

CV-SALTS Conceptual Model Summary Description

Conceptual Model for Understanding Salts and Nitrates in the Central Valley

1. CV-SALTS has proposed a Conceptual Model¹

This conceptual model would use existing Geographic Information System data layers, model outputs, and existing salt source information. The concept is to summarize and aggregate water, salt, nutrients and other relevant information to a very high level through GIS to allow a common level of representation and integration. By doing this in phases the Model would serve to drive discussion and decisions at an appropriately high level. This level, shown by the largest puzzle pieces in Figure 1, would be used to discuss the Central Valley wide discussions and decisions and policy issues.

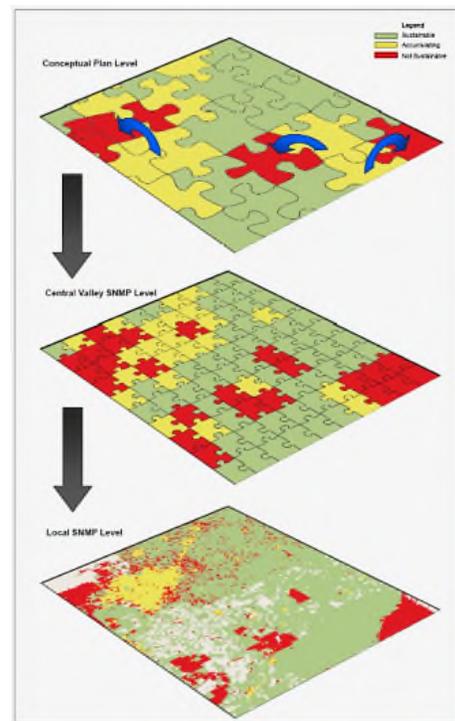
When a high level is completed it is expected that additional detail will be needed for Salt and Nutrient Management Planning (SNMP) which may be developed and summarized to fit this lower higher detailed level, shown by the smaller puzzle pieces in Figure 1. In summary provide information for each audience and set of decisions as shown below:

- Drive simple large scale understanding at high level - Large puzzle pieces (35Kft)
- Provide clear understanding for SNMP at more detailed level smaller puzzle pieces (10Kft)
- Integrate available data and be defensible at lowest level (ground floor)

This approach would address the following goals:

- Has credible water balance
- Uses the best existing available data
- Will shows/explains
 - Where salt is accumulating
 - Relative magnitude of accumulation and where
 - Interaction between regions water and salt
 - Where there are short term/long term problems
 - Facilitates cooperating groups to provide better information
- Works with existing data sets and accommodates future boundaries
- Approximates salt/nitrate balance adequately for high level decisions and will contain adequate detail

This approach is also consistent with work being done by many other studies including those on the West Side of the San Joaquin by the Bureau



¹ Conceptual Model, as used here is intended to be a GIS based decision support tool used to summarize and illustrate the salt and nitrate status and assist in understanding of the water and salt sources in large areas of the Central Valley. Similar to a physical model of a building in design by an architect it represents the structure and appearance (data based information) but is simplified to an appropriate level for discussion and decisions.

of Reclamation, CV-SALTS Pilot Study, and work being done for the Drinking Water Policy and Irrigated Lands efforts. The Model should clearly state what is capable of providing at each level of detail and what is not to be provided.

2. Technical Committee Considerations and Recommendations

The Technical Committee at a meeting on December 16, 2011, reviewed the concept and discussed it in the detail described herein. Several suggestions and recommendations were made that improve the concept toward implementation. These consensus recommendations are incorporated throughout this description and outlined in the sections below.

Utilize CVHM² for water balance in the Central Valley, this existing geodatabase has peer reviewed and validated flow and used 8500 drillers logs to develop subsurface characteristics for the model. More information on the model is shown in Attachment A and at the link in the footnote.

Use Land Use Based Estimation for primary salt sources as was done in the pilot program, and is done in most other models for source information. DWR and others provide information that can be augmented and verified.

Utilize Region Wide Databases especially GIS databases for water quality and other data. Geodatabases discussed include:

Drinking Water Policy Technical Working Group –

Groundwater and water supply data derivable from models run for this group.

DWR Applied Water Data for Irrigate Agriculture – DWR applied water values are available and have been demonstrated to provide a preferred assumed water usage for agricultural water use compared to evapotranspiration.

SB X2 1 Nitrate Project – Study directed by Thomas Harter’s recently published reports on water quality modeled in the Tulare Lake Basin.

Pilot Study Data Sources – Use the consistent data from the West Side Reclamation Study and the CV-SALTS Salt and Nutrient Source Pilot Study Areas.

Dairy General Order Representative Groundwater Monitoring Results Report³ - Includes data developed in response to the Regional Board Dairy General Order for dairy monitoring of groundwater. This dataset covers the entire Central Valley and contains GIS layer information for several relevant



Graphic from USGS CVHM factsheet showing the area covered by the model

² Central Valley Hydrologic Model developed by the USGS <http://pubs.usgs.gov/fs/2009/3057/> provides hydrologic water balance for surface and groundwater waters for the Central Valley; additional information is available in Attachment A. CV2SIM is an alternative model with differing assumptions and therefore differing water balance.

³ Dairy General Order Representative Groundwater Monitoring Results Report was developed for the Dairy General Order monitoring program and provides data in GIS format for the assessment of monitoring groundwater for Dairy CARES. Additional information is available in Attachment B.

needs. While this data was developed to determine priority groundwater monitoring areas its water quality data and other physical parameters may be used for CV-SALTS. Layers include average depth to groundwater, average recharge, average soil permeability and water quality data from 1960 to 2000 for nitrate and chloride. Additional information on this dataset is available in Attachment B.

Validate Salt and Nitrate Sources Data – Several major sources of salt can be augmented or validated in the land use models with specific information such as:

- Irrigation District Records
- Fertilizer and pesticide use from State databases to validate land and crop information
- Sales Records of Gypsum use by County Ag Commission
- Animal Waste values from County Ag Commission
- Dairy and other significant permitted sources from Regional Board
- Wastewater treatment and permitted treatment plants from Regional Board
- Irrigated Lands monitoring data and modeling

Stated Assumptions and Default Values – Where information is lacking or data gaps are known utilize default values and clearly stated assumptions. This will allow these assumptions to be replaced with actual data and information layers but will not impede the assessment of the area if not all data is available.

Stakeholders Coordination is Key – The Committee stressed that engaging and having a method to engage the stakeholders who have data and management capability. This conceptual model approach would encourage participants who may want to provide data in the initial or after the initial work to provide additional or separate information. It must engage them and allow them to get something in return.

3. Questions Answered

The committee also discussed some of the questions that were posed, from the level of information provided were able to respond:

- The approach can accommodate the level of spatial and temporal aggregation/disaggregation is needed for CV-SNMP?
- The GIS database can be used to stitch these data sources together when aggregated
- This system can be compatible with the level needed for local SNMP or project assessment?
- Site Specific Objective work we integrated if this approach?
- Approach would be compatible with the assessment needed for alternative or archetype evaluation

Regional Board Questions - Several questions were posed by the Regional Board for discussion and were addressed by the Committee and the following answered and modified. They are here to be sure they are incorporated into the standards for questions the model should be able to answer. This approach to modeling provides much of needed support as shown in the ** notes below in italic* (this section may need further development):

- 1) Which areas/ regions/subareas are achieving water, salt, and/or nitrate balances?

**Addressed at the SNMP Level visible at the Conceptual Model level.*

- 2) Which areas/regions/subareas are accumulating water, salt, and/or nitrate?
For each of these:
 - Where are water, salt, and/or nitrate accumulating? And * Yes it would show imbalance
 - What is the rate of accumulation? * Yes depending on the available data, forecasting limited
- 3) In which areas are water, salt, and/or nitrate being depleted?
For each of these:
 - Where is water, salt, and/or nitrate being depleted? And * Yes
 - What is the rate of depletion? * Yes depending on the available data, forecasting limited
- 4) What are the sources of water, salt, and nitrate into the Central Valley?
 - Where are these sources entering the Central Valley? * Yes
 - What is the rate at which they are entering the Central Valley? * Yes
- 5) Where are water, salt, and nitrate moving within and out of the Central Valley, and what is the rate of that movement? * Yes
- 6) Which areas require additional study (i.e. high priority areas)?
* Yes – it would provide the data for the Executive committee to identify priority criteria/areas
- 7) What major data gaps have been identified? * Not yet but will become obvious in the analysis.
- 8) What are the primary drivers * Yes
and how do they drive different management practices? * Maybe but this question will need further development.
- 9) What is the Rate of Change of the concentrations in Groundwater and vadose zone?

4. Additional Development and Questions

Several questions the Committee was not able to address in the meeting and should be addressed in future meetings are shown below:

- What level of spatial and temporal aggregation is needed for the highest level assessment to be able to communicate the big picture?
- Are there incompatibilities in the models assumptions that make them incompatible at the level of data to be used?
- How should areas where there is little data be handled?
- What are the areas of significant assumptions in the data and models?
- What are the most likely gaps that have a long lead time?
- What limitations are likely other than data and assumptions?
- What has worked to encourage sharing of Models and Data?
- What process for outreach should be taken for the initial high level step
- What process should be used for subsequent rounds of inquiry in the SNMP steps

5. Scoping and Procurement Steps

This initial Conceptual Plan Description will be reviewed by those participating in the last Technical Committee meeting and feedback incorporated and presented to the full Technical Committee and Executive Committee for Concurrence. If acceptable a scope of work should be prepared for procurement. Likely the project would have several phases; a very rough cut at the phases for discussion is shown below:

Initial Phase

- Develop Work Plan, assumptions, methodology, and data sources for Conceptual Model
- Upon Approval implement work plan and construct model geodatabase consistent with existing BUOS Phase I
- Data acquisition, formatting and GIS development to provide Conceptual Model
- Provide information, briefings and outreach for understanding
- Develop needs for SNMP Data beyond existing Conceptual Model
- Schedule 6-8 months
- Budget \$200,000

Phase 2

- Develop Work Plan, modifications and additional data sources for second level of detail
- Upon Approval implement work plan, aggregate analyze additional data and develop additional model components such as temporal capacity forecasting etc.
- Data acquisition, formatting and GIS development to provide SNMP Level Model
- Provide information, briefings and outreach for understanding
- Develop needs for SNMP Data beyond existing SNMP Level Conceptual Model, testing implementation etc.
- Schedule 10-12 months
- Budget \$400,000

Final Phase

- Assessment and support for the SNMP, Implementation Plan and Documentation
- Incorporating Data from Regional SNMP
- Other Tasks
- Schedule 12 months
- Budget \$100,000

Questions for the Committee and Executive Committee and the Regional Board:

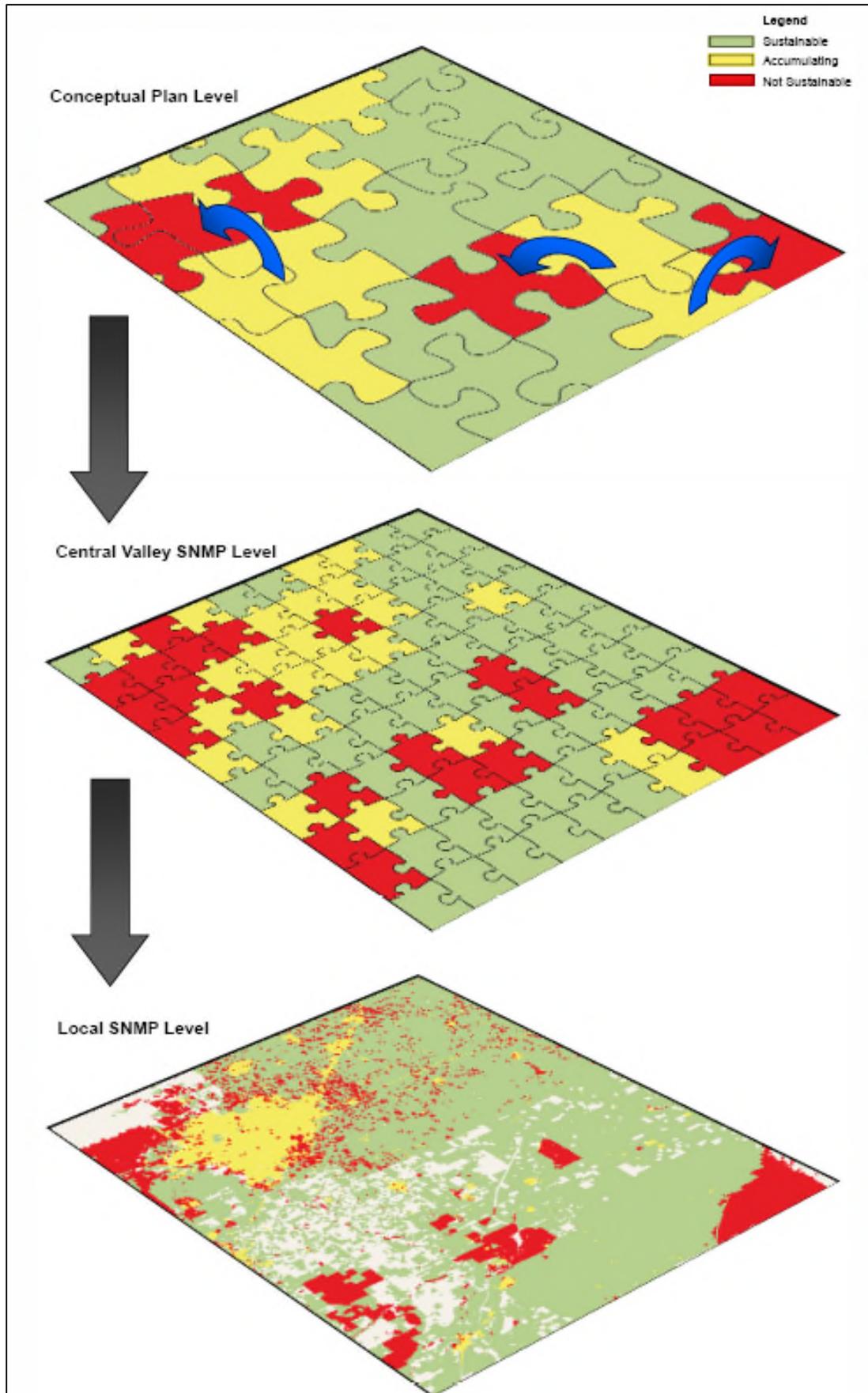
- What other scope elements are needed to procure these services?
- Can we utilize the TMP SOQ for procuring these services?
- Different consultants have access to different data, how can we be sure we can demonstrate competitive process?
- What roles should the TPM and Basin Planning Manager in review of the scope and the project?
- Which steps would require approval of the Technical Committee or Executive Committee?

6. Acknowledgements

This document includes significant contributions from the consultants working for and with CVSC Members and others participating with CV-SALTS as well as work from EKI as Technical Project Manager. Assistance and feedback from the Regional Board Staff and from the Committee Chair Nigel Quinn provided significant clarifications to the work and the concept.

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Figure 1 Conceptual Model Diagram



Attachment A

<http://pubs.usgs.gov/fs/2009/3057/pdf/fs20093057.pdf>

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Appendix B

Dairy CARES Data Description to be provided

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