BEFORE THE COLORADO WATER CONSERVATION BOARD

IN THE MATTER OF PROPOSED INSTREAM FLOW APPROPRIATIONS
WATER DIVISION 4: SAN MIGUEL RIVER

PRE-HEARING STATEMENT FOR FARMERS WATER DEVELOPMENT COMPANY

Farmer Water Development Company (hereinafter "FWDC"), through its attorneys FELT, MONSON & CULICHIA, LLC, by Chris D. Cummins, submits the following Prehearing Statement:

I. Statement of Factual and Legal Claims Asserted and Legal Basis of the FWDC:

FWDC is a mutual ditch company organized pursuant to C.R.S. 7-42-101 *et seq.*, and a Colorado Nonprofit Corporation, originally incorporated in 1913 for the purposes of enlarging Naturita Reservoir and ditches providing diversions thereto and therefrom, impounding water therein, and providing such water to the beneficial use of the shareholders in FWDC for domestic and irrigation uses. Said water and water rights are diverted from the East Branch of Beaver Creek, Saltida Creek, the Middle Branch of Beaver Creek, the East Fork of the East Branch of Beaver Creek, the West Branch of Middle Beaver Creek, and West Beaver Creek, all of which are tributary to the San Miguel River, with the places of use located in both San Miguel County and Montrose County. The current and future uses of the water rights of FWDC and its members would be injured by an appropriation of greater than the minimum flows necessary for the protection of the natural environment of the San Miguel River, said minimum representing the limit of the statutory authority provided to the Colorado Water Conservation Board ("CWCB"). CWCB must carry the burden of proof that it has limited its appropriation to "***minimum*** stream flows... to preserve the natural environment to a reasonable degree." C.R.S. 37-92-102(3) (emphasis added).

C.R.S. 37-92-102(3) charges the CWCB with the exclusive authority to appropriate instream flows "to preserve the natural environment to a reasonable degree", provided that such appropriations be limited to "minimum stream flows". The CWCB's authority to appropriate in-stream flows is burdened by a fiduciary duty to appropriate only the minimum amount necessary to preserve the natural environment for the people of the state. *See* Aspen Wilderness Workshop, Inc. v. CWCB, 901 P.2d 1251, 1256-1257 (Colo. 1995). FWDC intends to hold CWCB to a strict proof standard that the proposed in-stream flows are of a ***minimum*** quantity necessary for the preservation of the natural environment to a reasonable degree. FWDC asserts that the minimum in stream flow ("MISF") quantities sought by the CWCB are excessive, at times well in excess of the physical flows which exist in the subject reach of the San Miguel River, evidencing that whatever natural environment exists within the San Miguel River can be preserved with lesser appropriations, if such MISF appropriations are necessary at all.

The statutorily proscribed duties of the CWCB include: "conservation of the waters of the State of Colorado in order to ***secure the greatest utilization of such waters***" (see C.R.S. 37-60-106(1)); "to devise and formulate methods, means, and plans for bringing about the ***greater utilization of the waters of the state***" (Id. at (c)); "to gather data and information looking toward the ***greater utilization of the waters of the state***" (Id. at (d)); "***to maintain a balance between the development of the state's water resources and the protection of the state's fish and wildlife resources***" (Id. at (q)); "to foster the conservation of the water of the state of Colorado by promotion and implementation of sound measures to ***enhance water use efficiency in order to serve all the water needs of the state***, to ***assure the availability of adequate supplies for future uses***, and to ***assure that necessary water services are provided at reasonable cost***" (Id. at (c)) (emphasis added). FWDC intends to hold the CWCB to strict proof as to compliance with all of its statutory duties. The FWDC believes that CWCB's utilization of flawed scientific methodology in determining excessive MISF quantities may be violative of the above referenced duties, resulting in over-appropriation of MISF amounts to the detriment of the "greater utilization" of Colorado's water resources, failing to "balance" the development of water resources with protection of fish and wildlife, failing to "serve all the water needs of the state", failing to "assure the availability of adequate supplies for future uses" and "at a reasonable cost", all resulting from appropriations in excess of the minimum flows required for the preservation of the natural environment to a reasonable degree.

FWDC will provide evidence that the methodologies, analysis and techniques utilized by the CWCB in determining the volumes and quantities of the MISF at issue here are inappropriate and result in over-appropriation of water, in excess of that amount required for the preservation of the natural environment to a reasonable degree, and resulting in injury to the vested water rights of others. FWDC will demonstrate that material errors exist in the analysis and data relied upon by the CWCB in calculating the MISF amounts for the San Miguel River, and that an independent analysis of water availability and the quantities necessary for the preservation of the natural environment provide far reduced flows than those recommended by the CWCB. Should CWCB obtain an MISF for greater than the minimum amounts required for the preservation of the natural environment to a reasonable degree, the result will be an unnecessary burden on the future uses of vested water rights, with a greater call than can be legally beneficially used by the CWCB being placed on the San Miguel River.

II. List of Exhibits to be Introduced at Hearing:

A. Exhibit 1: November 2009 Evaluation of Technical Basis for Lower San Miguel River CWCB Instream Flow Recommendation – analysis by Bikis Water Consultants, LLC;

B. Exhibit 2: April 5, 2010 Memorandum concerning Colorado Division of Wildlife's response to November 2009 Bikis Report – analysis by Mark Uppendahl (Colorado Division of Wildlife) and Roy Smith (Bureau of Land Management);

C. Any and all exhibits identified by other parties in these proceedings. FWDC further reserves the right to supplement this list in any rebuttal statement with relevant materials that may become available subsequent to this Pre-Hearing Statement.

III. List of Witnesses to be Called and a Description of Their Testimony:

A. David Alexander
President, Farmers Water Development Company
P.O. Box 10
Norwood, Colorado 81423
(970) 327-4650

Mr. Alexander may testify to information relevant to this action including knowledge of FWDC's water rights and the use thereof, historic water rights administrative practices on the San Miguel River as pertains to FWDC's and other water rights, and the potential effect of the proposed Minimum In-Stream Flow water rights on FWDC's and similarly situated parties' water rights, both as existing and as may be changed in the future.

B. Dave Mehan, P.W.S.
Bikis Water Consultants, LLC
555 RiverGate Lane, Suite B4-82
Durango, Colorado 81301
(970) 385-2340

Mr. Mehan may testify as to the opinions contained in the November 2009 Bikis Water Consultants, LLC report, in regards to CWCB analysis of MISF quantities and the minimum requirements for the protection of the natural environment, and potential impacts which could occur should the CWCB proposed MISF be approved as requested, and other matters of water resource, water supply planning, and analysis.

C. Aaron Todd
Water Commissioner, District 60
Division of Water Resources
Department of Natural Resources
1871 E. Main Street
P.O. Box 456
Montrose, Colorado 81401
(970) 327-4118

Bob Hurford
Division Engineer, Water Division 4
Division of Water Resources
Department of Natural Resources
1871 E. Main Street
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Montrose, Colorado 81401
(970) 249-6622

Mr. Todd and Mr. Hurford may testify as to their familiarity with existing water rights and their uses on the lower San Miguel River, the typical flows available during various seasons, their knowledge of the natural aquatic environment in the lower San Miguel River, the potential impacts of the requested MISF on the use and enjoyment of such existing water rights, and the restrictive impacts on the potential change of such water rights to other uses should the MISF be approved as requested.

IV. Alternative Proposal to Proposed Minimum Instream Flow:

FWCD asserts that it is the CWCB's burden to evidence and substantiate whether or not a MISF is necessary, and if necessary the minimum flows thereof. FWCD does not believe CWCB has met that burden with reliable evidence, and will not at this time recommend any alternative to the proposed MISF.

To the extent that any MISF may be approved in this matter, FWCD does believe that certain terms and conditions protective of FWCD's water rights and those of other water users on the San Miguel River are appropriate. FWDC agrees with fellow-party Montrose County that the following terms and conditions are appropriate:

(1) (a) Pursuant to section 37-92-102(3)(b), C.R.S. (2010), this instream flow appropriation shall be subject to the present uses or exchanges of water being made by other water users, pursuant to appropriation or practices in existence on the date of this appropriation, whether or not previously confirmed by court order or decree. The CWCB will apply this provision if the proponent provides adequate documentation and verification of present uses and exchanges.

(b) The Board shall specifically identify existing uses or exchanges of water in the decree for the San Miguel River ISF if those uses / exchanges are documented and verified as set forth below.

Within 6 months from the date of filing the ISF water court application, a person claiming an existing use of water that falls under this statute must provide an affidavit to the Board from a person with personal knowledge of the existing use. The affidavit should set forth:

- the person's name and how the person obtained personal knowledge of the use;
- a full description of the amount legally diverted, months diverted and type of use; and
- a statement that the use was occurring on or about the date that the CWCB appropriated the ISF water right.

Upon receipt of such an affidavit, CWCB staff will consult with the water

commissioner for the affected area to verify the claimed use. After receiving verification, staff will recommend that the CWCB include the description of the claimed use in the San Miguel River ISF decree so the Division of Water Resources knows to administer the instream flow water right as junior to the existing use. Below is an example of how a 102(3)(b) use would be documented in an ISF decree:

> Based upon the affidavit of James Diverter (attached as Exhibit A and incorporated herein) and discussions with Water Commissioner Carl Curtailer, the CWCB agrees that James Diverter's diversion of water from Wet Creek for the first fill of and storage in Beautiful Pond in the amount of 5.05 acre-feet, and use of said stored water for irrigation of Mr. Diverter's ___ acres of land, were uses of water in existence on the date the CWCB appropriated the instream flow water right applied for herein.
>
> The CWCB's instream flow water right described herein is subject to Mr. Diverter's water use described above pursuant to section 37-92-102(3)(b). The limited subordination of the instream flow water right to Mr. Diverter's preexisting water use pursuant to section 37-92-102(3)(b) in this case shall not interfere with the administration of Mr. Diverter's water rights as against other water rights, and shall not result in general subordination of the CWCB's ISF water right decreed herein to any other water rights junior to that instream flow water right.

(2) (a) During any period identified by the Upper Colorado River Commission in a finding issued pursuant to Article VIII(d)(8) of the Upper Colorado River Basin Compact of 1948 for curtailment of Colorado River basin water uses within Colorado, which the State of Colorado has agreed to implement in a manner that impacts water diversions within Water Division 4, the CWCB agrees that this ISF water right will be administered in accordance with compact curtailment rules adopted by the State of Colorado that are then in effect, if any. If no such compact curtailment rules are then in effect, it is the intent of the CWCB that this instream flow right will not be administered to prevent or limit the use of water that may be consumptively used in the San Miguel River basin during such a period of compact curtailment.

(b) This ISF water right will not be administered to prevent or limit exchanges within, through, or affecting this ISF reach of water that may be consumptively used in the San Miguel River basin during such a period of compact curtailment, including exchanges of such water to storage prior to and in anticipation of such curtailment.

(3) (a) The CWCB agrees not to file a statement of opposition to applications for water rights in the San Miguel River basin made after the date of appropriation of this ISF water right that result in depletions that do not exceed 100 acre feet. This term and condition does not preclude the CWCB from enforcing this ISF appropriation in accordance with the priority system.

(b) The CWCB agrees to evaluate applications for water rights made after the date of this filing to determine whether they are appropriate for application of the Injury with Mitigation Rule 8i.(3) of the Rules Concerning the Instream Flow and Natural Lake Level Program.

(c) The CWCB agrees not to file a statement of opposition to applications for changes of water rights in the San Miguel River basin made after the date of appropriation of this ISF water right in order to protect this ISF Right against injury from the change.

(4) It is the intent of the CWCB that this ISF provide protection of the natural environment only to the extent authorized by state statute as against adjudications of water rights made after the date of this filing. The CWCB intends that the ISF water right decreed herein is not appropriate for consideration as a streamflow standard in other administrative or regulatory permitting contexts.

(5) This ISF is a unique ISF appropriation in that it involves the mainstem of the San Miguel River above the confluence with the Dolores River, the relative size of that river, the current level of water supply development, the anticipated level of future development for municipal, agricultural, recreational, and other purposes, and the river's overall importance to the State of Colorado. The terms of this appropriation are part of a compromise and settlement and are unique circumstances that shall not establish any precedent and shall not be construed as a commitment to include any specific findings of fact, conclusions of law or administrative practices in future appropriations.

V. Written Testimony to be Offered into Evidence at hearing:

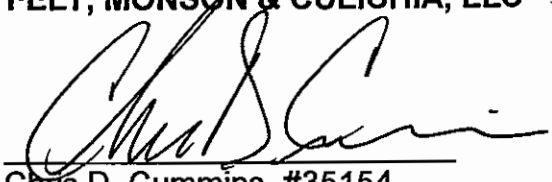
None known at this time, but FWDC reserves the right to submit written testimony to the extent that individuals who might provide valuable testimony are unable to attend the hearing, and to so advise in a rebuttal statement.

VI. Legal Memoranda:

None at this time, but FWDC reserves the right to submit legal memoranda in a rebuttal statement.

RESPECTFULLY SUBMITTED this 14th day of July, 2011

FELT, MONSON & CULICHIA, LLC



Chris D. Cummins, #35154
Attorney for Farmers Water
Development Company

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the enclosed documents were served via FedEx (Priority Overnight Delivery), via U.S. Mail, postage prepaid, or via e-mail (as indicated) on the following person(s) this 14th day of July, 2011:

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EVALUATION OF TECHNICAL BASIS FOR LOWER SAN MIGUEL RIVER CWCB INSTREAM FLOW RECOMMENDATIONS

Preliminary

November 2009

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1.0 INTRODUCTION/PURPOSE

This report presents an evaluation of the data and technical analyses which form the basis of the upcoming instream flow (ISF) recommendations for the Lower San Miguel River. The Colorado Water Conservation Board (CWCB) is planning on filing an ISF for a 16.5-mile reach of the river from Calamity Draw to the Dolores River. The filing is based on fieldwork and technical evaluations performed by Colorado Division of Wildlife (CDOW) and U.S. Bureau of Land Management (BLM) as described in the draft "Executive Summary" available at http://cwcb.state.co.us/NR/rdonlyres.

Additional supporting information, including data from fish and macroinvertebrate (benthic organism) surveys, and the results of the modeling, was provided to Bikis Water Consultants, LLC (BWC) by CDOW staff in November 2008. A memorandum from CDOW, "Fish Sampling Report" dated July 15, 2008, was also provided to BWC in March 2009. The draft Executive Summary and supporting information were reviewed for reasonableness and consistency with existing data. These data include information from fieldwork completed by BWC on October 8, 2008, and March 17, 2009.

This evaluation is based on the data and information available at this time. It is possible that additional data will become available which could alter the conclusions contained herein.

2.0 SUMMARY OF CDOW/BLM WORK AND RECOMMENDATIONS

CDOW and BLM claim to have been collecting data on the physical and biological characteristics of the river throughout the past ten years. The subject reach of the river is reported to support a fishery which includes bluehead and flannelmouth suckers and roundtail chub. All three of these fish are considered "sensitive species" by the BLM; the roundtail chub is also a State of Colorado Species of Concern. The July 15, 2008, memorandum from CDOW presents the results of a fish collection effort from the Uravan stream gage (U.S. Geological Survey (USGS) Gage No. 09177000) to the Dolores River on July 15, 2008, which found that most of the fish collected (72%) were natives. CDOW and BLM have a plan for management of these species to foster their long-term survival. New Mexico privet and skunk brush riparian shrubland communities, which are designated as being "globally impaired", are also stated as occurring along the subject reach of the river.

The following flows are recommended by the CDOW and BLM (see Figure 1 for graphic display):

- 80 cubic-feet/second (cfs), September 1–February 28
- 115 cfs, March 1–April 14
- 325 cfs, April 15–June 14
- 170 cfs, June 15–July 31
- 115 cfs, August 1–August 31

These recommendations are based on the results of modeling using both the PHABSIM/RHABSIM and R2CROSS models with cross-section information from seven sites on the river. The sites were reportedly located approximately 1.5 miles upstream of Tabeguache Creek on the Nature Conservancy Preserve (NCP) and were reportedly representative of riffle, pool, run, and glide habitats (see Figure 2).

PHABSIM determines the weighted usable area (WUA) for a species based on depth and velocity criteria. R2CROSS determines the water depth, velocity, and wetted perimeter at a cross-section for a range of flows, and is best suited for use in riffles. The flow which meets all three hydraulic criteria (depth, velocity, and percent wetted perimeter) is used as the initial summer ISF; the flow which meets two of the three criteria is used for the initial winter ISF. Values of the R2CROSS criteria from the R2CROSS manual are based on stream top width. The top width of the reach of the San Miguel River of interest is generally greater than 60 feet which results in the following criteria values:

- Average depth - 0.6 feet
- Average velocity - 1.0 feet/second
- Percent wetted perimeter - at least 70%

In the modeling work by CDOW, the bluehead sucker was used as the primary indicator species since the abundance of this fish is highly dependent on the availability and quality of riffles (which is the habitat type most affected by low flows). Specific hydraulic criteria for bluehead suckers were derived by Stewart et al. 2005, and these criteria for “marginally suitable” habitat are as follows:

- Average depth - 1.0 feet
- Average velocity - 1.3 feet/second

A water availability assessment was completed by CDOW/BLM which shows the percent of the time that flows occur at the Uravan gage located just downstream of Tabeguache Creek. CDOW and BLM state that they analyzed water rights information and will consult with the Division Engineer's Office to identify water availability concerns due to existing diversions. It does not appear that existing water rights were actually considered in the ISF recommendations. A combination of modeling results and information was used with "best professional judgment" to develop the ISF recommendations, as reported in the draft Executive Summary.

Prior to issuance of this draft report, it was learned that the CWCB may have completed a more detailed assessment of water availability using methods in the USGS Technical Water Resources Investigations Report. This method reportedly is more rigorous than the one used by CDOW/BLM and entails determination of confidence limits on flow estimates. BWC has not been able to confirm the use of this method for the Lower San Miguel River.

The following explains the flows proposed by CDOW/BLM:

- 80 cfs September 1–February 28: The 115 cfs was reduced to 80 cfs due to water availability. 80 cfs still provides an average depth of 0.63 feet, average velocity of greater than 2.5 feet/second, and 60% of the wetted perimeter.

- 115 cfs March 1–April 14: The winter recommendation of 115 cfs occurs at least 50% of the time during this period and so was used as the ISF.

- 325 cfs April 15–June 14: This is based on PHABSIM which found the maximum usable area for flannelmouth suckers at 325 cfs, and 90% of the WUA for bluehead suckers at this flow.

- 170 cfs June 15–July 31: The 325 cfs was reduced to 170 cfs during this time due to water availability concerns. 170 cfs occurs at least 50% of the time, and meets two of the three R2CROSS criteria.

- 115 cfs August 1–August 31: R2CROSS was used to determine the winter ISF recommendation using cross-section 1 since it was in a riffle. The results show that 115 cfs meets two of the three criteria by providing an average depth of 0.8 feet and velocity of 2.8 feet/second.

Information provided by CDOW indicates the presence of a fishery with bluehead suckers, flannelmouth suckers, roundtail chubs, and other species. Results of macroinvertebrate (also known as benthic organism) collections at three locations within the ISF reach and several upstream sites were also provided. These results show that there is a macroinvertebrate community with mayflies, caddis flies, true flies, and other families in the lower San Miguel River, but that it is less robust, less diverse, and more pollution tolerant than the community upstream (near Placerville and Beaver Creek) on the San Miguel. A qualitative survey of macroinvertebrates in riffles by BWC found a low density of organisms with few species on October 8, 2008, but a moderate density with more species on March 17, 2009.

3.0 URAVAN WATER RIGHTS

As part of the consent decree entered in February 1987 to settle litigation with Union Carbide (Umetco Minerals Corporation) for reclamation activities, the CWCB received a deed for the water rights in the Miguel Power Company Canal, Johnson Ditch and several wells–referred to collectively as the Uravan Water Rights (UWR). In 1991, the CWCB entered into a Memorandum of Understanding (MOU) with Montrose County, Nucla, and Naturita regarding the future use and disposition of the UWR. There have been several meetings between the signatories of the MOU to discuss potential uses of the water rights and the time schedule for their availability. Two studies have been completed on the water rights, one by Leonard Rice Engineers in 2005, and the other by Harris Water Engineering, Inc. in July 2008 (final report).

The Harris Engineering report estimated the historic consumptive use (HCU) of the irrigation portion of the UWR is 200 acre-feet/year (AF/yr); the HCU of the industrial portion of the rights was estimated to be 350 AF/yr. Harris Engineering recommended the following for the disposition of the UWR:

- Several of the wells be conveyed to Montrose County for use in the Lower San Miguel basin, consistent with the MOU;

- The Johnson Ditch rights, which are senior rights, be conveyed to the municipalities in the MOU for use in meeting their future water needs. This should include consideration of loaning or leasing the HCU associated with the rights to the CWCB through the CWCB's Water Acquisition Program;

- The remaining wells and rights in the Miguel Power Company Canal be relinquished to the river. All but 40 cfs of this right has been abandoned, and poor documentation of use of the remaining water would make a change of use difficult.

The UWR were discussed at the July 2008 CWCB Board meeting, at which time Harris Engineering gave a presentation on their report, and the Southwestern Water Conservation District (SWCD) made recommendations.

The UWR will not be available until 2010. The CWCB has stated its intent to continue to work with the signatories of the MOU, SWCD, San Miguel County, and "other interested persons and entities" on the use of the UWR. The latest actions regarding the water rights and the intentions of the CWCB are not known at this time, but need to be investigated.

BWC observed the subject reach of the river on October 8, 2008, and March 17, 2009. Five cross-sections were completed in riffle, run, and pool habitat on October 8, 2008, at the locations shown on Figure 2. The cross-sections were surveyed with a tape, rod, and level. Flow was measured at Section 2 using a Price AA current meter. A qualitative assessment of macroinvertebrates was completed by picking rocks throughout the riffle at Section 1. Conditions were documented with photographs (see Appendix 1). Plots of the channel cross-sections are included in Appendix 2.

An additional section (Section 6) was completed on March 17, 2009, in a riffle on the NCP (see Figure 2). Flow was measured at Section 1 on this day using a Price AA current meter (see Appendix 3). A qualitative assessment of macroinvertebrates was also completed on this day at both Sections 1 and 6, and conditions were documented with photographs (see Appendix 1).

BWC ran the R2CROSS model with the field data at the riffle at Section 1. The results of this modeling are included in Appendix 4.

A water availability study was also completed using daily flow records from the Uravan gage for the entire available record of flow (1954-2008). This analysis focused on the number of days that the flow in the river is less than the proposed flows. The results of this analysis are shown in Table 1. Hydrographs for selected years (2000-2004) were also plotted with the proposed flows in Figures 3a-3e.

Lastly, information on water rights upstream of the proposed ISF reach was analyzed. This included a tabulation of decreed water rights and evaluation of the potential effects of the ISF on the rights. Figure 4 shows the decreed water rights in the lower reach of the San Miguel River.

4.0 EVALUATION

We have the following concerns with the work completed by CDOW/BLM to support the proposed ISF amounts.

4.1 R2CROSS Analysis

The R2CROSS runs by the CDOW/BLM show that the fall/winter goal of meeting two of the three criteria is met at flows less than the recommended flow of 115 cfs. The text of the draft report states that 115 cfs was chosen because it meets two of the three of the criteria by providing an average depth of 0.8 feet and velocities greater than 2.5 cfs. However it is also stated that 80 cfs is adequate (for the period of September-February) as it maintains an average depth of almost 0.7 feet, velocity greater than 2.5 feet/second, and wetted perimeter of almost 60%. However, the results for Section 1 by CDOW/BLM show that two of the three criteria are provided at a flow of 73 cfs, where the average depth is 0.6 feet and the average velocity is greater than 2.5 cfs.

R2CROSS results for other sections by CDOW/BLM show considerable variability in the amount of flow which meets the hydraulic criteria. For example, the flow that meets at least two of the three criteria (the wintertime requirement) ranges from 28 cfs at CDOW/BLM Section 7 to 431 cfs at Section 4 (all flow values). This indicates a relatively high level of uncertainty in the quantity of flow necessary to protect the natural environment to a reasonable degree. It appears that the natural environment could be protected to a reasonable degree at flows lower than the ones proposed.

Observations of the river on March 17, 2009, show that flows less than 115 or 80 cfs are adequate to support the aquatic community. BWC measured 69 cfs of flow on this day at Section 1 (see Figure 2); flow at the Uravan gage approximately 4,440 feet downstream was 71 cfs. As shown on photographs 4-7 in Appendix 1, water covers most of the channel bottom at 69 cfs, the average depth that was measured at Section 1 was 0.6 feet, and the average velocity was 1.84 cfs. Therefore, at least two of the three criteria are met at 69 cfs based on the field data.

BWC ran R2CROSS for Section 1 using the field data from October 8, 2008, and March 17, 2009 (see Appendix 4). The results found that both the initial summer and winter flow recommendations are met at flows much lower than the recommendations by CDOW/BLM. For example, 11 cfs (average for two dates) results in an average velocity of 1.0 feet/second with 70% wetted perimeter which meets the winter flow requirements. All three criteria are met at a flow of 88 cfs. The initial winter and summer flow recommendations by CDOW/BLM are 115 and 325 cfs, respectively.

Figure 5 shows the flows which meet one, two, and three of the R2CROSS criteria from the work by CDOW/BLM and BWC. There is a relatively wide range of flows that meet the criteria, and two or three of the criteria are met at flows much lower than the flows proposed.

4.2 Increase in Flow in Reach

Analysis of flow records for USGS stream gages in the lower San Miguel show that natural groundwater increases flow in the river, and this is not accounted for in the ISF recommendations. Streamflow data exist at the following gages (see Figure 4):

- Uravan (USGS 09177000) 1954-present
- Naturita (USGS 09175500) 1917-1981
- Near Nucla at Brooks Bridge (USGS 09174600) 1995-2008

The average daily flow increases by 21.7 cfs between the Nucla and Uravan gages during September-February when the proposed ISF is 80 cfs. Naturita Creek and its major tributary, Maverick Draw, are located between these gages and most of the return flow from irrigation on

the south side of the river reaches the San Miguel in these tributaries. Flow records for West Naturita Creek from 1940-1981 show an average flow of only 1.7 cfs from September-March, but this gage is located in the upper part of the watershed.

The average daily flow increases by 10.2 cfs between the Naturita and Uravan gages during September-February. Only several relatively small and dry tributaries occur between these gages. The largest of these is Tabeguache Creek, the confluence of which is just upstream of the Uravan gage. The flow was estimated to be 0.2 cfs at the mouth of Tabeguache Creek on October 8, 2008. Therefore, most of the increase in flow between the Naturita and Uravan gages during September-March is shallow groundwater inflow.

The 10.2 cfs of total gain represents 0.75 cfs/mile of increased flow. This increase in flow should be accounted for in the ISF. For example, if there is 80 cfs at the upstream end of the reach (Calamity Draw) during baseflow conditions, 92 cfs would be expected 16.5 miles downstream at the confluence with the Dolores River. For 80 cfs to be found anywhere in the reach under base flow conditions, only 68 cfs is needed in the river at Calamity Draw. The amount of flow should, therefore, be reduced if the ISF is to be 80 cfs.

4.3 Water Availability Assessment

The water availability assessment completed by CDOW/BLM focused on the flow that is available one-half (50%) of the time. The approach used is that the CWCB has the right to claim all of the flow in the river under average-to-dry flow conditions. However, it is during these times that other beneficial users of the river need water the most. Water planning for interests in the watershed is based on dry year conditions; that is, flow which occurs less than 50% of the time. This creates a conflict with existing and future beneficial uses in the basin.

Table 1 shows the average (and minimum and maximum) number of days that, if the proposed ISFs are adopted, the flow in the river would be less than the ISF, based on records at the Uravan gage. For example, if the proposed ISF of 80 cfs is adopted for September-February, the flow in the river would be less than this value an average of 63 days each year (35% of the time); a flow of 325 cfs does not occur an average of 11 days early in the irrigation season from April 15-June 14 each year.

Figures 3a-3e graphically show the findings in Table 1 for the selected years of 2000-2004. These figures show that flow in the river is often less than the proposed flows in August, September, October, and other times. The lack of available flow was noted by CDOW in their July 15, 2008, memorandum wherein it is stated: "Of special concern is the late summer period from about mid-August to October when base flows in the upper basin average around 100 cfs at Placerville but routinely drop to near 50 cfs at Uravan".

4.4 Effects on Water Rights

Water rights senior in priority to the proposed ISF right can not be called out by the ISF right. Since the ISF right will likely have an appropriation date of 2010, this means that only new rights junior to 2010 could be called out. Exchanges, transfers, or other changes in rights filed after the date of the ISF rights would be junior to the ISF rights, even though the priority dates for the rights themselves are senior. These changes in existing rights could be affected by the proposed ISF rights. This includes junior changes in the upper watershed, including in the Town of Telluride.

As shown in Table 1 and on Figures 3a-3e, there are significant periods during which the flow in the river will not be adequate to meet the proposed ISFs. During these times, junior water rights can be curtailed to meet the ISFs. For example, junior diversions for snowmaking in the upper watershed (which supports an economically beneficial activity to the County and State) could be curtailed. Likewise, filling of irrigation reservoirs in the lower basin, which routinely occurs in early March of each year, could be curtailed if junior to the ISF at that time. The water which would not be diverted represents "lost diversion potential"; this water could be diverted and put to beneficial use but for the proposed ISFs.

BWC calculated the amount of water that could not be diverted for each ISF period. This equals the difference between the amount of water in the river and the amount of the proposed ISF filings. The results of these calculations are shown in Table 1.

The lost diversion potential averages 8,667 acre-feet/year, at the flows proposed (Table 1). That is, if the flows are adopted, this is the average amount of new diversions each year that could be affected. The actual amount varies each year.

A broader approach to evaluating the amount of lost diversions and beneficial uses would look at the amount of water lost from the State in the context of the Colorado River Compact. The amount of water required to protect the natural environment to a reasonable degree could be defined as the State's compact obligation, which is left in the river for non-consumptive use. It may be possible to develop an apportionment each year based on snowpack/flow conditions and an agreement as to reasonable percentages of flow to be left in the river.

5.0 CONCLUSIONS AND RECOMMENDATIONS

This technical evaluation indicates that the flow levels proposed for ISFs for the Lower San Miguel River:

- Are higher than that needed to maintain the natural environment to a reasonable degree;
- Are higher than the available flow in the river during significant periods in each year;
- Do not consider natural groundwater inflows which reduce the amount the ISF filing necessary by increasing flow in the river;
- Will adversely affect water rights in the San Miguel River watershed and limit future development of water for beneficial purposes in the State of Colorado.

The following recommendations are made with respect to ISFs for the Lower San Miguel River:

- An effort should be made to work with the CWCB and CDOW to refine specific flow levels necessary to protect the river to a reasonable degree, per the findings in this report.

P:\Project Files\007-06 TMV\2009\Task 04 CWCB\BlueDot\Eval of Tech Basis for Lower SMRiver CWCB ISF Recommendations-11-18-09.doc

Tables

Table 1. Number of Days Flow in River is Less than the Proposed ISF Values
San Miguel River at Uravan Gage
DRAFT

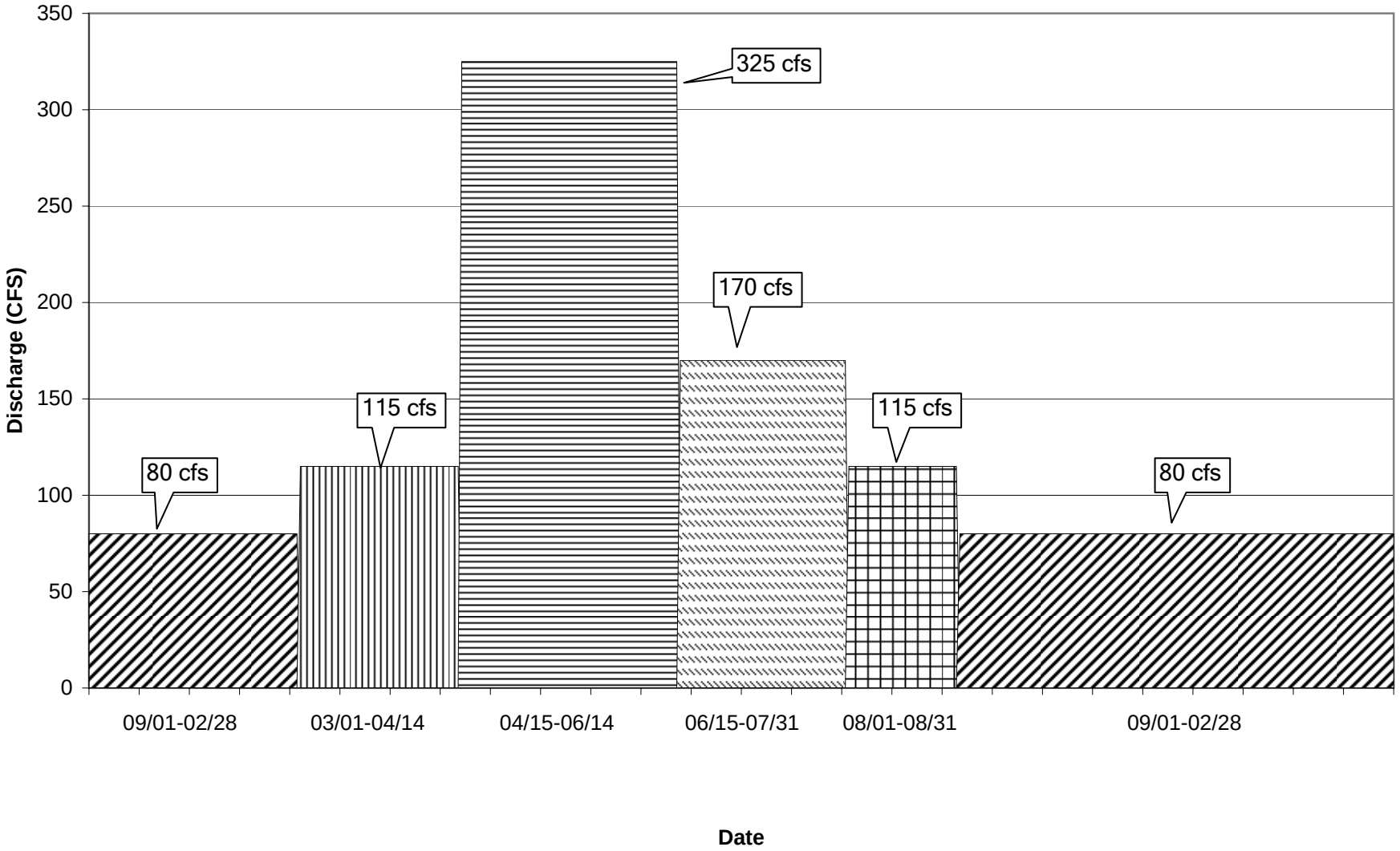
Date	Proposed ISF (cfs)	Percent of Days on Record Below ISF	Average Number of Days below ISF	Maximum Number of Days below ISF	Average AF of Potential Lost Diversion
4/15 - 6/14	325	11	7	61	1871
6/15 - 7/31	170	23	11	47	1691
8/1 - 8/31	115	44	14	31	1478
9/1 - 2/28	80	35	65	171	2763
3/1 - 4/14	115	32	15	44	864
				Total	**8667**

Source:
USGS Streamflow Data for San Miguel River at Uravan gage. Period of Record 1954-2008 with gaps (10-1-1962 through 9-30-1973 and 10-1-1994 through 8-29-1996).

Notes:
AF = acre-feet
cfs = cubic feet per second
ISF = in-stream flow

Figures

Figure 1. Proposed ISF Filings for the Lower San Miguel River



108°42'30"W

108°42'0"W

38°21'30"N

38°21'0"N

38°20'30"N

SAN MIGUEL RIVER AT URAVAN, CO.

CX6

CX4

CX5

CX3

CX2

CX1

Tabeguache Creek

San Miguel River

141

CWCB Study Area*

*Location based on description provided by CDOW/BLM Executive Summary

San Miguel Valley Corporation\ Mapping\ ArcMap\ Task2 \Water Rights - Stream Cross Section Location Map.mxd

Map Legend

- Gage Station
- CX1 — BWC Cross Section Location
- Perennial Stream
- Intermittent Stream

BIKIS Water Consultants LLC
555 RiverGate Lane, Suite B4-82
Durango, CO 81301
(970) 385-2340ph 385-2341fx
www.BikisWater.com

0 225 450 900 Feet

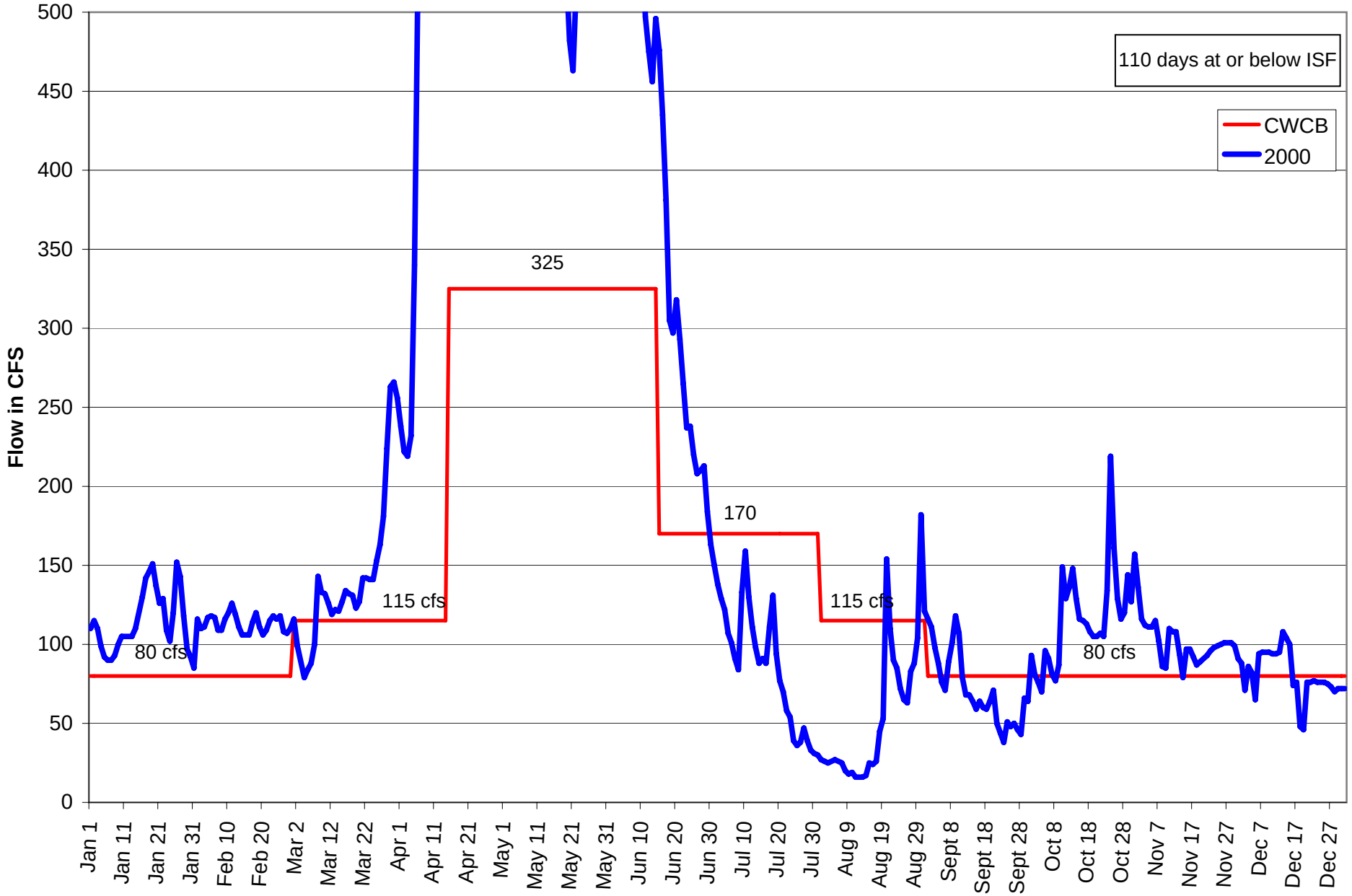
1 inch = 450 feet

Designed by: DSS
Detail by: EAB/DBM
Date: 04/17/2009
Scale: 1:5,400

Lower San Miguel River Stream Cross Section Location Map

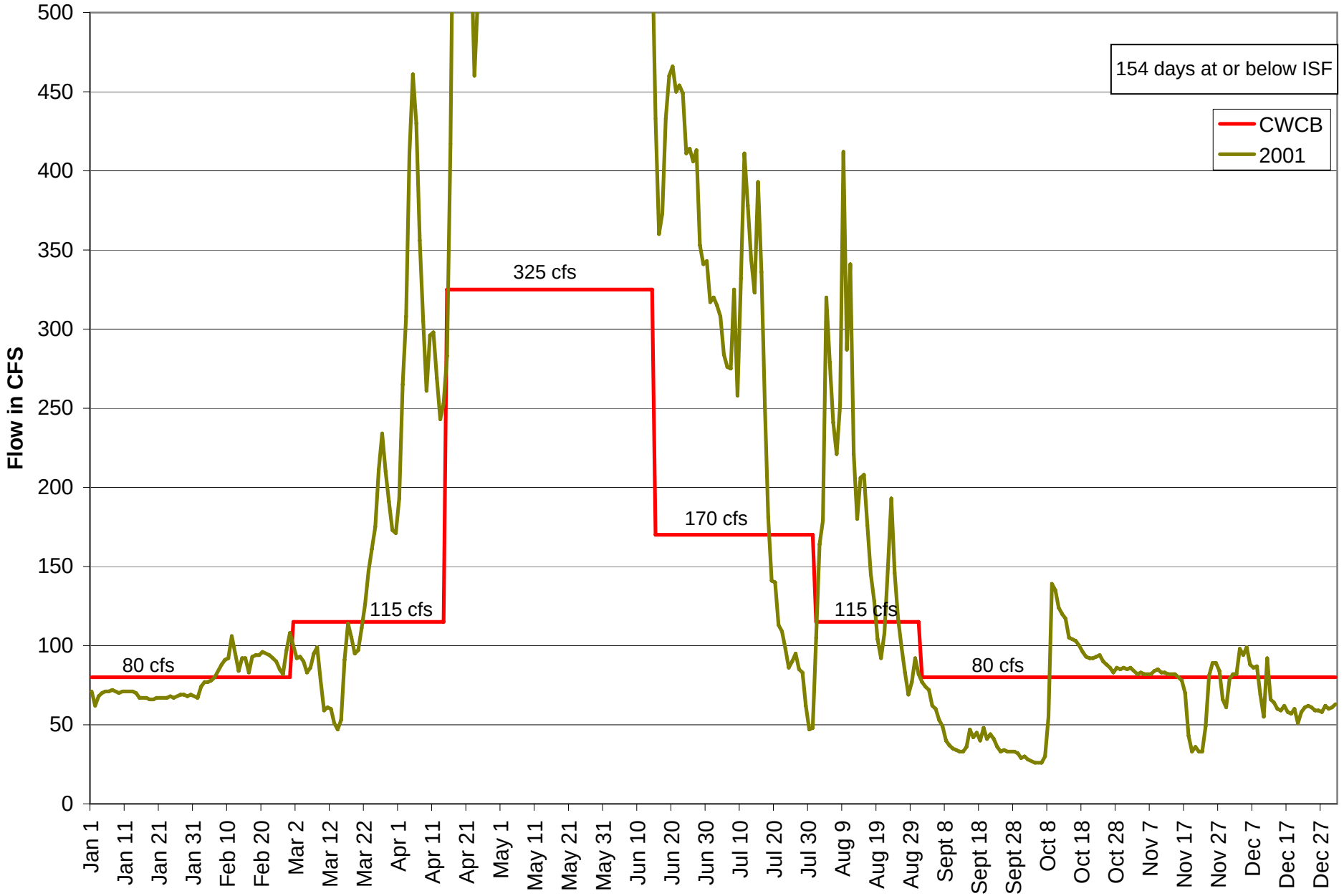
Figure 2

Figure 3a. Comparison of Flow at Uravan in 2000 to proposed ISFs



Source: U.S. Geological Survey Gage No. 09177000 (Uravan)

Figure 3b. Comparison of Flow at Uravan in 2001 to proposed ISFs

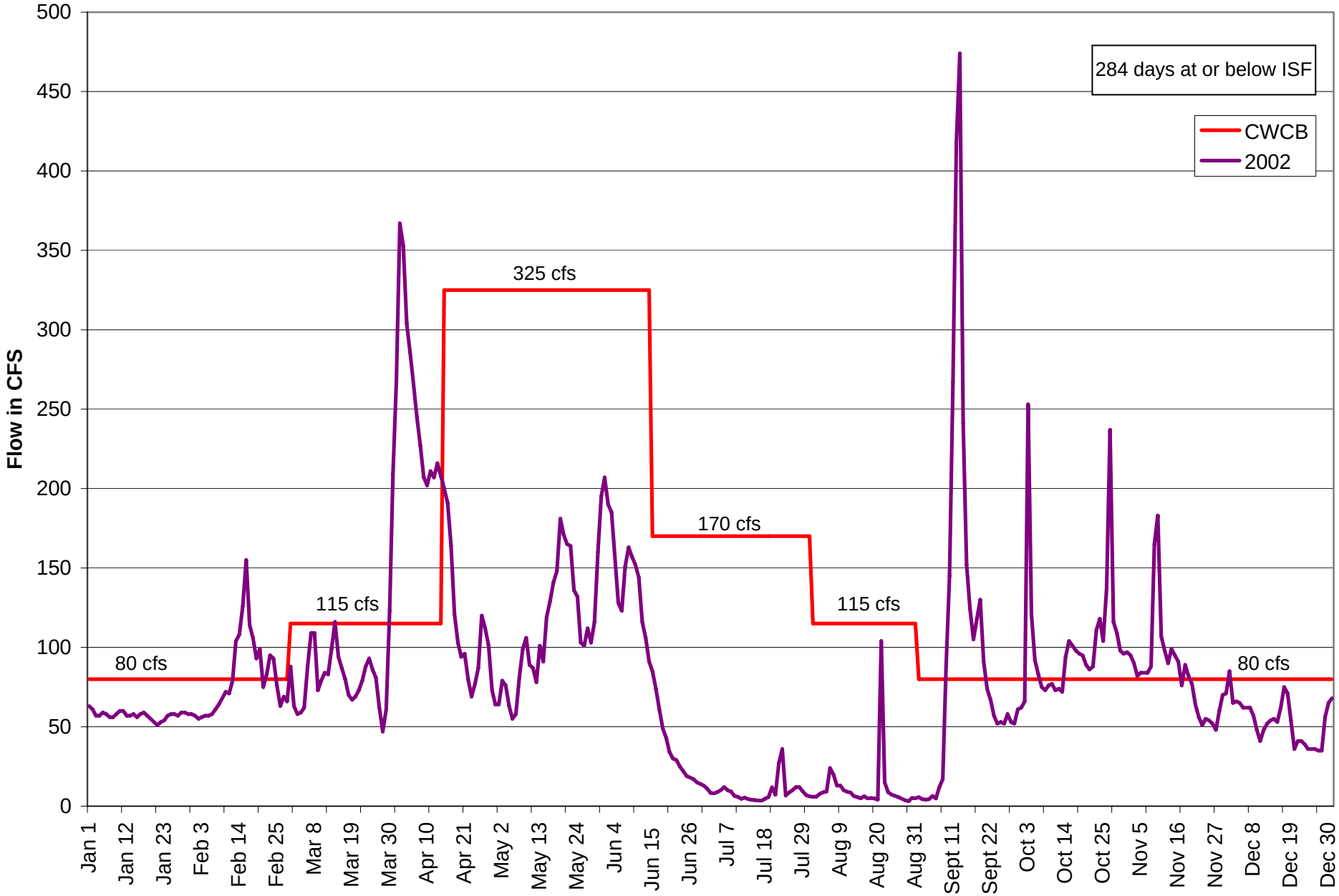


Source: U.S. Geological Survey Gage No. 09177000 (Uravan)

Bikis Water Consultants, LLC
04/20/2009

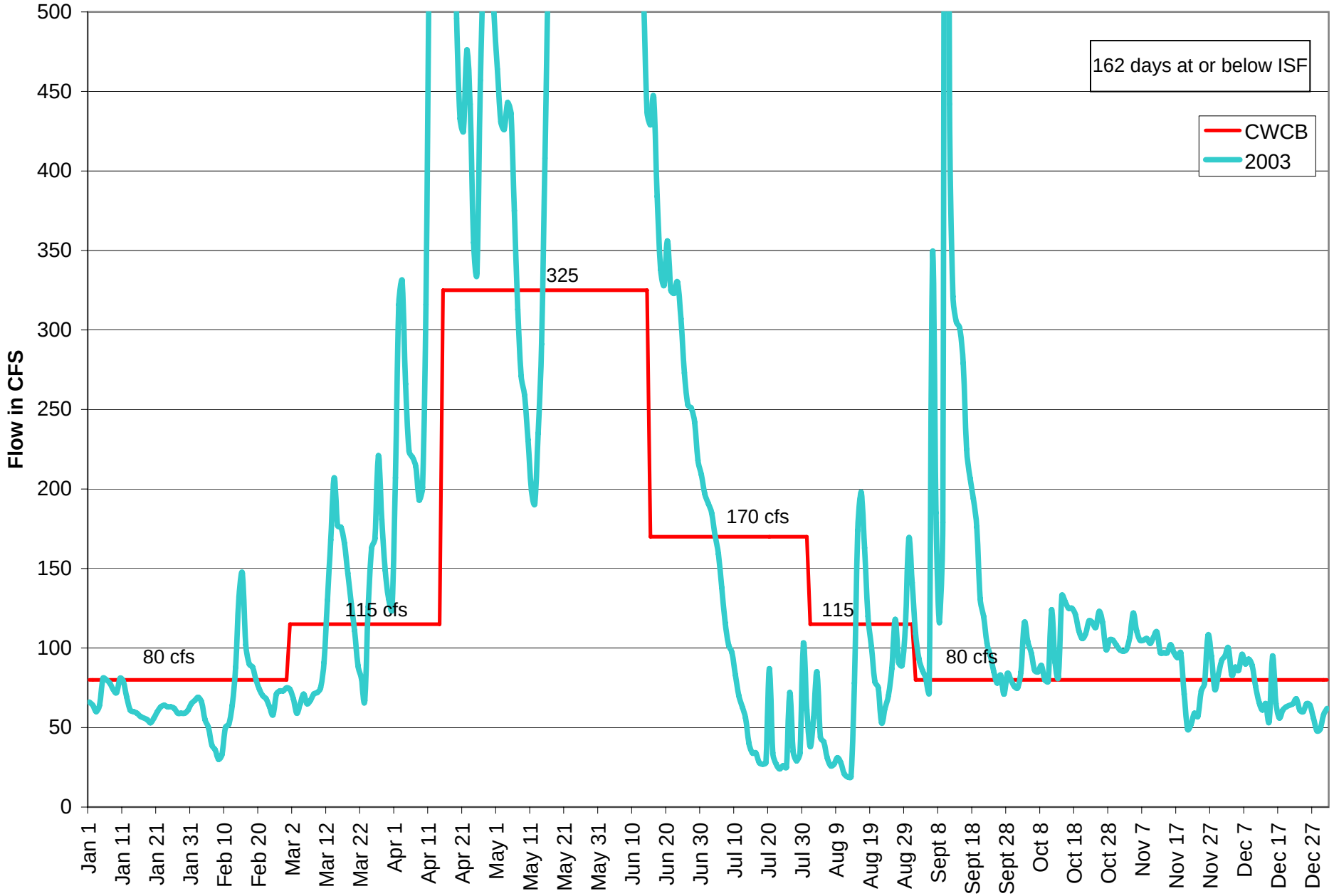
P:\Project Files\115-08 San Miguel Valley Corporation\2009\Task 02-CWCB\Uravan\
San Miguel River flows Uravan gage 2000 - 2007.xlsFig3b-2001 Flow

Figure 3c. Comparison of Flow at Uravan in 2002 to proposed ISFs



Source: U.S. Geological Survey Gage No. 09177000 (Uravan)

Figure 3d. Comparison of Flow at Uravan in 2003 to proposed ISFs

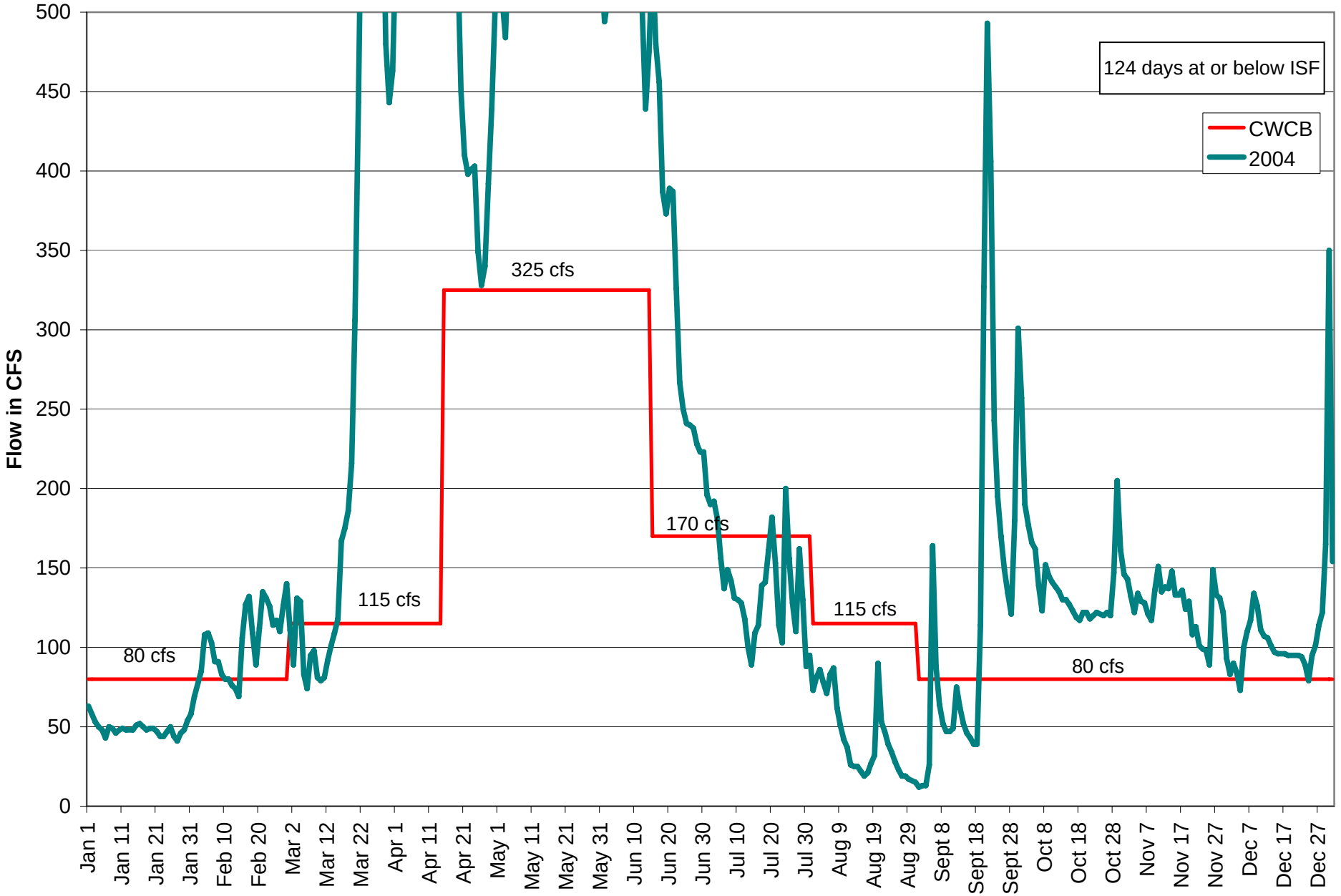


Source: U.S. Geological Survey Gage No. 09177000 (Uravan)

Bikis Water Consultants, LLC
04/20/2009

P:\Project Files\115-08 San Miguel Valley Corporation\2009\Task 02-CWCB\Uravan\
San Miguel River flows Uravan gage 2000 - 2007.xlsFig3d-2003 Flow

Figure 3e. Comparison of Flow at Uravan in 2004 to proposed ISFs



Source: U.S. Geological Survey Gage No. 09177000 (Uravan)

Map Legend

- Gage Station
- Water Body
- Irrigation Canal or Ditch
- Perennial Stream
- Intermittent Stream
- Highway
- Mountain Summit
- Town
- Township and Range Line

Elevation (Feet)

High : 4359.67

Low : 1398.42

Water Rights Diversions- Current In-Use Type

See Table 1 for Label Key

- Active structure with contemporary diversion record
- Historical structure only - no longer exists or has records, but has historical data
- Inactive structures which physically exist, but no diversion records are maintained
- Non-existent structure with no contemporary or historical records
- Active structures but diversion records are not maintained

BIKIS Water Consultants
555 RiverGate Lane, Suite B4-82
Durango, CO 81301
(970) 385-2340ph 385-2341fx
www.BikisWater.com

0 1 2 4 6 8 Miles

0 7,500 15,000 30,000 45,000 Feet

1 inch = 1.420455 miles

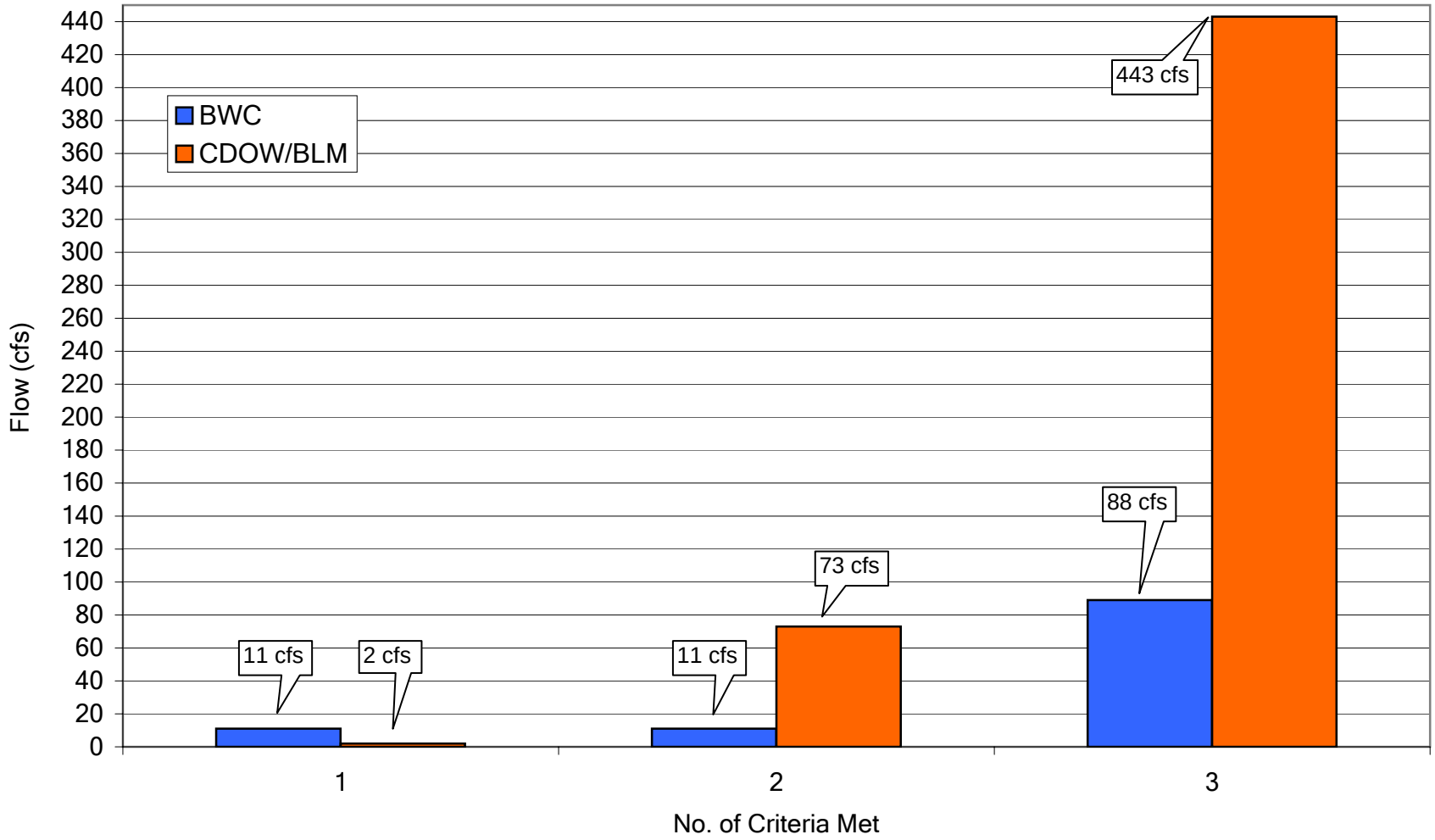
Sources:
Hydrography - CDOW and National Hydrography Dataset, USGS and EPA
Roads - San Juan National Forest
Diversions and Irrigated Areas - CDSS Sept. 2007
Background - Shaded relief derived from 30 meter USGS DEMs

Designed by: DSS
Detail by: EAB/DBM
Date: 04/17/2009
Scale: 1:95,040

Lower San Miguel River Water Rights Vicinity Map

Figure 4

Figure 5. Comparison of Flows Which Meet R2CROSS Hydraulic Criteria
(70% Wetted Perimeter - Average Depth 0.6 Feet, Average Velocity 1 Foot/Second)



Data sources: CDOW/BLM Section 1, BWC Section 1, Average of 10/08/2009 and 03/17/2009

Appendix 1
Photographs

Lower San Miguel River Photographs
October 8, 2008 and March 17, 2009

Photo 1. Cross-section 1 was in riffle in foreground.

Photo 2. Riffle at Cross-section 1. Note flow covering nearly all of the channel bottom.

Lower San Miguel River Photographs
October 8, 2008 and March 17, 2009

Photo 3. Lower part of riffle at cross-section looking downstream. Note relatively uniform flow.

Lower San Miguel River Photographs
October 8, 2008 and March 17, 2009

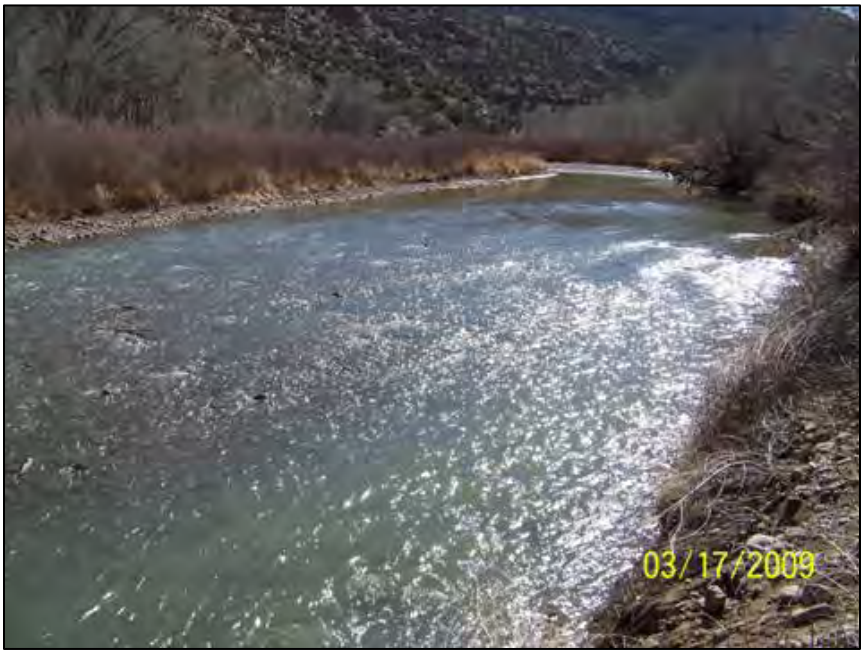


Photo 4. Cross-section at riffle.

Photo 5. Cross-section looking downstream. Note flow (69 cfs) covering most of the channel bottom.

Lower San Miguel River Photographs
October 8, 2008 and March 17, 2009

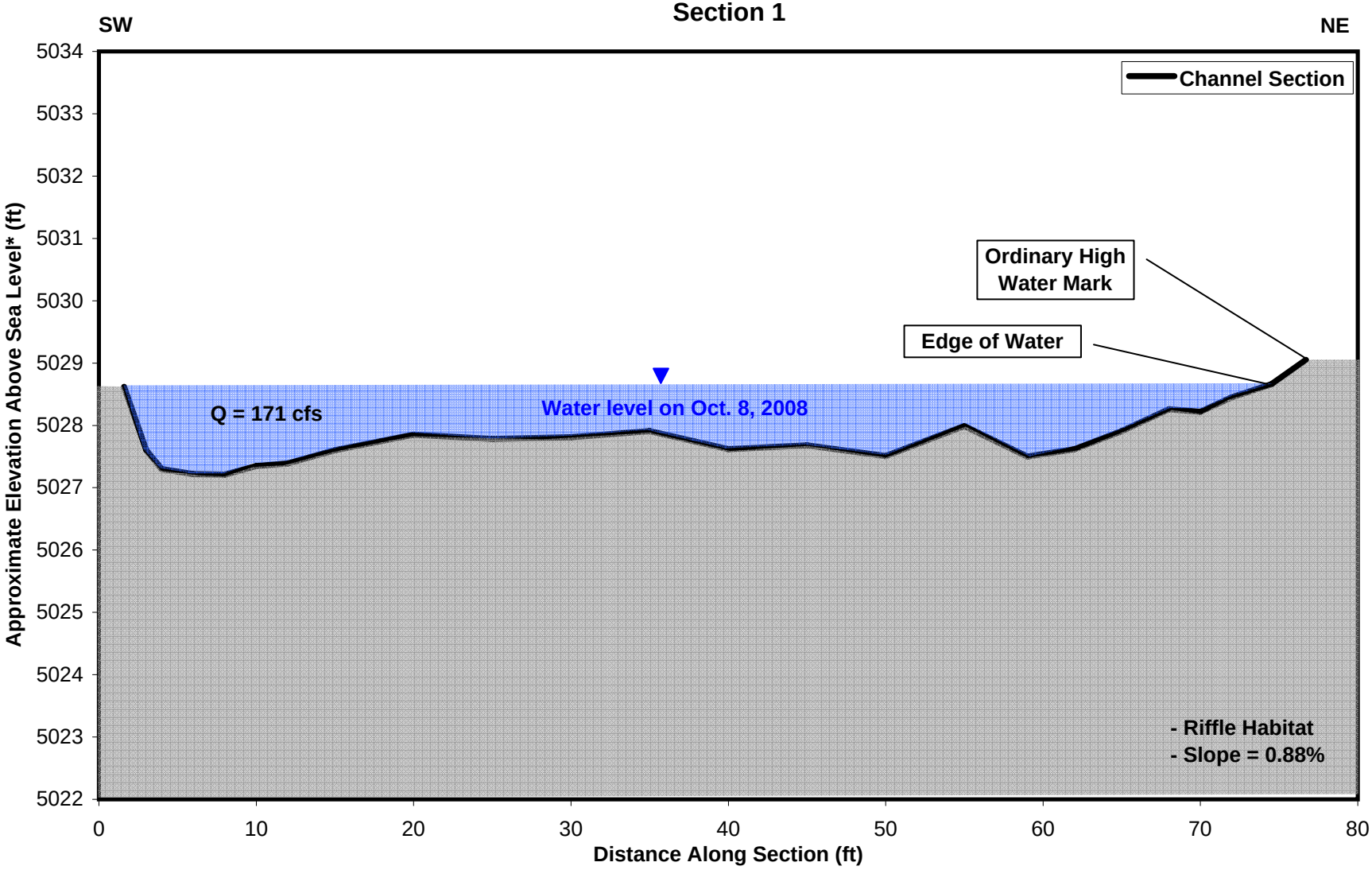
Photo 6. Riffle at cross-section 6. Note larger substrate and flow (69 cfs) covering most of the channel bottom.

Photo 7. Cross-section 6 from opposite bank.

Appendix 2
Channel Cross-sections

DRAFT

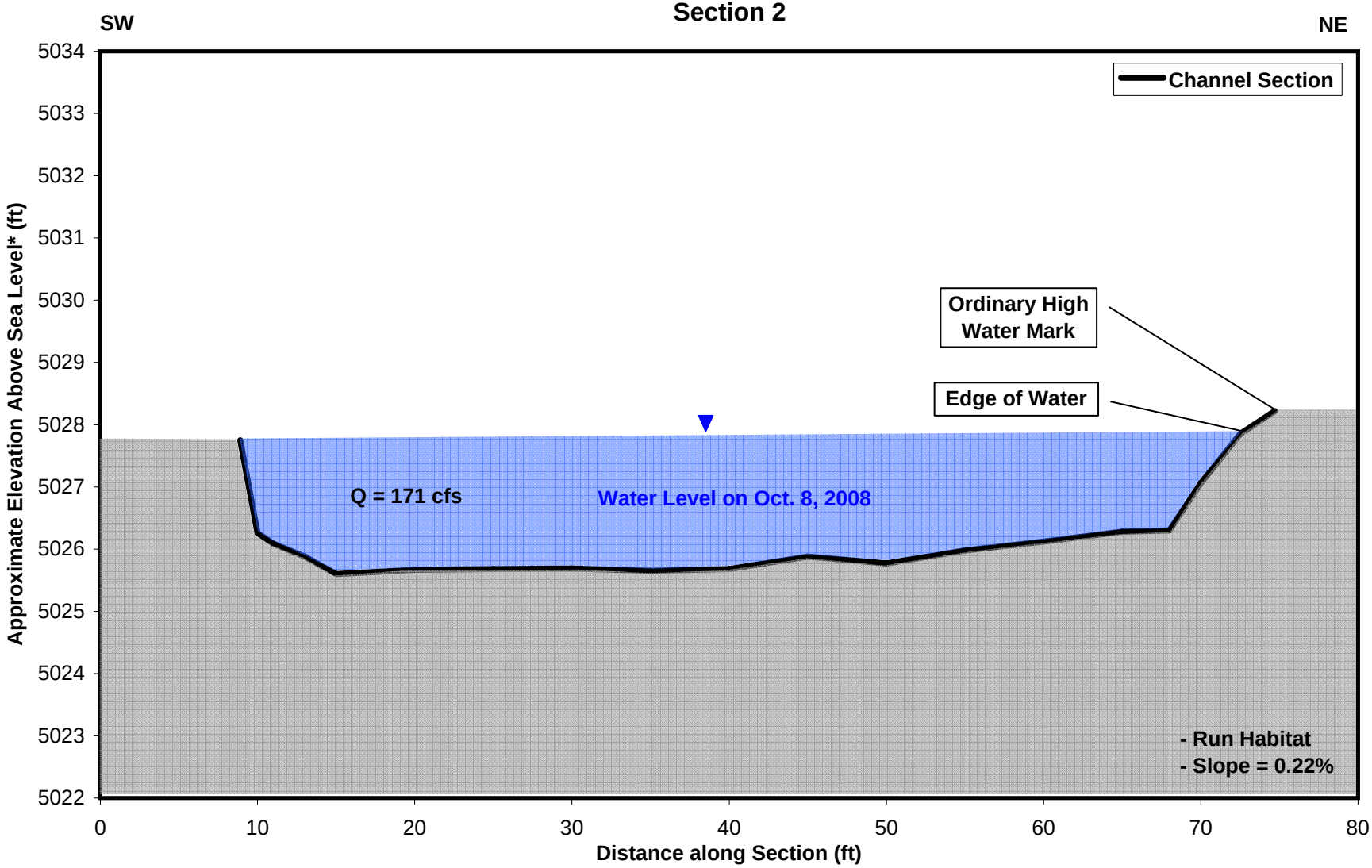
Lower San Miguel River
Section 1



*Note: Elevations were calculated using a survey level, GPS, and digital elevation mode. The elevation of the survey level was assumed to be 5,038 ft ASL.

Lower San Miguel River
Section 2

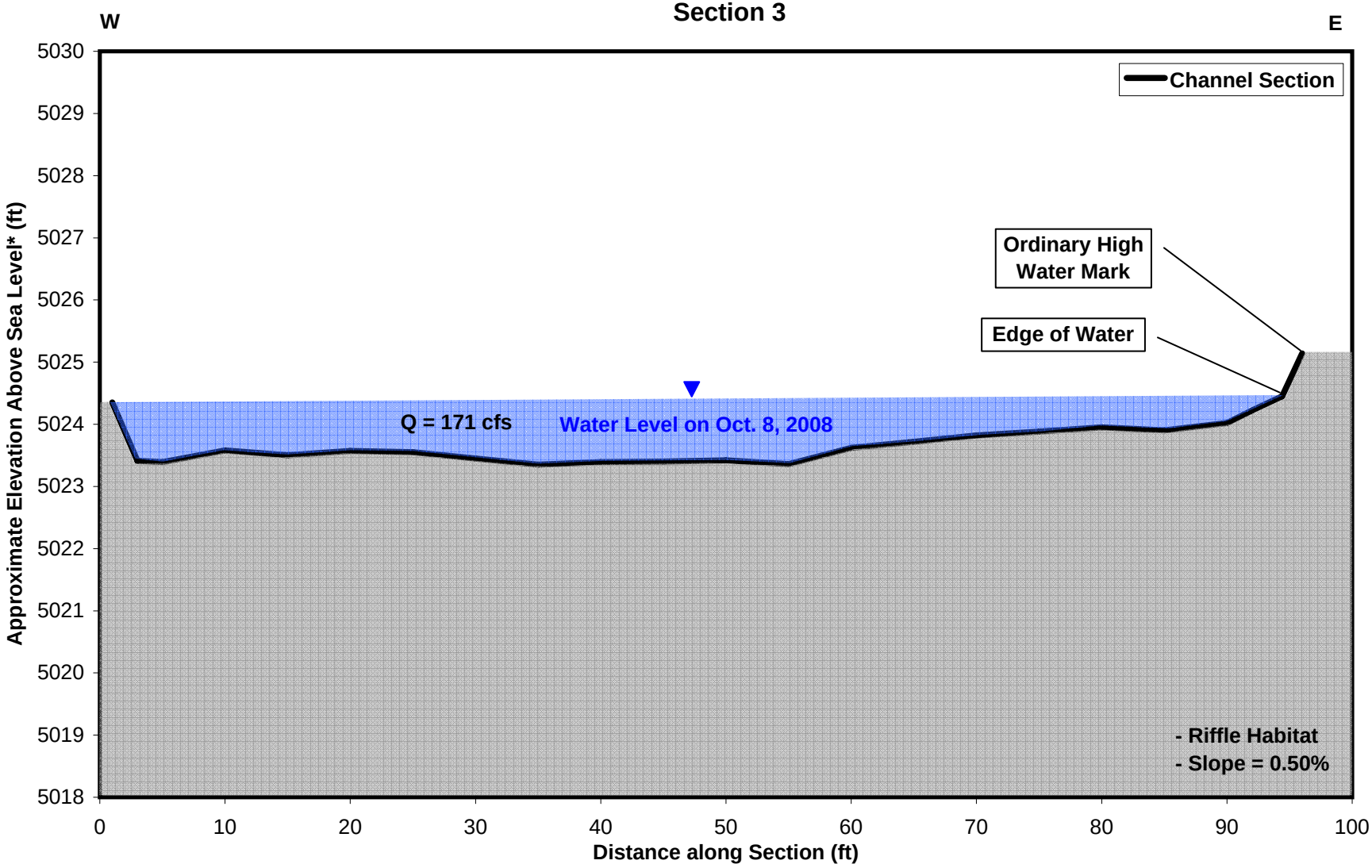
DRAFT



*Note: Elevations were calculated using a survey level, GPS, and digital elevation mode. The elevation of the survey level was assumed to be 5,037 ft ASL.

Lower San Miguel River
Section 3

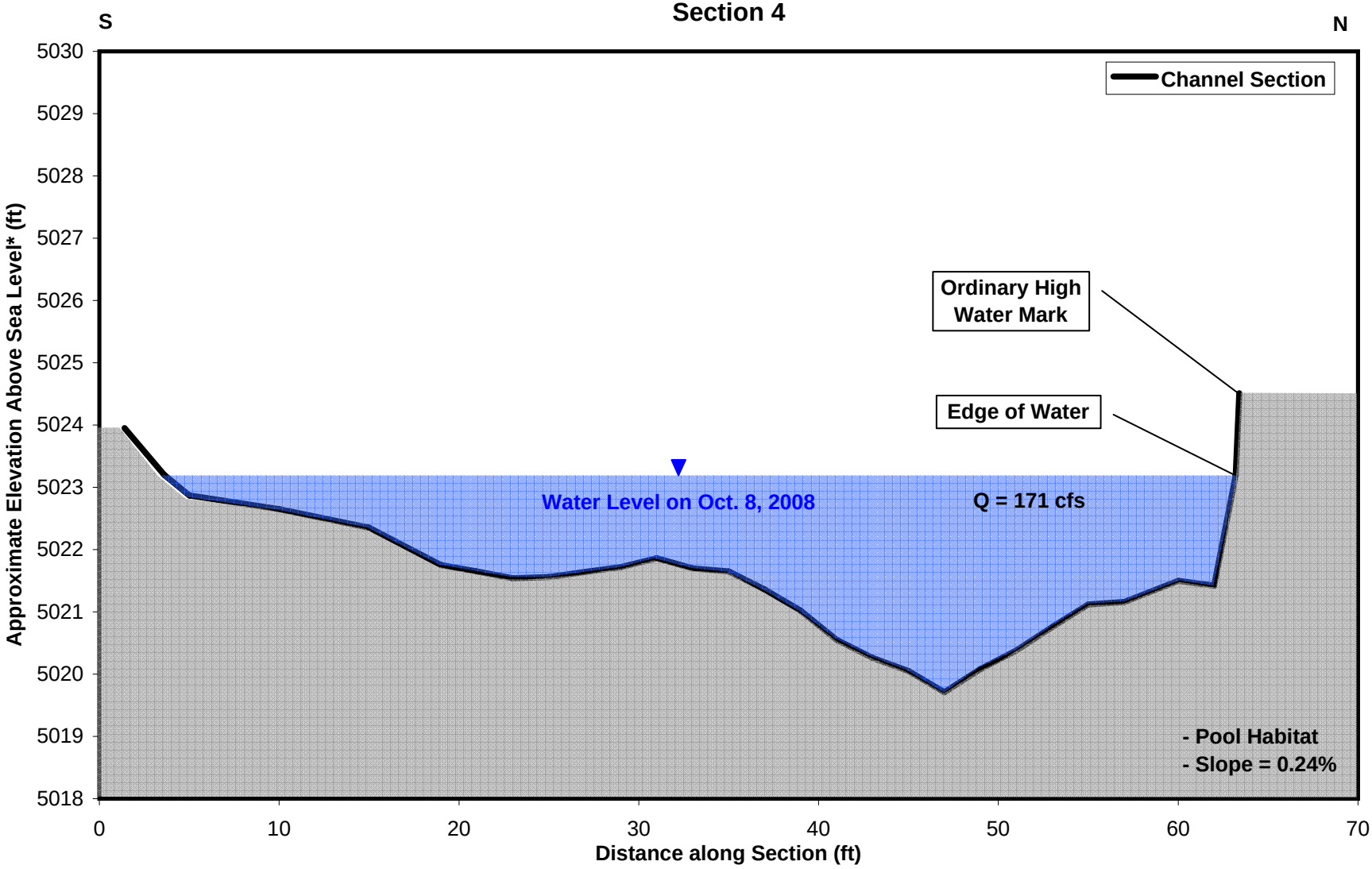
DRAFT



*Note: Elevations were calculated using a survey level, GPS, and digital elevation mode. The elevation of the survey level was assumed to be 5,032 ft ASL.

Lower San Miguel River
Section 4

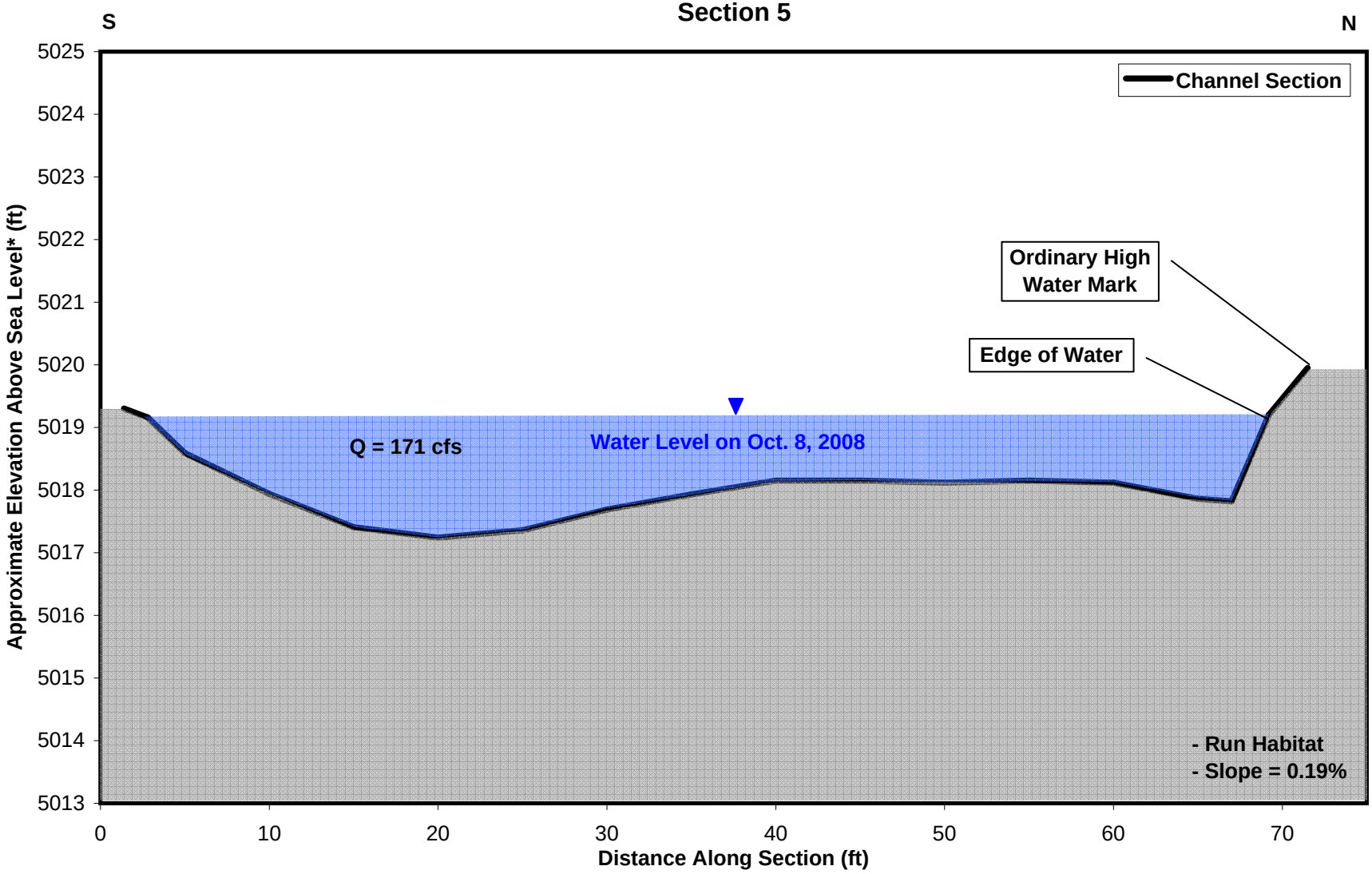
DRAFT



*Note: Elevations were calculated using a survey level, GPS, and digital elevation mode. The elevation of the survey level was assumed to be 5,024 ft ASL.

Lower San Miguel River
Section 5

DRAFT



*Note: Elevations were calculated using a survey level, GPS, and digital elevation mode. The elevation of the survey level was assumed to be 5,024 ft ASL.

Appendix 3

Streamflow Discharge Measurement Forms

C7 80

Q = V a

V = 2.2048 R + 0.0178 (R in REVS/SEC)

DONE at SECTION #2 RB

Form 9-275F (Apr. 2001)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey
WATER RESOURCES DIVISION
DISCHARGE MEASUREMENT AND GAGE INSPECTION NOTES

Meas. No. 1
Comp. by DBM
Checked by DSS

Sta. No. Site 2 (run)
Sta. Name San Miguel ± 1 mi US bridge
Date 10/8/08, 20__ Party BWC
Width 63.7 Area 90.93 Vel. 1.88 G.H. — Disch. 171.4 cfs
Method Wading No. secs. 14 G.H. change ______ in ______ hrs.
Method coef. ______ Horiz. angle coef. ______ Susp. ______ Tags checked ______
Meter Type AA Meter No. ______ Meter ______ ft. above bottom of wt.
Rating used ______ Spin test before meas. Brand new, after ______
Meas. plots ______ % diff. from rating no. ______ Indicated shift ______

GAGE READINGS						
Time					Inside	Outside
	Start					
	Finish					
Weighted MGH						
GH correction						
Correct MGH						

Samples collected: water quality, sediment, biological, other Qualitative macroinvertebrates
Measurements documented on separate sheets: water quality, aux./base gage, other ______
Rain gage serviced/calibrated ______
* Weather: Clear
Air Temp 70 °F at 12-
Water Temp ______ °C at ______
Check bar/chain found ______
Changed to ______ at ______
Correct ______

(Wading), cable, ice, boat, upstr., downstr., side bridge, ______ ft., mi. upstr., downstr. of gage.
Measurement rated excellent (2%), good (5%), fair (8%), poor (>8%); based on following conditions: Flow uniform velocity
Cross section: uniform depth; no bars

Gage operating Uravan Record Removed ______
Battery voltage ______ Intake/Orifice cleaned/purged ______
Bubble-gage pressure, psi: Tank ______, Line ______, Bubble-rate ______ /min
Extreme-GH indicators: max ______, min ______
CSG checked ______ HWM height on stick ______ Ref. elev. ______ HWM elev. ______
HWM inside/outside: ______
Control ______
Remarks ______
GH of zero flow = GH ______ - depth at control ______ = ______ ft. rated ______
Sheet No. ______ of ______ sheets

Front

* Rain/snow last weekend in area (10/4-5/08)

(water slightly turbid)

River at -

Angle coef-ficient	Dist. from initial point	Width	Depth	Observation depth	Revo-lutions	Time in sec-onds	Velocity at point	Velocity mean in vertical	Adjusted for hor. angle or	Area	Discharge
	72.6	1.8	0	.6						0	
	69	3.8	.9		11	45		.56		3.42	1.92
	65	4.5	1.05		23	47		1.10		4.73	5.20
	60	5	1.25		24	48		1.12		6.25	7.00
	55	5	1.3		29	46		1.41		6.50	9.17
	50	5	1.4		36	46		1.74		7.00	12.18
	45	5	1.5		38	46		1.84		7.50	13.80
	40	5	1.75		40	46		1.94		8.75	16.98
	35	5	1.75		43	46		2.08		8.75	18.20
	30	5	1.65		40	47		1.89		8.25	15.59
	25	5	1.6		52	46		2.51		8.00	20.08
	20	5	1.6		57	46		2.75		8.00	22.00
	15	4	1.7		50	46		2.41		6.80	16.39
	12	2.5	1.8		42	45		2.08		4.50	9.36
0	10	1.55	1.6		30	46		1.46		2.48	3.62
	8.9		0						Σ =	90.95	
										Σ =	171.4

± 1 0.80 mile D.S.

Flow at Uravan gage reported as

163-165 cfs @ 12:05

Inside Top

Appendix B7. Form 9-275-F, Discharge Measurement Notes

Lat N 38° 20' 54.474"
Long W 108° 42' 15.360"

Form 9-275F (Apr. 2001)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey
WATER RESOURCES DIVISION
DISCHARGE MEASUREMENT AND GAGE INSPECTION NOTES

Mess. No. 1
Comp by DSM
Checked by

Sta. No. 1
Sta. Name CX-1 RIFFLE
Date 3/17/2009 Party RWC
Width ____ Area 37.2 Vel. 1.84 G.H. - Disch. 68.6 cfs
Method Rod, wading No. secs. 18 G.H. change — in — hrs.
Method coef. ____ Horiz. angle coef. ____ Susp. ____ Tags checked ____
Meter Type AA Meter No. ____ Meter ____ ft. above bottom of wt.
Rating used ____ Spin test before meas. ____ ; after ✓
Meas. plots ____ % diff. from rating no. ____ Indicated shift ____

GAGE READINGS

Time					Inside	Outside
	Start					
	Finish					
Weighted MGH						
GH correction						
Correct MGH						

Samples collected: water quality, sediment, biological, other —

Measurements documented on separate sheets: water quality, aux./bass gage, other —

Rain gage serviced/calibrated —

Weather: CLEAR, SUNNY
Air Temp 60 °F at ____
Water Temp. ____ °C at ____
Check bar/chain found —
Changed to — at —
Correct —

(Wading), cable, ice, boat, upstr., downstr., side bridge, 4,400 ft., mi. upstr., downstr. of (gage)
Measurement rated excellent (2%), (good (5%)) fair (8%), poor (> 8%); based on following conditions: Flow, UNIFORM FLOW in RIFFLE
Cross section: ____

Gage operating: ____ Record Removed ____
Battery voltage: ____ Intake/Orifice cleaned/purged ____
Bubble-gage pressure, psi. Tank ____, Line ____, Bubble-rate ____ /min
Extreme-GH indicators: max ____, min ____
CSG checked ____ HWM height on stick ____ Rel. elev. ____ HWM elev ____
HWM inside/outside: ____
Control ____

Remarks: ____

GH of zero flow = GH ____ - depth at control ____ = ____ ft. rated ____

Sheet No 1 of 1 sheets

Front

River at -

ANGLE COEFFICIENT	DIST FROM INITIAL POINT	WIDTH	DEPTH	OBSERVATION DEPTH	REVOLUTIONS	TIME IN SECONDS	VELOCITY AT POINT	VELOCITY MEAN IN VERTICAL	ADJUSTED FOR HOR. ANGLE OR	AREA	DISCHARGE
	4.9		0	-	0	0					
	5.5	.8	0.5		4	40	.24			.40	0.10
	6.5	1.25	0.6		12	39	.73			.75	.55
	8.0	2.75	0.7		36	40	2.00			1.93	3.86
	12.0	3.5	0.8		16	40	.90			2.80	2.52
	15.0	3.5	0.8		37	30	2.74			2.80	7.67
	19.0	4.0	0.6		35	33	2.36			2.40	5.66
	23.0	4.0	0.5		40	32	2.77			2.00	5.54
	27.0	4.0	0.55		30	30	2.22			2.20	4.88
	31.0	4.0	0.35		30	34	1.96			1.40	2.74
	35.0	4.5	0.4		26	36	1.61			1.80	2.90
	40.0	5.0	0.4		22	35	1.40			2.00	2.80
	45.0	5.0	0.5		25	40	1.40			2.50	3.50
	50.0	5.0	0.55		26	36	1.61			2.75	4.43
o	55.0	5.0	0.5		25	33	1.69			2.50	4.23
	60.0	4.5	0.6		48	39	2.73			2.70	7.37
	64.0	4.5	0.6		39	40	2.17			2.70	5.86
	69.0	3.35	0.65		27	40	1.51			2.18	3.29
	71.9	3.50	0.4		9	44	.47			1.40	0.66
	76.0		0		0	0					
Σ=		60.15	.56 = X							37.2	68.6

Inside Top

Appendix 4

R2CROSS Model Run Results by BWC

Data Input & Proofing

STREAM NAME: San Miguel River
XS LOCATION:
XS NUMBER: 1
DATE: 10/8/08
OBSERVERS: Dave Mehan

1/4 SEC: NW
SECTION: 12
TWP: 47N
RANGE: 17W
PM: NM

COUNTY: Montrose
WATERSHED: San Miguel
DIVISION: 4
DOW CODE:
USGS MAP: Uravan
USFS MAP:

Level and Rod Survey

TAPE WT: 0.0106 lbs / ft
TENSION: 99999 lbs

SLOPE: 0.0088 ft / ft

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

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

Total Data Points = 25

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
1	5029.05	0.80	8.95	0.00	0.00	0.00	0.00	0.00
	5028.62	1.60	9.38	0.00	0.00	0.00	0.00	0.00
	5027.6	3.00	10.40	1.02	2.75	1.22	3.37	9.38
	5027.3	4.00	10.70	1.32	2.75	1.98	5.45	9.38
	5027.22	6.00	10.78	1.40	2.75	2.80	7.70	9.38
	5027.21	8.00	10.79	1.41	2.75	2.82	7.76	9.38
	5027.35	10.00	10.65	1.27	2.75	2.54	6.99	9.38
	5027.39	12.00	10.61	1.23	2.75	3.08	8.46	9.38
	5027.6	15.00	10.40	1.02	2.75	4.08	11.22	9.38
	5027.85	20.00	10.15	0.77	2.75	3.85	10.59	9.38
	5027.78	25.00	10.22	0.84	2.75	4.20	11.55	9.38
	5027.81	30.00	10.19	0.81	2.75	4.05	11.14	9.38
	5027.91	35.00	10.09	0.71	2.75	3.55	9.76	9.38
	5027.62	40.00	10.38	1.00	2.75	5.00	13.75	9.38
	5027.68	45.00	10.32	0.94	2.75	4.70	12.93	9.38
	5027.51	50.00	10.49	1.11	2.75	5.55	15.26	9.38
	5027.99	55.00	10.01	0.63	2.75	2.84	7.80	9.38
	5027.5	59.00	10.50	1.12	2.75	3.92	10.78	9.38
	5027.62	62.00	10.38	1.00	2.75	3.00	8.25	9.38
	5027.91	65.00	10.09	0.71	2.75	2.13	5.86	9.38
	5028.26	68.00	9.74	0.36	2.75	0.90	2.48	9.38
	5028.22	70.00	9.78	0.40	2.75	0.80	2.20	9.38
	5028.45	72.00	9.55	0.17	2.75	0.39	1.07	9.38
	5028.66	74.50	9.34	0.00	0.00	0.00	0.00	0.00
1	5029.05	76.70	8.95	0.00	0.00	0.00	0.00	0.00

STREAM NAME: San Miguel River
XS LOCATION: 0
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)
8.95	75.90	1.26	1.84	95.29	76.56	100.0%	1.24	334.38	3.51
8.98	75.68	1.23	1.81	93.06	76.33	99.7%	1.22	322.10	3.46
9.03	75.30	1.19	1.76	89.29	75.94	99.2%	1.18	301.65	3.38
9.08	74.93	1.14	1.71	85.53	75.55	98.7%	1.13	281.77	3.29
9.13	74.55	1.10	1.66	81.79	75.16	98.2%	1.09	262.46	3.21
9.18	74.18	1.05	1.61	78.07	74.77	97.7%	1.04	243.73	3.12
9.23	73.80	1.01	1.56	74.37	74.37	97.1%	1.00	225.57	3.03
9.28	73.43	0.96	1.51	70.69	73.98	96.6%	0.96	208.01	2.94
9.33	73.05	0.92	1.46	67.03	73.59	96.1%	0.91	191.03	2.85
9.38	72.43	0.88	1.41	63.39	72.95	95.3%	0.87	175.08	2.76
9.43	71.77	0.83	1.36	59.79	72.27	94.4%	0.83	159.80	2.67
9.48	71.10	0.79	1.31	56.22	71.59	93.5%	0.79	145.12	2.58
9.53	70.44	0.75	1.26	52.68	70.91	92.6%	0.74	131.05	2.49
9.58	69.87	0.70	1.21	49.17	70.32	91.8%	0.70	117.49	2.39
9.63	69.37	0.66	1.16	45.69	69.79	91.2%	0.65	104.47	2.29
9.68	68.86	0.61	1.11	42.23	69.27	90.5%	0.61	92.10	2.18
9.73	68.36	0.57	1.06	38.80	68.75	89.8%	0.56	80.38	2.07
9.78	65.51	0.54	1.01	35.44	65.88	86.0%	0.54	71.11	2.01
9.83	65.02	0.49	0.96	32.18	65.37	85.4%	0.49	60.85	1.89
9.88	64.52	0.45	0.91	28.94	64.85	84.7%	0.45	51.26	1.77
9.93	64.02	0.40	0.86	25.73	64.33	84.0%	0.40	42.36	1.65
9.98	63.53	0.35	0.81	22.54	63.82	83.3%	0.35	34.16	1.52
10.03	62.67	0.31	0.76	19.38	62.94	82.2%	0.31	26.80	1.38
10.08	61.24	0.27	0.71	16.28	61.49	80.3%	0.26	20.36	1.25
10.13	57.10	0.23	0.66	13.31	57.32	74.9%	0.23	15.25	1.15
10.18	49.54	0.21	0.61	10.61	49.73	65.0%	0.21	11.50	1.08
10.23	37.73	0.22	0.56	8.45	37.89	49.5%	0.22	9.43	1.12
10.28	34.35	0.19	0.51	6.65	34.49	45.0%	0.19	6.73	1.01
10.33	29.92	0.17	0.46	5.02	30.03	39.2%	0.17	4.62	0.92
10.38	20.85	0.18	0.41	3.75	20.93	27.3%	0.18	3.62	0.96
10.43	16.24	0.17	0.36	2.83	16.30	21.3%	0.17	2.66	0.94
10.48	11.71	0.18	0.31	2.13	11.76	15.4%	0.18	2.06	0.97
10.53	9.72	0.17	0.26	1.61	9.76	12.7%	0.17	1.47	0.91
10.58	8.84	0.13	0.21	1.15	8.87	11.6%	0.13	0.89	0.78
10.63	7.27	0.10	0.16	0.73	7.28	9.5%	0.10	0.48	0.66
10.68	5.65	0.07	0.11	0.42	5.66	7.4%	0.07	0.23	0.54
10.73	4.13	0.04	0.06	0.17	4.13	5.4%	0.04	0.06	0.36
10.78	2.28	0.01	0.01	0.01	2.28	3.0%	0.01	0.00	0.09

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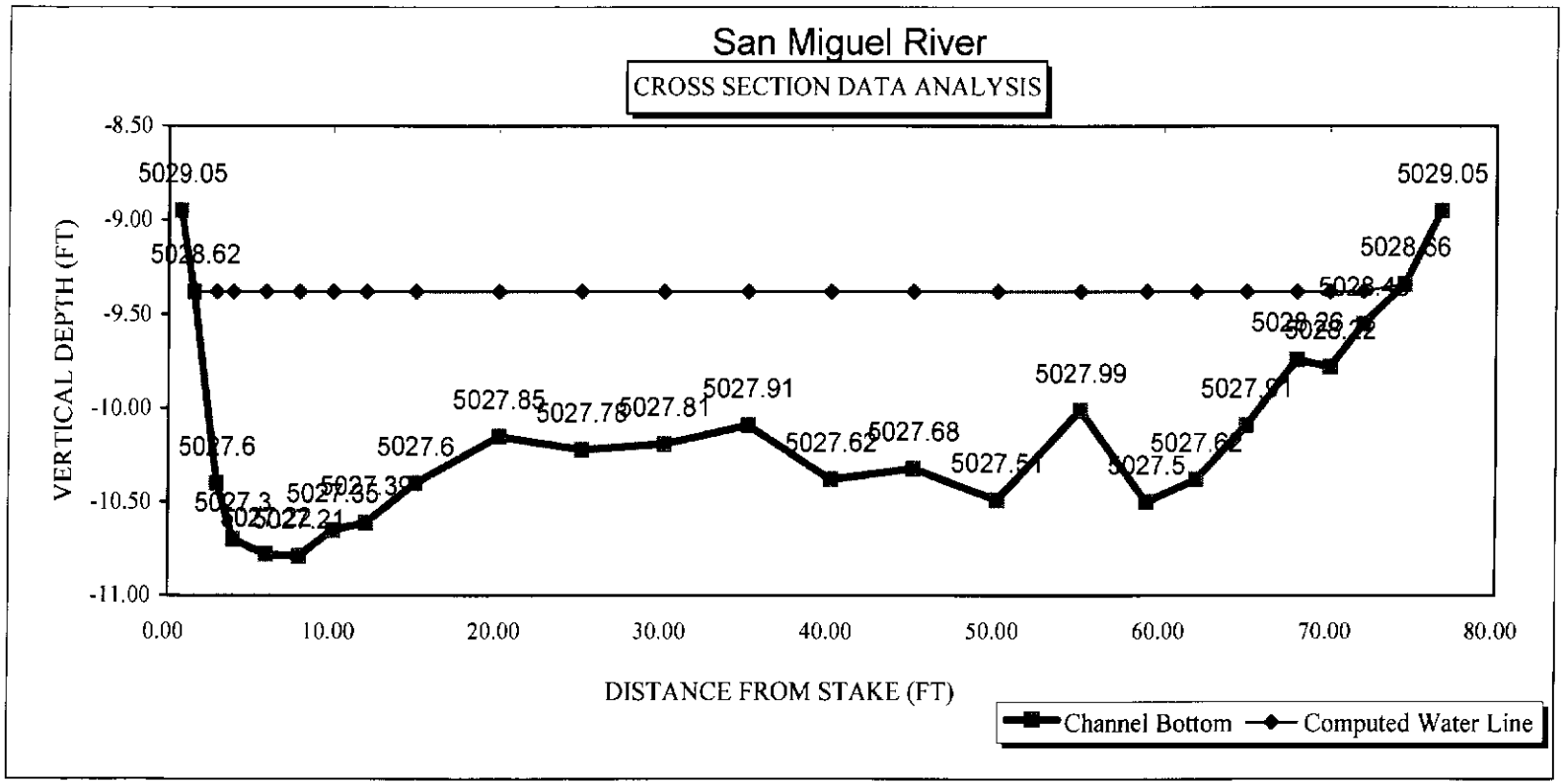

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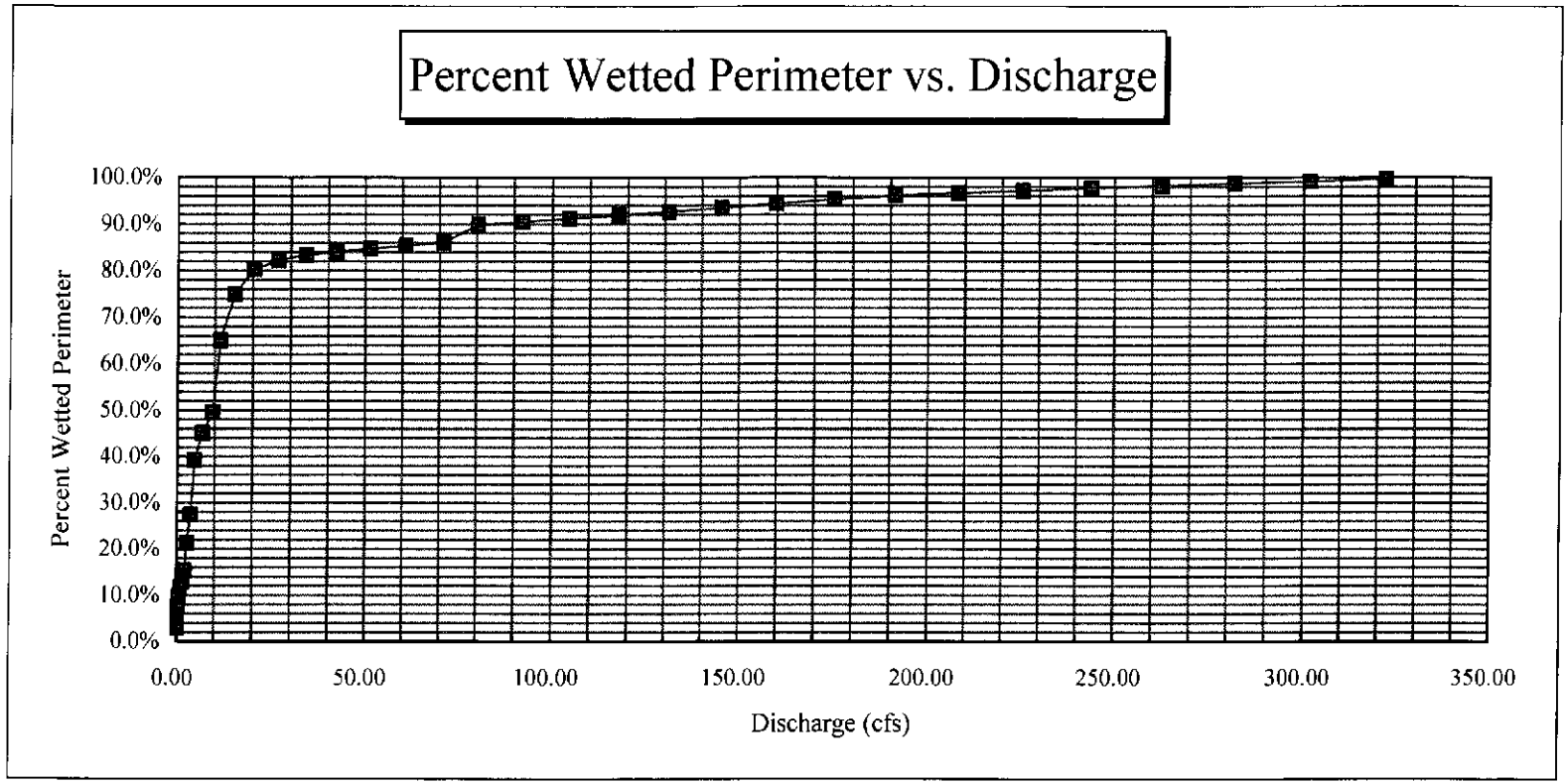
Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
Discharge (cfs)

Data Input & Proofing

STREAM NAME:	San Miguel River
XS LOCATION:	
XS NUMBER:	1
DATE:	3/17/09
OBSERVERS:	Dave Mehan
1/4 SEC:	NW
SECTION:	12
TWP:	47N
RANGE:	17W
PM:	NM
COUNTY:	Montrose
WATERSHED:	San Miguel
DIVISION:	4
DOW CODE:	
USGS MAP:	Uravan
USFS MAP:	
TAPE WT:	0.0106 lbs / ft (Level and Rod Survey)
TENSION:	99999 lbs
SLOPE:	0.007 ft / ft

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

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

Total Data Points = 27

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
		3.00	6.14			0.00	0.00	0.00
1		4.00	6.68			0.00	0.00	0.00
		4.70	8.49			0.00	0.00	0.00
		4.90	8.94			0.00	0.00	0.00
		5.50	9.44	0.50	0.24	0.40	0.10	8.94
		6.50	9.54	0.60	0.73	0.75	0.55	8.94
		8.00	9.64	0.70	2.00	1.93	3.85	8.94
		12.00	9.74	0.80	0.90	2.80	2.52	8.94
		15.00	9.74	0.80	2.74	2.80	7.67	8.94
		19.00	9.54	0.60	2.36	2.40	5.66	8.94
		23.00	9.44	0.50	2.77	2.00	5.54	8.94
		27.00	9.49	0.55	2.22	2.20	4.88	8.94
		31.00	9.29	0.35	1.96	1.40	2.74	8.94
		35.00	9.34	0.40	1.61	1.80	2.90	8.94
		40.00	9.34	0.40	1.40	2.00	2.80	8.94
		45.00	9.44	0.50	1.40	2.50	3.50	8.94
		50.00	9.49	0.55	1.61	2.75	4.43	8.94
		55.00	9.44	0.50	1.69	2.50	4.23	8.94
		60.00	9.54	0.60	2.73	2.70	7.37	8.94
		64.00	9.54	0.60	2.17	2.70	5.86	8.94
		69.00	9.59	0.65	1.51	2.57	3.88	8.94
		71.90	9.34	0.40	0.47	1.40	0.66	8.94
		76.00	8.94			0.00	0.00	0.00
		82.00	8.34			0.00	0.00	0.00
1		84.50	7.96			0.00	0.00	0.00
		86.10	6.93			0.00	0.00	0.00
		93.00	6.15			0.00	0.00	0.00

STREAM NAME: San Miguel River
XS LOCATION: 0
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)
7.96	80.00	1.40	1.78	112.03	80.95	100.0%	1.38	392.18	3.50
7.99	79.80	1.37	1.75	109.63	80.72	99.7%	1.36	379.00	3.46
8.04	79.45	1.33	1.70	105.65	80.34	99.2%	1.32	357.48	3.38
8.09	79.10	1.29	1.65	101.69	79.95	98.8%	1.27	336.49	3.31
8.14	78.75	1.24	1.60	97.74	79.56	98.3%	1.23	316.03	3.23
8.19	78.40	1.20	1.55	93.81	79.18	97.8%	1.18	296.10	3.16
8.24	78.05	1.15	1.50	89.90	78.79	97.3%	1.14	276.71	3.08
8.29	77.71	1.11	1.45	86.01	78.40	96.8%	1.10	257.87	3.00
8.34	77.36	1.06	1.40	82.13	78.02	96.4%	1.05	239.58	2.92
8.39	76.84	1.02	1.35	78.28	77.46	95.7%	1.01	222.19	2.84
8.44	76.32	0.98	1.30	74.45	76.91	95.0%	0.97	205.36	2.76
8.49	75.80	0.93	1.25	70.64	76.35	94.3%	0.93	189.08	2.68
8.54	75.28	0.89	1.20	66.87	75.79	93.6%	0.88	173.38	2.59
8.59	74.76	0.84	1.15	63.12	75.24	92.9%	0.84	158.25	2.51
8.64	74.23	0.80	1.10	59.39	74.68	92.2%	0.80	143.71	2.42
8.69	73.71	0.76	1.05	55.69	74.12	91.6%	0.75	129.75	2.33
8.74	73.19	0.71	1.00	52.02	73.56	90.9%	0.71	116.39	2.24
8.79	72.67	0.67	0.95	48.37	73.01	90.2%	0.66	103.64	2.14
8.84	72.14	0.62	0.90	44.75	72.45	89.5%	0.62	91.50	2.04
8.89	71.62	0.57	0.85	41.16	71.89	88.8%	0.57	80.00	1.94
8.94	71.10	0.53	0.80	37.59	71.34	88.1%	0.53	69.13	1.84
8.99	70.53	0.48	0.75	34.05	70.74	87.4%	0.48	58.95	1.73
9.04	69.95	0.44	0.70	30.54	70.15	86.7%	0.44	49.45	1.62
9.09	69.38	0.39	0.65	27.06	69.56	85.9%	0.39	40.64	1.50
9.14	68.81	0.34	0.60	23.60	68.96	85.2%	0.34	32.55	1.38
9.19	68.24	0.30	0.55	20.18	68.37	84.5%	0.30	25.21	1.25
9.24	67.66	0.25	0.50	16.78	67.78	83.7%	0.25	18.64	1.11
9.29	67.09	0.20	0.45	13.41	67.19	83.0%	0.20	12.91	0.96
9.34	56.52	0.18	0.40	10.19	56.59	69.9%	0.18	9.16	0.90
9.39	52.38	0.14	0.35	7.47	52.43	64.8%	0.14	5.74	0.77
9.44	48.24	0.10	0.30	4.96	48.27	59.6%	0.10	3.06	0.62
9.49	27.66	0.11	0.25	3.06	27.68	34.2%	0.11	1.98	0.65
9.54	18.08	0.10	0.20	1.81	18.09	22.3%	0.10	1.10	0.61
9.59	10.75	0.10	0.15	1.09	10.76	13.3%	0.10	0.67	0.61
9.64	9.00	0.07	0.10	0.60	9.00	11.1%	0.07	0.28	0.46
9.69	6.00	0.04	0.05	0.22	6.00	7.4%	0.04	0.07	0.32

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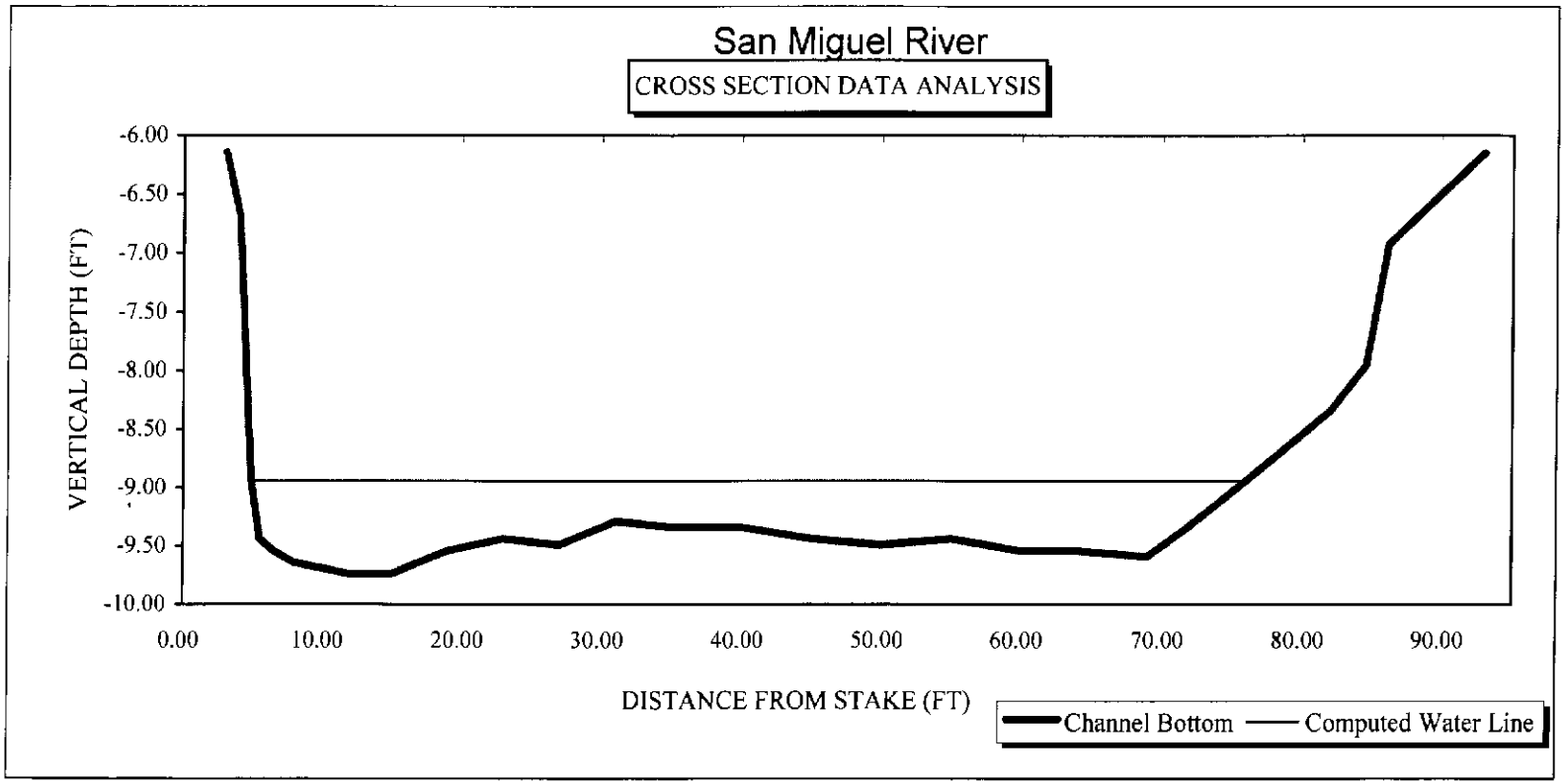

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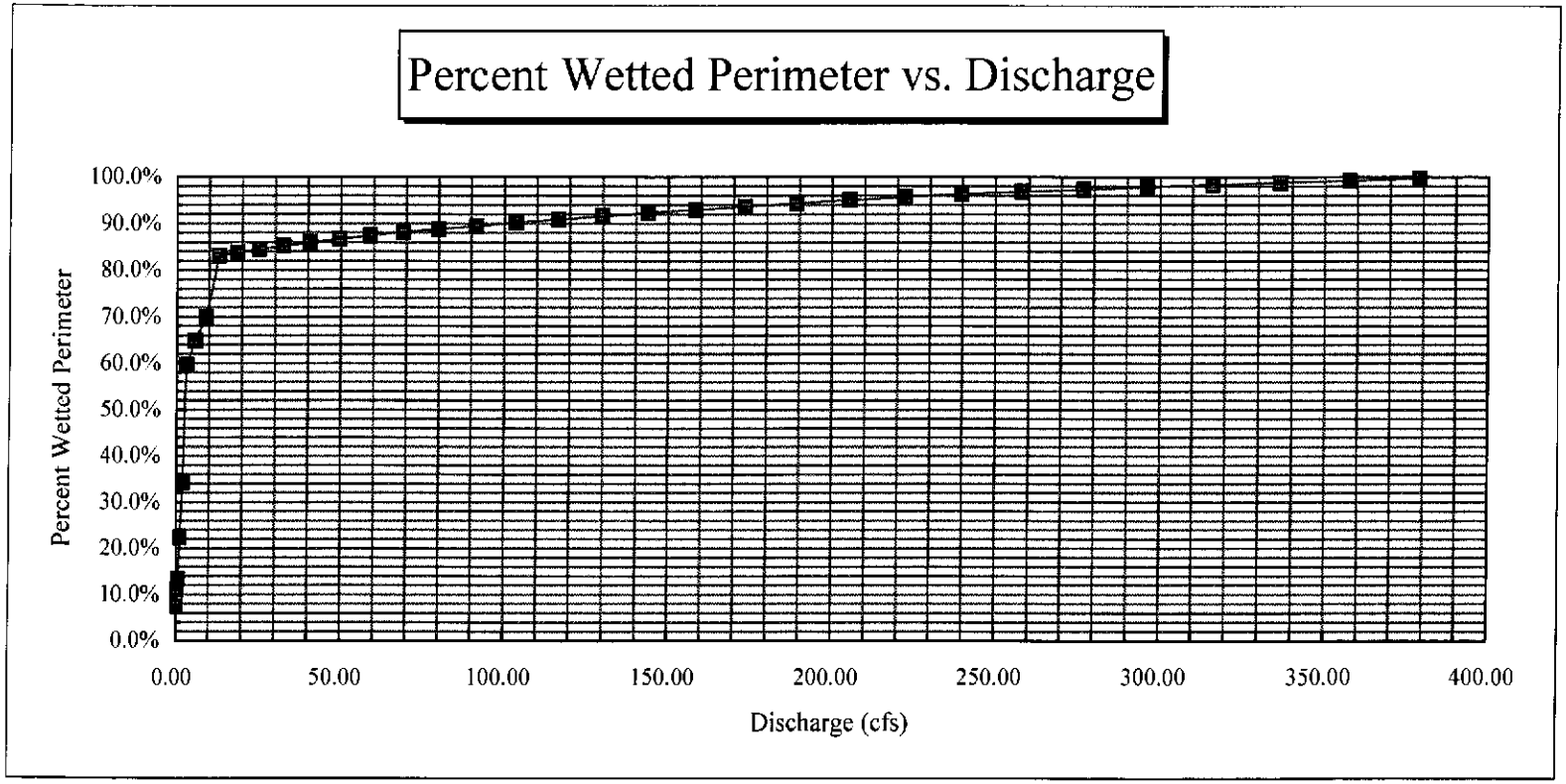
Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
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80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
Discharge (cfs)

www.BikisWater.com

STATE OF COLORADO

Bill Ritter, Jr., Governor
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE
AN EQUAL OPPORTUNITY EMPLOYER

Thomas E. Remington, Director
6060 Broadway
Denver, Colorado 80216
Telephone: (303) 297-1192
wildlife.state.co.us

For Wildlife-
For People

To: Linda Bassi, Colorado Water Conservation Board

From: Mark Uppendahl, Colorado Division of Wildlife
Roy Smith, Bureau of Land Management

Re: Technical Evaluation of Bikis Water Consultants LLC report regarding San Miguel River Instream Flow Recommendation

Date: April 5, 2010

The CDOW and BLM welcome the independent review by Bikis Water Consultants of the information provided by the CDOW and BLM to support our instream flow recommendation for the lower San Miguel River. We have reviewed the "Evaluation of Technical Basis for Lower San Miguel River CWCB Instream Flow Recommendations" report prepared by Bikis Water Consultants LLC (Bikis Report). Our detailed analysis is provided below. The primary conclusions of our review are as follows:

- The Bikis Report adopted inappropriate hydraulic criteria when using the R2CROSS model to determine the flows required to preserve the natural environment to a reasonable degree.
- The Bikis Report applied these inappropriate hydraulic criteria when evaluating the CDOW/BLM modeling work.
- The Bikis Report ignored the "modeling range of accuracy" limitations of the R2CROSS model when suggesting alternative flow recommendations.
- The Bikis Report appeared to utilize incorrect field techniques when gathering data for R2CROSS modeling runs.
- The Bikis Report flow recommendations protect substantially less habitat than the CDOW/BLM flow recommendations and do not preserve the natural environment to a reasonable degree.

1. Application of Instream Flow Methodologies

We believe that the Bikis report exhibits a general misunderstanding of the fundamentals of the instream flow methodologies (PHABSIM and R2CROSS) used by CDOW & BLM. The CDOW/BLM study modeled an 815 foot representative reach of stream incorporating different mesohabitat types, including pools, runs, glides and backwaters. CDOW/BLM analyzed multiple habitat types because all of these habitat types are critical for the targeted three species of concern, roundtail chub, bluehead sucker and flannelmouth sucker. The CDOW/BLM

study included a biological component, which consisted of habitat suitability curves for bluehead and flannelmouth sucker derived from extensive research relating to the habitat preferences of these species. These curves identify habitat attributes that are preferred by the species they are specifically developed for and generally relate to hydraulic characteristics such as velocity, cover and water depth. The BLM/CDOW study also included a hydraulic component, compromised of a series of one-dimensional cells linked together to incrementally model hydraulic parameters. Each cell represents hydraulic components found in that cell, such as velocity and depth. The habitat and hydraulic components were used in combination to measure the amount of suitable habitat available to these species over a range of flows. Habitat availability was measured by a standard index called Weighted Useable Area (WUA).

CDOW and BLM also incorporated the R2CROSS hydraulic model as a cross-check in the development of the flow recommendations. The R2CROSS model is single-transect model designed to examine only hydraulic characteristics found in riffles, which is only one of the habitat types used by the target species. The CDOW derived R2CROSS model hydraulic criteria for bluehead suckers from the habitat suitability curves. However, because the R2CROSS model analysis only identified habitat suitability for bluehead suckers in riffle environments, CDOW/BLM relied on their more detailed PHABSIM analysis which incorporated the habitat requirements of both bluehead and flannelmouth suckers for all habitat types including riffles, pools and runs to develop their instream flow recommendations. The Bikis Report relied solely upon the R2CROSS model. CDOW and BLM conclude that placing exclusive reliance on R2CROSS modeling in this situation is inappropriate because it does not consider habitat requirements for the flannelmouth sucker and it does not consider the other important habitats (pools and runs) used by these species. CDOW and BLM concluded that use of the R2CROSS model was beneficial in assisting in developing seasonal flow recommendations after incorporating their weighted usable area habitat and historical water availability analysis.

2. R2CROSS Hydraulic Criteria

The Bikis Report acknowledges that "specific hydraulic criteria for bluehead suckers were derived by Stewart, et al 2005, and these criteria for "marginally suitable" habitat are as follows: Average Depth = 1.0 Feet and Average Velocity = 1.3 feet/second" (page 3). However, the Bikis report, without justification, chose to use the following hydraulic criteria: Average Depth = 0.6 Feet and Average Velocity = 1.0 feet/second (page 2). This arbitrary reduction in hydraulic criteria reduces the Average Depth criteria by 40% and Average Velocity criteria by 23% from the CDOW-developed hydraulic criteria for bluehead suckers.

The CDOW and BLM hold that limiting the average depth criteria to 0.6 feet for these species and for this segment of the San Miguel River is an incorrect application of the R2CROSS Criteria developed for bluehead suckers. The CDOW and BLM take the position that if flow recommendations are based solely on the results of the R2CROSS model and do not incorporate other habitat suitability criteria than only the specie specific hydraulic criteria should be used in the analysis. However, CDOW and BLM accept that the average depth criteria standard of 1.0 foot could be modified, if other PHABSIM habitat criteria are considered, by the accepted R2CROSS practice of using the average depth calculated from 1% of the measured bankfull top width. For example, if the measured top width was 70 feet then the average depth criteria would equal 0.7 feet, if it was 80 feet then the average depth criteria would equal 0.8 feet.

As Figures 1 and 2 below show, 325 cfs maximizes the amount of useable habitat for flannelmouth sucker (WUA = 24,104 units or 36% of total area) and provides substantial useable habitat for bluehead sucker (WUA = 40,352 units or 60% of total area). Because the PHABSIM/RHABSIM data only quantified suitable versus unsuitable hydraulic habitat as a function of discharge, CDOW and BLM staff used the results of the R2CROSS Model to assist in developing the late summer/fall/winter instream flow recommendations of 170 cfs, 115 cfs and 80 cfs. Using the hydraulic criteria developed for bluehead suckers for the R2CROSS model at the Cross Section #1 representative riffle site: 170 cfs summer flow meets the 1.0 foot average depth criteria and exceeds the 1.3 ft/s velocity criteria (WUA = 24,750 units of 40% of total area); 115 cfs fall/winter flow meets the average depth criteria calculated from 1% of the measured bankfull top width (this method is routinely used for instream flow recommendations for trout) by providing on average 0.8 feet of depth and velocities over 1.3 ft/sec (WUA = 15,271 units or 26% of total area). The fall/winter flow recommendation was further reduced to 80 cfs, for the time period of September through February, due to water availability concerns. It should be noted however, that

80 cfs still maintains adequate velocity (approximately 2.5 ft/sec), a wetted perimeter of almost 60% and an average depth of nearly 0.7 feet (WUA = 8,924 units or 16% of total area).

Figure 1: Bluehead Sucker WUA vs Discharge

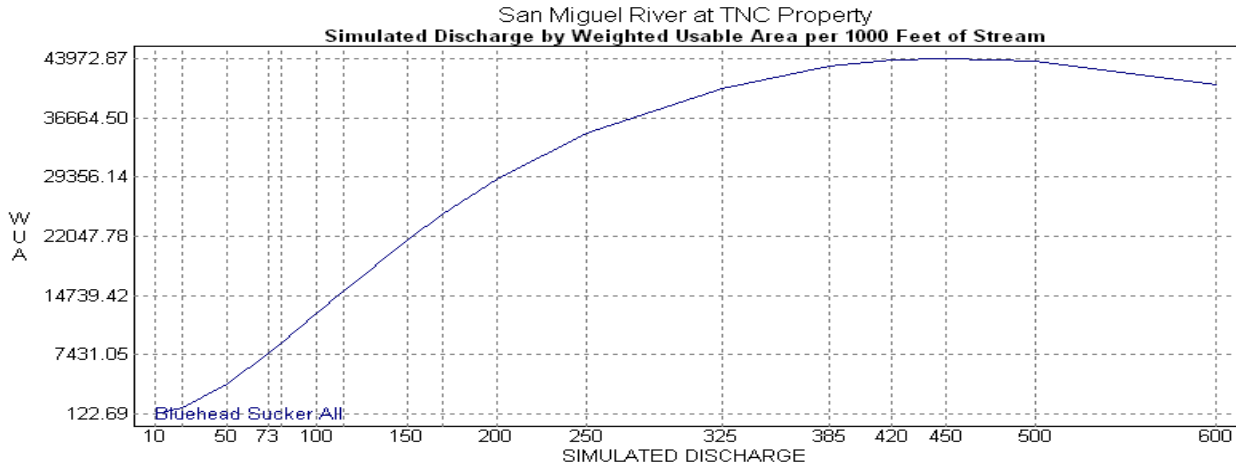
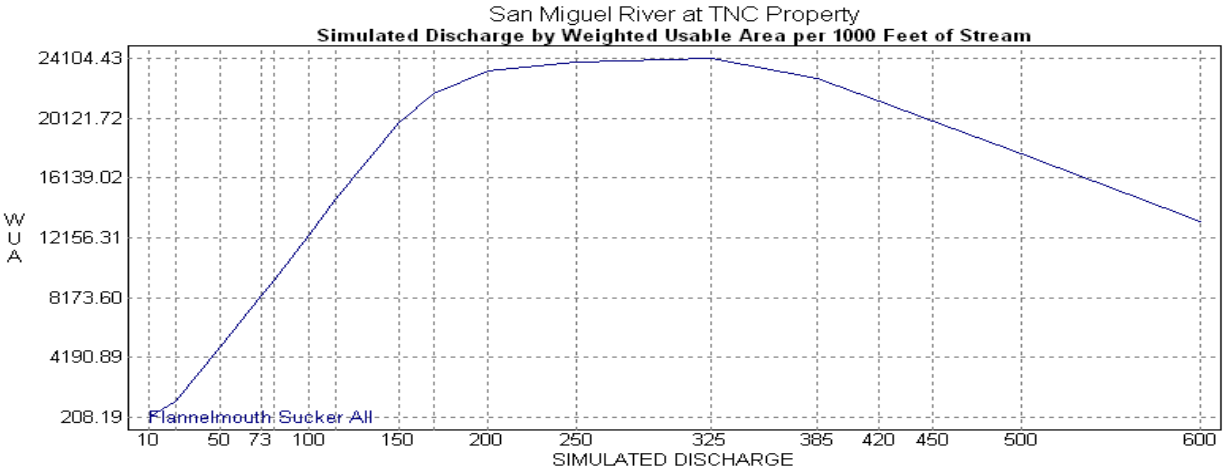


Figure 2: Flannelmouth Sucker WUA vs Discharge



3. Bikis Analysis of CDOW/BLM Flow Recommendations

The Bikis Report uses erroneous hydraulic criteria to evaluate the CDOW and BLM modeling analysis. The Bikis report states that "the results for [cross] section 1 [collected] by CDOW/BLM show that two of three criteria are provided at a flow of 73 cfs, where the average depth is 0.6 feet and the average velocity is greater than 2.5 [ft/sec]". As was pointed out earlier, if the R2CROSS model is used alone, the recommended application of the average depth criteria is 1.0 foot to provide marginally suitable habitat or at the very least calculating the average depth criteria using the 1% of the measured bankfull top width method should be used. The Bikis Report provides no justification for why the hydraulic criteria developed specifically for bluehead suckers was reduced to 0.6 feet.

The Bikis Report erroneously applies R2CROSS hydraulic criteria to habitat types outside of the capabilities of the R2CROSS model. Specifically, the Bikis Report, on page six, incorrectly applies data collected by CDOW & BLM to justify their conclusions that lower flow amounts would satisfy the needs of the natural environment. The Bikis Report states the "R2CROSS results for other sections by CDOW/BLM show considerable variability in the amount of flow which meets the hydraulic criteria". However, the Bikis report does not acknowledge that

some of the cross section data collected by CDOW and BLM were collected in different mesohabitat types (i.e. pools, runs, glides) rather than in a standard reference riffle as used in an R2CROSS Analysis. In addition, some of CDOW/BLM cross-sections were located on stream meanders. One would expect the hydraulic characteristics of a critical representative riffle to vary considerably from the hydraulic characteristics of a pool, run, glide or backwater. This variation of hydraulic characteristics is the reason why different species prefer different mesohabitat types and further justifies the use of a model that is capable of modeling such variable habitat. The CDOW /BLM chose the PHABSIM model for the San Migule River for that reason. Using hydraulic criteria designed for use in riffle habitat in pool, run or glide habitat is an incorrect application of the R2CROSS Methodology.

The Bikis Report also ignores the predicted accuracy range of the R2CROSS model when concluding that the CDOW/BLM modeling effort "indicates a high level of uncertainty in the quantity of flow necessary to protect the natural environment." In arriving at this conclusion, the Bikis Report compares the 2 of 3 criteria winter flow recommendations from cross section 7 with the 3 of 3 criteria summer flow recommendation from cross section 4. The CDOW/BLM study measured flows at 100 cfs, 175 cfs, 325 cfs and 450 cfs. The expected accuracy range of modeled streamflows would be 40 cfs (40% of 100 cfs) to 1,125 cfs (250% of 450 cfs). This accuracy range is standard for models using the Manning's "n" coefficient to predict streambed roughness. Instream flow recommendations based on instream flow criteria which are met outside of the 40 cfs to 1,125 cfs range are suspect because of the ability of the model to accurately predict velocity and discharge without an accurate estimate of streambed roughness at lower stages.

For example, the Bikis Report references a flow of 28 cfs without stating this flow would fall outside the accuracy range of the hydraulic model used. The Bikis Report also states the flow of 28 cfs at cross-section 7 satisfies 2 of 3 R2CROSS hydraulic criteria. CDOW/BLM review of this cross-section did not support this conclusion. Based on staging table data for cross-section 7 and assuming the modeled hydraulic characteristics are accurate, a flow of 28 cfs results in an average depth of 1.2 feet, an average velocity of 0.72 ft/sec, and a percent wetted perimeter of 45%. Only one of these values (average depth) meets the standard hydraulic criteria. In addition, this cross-section is not valid for use with the R2CROSS Methodology because it was not considered a representative critical riffle.

The Bikis Report also claims a flow of 431 cfs is required to meet 3 of 3 R2CROSS hydraulic criteria at cross-section 4. After further review, the CDOW/BLM calculations did not agree with those in the Bikis Report . It is important to recognize that cross-section 4 was located in a run on a meander bend (a high percentage of the flow is located on one side of the cross-section) and thus should not be used with the R2CROSS Methodology designed for a critical hydraulic control feature. Even if this inappropriate application of R2CROSS on a meander bend is acknowledged, the Bikis report conclusions are still inaccurate. All 3 R2CROSS hydraulic criteria would be met at 605 cfs, not 431 cfs, as stated in the report.

4. Field Work Conducted for Bikis Report

The Bikis Report bases its instream flow recommendation on R2CROSS Model estimates of the hydraulic characteristics at one cross-section location surveyed on two occasions (October 8, 2008 and March 17, 2009). CDOW and BLM conclude that the field data collection techniques may have been erroneously applied in this location.

The graphs of the channel cross-sections performed by Bikis, as shown in Appendix 2, indicate the total bankfull top width measurement was in error. The left top of bank grassline elevation (ordinary high watermark) of each surveyed cross-section was omitted from their surveys. The graphs clearly, and it is assumed correctly, identify the "ordinary high water mark" or bankfull condition on the right bank of each graph, but fail to identify the same on the left bank of each graph. The distance between these two "ordinary high water marks" is the bankfull top-width that is used in the R2Cross Methodolgy to calculate % Wetted Perimeter and Average Depth (if the 1% of bankfull method is used).

This error in data collection leads to errors in the calculations used to determine the flow required to meet the three key hydraulic criteria identified in the R2CROSS Methodology, (percent wetted perimeter, average velocity and average depth). An error of this sort would affect R2CROSS hydraulic criteria estimates by underestimating

bankfull width. Underestimation of bankfull width would lead to errors in determining the flow required to meet the 70 percent wetted perimeter criteria and the average depth criteria, if based on 1% of measured bankfull width method.

An error in identifying bankfull width would also produce errors in correlating modeling results with actual flow rates found in the San Miguel River. The staging tables in Appendix 2 of the Bikis Report indicate a range of modeled maximum of bank full flows from 334 cfs to 392 cfs. Bankfull flows calculated by the model should generally reflect average annual peak flows, as indicated by stream gage data. In contrast, the water availability graphs of the Bikis Report show flows regularly exceeding 500 cfs at Uravan in the driest years of record. In addition, data from the San Miguel River at Uravan Gage for the month of May reveals median flow to be approximately 943 cfs and average flow to be 1,142 cfs. CDOW and BLM conclude that erroneous field measurements by Bikis did not correctly identify the bankfull channel.

It should also be noted that the Bikis Report did not provide the hydraulic data from the four additional cross-section graphs mentioned in the report. It would be useful to examine these data and their analysis, especially cross-section #3, to ascertain the consistency of data collection and analysis.

5. Summary

The Bikis Report recommends flows of 88 cfs and 11 cfs to satisfy the instream flow needs of the San Miguel River. The basis for this flow recommendation is data collected at one cross-section at two different flow rates. The CDOW used their PHABSIM model to calculate the amount of useable area provided by the Bikis Report flow recommendations. This analysis shows 88 cfs provides a WUA of approximately 10,367 units (18% of total area) and 11 cfs provides a WUA of only 155 units (0.5% of total area). The CDOW/BLM flow recommendations provide a WUA of 40,352 units at 325 cfs (60% of total area), WUA of 24,750 units at 170 cfs (40% of total area), WUA of 15,371 units at 115 cfs (26% of total area) and WUA of 8,924 units at 80 cfs (16% of total area). The Bikis Report's flow recommendation of 88 cfs only protects 26% of the habitat that is protected by the CDOW/BLM flow recommendation of 325 cfs and their 11 cfs recommendation protects less than 2% of the habitat protected by the CDOW/BLM flow recommendation of 80 cfs. It is our opinion that Bikis Report flow recommendations would not protect a sufficient amount of habitat to maintain naturally reproducing populations of bluehead and flannelmouth sucker or roundtail chub.