

LWA Project Team Responses to Comments on Salt and Nitrate Sources Pilot Study Draft Work Plan

Written comments on the draft Salt and Nitrate Sources Pilot Study Work Plan were received from the following sources:

1. Central Valley Salinity Coalition (Daniel Cozad)
2. Dennis Westcot
3. John Herrick
4. EKI
5. Brown and Caldwell

Comments received from each source are listed below either in original or condensed form followed by the project team's response to each comment.

CVSC COMMENTS

General Comments

1. A response summary to be an attachment to the Work Plan

Response: Response summary is provided by this document

2. The plan would benefit from definitions and added detail on the goals and objectives. Some of these goals are provided in the RFP scope of work.

Response: Section 1 of the Work Plan will be revised to include an expanded discussion of goals and objectives of the Project.

3. Identify the process and rationale for selection of the pilot areas can be taken from the meetings materials.

Response: Section 2 of the Work Plan will be revised to include a summary description of the pilot area selection process and rationale. Previously submitted documents, which have been posted on the CVSC website will be referenced for details.

4. Recommend the final workplan include a section which identifies:
 - a. Data needed to characterize an area for salt and nitrate sources. As discussed in the meeting, the information needed to "fill the box" adequately to assure that any of the pilot area salt balance and sources are understood.
 - b. Generalized methodology should be presented between the objectives and the pilot study areas to help the reviewer understand why the various efforts are being undertaken in the pilot areas.

- c. Once the generalized approach and data needs are stated, identify the sources of this data for the pilot areas and how the work plan fulfills the generalized approach.
- d. Identify and outline the procedural steps used to ensure the data is appropriate for this study
- e. Identify how other data sources, especially those identified in the committee meeting on July 14 will be included, used for corroboration, or not used in the study.

Response: Section 1 of the Work Plan will be revised to include a description of the project objectives, general methodology, constituents of concern, significant sources of salts and nitrates, data needs, and data sources. Suggestions noted during the July 14 meeting will be addressed.

- 5. A generalized definition of products and report table of contents may be useful in the plan so the reviewers can identify issues prior to the draft report if possible.

Response: The work products will be described in the general methodology to be described in Section 1. Since the study itself has not yet commenced, a table contents would add little information at this time.

- 6. Somewhere in the plan specifically identify how WARMF is used to produce the products that are the deliverables, preferably in as non-technical terms as possible for the widest audience

Response: This information will be summarized and included in the description of the general methodology in the revised Section 1. The general description of the WARMF model in Section 3 of the Draft Work Plan also provides this information. Note that we plan to move Section 3 into an attachment to provide focus on the methodology and less on the tools.

- 7. List WARMF data sources (may be generalized) and why they should be accepted without further validation or the validation criteria that were used to accept exiting data.

Response: WARMF data sources will be listed in Section 1 as part of the description of the general methodology in the revised Section 1. A subsection will be added to Section 4 under Data Collection and Assessment that discusses data validation and acceptance. Comparison of model results to actual water quality observations is intended to provide some measure of data validation. Similar comparisons can be made for flow and fertilization data, for example. Assumptions regarding parameters such as irrigation efficiency can be reviewed with irrigation district staff, cooperative extension staff, etc. Whenever practicable within the approved scope, data validation steps will be incorporated and documented.

- 8. Identify the quality criteria and techniques used to validate the data added to WARMF or otherwise used in the study.

Response: A subsection will be added to Section 4 under Data Collection and Assessment that discusses data validation and acceptance.

9. Identify in appropriate section the reporting parameters for constituents of concern.

Response: It is unclear what is meant by “reporting parameters”. Does the intended meaning relate to reporting of analytical data (detection limits, for example)? If so, analytical data will be primarily an input, not an output of the work. As indicated in Table 4-4 through 4-6, mass balances of TDS and nitrates from the listed sources and sinks will be reported in units of kg/d or lbs/d.

10. Review literature and the draft report from Glen Hoffman (LINK) for irrigation efficiencies for applied water.

Response: The report will be listed and used as a data source. Irrigation efficiencies employed for all watersheds will be reviewed with available resources, including irrigation districts, cooperative extension staff, etc.

11. Prepare an overview or non-technical executive summary for the work plan and include a similar preparation for the draft report. Something on the order of a press release for a lay audience to maximize the value to all stakeholders.

Response: Section 1 will be revised to provide this summary.

12. Identify how the pilot areas characterize the Central Valley, Land use, water source, salt sources etc. the beginning could be pulled from the tables provided during selection and augmented.

Response: The introductory subsection in Section 2 will be expanded to include a summary table of the pilot area characteristics.

13. For all pilot areas list significant cities, water/irrigation districts or others organizations that should be aware of the study and review its conclusions.

Response: This information will be added to the descriptions of pilot areas in Section 2.

14. Identify the Constituents of Concern that are being used in the work, specifically list any that were in the RFP but are not in the planned work, or are included for specific areas or cases.

Response: This information will be included in the revised Section 1.

Specific Comments

1. Page 1-1: bullets under Sources and Sinks; for the report identify if sources or sinks are coming from/to:

- another part of the Central Valley and where if known
- outside the Central Valley
- cannot be determined and why

Response: This information will be included in the study report.

2. Page 1-2: Consider a flow or input-output chart in section 1 or in the generalized methodology section.

Response: A flow chart will be provided in Section 1 along with a description of the general methodology.

3. Page 2-1: If not included in the general section, break out the “common sections” from the individual pilot areas for presentation and show a table or chart illustrating the common or pilot specific areas for each pilot, possibly by color or some other designation

Response: We will attempt to identify tasks common to all areas in the flowchart.

4. Page 2-9: committee members suggested validating WARMF input on land use related to fertilizer usage by comparing to actual use on a regional scale with CDFA or other sales data.

Response: This method of data validation will be described in Section 4 (see response to General Comments #7 and #8).

5. Page 2-10: for the final work plan and report consider reproducing these graphics on a larger page so that they are more readable. Possibly add road and major landmarks to assist reviewers with orientation.

Response: Graphics will be enlarged. Please note that these maps are intended only to illustrate the range of land uses in the area. They are not intended as “working maps”.

6. Page 2-17: see recommendation 5 above.

Response: See response to #5 above.

7. Page 2-23: Figure 2-13 is difficult to read, if critical reproduce larger or obtain original graphics

Response: We will attempt to improve readability.

8. Page 3-1 etc: As discussed in the committee meeting provide a table on sources of data land use, and other information to be updated from work plan to reporting.

Response: See response to General Comment # 4.

9. Page 3-6: bottom of the page, provide reference and availability for the land use spreadsheet identified in the final paragraph.

Response: Reference will be cited in revised Work Plan.

10. Page 3-7: Consider breaking out the Urban Irrigated uses of groundwater because it is estimated that this can be 50-75% of water use and it is not a return flow to the WWTP but applied to the surface. Even though there may not be a significant recharge component it is a use that should be accounted for if not accounted for elsewhere. In the work plan identify, if information exists, residential sources of salt and any reductions or BMP's that may have been implemented in these areas.

Response: Available urban land use mapping will be employed to estimate irrigated landscape area as a % of the urban land surfaces. Recharge quality from these lands will be calculated by WARMF in a similar manner to agricultural irrigation. Major salt sources associated with agricultural and landscape irrigation (mainly irrigation water) and minor sources (e.g. fertilizer) are accounted for in WARMF. Urban salt sources that are not associated with landscape irrigation, such as water softeners and other household sources, are captured in wastewater discharge data.

11. Page 3-12: Provide additional detail on the connections between WARMF and other models including MODFLOW.

Response: Additional detail will be provided on the linkages between WARMF and the MODFLOW models for the Modesto and Tule River areas. For example, in addition to recharge inputs that WARMF will receive from MODFLOW, groundwater pumpage from the MODFLOW models is also an input. This is explained elsewhere in the Work Plan; however, the WARMF-MODFLOW-COMMUNICATION discussion will be expanded.

12. Page 4-4: Provide additional detail on the sensitivity analysis and its uses, especially on the differences in nitrate and salt ions.

Response: Additional detail will be provided in the sensitivity analysis section of the Work Plan.

WESTCOT COMMENTS

General Comments

We have consolidated the essential comments as follows:

1. The Study Plan should have attempted to lay out a procedure to answer the following questions in the following order:

Response: The commentor lists several suggested steps or questions to be answered (e.g. constituents of concern, significant sources of salts and nitrates, data needs, data sources, data collection, data assessment, analytical methods, pilot area selection, etc). Section 1 of the Work Plan will be revised to include a description and flowchart of the

general methodology that addresses the questions suggested by the commenter. While we mostly concur with the list of questions to be addressed, our opinion differs somewhat from that of the commenter regarding the order in which they should be addressed. The general methodology description will indicate the order in which the study elements will be conducted.

2. What methodology or procedures will be used to obtain the data above and how will the consultant determine that they have a valid data set?

Response: A subsection will be added to Section 4 under Data Collection and Assessment that discusses data validation and acceptance. Comparison of model results to actual water quality observations is intended to provide some measure of data validation. Similar comparisons can be made for flow and fertilization data, for example. Assumptions regarding parameters such as irrigation efficiency can be reviewed with irrigation district staff, cooperative extension staff, etc. Whenever practicable within the approved scope, data validation steps will be incorporated and documented.

3. From the analysis conducted..., will they be able to identify what are the potential significant data gaps?

Response: The identification of data gaps and the importance of those gaps is part of the process of creating mass budgets of salt and nitrate. The significance of data gaps can be determined through sensitivity analysis, which is described in Section 4 of the Work Plan.

4. What models or analytical methods does the consultant suggest for evaluating the importance of each of the sources of salt on a Valley-wide perspective, at one level, and on a more localized basis on the other level?

Response: The key consideration in choosing analytical tools is whether they can account for all the elements of salt (and/or nitrate) mass balance including movements and transformations. The practicality of analytical tools may or may not depend on the spatial scale for which it is used. The experience gained from the pilot study may help refine the criteria for selecting analytical tools. The WARMF model performs mass balance calculations on a catchment basis and sums the results from the catchments in the study area to yield results for the entire study area. Thus WARMF is capable of accounting for balances on both regional and local scales.

Technical Comments

1. Other significant sources that need to be considered are fertilization and septic tanks.

Response: Fertilization and septic tanks will be added to the list of sources in Section 1 and to the mass balance accounting table for near-surface groundwater in Section 4.

2. It is unclear in the category “dairies” whether this includes only the production area or also includes the cropland associated with the dairy. The same comment applies to feedlots and poultry areas or industrial reuse areas such as at wineries or food processing plants.

Response: Data from the RWQCB database on dairies and the Hilmar SEP database on industrial and food processing discharges will be input to the WARMF model. The

loadings include cropland associated with the facilities. These croplands will be subtracted from the general land cover data to avoid double counting.

3. It is unclear how wastewater and solid waste from dairies and other animal confinement areas is taken into account in the evaluation.

Response: See response to #2 above.

4. The use of older data from DWR and others needs to be updated. Many land use practices have changed. For example dairies are much larger now and there are many more of them since the 1990s. For example in the Yolo subbasin, there are at least three large dairies but the land use data shows none.

Response: We agree that land use data needs to reflect current conditions, or at least be consistent with timeframes represented by other input data (hydrology, water quality, etc.), and recognize that existing DWR land use mapping will probably have some deficiencies. However, the current scope of work assumes that existing DWR and other readily available land cover data will, with minor modification, meet analytical needs. It is our intention to incorporate these land use data and refine them as efficiently as possible to attempt to meet project goals, this being the most cost-effective way to proceed. However, should sensitivity analysis and validation runs of the WARMF model indicate that more intensive updating of land cover is required, these needs, along with recommendations for their quick resolution, will be brought immediately to the attention of CV-SALTS. This approach, developed during stakeholder meetings, seems to do as much as possible with the least costly data sources, and reserve judgment and commitment of resources to refinement efforts until the need for these is established and focused into areas where it will significantly improve the analysis. At this work planning stage, we have imported and summarized land use data. Some deficiencies are immediately apparent, but we have not yet begun to work through these, tried to resolve them, or assessed their likely impact on model run results.

5. These pages (Pages 2-12 to 2-15, 2-19 and 2-23 to 2-24) describe the groundwater basin and their associated hydrogeology and water bearing capacity. If I was conducting a water supply study, I would be comfortable with this presentation but this is a water quality study and there is nothing in any of this write-up that defines the present groundwater salinity or nitrate levels. As water use and especially groundwater pumping may be a major source of salts and nitrate, I am very concerned that there was no emphasis on this part of the groundwater basin.

Except for the Tule River Basin, there is no attempt to summarize the extent of ground and surface water use in proportion to the total water use in the study area or how this type of data will be developed. Ground water use brings salt to the surface and then apply it either locally or regionally, or may export it to other areas. This level of water extraction and use is very important.

Response: While there certainly is information on groundwater quality conditions that could be described for each of the areas, this information is expected to be more complete following implementation of the Work Plan tasks. The Study Report is expected to include a detailed groundwater quality description for each study area.

Detailed information on the sources of supply to meet water requirements in each study area is necessary to develop (or refine) the inputs to the WARMF model. This information will be detailed in the Study Report.

6. Figure 2-10: I do not know what the Tulare Valley is??

Response: The area labeled "Tulare Valley" is the portion of the Tulare Basin that is not topographically in any of the three surface water drainages that enter the basin.

7. Page 4-1: The Study plan states: The following principal tasks will be performed for each pilot study area to complete the Pilot Salt and Nutrient Studies Report:

- Data assessment – needs, sources, availability, gaps
- Data collection and review
- Mass balance calculations and analysis
- Trend analysis
- Sensitivity analysis

This again appears to be backwards. As stated in the original RFP, the Coalition was looking for an assessment of the procedures that could be used and then trying them in 2-3 pilot areas to see what the shortcomings are.

Response: Section 1 of the Work Plan will be revised to include a description and flowchart of the general methodology that addresses the questions suggested by the commenter. While we mostly concur with the list of questions to be addressed, our opinion differs somewhat from that of the commenter regarding the order in which they should be addressed. The general methodology description will indicate the order in which the study elements will be conducted.

HERRICK COMMENTS

Our interpretation of the essence of these comments is that one of the areas selected for pilot study should have been the west side of the San Joaquin River basin, because this is an area with known salinity issues.

Response: Selection of the pilot study areas was a CV-SALTS stakeholder process. The Technical Committee provided recommendations, guidance on the final selection of the pilot study, and, ultimately, approved the selection of the pilot areas. We understand that the Westside Region will be the focus of a Bureau of Reclamation study on the Assessment of Salt Sources, Transport, and Fate within the Westside Region of the San Joaquin River Valley. This study should address the issues of concern to the commenter.

EKI COMMENTS

1. One of the objectives of the pilot study is to test the applicability of the procedures and methodologies for region-wide applicability. The Work Plan should specifically describe the proprietary or public domain status of WARMF in relation to region-wide applicability. We understand the WARMF is publically available from the U.S. EPA, but does application of WARMF to other areas of California require assistance from Systech Water Resources, Inc.?

Response: Clarification has been added to Section 3 of the Work Plan indicating that anyone can create a WARMF application without the assistance of Systech Water Resources, Inc.

2. Fundamentally, the complexities and the details behind the WARMF model user interface will not be understood by many of the stakeholders. The Work Plan should clearly state that WARMF is a technical tool that requires a significant amount of knowledge and experience (and money) to lead stakeholders through the decision making process. Stakeholders should not be given the impression that they can make changes to the model themselves and run different scenarios to make management decisions.

Response: The accounting of salt and nitrate in the Central Valley is a complex process regardless of what tool is used for the analysis. For those using WARMF, the existing Central Valley WARMF applications and the ability to create additional applications are available free of charge.

3. The Work Plan should specifically describe the benefits of using WARMF compared to simpler procedures and methods...For examples the Work Plan should discuss whether the level and accuracy of available data supports the use of a complex model.

Response: The Work Plan is to describe how a methodology will be developed to account for the sources and sinks of salt and nitrate. The analytical tools chosen need to have enough complexity to include the identified elements of salt and nitrate transport and transformations. WARMF is being used as an analytical tool in all three pilot studies because in combination with groundwater modeling and data it can calculate the sources and sinks of salt and nitrate and because WARMF has already been applied, and thus most of the needed data already collected, in two of the three selected areas (Yolo and Modesto).

4. We recommend that, at the very least, that the Work Plan specifically include a sensitivity analysis for the input parameters used for mineral weathering and root respiration, specifically, the decay constants, and the initial mass, type, and distribution of minerals in the soil.

Response: Investigators have found that mineral weathering is a source of salinity in at least parts of the Central Valley. Data describing the underlying mechanisms such as mineral content and weathering rates may be very limited, which is one of the criteria for sensitivity analysis. The other criterion for sensitivity analysis is whether mineral weathering could, within the range of data uncertainty, be a significant source of salt in the overall mass budget.

5. The Work Plan is inconsistent in the naming of the Stanislaus Study Area. In some places in the Work Plan, it is also referred to as the Modesto Study Area.

Response: The Work plan will be revised to be consistent.

6. Figure 2-7 should include the outline of the Stanislaus/Modesto Study Area overlying the groundwater model boundary.

Response: The Modesto Study Area coincides with the groundwater model boundary. Section 2, where the Modesto Study Area is introduced, will be revised to make this clear.

7. It is unclear how the boundaries of Stanislaus/Modesto Study Area were chosen. They do not appear to match natural watershed or groundwater boundaries. In particular, the inclusion of the northeast triangular piece is odd, especially given that the area doesn't have soil data coverage (Figure 2-9) and may not include the groundwater model domain.

Response: See response No. 6 above. The Modesto Study Area was selected to coincide with the hydrological area selected for the development of the USGS MODFLOW model.

8. The Work Plan should discuss how soil data information from SURGO will be used to define mineral content of the soil. e.g., the percentages of silicates, gypsum, calcite, etc., that are required input for the WARMF model to model mineral weathering.

Response: Additional explanation has been provided.

Again, WARMF soil assumptions will be used initially, and only refined as needed, after land cover refinements are completed. When SSURGO soil survey data are employed, they will be summarized at the catchment level, since the level of spatial detail in soil mapping exceeds the spatial resolution anticipated for the catchments. When this occurs, properties such as texture, evaporite composition, depth of horizons, and organic matter that are employed in WARMF will be averaged to create modal soil profiles representing the catchments. This approximation would be a significant refinement of existing WARMF soils inputs, and is a logical next step after completing the land cover data refinement, should it appear justified to achieve model performance goals. Evaporite and other weathering are captured, or where necessary can be added, within the WARMF process framework.

9. The Work Plan should include a discussion of how information about the use of soil amendments that contain carbonates and gypsum will be obtained and included into WARMF.

Response: Soil amendments are handled like fertilizer, added to the soil along with irrigation water. In the case of sparingly soluble or organic amendments, we will ensure that modeling appropriately incorporates them into the soil solid phase, where they will be subject to transformation and transport along with other soil constituents.

10. The Work Plan suggested that only permits for dischargers that release wastewater directly to surface water will be obtained for input to WARMF, of which there are perhaps dozens throughout the pilot study areas. However, will available data for the thousands of land dischargers be included, eg., food processors, and dairies that discharge to land be included in the model? Any such effort should be coordinated with work completed for the Hilmar SEP. The Work Plan should specifically state whether this information will be obtained and used, and if not, how such land application dischargers will be included in the WARMF model.

Response: The Hilmar SEP database will be listed as a data source in the general methodology and used as input to the WARMF model. In addition, data from RWQCB land discharge/WDR permits will be used to the extent these data are available electronically.

BROWN AND CALDWELL COMMENTS

1. It would be helpful if the overall goals and objectives for this work were defined with more detail and specificity. A number of approaches and techniques may be relevant based on how the problem (or project goal) is defined. Clarification of the goals would also help to clarify the Work Plan design so that it can address CVSC priority needs and concerns.

Response: Section 1 of the Work Plan will be revised to include an expanded discussion of goals and objectives of the Project.

2. The RFP states the purpose of the Salt and Nitrate Source Pilot Implementation Study is to develop a methodology that can fairly and equitably identify salt and nitrate sources throughout the Central Valley. Does this Work Plan address this larger goal?

Response: see response to Comment #1 above.

3. The emphasis of this Work Plan appears to be the development of three basin models rather than the identification of salt and nitrate source database to be used for the appropriate hydrogeologic model(s).

Response: see response to Comment #1 above.

4. The Work Plan should provide a specific rationale to explain how the current scope will assist CVSC overall goals.

Response: see response to Comment #1 above.

5. If all three different models succeed, have you considered which methodology the CVSC would use for the remainder of the Central Valley not addressed in this work – or is that something that might be determined based on the level of success of each model?

Response: Consideration of methodologies for other areas in the Central Valley is beyond the scope of the pilot project and will be address by the CVSC as a follow-up to this pilot study. However the methodologies proposed for the pilot areas in the Work Plan are designed to be applicable to all Central Valley locations.

6. There is a great deal of technical description of the WARMF model for some of the basins. However it appears that the WARMF model is not to be used at all in other basins. Is that something significant or indicative of your overarching goal or objective?

Response: The WARMF model will be the primary analytical tool used for all three pilot areas.

7. The sources of water quality data to be used in the Tule River basin are not identified. Is that by design? What is the contingency if these data are not available?

Response: Water quality data sources will be preliminarily identified in the table that will be developed for inclusion in the revised Work Plan (see response to Coalition General Comment No. 4). Additional data sources may also be identified once the Work Plan is implemented.

8. Model calibration and sensitivity analysis are important in deciding which model will be used in the next study. However, the explanation in the scope does not provide a specific direction. Is that by design?

Response: The Salt and Nitrate Sources Pilot Study is to develop a methodology for salt and nitrate budgets in the Central Valley. The specific method of calibration depends on the tools used to apply the methodology. Clarification has been added to Section 3 of the Work Plan to indicate that the WARMF applications used for the pilot study areas either have been or will be calibrated.

As discussed in Section 3, both the Modesto and Tule River MODFLOW models have been calibrated. Pending changes made to these models for purposes of this study, consideration will be given to the need for recalibration.

9. The primary tool used by this Work Plan (to identify sources of salts and nitrates) appears to be the WARMF model. The authors apparently propose to achieve mass balance by adjusting groundwater parameters to calibrate the WARMF/groundwater models with the actual monitoring data. Some valuable information may be lost in this process unless each step is carefully documented. Please consider:

Step 1) Compile all data, carefully documenting all data sources;

Step 2) Run the model(s);

Step 3) Compare the raw model output/predictions with actual surface water and groundwater monitoring data. This will clarify the limitations of the models, the input data and discrepancies between the model and actual monitoring data. Taking time to discuss the limitations to the data and the models has value and would be lost by adjusting the model to resolve these discrepancies;

Step 4) Evaluate effects of each model parameter adjustment prior to complete model calibration with monitoring data (sensitivity analysis).

Response: The commenter's statement at the beginning of this comment about the apparent intent to adjust groundwater parameters to calibrate WARMF is incorrect. Groundwater inputs from the MODFLOW models are only inputs. WARMF will be calibrated as described in Section 3 of the Work Plan and as further commented on in response to Brown and Caldwell Comment No. 8. Steps 1-4 provided above describe standard procedures, which will be followed for the study areas involving simulations with the MODFLOW models.

Attachment 1

Original Responses

CVSC COMMENTS

General Plan Comments and Recommendations

This first section provides general overarching comments on the draft work plan and includes most of our recommendations. The recommendations are provided in this section allow the team maximum flexibility to incorporate them. These comments either reflect CVSC technical review or may generalize or expand on comments provided in the July 14, Technical Committee Meeting.

1. A response summary to be an attachment to the workplan
2. The plan would benefit from definitions and added detail on the goals and objectives. Some of these goals are provided in the RFP scope of work.
3. Identify the process and rationale for selection of the pilot areas can be taken from the meetings materials.
4. Recommend the final workplan include a section which identifies:
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13. For all pilot areas list significant cities, water/irrigation districts or others organizations that should be aware of the study and review its conclusions
14. Identify the Constituents of Concern that are being used in the work, specifically list any that were in the RFP but are not in the planned work, or are included for specific areas or cases.

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9. Page 3-6: bottom of the page, provide reference and availability for the land use spreadsheet identified in the final paragraph
10. Page 3-7: Consider breaking out the Urban Irrigated uses of groundwater because it is estimated that this can be 50-75% of water use and it is not a return flow to the WWTP but applied to the surface. Even though there may not be a significant recharge component it is a use that should be accounted for if not accounted for elsewhere. In the work plan identify, if information exists, residential sources of salt and any reductions or BMP's that may have been implemented in these areas.
11. Page 3-12: Provide additional detail on the connections between WARMF and other models including MODFLOW.
12. Page 4-4: Provide additional detail on the sensitivity analysis and its uses, especially on the differences in nitrate and salt ions.

WESTCOT COMMENTS

I expected a work plan of about 15-20 pages, not 72 pages. In critically looking at it, much of what is presently in the work plan does not need to be there and makes it very difficult to go into the plan and grasp it in a short period of time. Therefore, my comments are going to look at the entire effort from a 5-10,000 foot level rather than in the detail (I will leave that to others). In addition, my comments are just that, comments. The actual comments made to the contractor should be made by the Salinity Coalition as the Coalition is the one managing this study and the consultant is responsible to them, not individuals on the Technical Committee such as myself. I appreciate the opportunity to comment but please do not let these comments conflict with any directions given by the Coalition steering committee.

My comments are only directed at the "salt" portion of the study and are not detailed on the technical aspects presented but why they are presented and whether they cover the critical needs of the project. The entire presentation appears to be backwards and spends most of the time on details of modeling and ground water hydraulics rather than the aspects of a salt management plan that was envisioned by the Salinity Coalition.

According to the Salinity Coalition, the study was to "to develop and document procedures and methodologies to quantify, fairly and equitably, the significant salt and nitrate sources in the Central Valley and to pilot those procedures in selected areas to validate the appropriateness and region-wide applicability of the procedures."

Unfortunately the Study Plan as now written emphasizes the pilot areas rather than the procedure to evaluate the important sources of salt in the Central Valley. It is stated in the Study Plan that "This Work Plan describes the pilot areas to be investigated in the Pilot Study and documents the methods and resources to be used to characterize the significant sources and sinks of salts and nitrates in the selected study areas." This is putting the cart before the horse. You first define the significance of the salt sources, whether data is available to describe them, what procedures will be used to define them and finally attempt utilize those procedures in a few pilot areas.

I looked initially for a flow chart to see the various steps that were to be used in the study but none was available. The Study Plan should have attempted to lay out a procedure to answer the following questions in the following order:

1. What types of salt (TDS, Na, Cl, etc) do the consultants feel is important to such a study and why?
2. What sources of salt (TDS, Na, Cl, etc) do the consultants feel should be evaluated in such a study and why?
3. Are the salt types or sources identified in #1 or #2 above different for a surface water analysis and a groundwater appraisal?
4. What data sources and methods will be utilized to quantify the various sources of salt identified in #1 or #2 above?
5. What methodology or procedures will be used to obtain the data identified in #1 - #4 above and how will the consultant determine that they have a valid data set?
6. From the analysis conducted in #5 above, will they be able to identify what are the potential significant data gaps?
7. What models or analytical methods does the consultant suggest for evaluating the importance of each of the sources of salt on a Valley-wide perspective, at one level, and on a more localized basis on the other level? The importance of this is based on the fact that some salt loads are dispersed over large areas and may degrade water supplies on a continual basis but over a long period of time. Dealing with the more diffuse sources may be as important as controlling the more localized sources of higher concentrations that occur. On the reverse side, the more concentrated localized sources may only show up as a small incremental increase if considered over the entire aquifer, but in fact may be causing serious localized problems.
8. Based on the assessment conducted in #1 - #7 above, can the consultant identify two or three pilot areas to test their findings and identify how important each source or missing source is in a salt loading analysis?
9. Define why the two or three pilot areas were chosen in #8 above and define how each is different and will give a new insight to the data needs?

10. What techniques (procedures, models, etc) will be used in each of the selected pilot areas to determine the significance of each of the salt sources identified in #1 - #7 above?

(The present section 2 and 3 in the present workplan contain this information but in too detailed a manner. The present workplan presents the modeling and on a detailed description of each basin hydrology and groundwater geohydrology rather than a description of the procedure that will be used to reach the point where we will do the modeling and how the modeling will help in making the assessment of what are the significant salt sources and which need to be quantified to make a valid analysis.)

The importance of the establishing a procedure for assessing salt loads will minimize the amount of later contention over how the salt load was calculated. This is the portion of the report that will need to have the closest review and acceptance. For example how you calculate the salt loading for a particular land use area or activity is likely to be very contentious and will be the important output of this report.

These are additional comments that are of a technical nature on the information presented.

Page 1-1: Other significant sources that need to be considered are fertilization and septic tanks.

Page 2-5: It is unclear in the category “dairies” whether this includes only the production area or also includes the cropland associated with the dairy. The same comment applies to feedlots and poultry areas or industrial reuse areas such as at wineries or food processing plants.

Page 2-5: It is unclear how wastewater and solid waste from dairies and other animal confinement areas is taken into account in the evaluation.

Page 2-9: The use of older data from DWR and others needs to be updated. Many land use practices have changed. For example dairies are much larger now and there are many more of them since the 1990s. For example in the Yolo subbasin, there are at least three large dairies but the land use data shows none.

Pages 2-12 to 2-15, 2-19 and 2-23 to 2-24: These pages describe the groundwater basin and their associated hydrogeology and water bearing capacity. If I was conducting a water supply study, I would be comfortable with this presentation but this is a water quality study and there is nothing in any of this writeup that defines the present groundwater salinity or nitrate levels. As water use and especially groundwater pumping may be a major source of salts and nitrate, I am very concerned that there was no emphasis on this part of the groundwater basin.

Except for the Tule River Basin, there is no attempt to summarize the extent of ground and surface water use in proportion to the total water use in the study area or how this type of data will be developed. Ground water use brings salt to the surface and then apply it either locally or regionally, or may export it to other areas. This level of water extraction and use is very important.

Figure 2-10: I do not know what the Tulare Valley is??

Page 4-1: The Study plan states: The following principal tasks will be performed for each pilot study area to complete the Pilot Salt and Nutrient Studies Report:

- Data assessment – needs, sources, availability, gaps
- Data collection and review
- Mass balance calculations and analysis
- Trend analysis
- Sensitivity analysis

This again appears to be backwards. As stated in the original RFP, the Coalition was looking for an assessment of the procedures that could be used and then trying them in 2-3 pilot areas to see what the shortcomings are.

BROWN AND CALDWELL COMMENTS

- 1) It would be helpful if the overall goals and objectives for this work were defined with more detail and specificity. A number of approaches and techniques may be relevant based on how the problem (or project goal) is defined. Clarification of the goals would also help to clarify the Work Plan design so that it can address CVSC priority needs and concerns.
- 2) The RFP states the purpose of the Salt and Nitrate Source Pilot Implementation Study is to develop a methodology that can fairly and equitably identify salt and nitrate sources throughout the Central Valley. Does this Work Plan address this larger goal?
- 3) The emphasis of this Work Plan appears to be the development of three basin models rather than the identification of salt and nitrate source database to be used for the appropriate hydrogeologic model(s).
- 4) The Work Plan should provide a specific rationale to explain how the current scope will assist CVSC overall goals.
- 5) If all three different models succeed, have you considered which methodology the CVSC would use for the remainder of the Central Valley not addressed in this work – or is that something that might be determined based on the level of success of each model?
- 6) There is a great deal of technical description of the WARMF model for some of the basins. However it appears that the WARMF is not to be used at all in other basins. Is that something significant or indicative of your overarching goal or objective?
- 7) The sources of water quality data to be used in the Tule River basin are not identified. Is that by design? What is the contingency if these data are not available?
- 8) Model calibration and sensitivity analysis are important in deciding which model will be used in the next study. However, the explanation in the scope does not provide specific direction. Is that by design?
- 9) The primary tool used by this Work Plan (to identify sources of salts and nitrates) appears to be the WARMF model. The authors apparently propose to achieve mass balance by adjusting groundwater parameters to calibrate the WARMF/groundwater models with the actual monitoring data. Some valuable information may be lost in this process unless each step is carefully documented. Please consider:

Step 1) Compile all data, carefully documenting all data sources;

Step 2) Run the model(s);

Step 3) Compare the raw model output/predictions with actual surface water and groundwater monitoring data. This will clarify the limitations of the models, the input data and discrepancies between the model and actual monitoring data. Taking time to discuss the limitations to the data and the models has value and would be lost by adjusting the model to resolve these discrepancies;

Step 4) Evaluate effects of each model parameter adjustment prior to complete model calibration with monitoring data (sensitivity analysis).

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EKI COMMENTS

14 July 2009

MEMORANDUM

From: Michael T. Steiger, P.E. (Erler & Kalinowski, Inc.) *mts*

To: Daniel Cozad and Nigel Quinn (Central Valley Salinity Coalition)

Subject: Comments on *Draft Work Plan for Salt and Nitrate Sources Pilot Implementation Study*

Erler & Kalinowski, Inc. ("EKL") reviewed the *Draft Work Plan for Salt and Nitrate Sources Pilot Implementation Study*, prepared by Larry Walker Associates, dated 3 July 2009 ("Work Plan"). We are providing the following comments and suggestions as an interested party and member of the Technical Advisory Committee.

The Work Plan was well organized and adequate in its descriptions of the proposed procedures and methodologies to quantify the significant salt and nitrate sources for the selected pilot study areas. Use of the Watershed Analysis Risk Management Framework ("WARMF") is a defensible and logical choice, as the model was developed specifically to provide a framework for calculating, allocating, and implementing Total Maximum Daily Loads ("TMDLs") for watersheds for stakeholder driven processes. However, we recommend that prior to distribution to the Central Valley Regional Water Quality Control Board ("RWQCB"), the Work Plan be revised to address the following:

1. One of the objectives of the pilot study is to test the applicability of the procedures and methodologies for region-wide applicability. The Work Plan should specifically describe the proprietary or public domain status of WARMF in relation to region-wide applicability. We understand the WARMF is publically available from the U.S. EPA, but does application of WARMF to other areas of California require assistance from Systec Water Resources, Inc.?
2. Fundamentally, the complexities and the details behind the WARMF model user interface will not be understood by many of the stakeholders. The Work Plan should clearly state that WARMF is a technical tool that requires a significant amount of knowledge and experience (and money) to lead stakeholders through the decision making process. Stakeholders should not be given the impression that they can make changes to the model themselves and run different scenarios to make management decisions.

3. The Work Plan should specifically describe the benefits of using WARMF compared to simpler procedures and methods, e.g., the methodology used by the Regional Water Quality Control Board to prepare water and salt balances and develop the TMDLs for salinity and boron for the Lower San Joaquin River (Reference: *Total Maximum Daily Load for Salinity and Boron in the Lower San Joaquin River*, January 2002). For example the Work Plan should discuss whether the level and accuracy of available data supports the use of a complex model.
4. The impact and importance of precipitation, dissolution, and carbonate reactions in the soil and groundwater are not adequately discussed in the Work Plan. Such reactions are critical to water quality during influx of irrigation water, in particular for the carbonates and gypsum that are naturally occurring, but also added in soil amendments. Groundwater data recently presented by Bryant Jurgen of the USGS at the GRA Conference in March 2009 show that the concentrations of calcium, carbonate, and sulfate (constituents associated with mineral dissolution and soil amendments) have increased in groundwater on average by 19%, 30%, and 18%, respectively, as compared to only 9% and 6% for sodium and chloride. This data suggests that dissolution of calcite and gypsum, enhanced by increased soil respiration, is a major source of increasing TDS in groundwater in the Central Valley. We understand that mineral weathering is included in WARMF, however, it is modeled using a simplified first order decay equation where the weathering rate is proportional to the mass of mineral and pH. WARMF also provides options for addressing carbon dioxide and carbonate reactions, but the default, and apparently only method used to date with WARMF, is to simply specify an expected level of carbon dioxide super saturation. The technical manual for WARMF states that “if a detailed accounting of carbon dioxide in the soil becomes an important issue, this part of the program may be revisited in the future”. Considering the watershed scale of the analysis for the selected pilot study areas, these modeling assumptions and simplifications may be appropriate. However, further work may be needed if these reactions are found to be significant contributors to the salinity balance. We recommend that at the very least, the Work Plan specifically include a sensitivity analysis for the input parameters used for mineral weathering and root respiration, specifically, the decay constants, and the initial mass, type, and distribution of minerals in the soil.
5. The Work Plan is inconsistent in the naming of the Stanislaus Study Area. In some places in the Work Plan, it is also referred to as the Modesto Study Area.
6. Figure 2-7 should include the outline of the Stanislaus/Modesto Study Area overlying the groundwater model boundary.
7. It is unclear how the boundaries of Stanislaus/Modesto Study Area were chosen. They do not appear to match natural watershed or groundwater boundaries. In particular, the inclusion of the northeast triangular piece is odd, especially given

that the area doesn't have soil data coverage (Figure 2-9) and may not include the groundwater model domain.

8. The Work Plan should discuss how soil data information from SURGO will be used to define mineral content of the soil., e.g, the percentages of silicates, gypsum, calcite, etc., that are required input for the WARMF model to model mineral weathering.
9. The Work Plan should include a discussion of how information about the use of soil amendments that contain carbonates and gypsum will be obtained and included into WARMF.
10. The Work Plan suggested that only permits for dischargers that release wastewater directly to surface water will be obtained for input to WARMF, of which there are perhaps dozens throughout the pilot study areas. However, will available data for the thousands of land dischargers be included, eg., food processors, and dairies that discharge to land be included in the model? Any such effort should be coordinated with the work completed for the Hilmar SEP. The Work Plan should specifically state whether this information will be obtained and used, and if not, how such land application dischargers will be included in the WARMF model.

Thank you for the opportunity to review and comment on the Work Plan.

JOHN HERRICK COMMENTS

From: Jherriaw@aol.com
To: dcozad@intpln.com;
cc: pcreedon@waterboards.ca.gov;
Subject: Re: CV-SALTS
Date: Friday, July 10, 2009 10:58:21 AM

Dear Daniel:

I attended one of the technical meetings last month, but was not able to send comments in a timely fashion. I would however like to echo one of the comments at that meeting. After the consultants outlined their mass-balance proposals for the three valley areas, Mr. Westcott asked why one area of study was on the eastern side of the San Joaquin River. This question/comment is not only key, but actually controlling.

Efforts aimed at the salt problems in the San Joaquin Valley have been ongoing for at least 40 years. Although there are many sources of salt and still some unknowns of how, why and how much, there is absolutely no question that the problems of high salt concentrations in the River are due to surface return flows from the west side of the valley, and the subsurface accretions affected/ caused by those surface flows. The river's problems are directly caused by the large amounts of CVP salts introduced onto the west side service area which make their way to the river.

To put it delicately, proposing to conduct a mass-balance test/analysis on the east side of the river indicates either a complete lack of knowledge of the problem by the consultant, or some misguided decision to avoid addressing the problem.

Of course one can certainly allege that the test is only an initial one, which will help tailor the process and create reliable tools for future use; but that simply avoids the issue I am re-raising. It does not further our understanding of the problem or help reveal potential solutions to study something which is absolutely known to not be part of the problem. This is even more egregious when one considers that shifting the test area to the immediate west would place it directly in the area known to be the source of the salt problem.

We have expressed our concerns and objections to the CV-SALTS process on a number of occasions and I don't mean to reiterate them here. However, no purpose is served by pretending the exact causes of the problem are somehow unknown, or that we need to know how the salt balance in an unimportant area functions. Very difficult decisions are required to "cure" the problem. The "hows" are very clear: either decrease the incoming salt from the CVP DMC; remove/ prevent salt from reaching the river; or dilute the salt reaching the river. That's it,

there are no other choices; amount in, amount out, level of dilution. Who does this, how much it costs, and what the effects of doing it are the tough choices. Looking at how east side salts travel and concentrate is irrelevant.

I encourage the process to stop and re-evaluate itself. The causes of the problem are clear and undisputed. The fixes are clear and limited, but difficult to accomplish. Those difficulties are what have plagued the process and hampered actions from being taken. CV-Salts now describes the problem as a "long term" one; but that is only to defer making the tough decisions. Please don't spend the limited resources on investigating something which is on the periphery of the problem. JOHN

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