Stream: Big Dominguez Creek

Executive Summary

Water Division: 4
Water District: 40
CDOW#: 39811
CWCB ID: 10/4/A-013

Segment: Dominguez Canyon Wilderness Area Boundary to Dominguez Canyon Wilderness Area Boundary

Upper Terminus: DOMINGUEZ CANYON WILDERNESS AREA BOUNDARY (Latitude 38° 44' 41.36"N) (Longitude 108° 32' 57.33"W)

Lower Terminus: DOMINGUEZ CANYON WILDERNESS AREA BOUNDARY (Latitude 38° 49' 41.33"N) (Longitude 108° 22' 49.25"W)

Watershed: Lower Gunnison (HUC # 14020005)
Counties: Delta, Mesa
Length: 14.2 miles
USGS Quad(s): Jacks Canyon, Keith Creek, Triangle Mesa
Existing ISF: 4-84CW426, 1.5 cfs (1/1-12/31)

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 by section 37-92-102 (3)(c), CRS and ISF Rule 5i.

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 Big Dominguez Creek to the CWCB for inclusion into the Instream Flow Program. Big Dominguez 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.

Big Dominguez Creek is approximately 29.2 miles long and it originates on the western flank of Snipe Mountain at an elevation of 8,920 feet and flows northeasterly through the Uncompahgre National Forest and Dominguez Canyon Wilderness Area as it drops to an elevation of 4,720 feet at its confluence with the Gunnison River. All of the land on the 14.2 mile segment addressed by this report is publicly owned. Big Dominguez Creek is located within Delta and Mesa Counties and the total drainage area of the creek is approximately 166 square miles.

The subject of this report is a segment of Big Dominguez Creek beginning at the Dominguez Canyon Wilderness Area boundary and extending downstream to the Dominguez Canyon Wilderness Area boundary. The proposed segment is located approximately 17 miles west of the city of Delta. Staff has received one recommendation for this segment, from the BLM. The recommendation for this segment is discussed below.

Instream Flow Recommendation

The BLM's recommendation differs from standard ISF recommendations in that it does not identify specific flow rates and seasons. Rather, the BLM recommends that the CWCB develop a quantified estimate of future water use related to private property parcels located in and immediately adjacent to the two watersheds ("development allowance"), and then appropriate all of the flow that is annually available in each creek after the development allowance is satisfied.

Land Status Review

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
Wilderness Boundary	Wilderness Boundary	14.2	0%	100%

100% of the public lands are part of the Dominguez Canyon Wilderness Area.

Biological Data

Big Dominguez Creek represents one of the very few examples in Colorado of a mid-to-low elevation perennial stream with a largely unaltered natural hydrology. The natural environment on this creek is a direct response to the extended high flow events that occur in association with seasonal snowmelt runoff and with short-term high flow events associated with seasonal thunderstorms and rain events. The natural environment is also a direct response to very low flow events that occur during summer and winter. Flow rates on this creek can range from more than 1,000 cfs during thunderstorm events to low flow of less than 1.0 cfs during summer. This wide natural variability of flows is critical to maintaining water-dependent plant and animal species.

This creek supports a number of plant communities that are becoming increasingly rare in the intermountain west, including cottonwood galleries with natural reproduction. It is also rare in Colorado find two low-elevation creeks that support highly functional and unmodified riparian communities throughout their entire length.

Big Dominguez Creek supports a high quality example of a fully functioning aquatic ecosystem, including robust fish and amphibian populations. This creek supports three distinct fish populations that are separated by natural barriers. Rainbow trout inhabit the high elevation of the creeks, speckled dace inhabit the middle elevations, and roundtail chub inhabit the lowest elevation portions of the creek.

The water quality of this creek can be characterized as very high. The small number of roads in the upper basin has resulted in the entire watershed being minimally disturbed.

Big Dominguez Creek flows through an uncommon geologic combination of red sandstone, which is susceptible to stream erosion, and black schist, which is resistant to stream erosion. This combination of geology creates numerous waterfalls, plunge pools, spring outcrops, and a well-defined canyon throughout the length of stream. This stream exhibits a wide variety of channel types, ranging from very narrow and straight stream reaches, to reaches with shallow and broad meanders. This environment creates a large number of microclimates and a variety of aquatic habitats that support an atypical quality and abundance of water-dependent species. The sediment regime created by the eroding sandstone exists in a dynamic equilibrium that neither excessively erodes nor aggrades. Maintenance of this equilibrium supports the continuous process of change and rejuvenation required by the area's aquaric and riparian communities.

Scientific Literature Review

The BLM has reviewed and provided scientific literature that supports seeking protection of the entire range of flows. One of the key conclusions was that establishment and recruitment of new cottonwoods is dependent on flood events that establish bare, moist soil surfaces, combined with weather patterns that minimize soil water depletion. These events occur on average from every three to ten years. Recruitment of new cottonwoods typically occurs when the soil water table does not decline more than 2.5 centimeters per day. Once established, riparian communities are highly dependent upon flows that maintain alluvial aquifer water levels. The width of the riparian zone and the diversity of riparian plant communities depend upon a variable flow

regime. A reduction in flow variability will result in transition from riparian vegetation to upland vegetation and narrowing of riparian zones.

Biological Flow Recommendation

R2CROSS MODELING: 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. 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, seven 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 believed 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	6/18/2003	0.67	1.7 – 0.3	Out of Range	1.42
BLM	6/18/2003	0.66	1.7 – 0.3	Out of Range	1.15
BLM	6/16/2005	7.09	17.7 – 2.8	4.00	Out of Range
BLM	7/15/2008	2.01	5.0 – 0.8	4.89	1.41
BLM	2/23/2007	3.59	9.0 – 1.4	1.79	1.47
BLM	2/23/2007	3.86	9.7 – 1.5	5.78	2.14
BLM	7/15/2008	1.55	3.9 – 0.6	2.82	1.45

When the stream model output from the seven cross sections are averaged, the results demonstrate that 1.53 cfs is needed to meet two of three instream flow criteria and the model suggests that 3.86 cfs is needed to meet three of three instream flow criteria.

HEC-RAS MODELING: The BLM utilized the U.S. Army Corps of Engineering HEC-RAS (Hydrologic Engineering Center River Analysis System) model to quantify the bankfull, overbank, and infrequent floodplain-occupying required for natural ecologic function.

Typically, bankfull flows occur in association with snowmelt runoff from March through June, and are critical for recharging alluvial aquifers that support the riparian communities. Overbank flows typically occur on an annual basis from short-term thunderstorm events that occur in the

July through September period, and are critical for supporting the shrubby riparian community. Less frequent events that occupy the entire flood plain typically occur on a 3 to 10 year return interval and occur during the July through September thunderstorm period. These events are critical for regenerating cottonwood communities.

The analysis revealed that the following flow rates are needed for ecologic function on Big Dominguez Creek:

- 75 cfs – bankfull flow for recharge of the aquifer.
- 250 cfs – overbank flow for inundation of shrubby riparian zone.
- 725 cfs – inundation of entire floodplain to support establishment of cottonwoods.

Hydrologic Data and Analysis

There are no streamflow gages on either Little or Big Dominguez Creeks. The recommending entity attempted to compensate for the resulting lack of discharge data by installing pressure transducers. The transducers would track water-depth over time to produce a set of time-incremented water-surface elevation data from which stream flow could be inferred. However, consequent to the inherent instability of the stream beds and the characteristically heavy sediment loads of these streams, the effort proved unsuccessful. Due to the press of time and limitations on financial and other resources, the only option remaining for describing the flow regime of these ungaged streams was the *basin characteristics* method as developed by the US Geological Survey. The method uses USGS-developed regional regression curves that relate existing and historical gaged streamflow data to basin attributes like area, precipitation, elevation, etc. When applied to ungaged basins within the same geographic region, the curves produce estimates of annual basin water yield along with a monthly apportionment of runoff. (An explanation of the methodology[1] along with an online version are available at: *http://water.usgs.gov/osw/streamstats/colorado.html*)

Once the estimates of annual water yield using the USGS method had been developed, the BLM applied a monthly distribution of runoff that was based on discharge records of selected gaged basins in the Uncompahgre Plateau area. The BLM submitted to the CWCB the monthly distribution of runoff, shown in Table 2, as a part of its submission "with specificity".

CWCB staff attempted to perform its usual water availability analysis wherein a form of water balance is developed to quantify the amount of water typically produced by the basin and the amount of water consumed under existing water uses. While the computation of existing water use was not difficult because of the small number and magnitude of existing water uses, the determination of the basin yield and its monthly distribution was a different matter. CWCB staff faced the same difficulties as those encountered by the BLM. As a consequence, staff turned to the USGS method to develop its own estimate of monthly discharges. Once completed it became evident that the BLM and staff had used different versions of the USGS method as well as different versions of the monthly distribution of runoff. However, while these differences were

[1] Capesius, J.P., and Stephens, V.C., 2009, Regional regression equations for estimation of natural streamflow statistics in Colorado: U.S. Geological Survey Scientific Investigations Report 2009–5136, 46 p.

academically significant, as a practical matter, they were of limited consequence, especially in light of the coarse input data. Staff determined that BLM's estimates of discharge were reasonable and defensible, especially within the context of the purpose of this particular water right. Staff concluded that water is available for this ISF water right.

Table 2: Monthly Distribution of Runoff

Water Yield Estimates from Equation for NW Region as defined in USGS WRI-85-4086				
Watershed:		**Big Dominguez at conf. w Gunnison R.**		
Location:				
Drainage Area Square Miles			166	
Mean Basin Elev. Ft.			7613	
Mean Basin Elev. -5000 ft/1000 ft			2.613	
Mean Annual Flow cfs			37.068	
Mean Annual Yield AF			26836	
	%of flow	AF/Month	AF/Day	Mean Monthly flow cfs
Jan	0.0032	85.892	2.771	1.399
Feb	0.0065	174.469	6.016	3.038
Mar	0.01	268.413	8.658	4.373
Apr	0.147	3945.678	131.523	66.426
May	0.5541	14870.11	479.681	242.263
Jun	0.2461	6602.971	220.099	111.161
Jul	0.013	348.938	11.256	5.685
Aug	0.005	134.207	4.329	2.186
Sep	0.004	107.365	3.579	1.807
Oct	0.0039	104.681	3.377	1.705
Nov	0.0037	99.313	3.31	1.672
Dec	0.0035	93.945	3.03	1.531

BLM's sensitivity to water users in the context of this recommendation resulted in an effort to establish a "development allowance" that would assure protection of existing water use as well as some level of future increased use. The proposed allowance would provide a level of certainty for existing water users as well as the proponents and managers of the new downstream Wilderness Area.

To provide the Board with a technical basis for the development allowance, the CWCB staff retained DiNatale Water Consultants, Inc. to establish the amount of additional water use that could be supported by the amount and type of land ownership in the Big Dominguez and Little Dominguez basins upstream of the Wilderness Area. DiNatale Water Consultants examined the

extent of upstream land ownership, current and anticipated types of land management, livestock water requirements, "practicably irrigable acreage", etc. The amount of the development allowance was then compared to the estimated runoff amounts to assure that wilderness environmental values would be protected by the remaining natural discharge. The CWCB and the BLM concluded the Wilderness Area environment could be protected by the recommended amount of instream flow as diminished by the development allowance.

A critical element of this recommendation is the protection of the natural variability of streamflow. The objective of maintaining a naturally variable flow regime is the preservation of a stream that follows a natural process of geomorphic and biological evolution. Specific aspects of the aquatic and terrestrial environments have particular responses to particular points on a continuum of flows. Consequently, if the full range of such responses is to be maintained, then the full spectrum of flows should be protected by the ISF water right. In terms of an analysis of water availability, the preservation of variability in streamflow lies outside of the usual analysis method. Variability is, for these purposes, a statistical concept. It can be regarded as the amount of difference between the usual or average flow and the unusual or rare flow event that occurs during times of flood or drought. These flows are typically described by using probabilities such as the 100 year flood or drought. These flows are critical to the preservation of a wilderness environment, but do not lend themselves to CWCB staff's analysis approach, although a quantification based on a fixed level of present and future water development may be well suited to such a need. The magnitude of impact upon these unusual or rare events can be confidently limited through the development allowance.

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 Big Dominguez Creek, between the Dominguez Canyon Wilderness Area boundary and the Dominguez Canyon Wilderness Area boundary, to preserve the natural wilderness 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: Dominguez Canyon Wilderness Area Boundary to Dominguez Canyon Wilderness Area Boundary

Upper Terminus: DOMINGUEZ CANYON WILDERNESS AREA BOUNDARY
(Latitude 38° 44' 41.36"N) (Longitude 108° 32' 57.33"W)
UTM North: 4294443.82 UTM East: 191519.49
NE SE S15 T15S R100W 6th PM
920' West of the East Section Line; 1390' North of the South Section Line

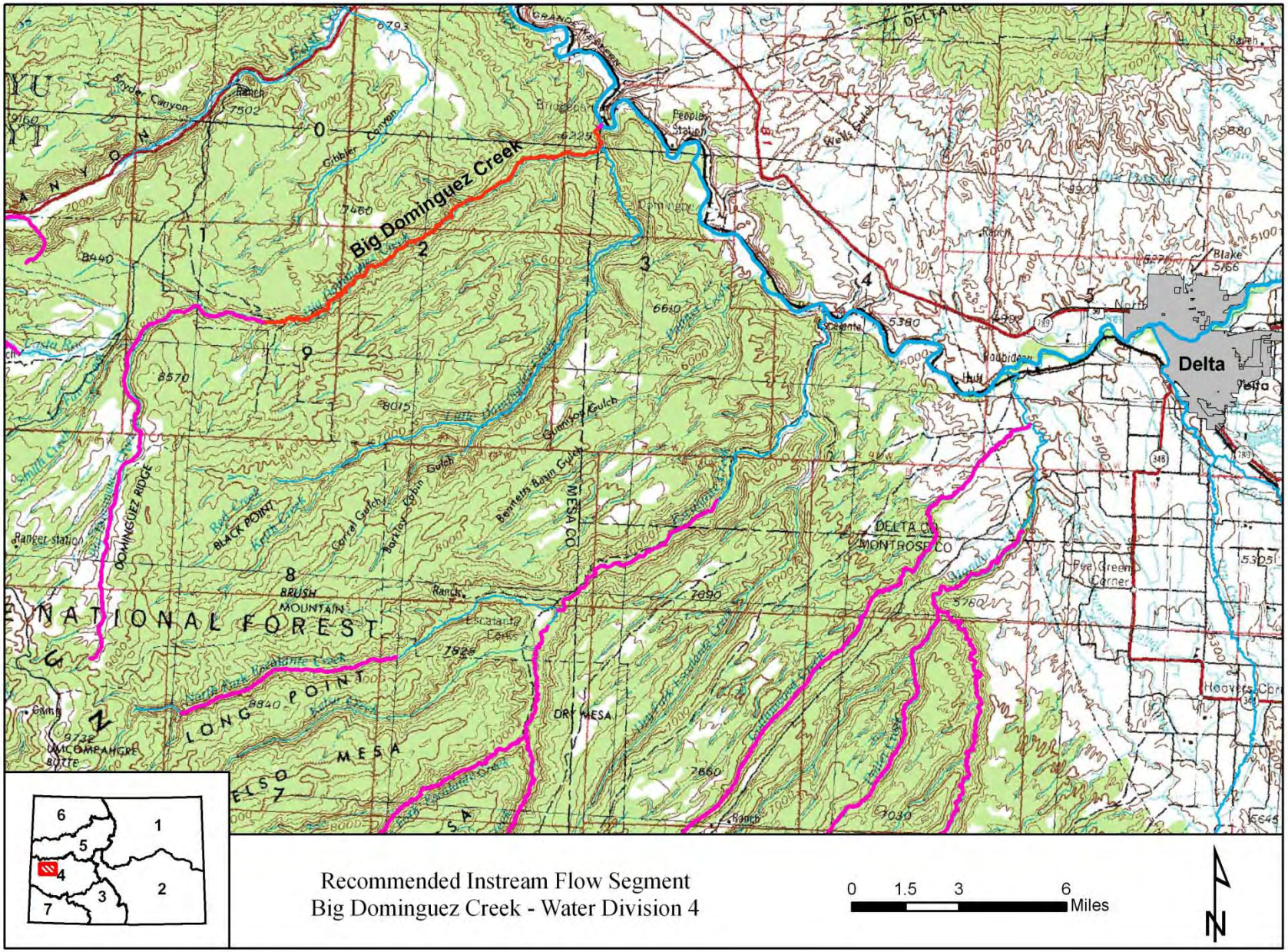
Lower Terminus: DOMINGUEZ CANYON WILDERNESS AREA BOUNDARY
(Latitude 38° 49' 41.33"N) (Longitude 108° 22' 49.25"W)
UTM North: 4303137.30 UTM East: 206546.35
SE SE S18 T14S R98W 6th PM
45' West of the East Section Line; 360' North of the South Section Line

Watershed: Lower Gunnison (HUC # 14020005)
Counties: Delta, Mesa
Length: 14.2 miles
USGS Quad(s): Jacks Canyon, Keith Creek, Triangle Mesa
Existing ISF: 4-84CW426, 1.5 cfs (1/1-12/31)
Flow Recommendation:
All of the flow that is annually available minus the quantified estimates of future water use shown in the table below:

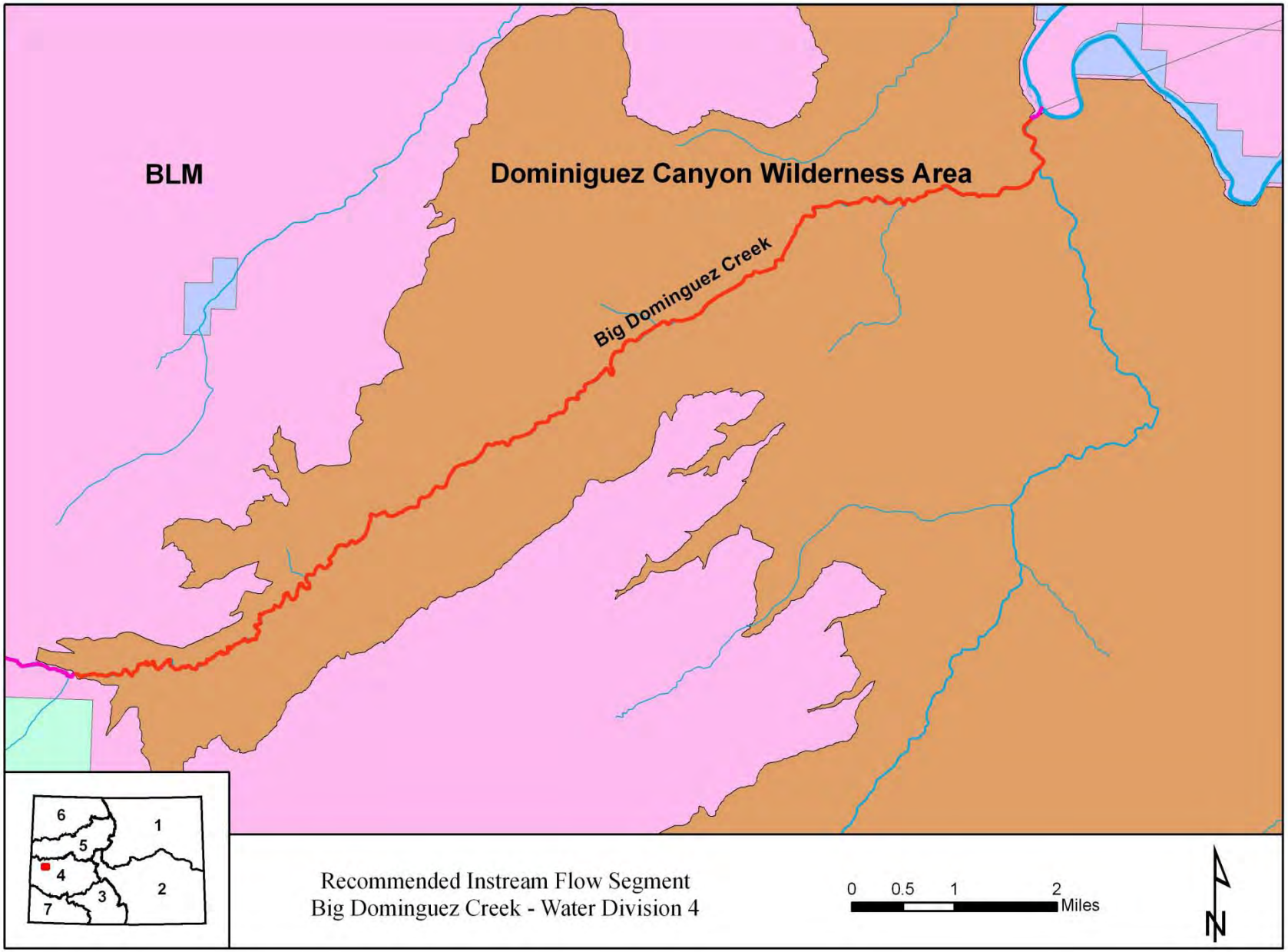
	Maximum Storage Volume Allowed - AF (Total of all new water rights)	Max Diversion Rate - cfs (April 15 – June 30)*	Maximum Diversion - cfs (July 1 – October 31)*
Private Parcels	100	3.30	0.198
USFS	1.14	.066	
BLM	1.0	0.11	

* The diversion rates are further limited to the maximum storage volume allowed in each case.

Vicinity Map



Land Use Map


BLM
Dominiguez Canyon Wilderness Area
Big Dominguez Creek
6
1
5
4
2
3
7
Recommended Instream Flow Segment
Big Dominguez Creek - Water Division 4
0 0.5 1 2
Miles
N

Topographic & Water Rights Map