

Draft Committee Responses to Upstream Salinity TMDL Questions:

1. Do any other models include the combination of land use and water quality features included in WARMF for the SJR watershed?
2. Do any models besides CalSim II represent California's water system accurately enough to be considered for use in this project?
3. Are 1-D flow models sufficient to represent the San Joaquin River system for the purposes of this project?

Chair Quinn requested further information on the model uses. The following is provided by Jay Simi (staff lead on the project) in response to Nigel's request:

Regional Board staff are seeking feedback from the Technical Action Committee on the selection of appropriate models for the achievability analysis to be conducted as part of the BPA project to establish salinity water quality objectives on the lower San Joaquin River above Vernalis. Modeling will be completed to evaluate the reasonableness of any proposed objective(s) and its impact on water supply. Regional Board staff envision a tiered modeling process with a 'system-level' model simulating reservoir operations and water supply with output being fed to a watershed level model to simulate water quality conditions at potential compliance locations on the lower San Joaquin River. Staff feel this tiered structure will allow for effective simulation of a full range of hydrology in the basin while also offering insight into the water quality impacts of proposed objectives at specific locations.

Potential Draft Responses below are included below only to be a straw response to begin discussions.

Redline edits by Dr. Thomas Harter

1. Do any other models include the combination of land use and water quality features included in WARMF for the SJR watershed?

Other surface water quality models have been mentioned in the discussions in CV-SALTS. USGS [is completing a Central Valley Hydrologic Model \(Claudia Fawn and Randy Hanson at the USGS, San Diego\)](#) and ~~Dr. Thomas Harter have discussed the SWAT model that~~. [The model is based on detailed groundwater representation using MODFLOW and surface water representation using the ~~uses a~~ MODFLOW FARM package model for water and watershed features. The USGS model is a flow model and does not include water quality at this point. Dr. Thomas Harter has mentioned that a colleague of his, Dr. Minghua Zhang, UC Davis, has used the USDA Soil and Water Assessment Tool \(SWAT\) and developed San Joaquin River SWAT model as well as a Sacramento River SWAT model to estimate pesticide loading and temporal water quality dynamics in the watershed \(Y. Luo, X. Zhang, X. Liu, D. Ficklin and M. Zhang, 2008. Dynamic modeling of organophosphate pesticide load in surface water in the northern San Joaquin Valley watershed of California, Environ. Pollut. 156, pp. 1171–1181\), to evaluate the impact of best management practices for pesticide use, and to model impacts of climate change on water quality. The San Joaquin SWAT model was calibrated using stream flow and nitrogen data. While Dr. Harter is not familiar with the modeling tool, he mentioned that it appeared conceptually similar to the WARMF model. Details can](#)

be found at <http://www.brc.tamus.edu/swat/>. The SWAT model has been extensively used and documented in the scientific literature (a search of Web of Science yielded several hundred articles related to “SWAT and WATER”). Dr. Minghua Zhang can be contacted at mhzhang@ucdavis.edu. CV-SALTS Technical Committee has recently selected WARMF for work in the Salt and Nitrate Source Work Plan and Pilot Study. It appears to have significant advantages (RELATIVE TO WHAT?), especially in the amount of data loaded and the background. In areas where surface water is not dominant it may not be the model of choice. WARMF has only sparse presence in the scientific literature (4 citations for “WARMF” in the scientific database Web of Science).

A detailed land use simulator is available for various IWFMs applications in the San Joaquin Basin. Three models C2VSIM (Dr. Dogrul, DWR), WESTSIM (Dr Quinn, LBNL) and MERCEDSIM (Dr Quinn, LBNL) use the land use simulator – which develops land-use based estimates of surface water hydrology including precipitation, ET, aquifer recharge and return flow for a 30 year time period. C2VSIM is a regional surface-groundwater model application to the entire Central Valley. WESTSIM simulates the surface and groundwater hydrology of the west-side of the San Joaquin Valley. MERCEDSIM simulates the hydrology of east and west-side Merced County. These models currently do not include a water quality component, but would provide a significant component towards building a water quality model.

2. Do any models besides CalSim II represent California’s water system accurately enough to be considered for use in this project?

CalSim II and the updates in CalSim III appear to be primary analysis tool for the Delta and Central Valley for Surface Water. Groundwater and rising groundwater into the river will be a significant issue and may need the use of modeling work done by Charlie Kratzer (USGS). More information on how the flow models would be used for water quality and forecasting would be needed to determine adequacy for use in the project. The committee may be able to provide additional recommendations based on the specific needs indicated.

CalSim II and CalSim III are primarily water allocation models. Their level of aggregation in the San Joaquin Basin may be too coarse for accurate simulation of the water system. However these models contain logic that takes account of the many constraints that dictate the allocation of water in the Basin and reservoir operating rules that govern water release from dams along each of the major tributaries.

3. Are 1-D flow models sufficient to represent the San Joaquin River system for the purposes of this project?

Depending on the actual detail and reliability needed for the project a 1 D tool could be used. 2 D models may be required depending on the dynamics of the river system and the locations determined for monitoring. The committee may be able to provide additional recommendations based on the specific needs indicated.

Also received are Responses by Dennis Westcot shown below:

1. Do any other models include the combination of land use and water quality features included in WARMF for the SJR watershed?

We need to keep straight what we are applying to model to and why? In the case of the WARMTM Model, the focus of data development is on the land use features that are included in the model. These have little influence on present day San Joaquin River salinity. For the development of Upstream Salinity Objectives, model development and use should focus on surface water discharges, groundwater accretions into the river and not on localized groundwater under different cropping or land use practices.

The WARMTM Model is data intensive and includes rainfall, cropping patterns, irrigation practices, fertilization, waste-water reuse and industrial-like activities such as confined animal production and food processing. These however may not be the controlling factors in meeting surface water quality objectives for salinity in surface water of the San Joaquin River. In the San Joaquin River Basin, the controlling factor for salinity management in surface water is the concentration and timing of discharges, of both good and poor quality water, as well as groundwater accretions to the river. Land use and other factors may influence groundwater in certain areas and need to be considered in developing a groundwater strategy but they are not that important for developing a surface water management program. A direct present day connection between land use practices and groundwater adjacent to the river is almost non-existent in the San Joaquin River Basin.

This said, groundwater is a strong influence on the quality of the river in certain reaches but the quality of the groundwater that is having this influence was established decades ago and present land use and waste disposal practices have little influence on groundwater quality in the vicinity of the river and on present water quality in the river. You need to move back from a data intensive model such as WARMTM and move to a hydrologic model such as CalSim II.

2. Do any models besides CalSim II represent California's water system accurately enough to be considered for use in this project?

CalSim II and the updates in CalSim III appear to be primary analysis tool for the Delta and Central Valley for surface water although we must recognize that CalSim III may not be

available in the near future so reliance may need to be centered on CalSim II. Groundwater and rising groundwater into the river will be a significant issue in the San Joaquin River Basin but it appears that the CalSim II Model can give CV-SALTS an overview of how important a factor it will be in the final analysis. If significant we may need the use of modeling work done by UC Davis or USGS to refine this part of the analysis. The use of CalSim II will also allow the CV-Salts program to coordinate with the SWRCB efforts on South Delta salinity standards which is also using CalSim II modeling.

3. Are 1-D flow models sufficient to represent the San Joaquin River system for the purposes of this project?

Based on taking a initial look at salinity management in surface water of the Lower San Joaquin River Basin, a 1 D tool could be used. The initial modeling effort should be on an input and output models to define the relative importance of each of the salt inputs to the River. The focus should not be on developing a complex model involving chemical changes as salt can be considered initially as conservative. The main emphasis at first should be on developing a model that can give us the relative importance of each of the variables that control river flow and quality. The Salt and Boron TMDL gave us the relative importance of the river inputs and we should be prepared to model these under different scenarios to see how well the river responds to management and the need for additional monitoring. The committee may be able to provide additional recommendations based on the specific sensitivity of the various inputs.

June 12th 2009 Modeling Conference Call

Attendees, Holm, Simi and Cozad

Lisa Comments

Some simple analysis would be a good place to start, for example, cap the Limits at the Vernalis and look at the effects and impacts. Use of WARMF with Cal SIM would give the detail needed in the watershed and Cal SIM would bring the broader water supply and delta dynamics.

Groundwater will become critically important especially locations where saline waters rise into the river.

Jay

While Vernalis TMDL may change with the State Board actions it the analysis would be helpful. Regional Working with Charlie Kratzer, with USGS on locations for Salinity to river additional work will be completed soon. They are also aware of a contract from ACWA and Systec and coordinate a framework for integrating CalSIM and WARMF in the Sacramento River Area, possibly this could be adapted for the San Joaquin and the other CV-SALTS areas with surface water.

Jay asked for any other information that would help the committee and Daniel and Lisa responded that not everyone understood how staff would be using the model. What part of the effort and in what manner the model data and assumptions would be utilized would help the committee focus their feedback.