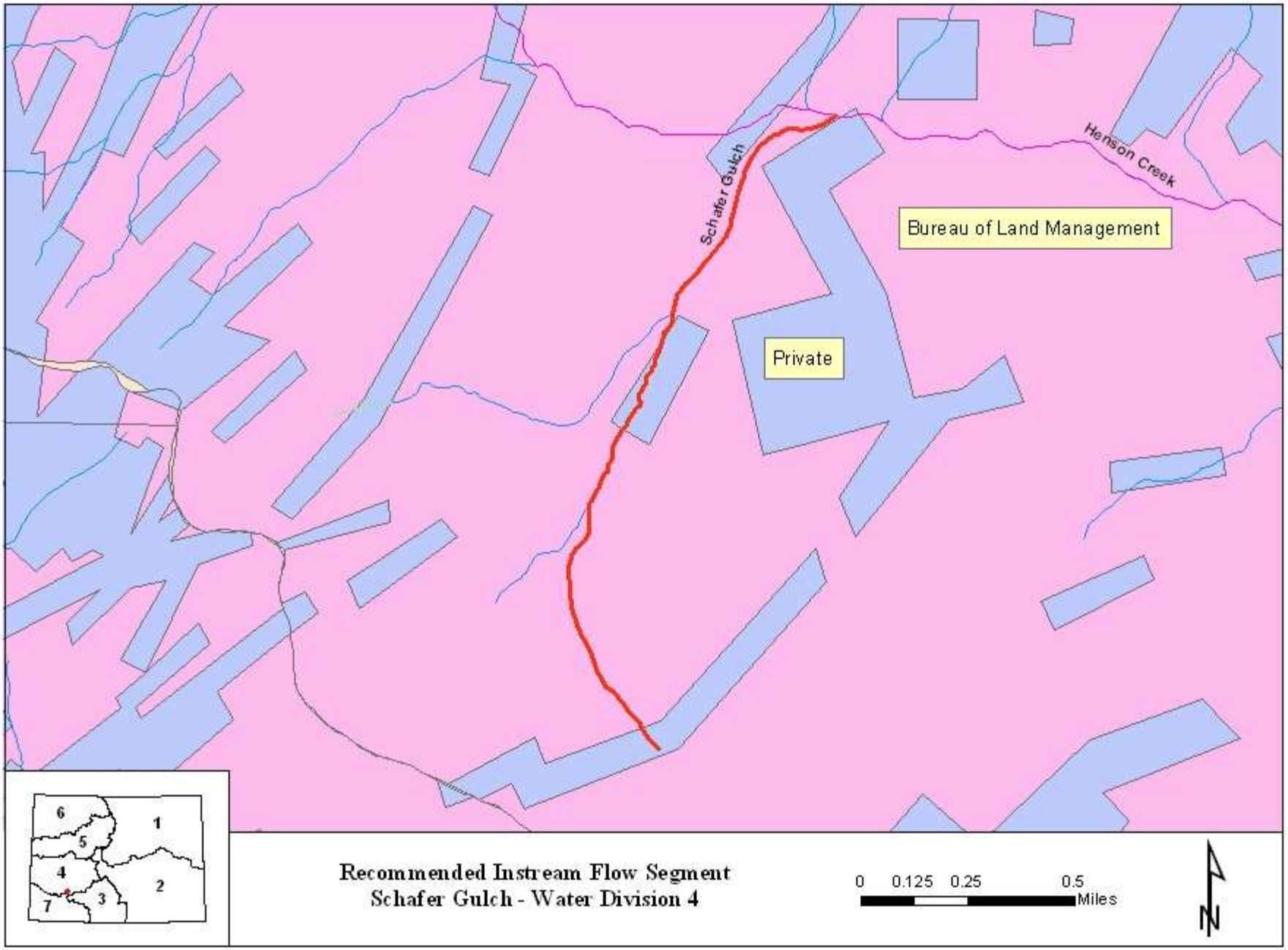
Lower Terminus: CONFLUENCE WITH HENSON CREEK
(Latitude 37° 58' 33.8"N) (Longitude 107° 32' 28.1"W)
UTM North: 4206203.5 UTM East: 276803.6
S17 T43N R6W NMPM
45' East of the West Section Line; 655' South of the North Section Line

Watershed: Upper Gunnison (HUC#: 14020002)
Counties: Hinsdale
Length: 1.7 miles
USGS Quad(s): Handies Peak
Existing ISF: 4-84CW383, 1 cfs (1/1-12/31)
Flow Recommendation: 1.3 cfs (April 1 to October 31)

Vicinity Map



Land Use Map


Schafer Gulch
Henson Creek
Bureau of Land Management
Private
6
1
5
4
2
7
3
Recommended Instream Flow Segment
Schafer Gulch - Water Division 4
0 0.125 0.25 0.5
Miles
N

Topographic & Water Rights Map