CV SALTS
Central Valley Salinity Alternatives for Long-term Sustainability

Draft

Joint Economic and Social Impact and Technical Advisory Committees Meeting and Central Valley Regional Water Quality Control Board
Thursday, March 11, 2010 9:00 AM to 12:45 PM

Attendees: See Roster for attendance.

Technical Committee Chair Nigel Quinn called the meeting shortly after 9:00 am followed by introductions of all present in-house and on teleconference.

1. **Welcome, Introductions, Circulate Roster**

2. **Review/Approve February 10 Technical Committee Meeting Notes**

   Page 1 – Comment on Item 10 – Joe DiGiorgio – "Concentration of salt seems more permanent" should be "prominent"

   Page 2 – Paragraph 1, second line – Daniel Cozad included twice

   Page 7 – Summary presented to the executive committee?

   Motion to approve by Karl Longley and seconded by Joe DiGiorgio the notes were approved

3. **Final Report Salt/Nitrate Source Pilot Implementation Study presentation**

The study report sections include: Executive Summary; Introduction; Study Methodology Overview; Data Collection and Analysis Methods; Pilot Study Results (Summary); Conclusions, Discussion, and Recommendations; References; Attachments. The report is available on the website.

Attachments include: WARMF Model Description; Groundwater Model Description; Pilot Study Area Descriptions; Yolo Study Area Catchment Results; Modesto Study Area Catchment Results; Tule R. Study Area Catchment Results; Yolo Area Time Series Plots; Irrigation, Fertilizer, and Salinity Loading Rates; List of Acronyms and Abbreviations; Data Sources Status Summary; Responses to Comments on Final Draft Report.

The goals of the study were to:

1) Develop and document procedures and methodologies to quantify, fairly and equitably, the significant salt and nitrate sources in the Central Valley;
2) Pilot procedures in selected areas to evaluate the appropriateness and region-wide applicability of the procedures;
3) Provide guidance on approaches and tools to accomplish better salt and nutrient management.

Specific study objectives were:

1) Define significant sources of salt and nutrients;
2) Provide methods and manner of collection, characterization, and use of salt and nutrient source data for the pilot areas;

3) Outline data currently available and the quality of the data;
4) Identify additional data that should be collected or developed;
5) Indicate how methodology accounts for total salt loading balance and accumulation and identify critical concentration discharges
6) Ensure accurate account of all sources;
7) Identify how historic, current, and future source quantities will be determined or estimated to provide trend information;
8) Identify and quantify areas where nitrate impacts beneficial uses of waters;
9) Select analytical tools and methods that work for the pilot areas as well as other parts of the Central Valley.

The constituents of concern were identified, potentially significant salt and nitrate sources were identified, analytic tools selected and appropriate data identified for those tools, as well as data sources. The primary tasks of the study were to select the pilot areas; collect, assess, and input data into analysis tools; perform preliminary analysis and data validation, perform final analysis and produce study results; and develop conclusions and recommendations.

Potentially significant salt and nitrate sources the study identified include:

- SW upstream inflow
- Imported SW
- Irrigation
- Fertilizer
- Stormwater discharges
- Septic tank discharges
- Land application, including dairies
- Point Sources (WWTP & Industrial)
- Livestock facilities
- Mineral weathering / reaction products
- Atmospheric deposition
- GW extraction (dewatering)

Potentially significant salt and nitrate sinks the study identified include:

- SW outflow
- SW diversions
- Near-surface groundwater
- Deeper groundwater
- Plant uptake
- Reaction decay
- Gaseous loss, volatilization

The group used the following study tools in their report:

- WARMF Model
- Groundwater Models
    - Yolo – CVHM (USGS, 2009)
    - Modesto – MODFLOW Model (USGS, 2007)
    - Tule River – MODFLOW Model (Harter)
    - Particle tracking MODPATH

In general the group used the best available models for each area.

Water data - SW flows, imported water flows, water diversions, meteorology/effective rainfall, land cover classes, ET rates, topography data were necessary to meet the needs of the study. Irrigation return flows, irrigation rates, and irrigation efficiency data were estimated. Certain point source flows, groundwater pumpage, groundwater recharges rates were necessary and estimated.

Salt and Nitrate Data – Surface water quality numbers were necessary. Estimates for land cover class (salt) loadings, fertilizer rates and land application rates were used. Data for groundwater quality and point source quality were both necessary and estimated.

Process parameters were also used: Actual atmospheric deposition numbers were necessary. Estimates of plant uptake rates were used. Data for soil properties was both actual and estimated. In addition, the following model values were used: nitrification, denitrification, mineralization, volatilization, and sorption rates, as well as Phytoplankton processes.

The study examined and compiled information from 27 data sources.

When deciding where to work, the group considered the following criteria:

1) Major Central Valley hydrologic basins represented (Sacramento River, San Joaquin River, and Tulare Lake)
2) Advanced application status of WARMF model for the area (previously applied, partially applied, or not currently)
3) Range of land use classes (including various urban, industrial, commercial, and agricultural)
4) Relatively advanced status of groundwater flow models applied
5) Available groundwater quality data

Using the above criteria, the group chose Yolo, Modesto, and Tule River as their pilot areas. Combined, these areas comprise about 8% of the Central Valley's overall watershed and about 13% of its population.

Study Results

An analysis of surface water quality data showed what the total dissolved solids were. Total dissolved solids included inorganic carbon, phosphate, chloride, nitrate, sulfate, sodium, potassium, magnesium, calcium, ammonia. Inorganic carbon is a significant part of salinity, particularly if the overall level of salinity is lower and the pH is higher. Because of the nature of inorganic carbon, it is not so much a management issue, but also pH and other factors that are not controllable.

Regarding near-surface groundwater loading, the more irrigation water you have the more likely you are to have return flow to the surface from a particular land use. Regarding near-surface groundwater total dissolved solids, irrigation makes up between 32 and 72 per cent of input, while recharge to deeper groundwater (output) accounted for 47 to 72 per cent, with Yolo having the highest percentage in both input and output. Regarding deeper groundwater total dissolved solids, 100% of the input for the three study areas was 100%. Output varied, though with Yolo reporting 95% of output due to pumping for irrigation, Modesto 81% of output due to pumping for Municipal and industrial use, and Tule River 100% due to pumping for irrigation.

For surface water nitrate, input rates vary between the three study areas. Yolo reported that 46 per cent of its input from imported water, Modesto 63 per cent from inflows from upstream, and Tule River 45 per cent from inflows of near-surface groundwater and 51 per cent of inflows from upstream. On the output side, Yolo reported 83 per cent of

outflow to downstream, Modesto 80 per cent outflow to downstream, and Tule River 56 percent outflow to downstream and 44 per cent of output through diversion.

Regarding near-surface groundwater nitrate, the major source of nitrate input in the three study areas was land application of fertilizer (Yolo: 63 per cent; Modesto: 83 per cent; Tule River: 56 per cent). Of note, is that Tule River also showed 29 per cent of its near-surface groundwater nitrate input from mineral weathering and reaction products.

Regarding deeper groundwater nitrate, the group can't say for sure that the nitrate's being depleted because there is more uncertainty in terms of the amount of storage and total output. All the input of deeper groundwater nitrate in the three study areas is from the recharge from near-surface groundwater. The output for the three areas is 95 per cent and 100 per cent in pumping for irrigation for Yolo and Tule River respectively, and 84 per cent in pumping for municipal or industrial in Modesto.

In summary for total dissolved solids, the input comes from irrigation and fertilizer/land application; other sources that contribute less than 10 per cent TDS to near-surface groundwater are atmospheric deposition in Yolo and Modesto, and mineral weathering and reaction products in Tule River; TDS accumulates in the near-surface and deeper groundwater in all three pilot areas.

In summary, for nitrate, the input comes from near-surface groundwater through irrigation and fertilizer/land application. Other sources contributing less than 10 per cent of nitrate to near-surface groundwater in both Yolo and Tule River are mineral weathering and reaction products. Nitrate accumulates in near-surface groundwater in all three pilot areas, and in the deep groundwater in the Yolo and Modesto areas, but depletes in the Tule River areas as a whole.

Conclusions

Key project objective 4 – Identify additional data that should be collected or developed

The data collected during the study was adequate to run models and perform mass balance calculation. Additional data would be helpful toward improving certainty and accuracy of results.

Key project objective 9 – Select analytical tools and methods that work for the pilot areas as well as other parts of the Central Valley.

The analytical tools and methods used in this study were applicable to all parts of the Central Valley. The primary data for the mass balance calculation model required meteorological, hydrologic, and land cover data, which was readily available for all regions. There was really no need for any additional data because the amounts can typically be estimated.

Key project objectives overall – Identify and assemble input data for available models, then use the models to quantitatively relate salt and nitrate sources and sinks within representative pilot study areas.

WARMF Output demonstrated use as an accounting method for tracking salts and nitrate on and beneath the land surface. Groundwater models provided complementary data for WARMF model application and insights regarding subsurface distribution of salts and nitrate in groundwater.

Study Recommendations

Land Cover

1) Refine handling of non-dairy CAFOs
2) Refine land use classes for mixed or blended classes of crops (e.g. other row crops)
3) Aggregate land use class with small percentages of total land use and loading where possible
4) Refine nitrogen loading parameters for dairy solids to include nitrogen forms
5) Perform sensitivity analyses for soil classes and parameters and refine, if appropriate, using SSURGO mapping and parameters
6) Compare estimated fertilizer application with fertilizer sales/use data.

Surface Water

1) Perform post-WARMF analyses to quantify salt and nitrate loadings to near-surface groundwater by land use class to better identify land use classes with the highest potential to impact groundwater.
2) Perform a more extensive set of sensitivity analyses to better define the relative importance of major input and process parameters.
3) Establish single point of contact on RWQCB staff for processing requests for discharge data related to salt and nutrient planning efforts.
4) Expand CIWQS public access database to include basic discharge data: flow, effluent quality, location, land discharge area.

Groundwater Data and Modeling

1) Identify construction of CDPH wells to improve utility of historical water quality records.
2) Add monitoring locations in under-samples areas.
3) Refine groundwater transport modeling to better account for nitrogen, salt, and recharge inputs and effects due to pumping.
4) WARMF output to groundwater – disaggregate to individual land unit scale, then use as input to groundwater model for improved simulation of source distribution.
5) Perform additional sensitivity analyses and recalibrate groundwater models as necessary. Consider use of both head and groundwater age data.

Other Analysis Tools

1) Evaluate water, salt, and nitrate balances with whole-systems approach (current and future scenarios)
2) Evaluate potential effects of future mass loadings on watersheds
3) Recognize limitations of tools and data sets
4) Evaluate sensitivity of tools to inputs and assumptions

The WARMF model is available for download from ftp://systechwater.com; Username: cvsalts; PW: nitrate. Questions or comments regarding the WARMF model should be directed to Joel Herr, Systech Water Resources, Inc. joel@systechwater.com.

Nigel thanked the group for their presentation and work on the study, then opened the floor for questions.

Comment (Lisa): There is good information, but the information presented doesn't really determine whether there is a salinity problem in the basin. How does the information translate to salt concentration levels? To what degree are things degrading? Perhaps if there were numbers of available water, I could do those calculations.

Response: The concentration numbers are there, but just not in one place.

Q re: disposition of the models: Would it be possible to get a CD of all models, or put them in an area where everyone could get them?

Response: Yes, but CD is probably not the ideal way to distribute it.

Q re: input data to surface groundwater: The irrigation/fertilizer and land application sources are all aggregated together, is that correct? Do you have those separately?

A: The fertilizer and land application were aggregated together. The irrigation was listed separately.

Q cont'd – I would suggest that for utility and regulatory control purposes, it would be good to present those separately, since from a regulatory perspective those represent very different inputs as far as the ability of control and the implications of control.

A: The information could be extracted separately.

Q (Paula): Did you match the model and WARMF output stuff to your historical data and how well did that match? Did you look at the change in the groundwater?

A: Yes, we did. It is in the report and there is a discussion about the application of the DVHM(?) to using the WARMF output and simulating a 10-year time period and then relating that to the historical data. So there are plots showing that comparison and there is also a table that summarizes that comparison. Overall, most of them were within a closed tolerance. It was looking at small changes over time, so it's something that gauges the overall accuracy of the inputs and outputs, but it was cross-checked with three different catchments in the Yolo area, and it matched fairly well.

A (cont'd) The gauging data and water quality monitoring data used to calibrate the model before going through the calculations for the mass balances is there in the main part of the report.

Q (Paula): I'm assuming inorganic carbon is primarily referring to bicarbonate alkalinity, which is the way it would be present in the surface and groundwater?

A: The pH ranges we see in the Central Valley are really bicarbonate.

Q (Paula cont'd): More people might recognize it if you name it that. Also, when you break down the sources in your charts where you're talking about TDS loading and land use it would be helpful to have a breakdown of that. A lot of it looks like bicarbonate alkalinity contributed by various water being used, but it's important also to break this down into the anthropogenic sources that are added by activity. It might be helpful to break that apart by taking out the alkalinity and leaving the other ions.

A: All that information is in the model. It simulates all the ions separately and then add them all up for TDS and so if anyone wants to extract that data from WARMF they can do so.

Q (Joe DiGiorgio): I'm still curious about the atmospheric deposition. How confident are you that the data you used is adequate to project like you have what those loadings are and why is it so different in different areas?

A: The atmospheric deposition, there are monitoring stations downwind in the Central Valley which we used for weekly monitoring data, air quality and rain chemistry. The Total Inorganic Carbon portion is tricky to traffic model

because it's also a function of pH and things like that. So, I'm going to go into detail to see what exactly was causing all the differences in atmospheric deposition between models, but I pretty have as much confidence in that as I would in the fertilizer application rates in terms of plus or minus in terms of the air.

Q (Joe DiGiorgio cont'd): I went to the National Atmospheric site and best I could tell there were four stations involved: three of them downwind of the valley and just one up. Is that really enough to be able to differentiate between these three areas that big of a difference. I can see the pH thing affecting things on the ground could explain some of it, but I'm just curious about that.

It looks like your flow chart at the very beginning showed that your land cover was where the order of magnitude higher effects are, which is the only thing we can really control given that the other sources are more like climate and topography. That's interesting in that it's the only thing we have a chance to control at all. So, if that's where most of the effects are then that's good news in a way. There's a chance to do something.

I was a little concerned, but I get what you're saying in that the accumulation numbers are subject to a larger percentage of error given where they are on the map and that's disconcerting that that's what really matters. The bottom line here, are we accumulating, but it goes to concentration going up because you could be accumulating and not, but depending on what's happening with the water, that may or may not mean the concentration is going up or down. If the water is going away faster, then you could be in trouble anyway and that might govern, if it's all gone.

Response: The report discusses the sources and limitations, but it would be nice to have air data sources right in the middle of Tulare County.

Q: (Linda Dorn) Is it possible for an individual discharger to go in and use this to develop a salt management and nutrient management plan, they could account for their sources?

A: The model is totally functional and can be downloaded. If anyone wants to change their discharge model and see how that affects salinity concentrations, there is nothing preventing anybody from doing that.

Q (Nigel): You mentioned the public access database. Can you tell us a little more about this? Where are the models conveniently located so we can continue to use them?

A: The one that I mentioned, the GeoTracker. The information that we had would all be on Joel's site as part of the input.

Q (Nigel – cont'd): That's going to be a database then on your site?

A (Joel): Yes.

Q (Nigel – cont'd): Joel, what was your last comment on the CDs. Is this something that CV-SALTS can…do we have the ability to have FTP into…can we store information anywhere?

A: The FTP site is being provided free of charge by Systech. They donated that. So anybody with an internet connection will have all the modeling, all the land use areas that went into the modeling anytime. My comment was simply the administrative task of burning CDs…. If there are special needs, they can be met. All the data is available on the FTP site.

Q: The conclusions on nitrate you state that nitrate is depleted in the Tule River area as a whole. I find that somewhat of an anomaly. Any comments?

A: In the deeper groundwater of the Tule River and the surface groundwater we weren't showing the complete data existing for deeper groundwater. The Tule River was the most challenging of the three study areas to come up with the mass balances on surface water because there wasn't any surface water. In the other study areas, we can learn a lot about what's going on in near-surface groundwater by looking at the monitoring data from surface water, but we don't have that option in the Tule River. We set up the Tule River with coefficient reaction rates that came from the San Joaquin River as our best estimate of what's going on there. The reactions are an important part of the mass balances in the soil. But there is a lot of uncertainty because the reactions may not be the same. So, one tends to be on this slopes for a relatively long time period, in Tule they flush out sideways. So there is some additional uncertainty for that reason as well. What we came up with based on our assumptions is a depletion of mass. When the concentration is going down and groundwater is high, higher than what's being pumped out, we're still showing depletion in the amount of water involved.

Q: From your model is it possible to tease out the contribution of land disposal and waste water processes, Tulare Lake area and elsewhere?

A: We've shown you that in point source of surface groundwater; it's a relatively small portion. And then if you wanted to take the model and then with or without your land disposal you can see what it will do in the alternate locations.

A: It pertains to municipal and industrial waste waters not agricultural.

Q: What are the next steps that the technical advisory committee needs to take in regards to this information.

A (Nigel): I'm not sure what the next steps are. Lisa brought up a good point in terms of putting the information in a format that's going to be generally useful. That's why I was concerned that we had the information in a form that we can continue to work with it because these guides in the final report would have provided a lot of information, but as we continue to work with the information, we can generate more information and conclusions.

Comment: It just seems like there's been a lot of effort and money and time put into this and I think when we started it, what we wanted was a methodology that we could use at least in determining salt sourcing. And I think it would be a shame for the committee not to come to some sort of formal defining approach for methodology. I think the technical committee should have a subcommittee to do this and make a proposal back to the bigger technical advisory committee. It just seems like something needs to be formalized.

A (Nigel): What we asked these guys to do is go out and pick up the best models to do the work and so, in a way, the models they selected ended up being the methodology that was followed. It's not necessarily better methodology, but you used existing tools. Maybe what we're also thinking about is, what is the nature of the tools that need to be built to do some of that. It's just the nature of the game that you pick up what's available.

Comment: Which brings us to the larger questions as to whether we're going to come up with some kind of plan and if that will require certain tools to be used in developing plans or whether we're going to give regions flexibility to use the tools that they feel are appropriate and help what we expect the outcomes to be.

Comment (Paula): It is the original subset of people that wrote the original plan steps for getting to a basin plan amendment on the brown arrow that Daniel made. It was originally envisioned that this would be a first and key step in that pathway, so, what was envisioned as the way this would be used to get us to a basin plan amendment. That's what should happen to it.

Comment (Daniel): As I think of it from the beginning, we came up with six things that that subcommittee might want to put into place. One of the things is a recommendation from the committee to the executive committee about the approval of the report. Whether there are significant comments on the data in the Tule River is not as good as what we could have provided, so that we provide a recommendation to the executive committee to approve the report and note any, if you certain people in certain areas and you all had the data in this area, you would have come to a different conclusion, then that is something ought to go in the file.

The other thing is documenting the methodology, what is the methodology that was used and I'm leaning towards use whatever model you want, use whatever tool you want, but this is what CV-SALTS wants out of it. How much salt in? How much salt out? How much water in? How much water out? What's the forecast for the future and some of the basic pieces were answered and in the model. And then one of the things I said we would do is based on this, to update the cost. So, if we calculated it right with the numbers that are in there, we covered about 13% of the population in the Central Valley with these three pilots and 8.5-9% of the land recovery, to multiply .5 million, if we get close to that we ought to take a look at that and what that means, in terms of characterizing, the rest of it. Data requests and reporting for areas where we find holes. If this is a hole then we need to let the board know so the board can help out with getting that information.

And then, lessons learned. This is a pilot. What did go well? What didn't go well? Did we put too much schedule pressure on them? I'm sure they would say yes. Would we have gotten a better product if we had taken an extra six months? What would that have done to the rest? How do people in a local area go about finding the data that's there if it doesn't show up in the larger databases? Things like that should come out of this process.

And, what I would like to do is identify folks who are really the significant holders of knowledge in these areas? If they weren't involved with this study, ask them whether they agree with the results of the study or not and, if not, we need to change that because we need an accurate picture so at the end somebody goes forward to do this for their region. We need to make sure there is a feedback loop for the people who are actually living with the data every day. Agree or that they disagree because they have a specific interest and point of view but all the data is being accounted for and is reviewed. I think a subcommittee of folks who would read through the rest of the report and could identify especially the methodology and serve major changes that would be really helpful.

Comment (Nigel): One thing we could do is keep it as an agenda item for the next six months or so as people come up with ideas or suggestions, that we can document that.

4. **Best Management Practice Review Template and instructions (Ver. 4a) (Daniel)**

   There was lots of interest and disagreement with what Daniel originally wrote. Most disagreement with what was written rather than what Daniel had said. Everybody said they agreed with what was said in the meeting, we disagree with what you put down on your form.

   What we agree to do last time is write the instructions and the process at the beginning of the form so several folks who gave reviews on how it looked last time reviewed those instructions. If all members approve of the new form, the next step is to take a look a the Wine Institute study with this in mind and see how it meets these and work with the folks at the Wine Institute to complete the form in this format.

   No comments or questions raised. The next step would be the approval of the Committee and Executive.

5. **Review and Discuss Technical Committee Work Plan** (Daniel)

A few changes were made to the draft work plan. Included in this version of the work plan is a list of items from the regional board that they would like to make sure get accomplished in 2010. Daniel added a column that would identify which committee within CV-SALTS would have the primary responsibility for actions or overseeing them or checking them and what's the document or event so we know when the work is done, and what's the deadline we're aiming for. Most committee members have seen before. Daniel suggested that he add a column for "date necessary" and then scope what data is needed and how is the committee going to store it and use it.

Daniel asked for feedback on the new items or anything that members felt is needed going forward.

Paula suggested that the next step for the regional board amendment is to sit down with management and staff and scope out the information that's needed for the various water body areas. How can you complete the database design before you've identified the data? Daniel responded that that is dependent on what database design means and suggested that there might be different phases of it.

Nigel suggested that this last study could help that process because it used a number of models and developed output from them. Perhaps the committee should look at that input data stream and that would give us a list of data input at least to start off with. If a master list of inputs was developed from the model, which would probably be the most detailed and then create a subset of those in a simpler model. It's always easier to start with more complicated and then simplify.

Daniel commented that the state already has database structures that CV-SALTS could adopt. It may not be necessary to generate a completely new one. Daniel asked that those from the regional board would be able to help develop the information and set up for a CV-SALTS database.

One committee member commented that there were already too many databases and to create one more would probably not be a good idea. Nigel commented that a model is really a working database, which is organized to direct the solving of a problem or simulate changes, and that the structures are fairly straightforward. Some of the flow charts in the report should show how the various information is organized. The committee should be able to glean some of that information from looking at the report.

Daniel asked for confirmation that committee members agreed that the database design or criteria should be split up, and then proposes back to the regional board to confirm that the work items are in the right order.

Nigel asked the study team: When you were trying to get WARMF and Harder's models together did you develop a data tree of some sort. Is there something that you developed as you were doing some of that that would be helpful to the committee?

A: The basic tests were to align the surface water catchments as the pre-boundary of the groundwater models.

Nigel continued: Was there some kind of document or some kind of diagram that would get us started on doing what we need to do as part of this work. Did you create a whitepaper?

A: I'm sure that in various places in the report describes how we did all that, but it's not all in one place.

6. **Outreach Meeting Questions and Plan (Joe DiGiorgio)**

Betty, Rudy and Dr. Longley weighed in on some of the information in these. These are for the workshops that are to be held, one in Woodland and the other in Tulare. The committee intends to publish it beforehand and

use it as a guide for discussion that will be held in the workshop and solicit feedback from the people that attend. The first five questions are those that everyone is going to hear and try to solicit answers from everybody. From there the group would be broken up into smaller groups to facilitate discussion on the first five, as well as the optional and grayed out items.

Joe asked for feedback on these questions and meeting plan. Joe asked for 3-4 volunteers to help with the workshops. Daniel explained that these were going to be outreach workshops and the intent of publishing the questions beforehand with the notice of meeting is to engage stakeholders that may not come to Sacramento.

7. **BUOS Phase 1 RFP Update Release 2/25/10 Pre-proposal 3/4/10 (Daniel)**

The Coalition released the request for proposals for the phase 1 Beneficial Use and Objective RFP on the 25th of February. Eleven (11) firms were called to a pre-proposal meeting on March 4. The committee didn't receive any written questions, but answered about 10 questions during the meeting. March 10, the committee sent out a clarification to some of the questions and answers related to two open-ended items: the report discussed in the RFP on beneficial uses, what's available; and indicator permits within the RFP (the committee wanted to select a subset of permits from the regional board to review to see how these regulations were being put into place at the end of the line. Proposals are due on the 19th and then we have a selection of volunteers to review the applications.

Daniel will lead discussion on Phase 2 and beyond at the meeting in April

8. **Actions/Recommendations/Report to the Executive Committee**

    1) Report on the final Pilot Study and presentation
    2) Follow-up Committee to determine next actions and lessons learned
    3) Update on Best Management Practice Review Template
    4) Update on BUOS Phase 1 RFP – should have the proposals submitted by next meeting.

9. **Salt Management Alternatives Development meeting to be schedule in May 2010**

10. **Discuss next meeting date, April 21, 2010 Calendar with locations**

After a seven-minute break (at approximately 11:10) the meeting reconvened.

11. **Coordination Programs - San Joaquin River Upstream Salt & Boron BPA/TMDL Audience Questions and Discussion**
    a. **Presentation of Draft Report - Salt Tolerance of Crops in the Lower San Joaquin River (Stanislaus to Merced River Reaches)**

Daniel Cozad provided a brief introduction to the second half of the meeting and Jay's presentation. One of the things we committed to doing was to try to have fewer meetings. Where there were salt studies, other regulatory programs, other studies that dealt with salt and nitrates and have those meetings at the same time, coordinated with CV-SALTS activities. This is the first one.
We've been coordinating with board staff and the folks with the Bureau of Reclamation for six months or more. Additionally, almost everyone here participated in the scoping meeting for this project that was held March 2009. At the same time members of the Coalition Board and other stakeholders in the region were concern about where upstream standard would fit in relation to CV-SALTS and real time management. Would

it come up with changes that were contradictory? Those discussions have continued. We're looking to see how the upstream standards could become more integrated and even transition to a CV-SALTS activity. So, think of this presentation as the beginning of your opportunity to be intimately involved in upstream standards work as it progresses toward a transition into CV-SALTS. Within the next month, we will develop a transition integration process with the Regional Board staff and present a recommendation to the Executive Committee in April.

Speaker: Jay Simi, Central Valley Water Quality Control Board

The technical analysis in the report may be used as a first step of the eventual preparation of the San Joaquin River Upstream Salt and Boron Basin Plan Amendment. The Basin Plan Amendment will develop and implement new water quality objectives for salt and boron in the lower San Joaquin River upstream of Vernalis, CA. Each of the designated beneficial uses must be considered as part of the development of water quality in the lower San Joaquin. This report uses only one approach to look at the protection of the agricultural beneficial use. Other Beneficial uses will need to be reviewed as part of the basin planning processes. The report defines the lower San Joaquin irrigation use area, which is intended to be an approximation of land receiving and all or part of the irrigation supply water from the lower San Joaquin River, or with the potential for receiving irrigation supply water from the lower San Joaquin River. The data compiled in the irrigation use area includes water quality data, hydrologic data, land use data, climatological data, and groundwater data.

Salt is a significant issue in the San Joaquin River. Increased salt concentrations have the potential to adversely affect designated beneficial uses around the San Joaquin River, particularly agricultural through irrigation water supply. The water quality degradation of the San Joaquin River was first recognized in the 1975 Basin Plan and listed on the 303 D List for salt and boron in 1998.

The report being presented is based on the report by Dr. Glenn Hoffman, Salt Tolerance of Crops in the the Southern Sacramento-San Joaquin River Delta. His report includes a review of relevant scientific literature on irrigated agriculture and also presents a methodology for finding salinity thresholds to protect the agriculture.

The purpose of the report was to use Dr. Hoffman's approach with site specific data for the lower San Joaquin River to identify potential thresholds for salinity that would be protective of the agricultural beneficial use. The first step was to examine the literature on this subject. Dr. Hoffman's 2010 report was used extensively for this purpose. The data compiled by staff in the Report includes electrical connectivity data collected from three sites on the San Joaquin River, precipitation data, temperature data, and relative humidity data. Also compiled were soil types, groundwater data, and crop distributions. These site specific data for the lower San Joaquin River were used for the steady-state soil salinity model to identify potential salinity objectives to protect the agricultural beneficial use.

This report used the methodology Dr. Hoffman used in his 2010 report. But this is not the only methodology for identifying crop salinity thresholds.

There are three water quality measuring sites along the river: one at Mace Blvd.; one at Patterson, and one at Crows Landing. There were also six climate monitoring sites: two in the Modesto area; three in the Patterson area; one in the Newman area.

The entire lower San Joaquin River basin consists of 68,458 acres. Of this, 52,541 acres are used for irrigated agriculture according to a 2009 DWR survey. The irrigation use area includes portions of San Joaquin, Stanislaus, and Merced Counties.

There are nine soil types in the LSJR Irrigation Use Area – predominantly clay and city loams. Much of the soil in the LSJR Irrigation Use area is non-saline, with surrounding areas showing smaller pockets of various amounts of salinity issues. Groundwater levels range from less than 10 ft to more than 50 ft – and on average 40 ft per irrigation use area. Dr. Hoffman reported that a depth of about 5 feet should minimize upward flow of water from the water table into the root zone. About 85% of the water wells in the San Joaquin Irrigation Use Area have a water depth of 10 ft. considering a significant portion of the water use area has an average depth of about 40 ft, there is limited chance that crops would extract water in these areas.

The average monthly maximum temperature is consistently higher in Riverside than in Patterson and Modesto, with the exception of May and June. The average monthly minimum temperature is higher in Riverside than it is in Patterson by about 4 degrees, and higher in Riverside than Modesto by about 8 degrees. Maximum relative humidity is always lower in Riverside than it is in Modesto. Average monthly minimum relative humidity data shows that Modesto is consistently higher than Modesto and Riverside. Riverside's highest levels of minimum relative humidity occur in June and July.

Hoffman stated in his report that precipitation during the non-growing season can be beneficial to the overall water balance in terms of evaporation during non-growing season.

Based upon Crop Surveys conducted by DWR, from the 1990's to 2000's the acreage in the Lower San Joaquin River Irrigation Use Area used to cultivate moderately salt-sensitive crops has decreased by about 20%.

Of the ten crops that are grown in the LSJR irrigation area, dry beans are the most salt sensitive at with a salinity threshold of 1.0 dS/m, and Sudan Grass having the highest tolerance at 2.8. Of the crops grown on at least 1% of the acreage in the LSJR Irrigation Use Area dry beans were the most sensitive to salinity.

The steady state model assumes a mass balance approach with no changes in salt water storage. Inputs include irrigation plus precipitation and outputs include evapotranspiration plus drainage. This model assumes that the amount of salt entering crop root zone is the same as the salt leaving the crop root zone. Staff used the Hargreaves equation and crop coefficients to calculate their crop evapotranspiration rates. Cropping assumptions included three crops: dry beans – 3 planting dates with a growth cycle of about 4 months; alfalfa – 7 cutting cycles with a growth cycle of about 28-30 days; and almonds – grown in orchards (for the purposes of this study, it was assumed that there was no cover crop on orchard floor).

The group examined the effect of bean planting dates on soil salinity levels. Their studies showed that the planting dates had little effect on the median soil salinity levels. Monitoring of alfalfa was challenging because of the cutting and growing stages. Peak canopy for almonds is reached in June and lasts through the end of September.

Regardless of the amount of rainfall the bean soil water salinity threshold (with an assumed irrigation water salinity of .7 dS/m) did not exceed threshold levels even if the annual rainfall were at the lower end of the spectrum. If the assumed irrigation water salinity is increased to 1.0 dS/m, there is a predicted yield at a leaching fraction of 15%. There is not predicted yield loss with LF's of 20 and 25%.

Increases in the leaching fraction increase the allowable irrigation water salinity.

Jay welcomed the committee members to submit any questions or comments once they have had a chance to review the draft report, which will be available on their website.

Q: When you showed the initial maps of the salinity and bean crops, do you know the reason they're dwindling?

A: No, we didn't investigate that.

Q: When you were picking beans, alfalfa and almonds, why those crops?

A: These were the crops selected for examination by Dr. Hoffman in his 2010 Report. I think we were trying to get sort of a representative sample of crops that are grown with irrigation in this area. Beans are more sensitive.

Q: The peaks that are shown on the graph on page 9, are those in the fall, in the growing season. On slide 17, you separate out the growing season from everything else?

A: There are two-month increments on the scale there.

Q (cont'd): Is there a characteristic to these peaks? What time of year are they appearing?

A: One of the reasons we provided this data is not only to look to see if there is an impairment or not, but to move into an analysis of what showed up about trends. This was a technical exercise.

Q (Joe DiGiorgio): So the comments you're looking for from us are basically, did we do the approach correctly?

A: Yes. When you look at the report, you will see that we used Hoffman's numbers and we wanted to know what would happen if we used his model.

Q: Your process for moving forward is what?

A: For moving forward we have a comment process for the next 70 days, then once all the comments are in we will adjust the report accordingly. We also have to look at the other beneficial uses, not just the agricultural irrigation uses.

Q (Joe G.): Any idea how much this effort cost?

A: We don't think in terms of cost, but it was a significant staff investment in it.

Q: Is this graph telling us that the borders of the Patterson area are diverting water at 1.0-1.5 and using that on their agricultural crops?

A: Those gauges are in the river. We don't have a gauge that's on the diverters.

Q (Paula): So, what's used on the crops is usually a blend of groundwater and river diversion?

A: It could be. We didn't examine all of the irrigation water supplies for the area.

Q (Paula): Why has the dry bean acreage decreased?

A: I don't know the answer to that. There are people from that area that might have a better answer.

Comment (Mark Gowdy): We had a similar decrease from the 90s to 2007, if I'm not mistaken in the south Delta. It's really hard to sort out economic forces that might affect what farmers are planting from, say, something related to salinity.

Q (Paula): Also I'm a little unclear as to the threshold where you start seeing the yield loss.

A: One is soil water salinity and the other is irrigation water salinity.

Comment (Mark Gowdy): Part of that too is the threshold data is measured as, what's called, ECE, which is a number that comes out of the actual test where they take a quantity of soil and take an equal quantity of water and dilute it so it's measurable. If you look back at the Westcot report, there was a discussion in general because there's a half-in-half dilution like that.

Q (Daniel): So the answer is that it could have been salinity that reduced the crops but it would be difficult to determine…

A: I'm not going to say we wouldn't do that, but one of the purposes is to get a generalized area of not where water is used, but where water could be used.

Q (Nigel): Just in terms of the modeling approach, you decided to use a steady state model. That's an annual study? What is your justification to use it compared with a transient model?

A: It was compared to Dr. Hoffman's report. We used Hoffman's approach and it has the limitations indicated in the report.

Comment (Nigel): You also need the data to populate the models. I think it is a great approach and it's what we're trying to do. You want to develop a good methodology that people like and can apply it in a number of different areas.

Then Committee had no further questions

12. **With no additional business the meeting adjourned**