

## San Juan River Basin Hydrology Model Operation and Maintenance

Susan Behery  
Bureau of Reclamation  
185 Suttle St. Suite 2  
Durango, CO 81303  
Phone 970-385-6560  
sbehery@usbr.gov

**Relationship to SJRIP:** Supports Program goals and management by developing, operating and maintaining a hydrology model of the San Juan Basin. The model is key to hydrological analysis of water development scenarios or other scenarios in relation to the flow recommendations.

### **Background:**

The San Juan Basin Hydrology Model (SJBHM) is a hydrologic model of the San Juan River Basin. The SJBHM consists of a series of models including evapotranspiration models, a natural flow model in StateMod, and a simulation model in Riverware. Revisions and modifications to the models and supporting data have occurred through a multi-year model development and validation phase. The FY2022 scope of work includes updates to data as available, annual operation and maintenance of the model and data management. FY2022 activities will also include continued streamlining of model processes as new Riverware updates and methods allow. The Bureau of Reclamation has the primary responsibility for model development and O&M. Reclamation continues to use Precision Water Resources Engineering to do the bulk of the modeling work, as their skillsets as specialists in Riverware make more efficient use of available resources.

The model is available to generate and analyze runs associated with Section 7 Consultations and/or special requests from the Biology or Coordination Committees related to the flow recommendations or other hydrological aspects of the Program.

### **Objective:**

The objective for this work is to ensure that the San Juan Basin Hydrology Model is available for run requests. This will be accomplished by adjusting model configurations or operating rules to incorporate new data and/or scenarios when requested, and evolving the data set forward through time. The FY2022 request also includes funds to continue coordination and interaction with the Program participants and their technical designees.

### **Deliverables:**

An annual hydrology meeting detailing the accomplishments of the model development, data development and model runs will be held for program participants. A report of the meeting will be provided to the coordination committee. In addition, data, documentation and reports from model runs will be provided throughout the model run process. The modified model(s) and supporting data and scripts will also be delivered / made available via Dropbox from PWRE.

### **Task Descriptions:**

**Task 1: Model Modifications** Implement and document any requested changes to the model from the SJRIP. This may include modifications for analysis of operational optimization scenarios, further requested climate change scenarios, inclusion of the Utah tribal water rights settlement, and improvement of Animas-La Plata operations as described below:

*Utah Settlement:* The recent Utah settlement affords 81.5 kaf to the Navajo Nation in Utah from the San Juan River. The model will be used to analyze the potential impacts of this future water use.

*ALP Operational Revision:* Currently, ALP demands are simulated identically every year with an average annual depletion of 57,100 AF. This does not do a great job of representing reality, as actual ALP operations and realized net depletions to the river system will depend on the year's hydrology. Conceptually, wetter years should see higher net depletions as ALP will store more than it releases. Conversely, drier years should see lower net depletions, as ALP will release more than it stores. Incorporating a more realistic operation at ALP will still result in a long-term average annual depletion of 57,100 AF. The representation of M&I users may also require revision or enhancement in this ALP improvement, as ALP is a significant supplementary source to M&I. All ALP water is allocated for M&I use. The assumptions used for this modeling will be developed during a technical meeting with SJRIP participants at the project start.

*Optimization modeling additional runs:* Optimization modeling was conducted in FY 2021 without Navajo Gallup Depletion Guarantee (NGDG), as recommended by the Coordination Committee. Modeling can be repeated with the inclusion of the NGDG as requested by the SJRIP at a smaller level of effort as the modeling framework has already been set up in FY 2021.

**Task 2: Model Maintenance** Includes maintenance of the actual model as well as the supporting data and software. Maintain data to evolve the data set forward through time. This includes an annual update (when available) of USGS data, Reclamation data, New Mexico non-irrigation data, New Mexico irrigation data, Arizona and Utah depletions, Colorado depletions, climate data, and natural flow data. Data must be obtained from various sources and processed for compatibility with the multiple data loaders. Load updated data into the model, run and test the new data. Adjust model configuration, methodologies, or assumptions, as needed. New Riverware updates and versions include streamlined methods that will be adopted when appropriate. Update and expand documentation to reflect current state of model. Update and maintain data management interfaces and other software associated with the data and models. Apply all Riverware updates and patches as they become available. Provide technology transference to Fish and Wildlife Service staff in the details of maintaining the data and models. Technology transfer will continue as model, data and software updates take place to ensure that several people are trained in the maintenance of the model.

**Task 3: Model Runs and Analyses** Generate and analyze requested model runs associated with the implementation of a revised hydrologic baseline, revised flow recommendation scenarios, Section 7 consultations or special requests from the Biology and/or Coordination Committees and/or special work groups. A consultation or scenario run usually requires model reconfiguration and the implementation of operating criteria.

**Task 4: Coordination** Attend or provide reports for Coordination Committee meetings, as needed, to update the committee on the model status and model results. Conduct any necessary Hydrologic Baseline Workgroup meetings to provide model status updates, present results, and work on developing the revised hydrologic baseline. Conduct an annual hydrology meeting of Program participants to review and solicit input on accomplishments and activities relating to the model for the previous year, status of the model, and proposed activities for the coming year; and provide a report on the meeting to the Coordination Committee for their review and approval. Develop the FY2023 budget and track FY2022 expenditures.

**Budget Summary FY 2022**

Model Modifications	\$33,080
Model Maintenance	\$16,200
Model Runs	\$12,960
Program Management	\$10,720
<b>Grand Total</b>	<b>\$72,960</b>
<b>FY-2023</b>	<b>\$75,150</b> †
<b>FY-2024</b>	<b>\$77,400</b> †
<b>FY-2025</b>	<b>\$79,700</b> †

Task 1 Model Development		\$135	salary total per hour	
	Task	days	hours	Total
A) Labor	1 Model changes and updates	19	152	\$20,520
	2 Tech Transfer	5	40	\$5,400
B) Travel	1 Meetings with SJRIP	2	16	\$2,160
C) Other	1 Riverware Technical Support	na	na	\$5,000
				\$33,080
Task 2 Model Maintenance				
A) Labor	1 Data updates as available	7	56	\$7,560
	2 Software Updates	3	24	\$3,240
	3 Methodology updates as needed	5	40	\$5,400
				\$16,200
Task 3 Model Runs				
A) Labor	1 Model Runs and Analyses as requested	12	96	\$12,960
				\$12,960
Task 4 Program Coordination				
A) Labor	1 Meetings and Coordination	8	64	\$8,640
	2 Budget	1	8	\$1,080
B) Travel	1 Meetings with SJRIP	2	16	\$1,000
				\$10,720
<b>TOTAL</b>				<b>\$72,960</b>