Hilmar SEP
Third Quarterly Report to the Central Valley Regional Water Quality Control Board

Yoram Rubin
David Sunding
Study Directors

Introduction

This report was prepared consistent with the SEP communications plan to keep the CVRWQCB staff, Hilmar, the peer review panel and the stakeholders panel apprised of status of the SEP. Progress remains in line with the project timeline. Tasks 4, 5, 6 and 7 are underway. Please refer to our website http://hilmarsep.com to review the presentations made to stakeholders in Modesto on January 29, 2007 describing our progress. Finally, please note that Hugo Loaiciga of the University of California, Santa Barbara has replaced Keith Loague on the Peer Review Panel.

Working with Gary Carlton and others, we are also developing a plan for improved stakeholder input to the SEP. Our plan is to hold a series of four focused presentations, each dealing with a particular aspect of the overall study. The topics of these presentations are as follows:

- Characterization of wastewater streams
- Modeling of land application and the vadose zone
- Subsurface modeling
- Strategies for source control in the four representative industries (cheese, wineries, meatpacking and tomato processing).

These seminars will be held in Modesto and will be completed by the middle of May. We will make material available to stakeholders prior to each meeting and solicit feedback on our modeling approaches and data.

Task Status

Tasks 1-3

These tasks are complete.

Task 4 Characterize Wastewater Discharges from the Food Processing Industry

Task 4A:

We continue to collect and compile the literature available on the major sources and disposition of salt in the Central valley. The data collected from the literature covers

approximately the last 20 years. The figure below summarizes the items covered in our study.

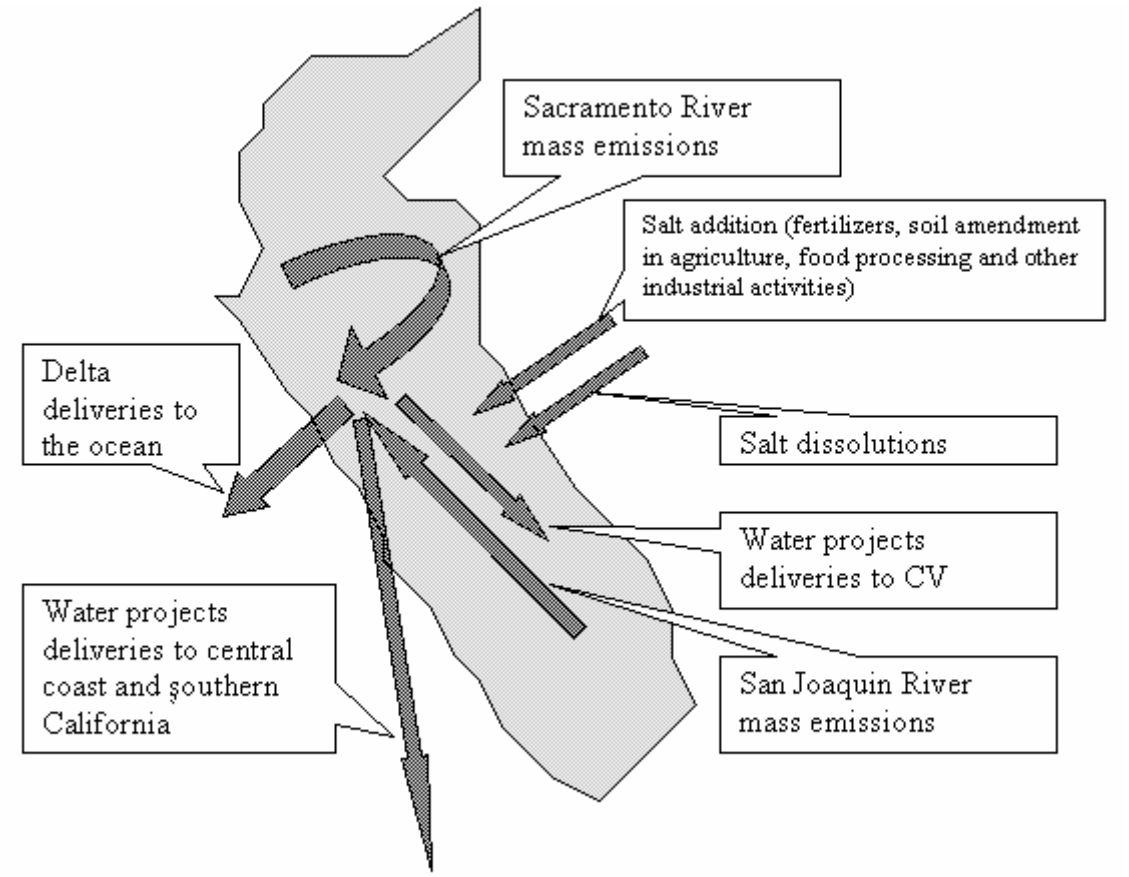


Figure 1: A schematic of external salinity sources for Central Valley.

Task 4B:

We continued to collect and compiled data on wastewater from food processors reporting to the CVWQB produced by food processing industry in the Central Valley. During the last quarter we sent our team twice to the CVWQB in Fresno to collect data on food processors. By now we have digitized, stored electronically, and analyzed data from most of the food processors in the Central Valley (Except the Sacramento Area), close to 200. The data collected covers 3 years from 2003 to 2005. The master list of processors reviewed by our team was compared with CVWQB lists for completeness and accuracy.

Task 4C

We continued to collect data on the items requested in 4C.

Task 4D

This task is completed. We have an extensive GIS database describing plant locations, well locations, and current and projected land use. Examples of this information can be found on the website.

Task 4E

We identified 4 industries as targets for detailed analysis, based on economic factors and environmental impacts, including tomato canners, wineries, meat processing and cheese manufacturing. We continued to update the profiles (concentrations, flow volumes, water quality parameters) of the first three industries based on the reports collected in Task 4B. Data for cheese manufacturing is limited, and our analysis here is based primarily on literature. We developed a series of discharge profiles, or discharge scenarios, that we will use for numerical analysis of environmental impacts. These scenarios represent best and worst case scenarios, or rather, good and bad scenarios in terms of potential environmental impacts.

Task 4F

We continued to focus on the area shown in the figure below (the black rectangle). In this Quarter we continued to study this area from different perspectives. This includes salinity mass balance, groundwater quality, hydrology, geology and hydrogeology of the entire region.

For a specific RA, we continue to study the Modesto Area, and we have developed a data base of soil properties for this area. We continued to develop and test a numerical model for the vadose zone underlying a typical land discharge site at the Modesto RA. Our numerical model is based on MIN3P (Mayer et al., 2002). We analyzed using this numerical model various discharge scenarios for the tomato processing industry and for the winemaking industry. Our numerical model allows us to calculate concentration profiles and fluxes of water, CH_2O, NH_4, NO_3, O_2, as well as various ions, total salinity and electrical conductivity. In the next quarter we expect to develop 2 additional RAs. We presented this model at the stakeholders' mtg on January 29, 2007. Following suggestions made at the meeting, we improved the root uptake component of the model such that we can model it as time dependent. In the coming quarter we plan to look at additional RAs and additional industries and scenarios. We also plan to compare our models with field data.

Task 5 Identify and Quantify Impairments to Beneficial Uses

Task 5.1A

In this quarter we started to develop a regional groundwater model for the Lower San Joaquin River (LSJR) area (the area within the black rectangle shown in Figure 2). The numerical groundwater flow model we employ is the USGS code MODFLOW, and for

development we use the GMS 6.0 interface: http://www.ems-i.com/GMS/GMS_Overview/gms_overview.html.
Thus far we have developed and implemented numerically a conceptual model for the LSJR area hydrogeology, based on USGS report by Burow et al. (2004). In the coming quarter we will further develop the flow model, calibrate it, and will augment it with the subsurface contaminant transport model MT3D or RT3D. We will link the flow and transport model with the vadose zone model developed under Task 4F, such that we will be able to compute the migration of contaminants from the discharge sites through the vadose zone and in the groundwater. We plan to test the integrated numerical model (vadiose zone-groundwater) in the first part of March 2007.

The effort involved in developing this numerical model is extensive, and we do not expect to be able to develop additional large scale models such as the one shown in Figure 2, within the scope of this study.

Task 5.2

This task is underway. We have reviewed available water demand and supply forecasts. We have conducted a literature review of water valuation studies. The work on water treatment is being completed in conjunction with Task 6.

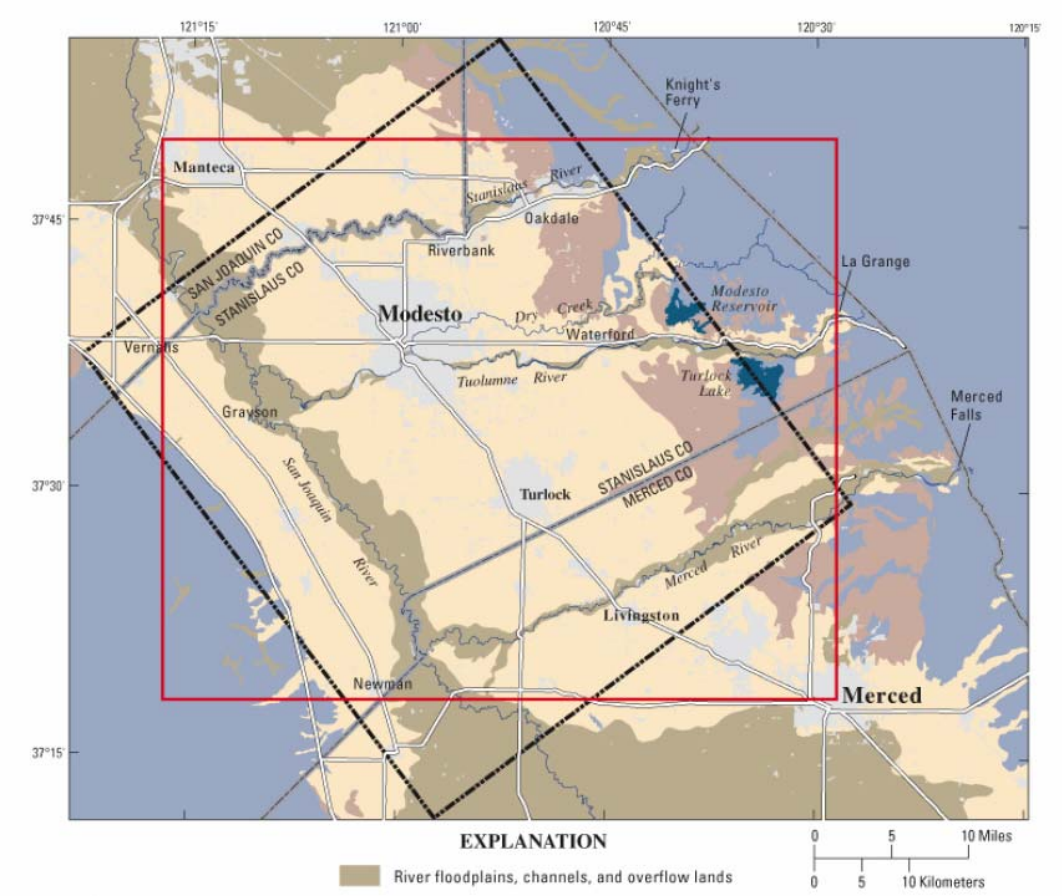
Task 6 Identify and Evaluate Salinity Management Options

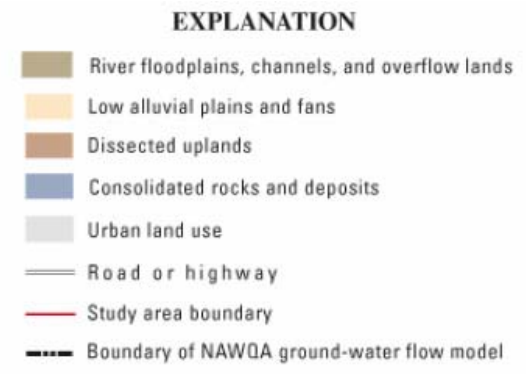
This task is underway. Upstream (or plant) management engineering options are being reviewed by Dr. Jatal Mannapurema of the University of California, Davis. Dr. Michael Kavanaugh of Malcome Pirne is studying downstream (post plant) management options including POTW and out-of-basin options. The product of these efforts will be cost and effectiveness values for use in Task 7. Dr. Pirjo Isosaari of the VTT Technical Research Center of Finland currently a post doc at the University of California Berkeley is also participating in the technology review. Finally, data was obtained in the last quarter from a deep drill experiment in the Central Valley. We plan to analyze it in the coming quarter to assess the feasibility of the deep well injection solution.

Task 7 Strategies to Implement Salinity Options

Work on this task has commenced and is being coordinated with Task 6 efforts. The basic structure of a model to incorporate cost and environmental impacts has been developed.

Figure 2: A diagram showing the Lower San Joaquin River area. The black rectangle shows the





References

Burow, K.R., et al., *Hydrogeologic Characterization of the Modesto Area, San Joaquin Valley, California*. 2004, United States Geological Survey. p. 54.

Mayer, K.U., E.O. Frind, and D.W. Blowes, *Multicomponent reactive transport modeling in variably saturated porous media using a generalized formulation for kinetically controlled reactions.* Water Resources Research, 2002. **38**(9).