

CV-SALTS Technical Memorandum

Date: April 18, 2011 Revised by Committee Members after the last Committee Meeting

To: CV-SALTS Technical Advisory Committee

From: Salt and Nitrate Sources Pilot Studies Review Knowledge Gained Subcommittee

Early in 2011, the CV-SALTS Executive Committee directed the Knowledge Gained Subcommittee to develop a framework for regional-scale salt/nitrate identification studies in the Central Valley by April 2011.¹ This memorandum responds to this direction. An additional and more detailed document will be submitted in May to provide more detailed guidance on preparing regional-scale salt/nitrate identification studies.

PROCESS: Following review of the Salt and Nitrate Pilot Implementation Study (SNPS) report, the Technical Advisory Committee (TAC) established a voluntary review subcommittee, (Knowledge Gained Subcommittee) to evaluate and document what CV-SALTS learned through the experience and to examine the role of the SNPS in the development of Salt/Nutrient Management Plans and the larger CV-SALTS program. In the fall of 2010 the Executive Committee suspended all subcommittees to refocus the mission of the CV-SALTS. This memorandum responds to this specific direction from the CV-SALTS Executive Committee.

RECOMMENDATION: The Knowledge Gained subcommittee submits this framework for salt/nitrate identification studies for adoption by the Executive Committee. Our recommendation is that **salt/nitrate source identification studies be conducted in a phased approach.**

A phased approach allows for cost-effective evaluation and provides opportunity for stakeholder input. With a phased approach, the scope of the salt/nitrate source identification studies are not pre-determined, but depend on encountered regional-specific technical and political factors that become apparent during preparation of the study (e.g., management priority, urgency of salinity/nitrate issues, data quality and availability, funding availability, and cooperation of stakeholders). Stakeholder input is critical to determine whether study results are adequate to make salinity/nitrate management decisions and meet regulatory endpoints, or whether additional data collection or analyses are needed.

¹ The subcommittee has used the term “regions” within this technical memorandum to define plan areas within the Central Valley, on the assumption that the Central Valley Salt and Nutrient Management Plan will be a collection of smaller plans that fit together. At this point we have not attempted to define regions beyond thinking of them as small enough to be managed. The framework described herein is specifically limited to regional-scale studies and not applicable to salinity and nitrate source identification studies that would be accomplished on a facility- or municipal-scale basis.

This submittal is intended to meet the Progress Goal due in April:

Framework developed for salt/nitrate identification studies (Assess the validity of the salt source survey pilot studies. If the approaches need modification, identify the adjustments that will be made to make the approach useful in the rest of the region.) [From the Knowledge Gained Subcommittee]

FRAMEWORK FOR SALT/NITRATE IDENTIFICATION STUDIES: The Knowledge Gained Subcommittee is producing a framework report that includes:

1. Description of the purpose of Salt/Nitrate Identification Studies
2. Study process
3. Technical principles
4. A list of the technical design questions for Salt/Nitrate Identification Studies
5. A technical outline of the contents of Salt/Nitrate Identification Studies
6. Examples of visualizations of results of Salt/Nitrate Identification Studies

This memorandum presents the final version of the first three sections of this framework report.

The Knowledge Gained Subcommittee is also producing a **final Framework Document that describes the final three sections in more detail.**

DESCRIPTION OF PURPOSE OF SALT/NITRATE IDENTIFICATION STUDIES: Salt/Nitrate Identification Studies serve several purposes:

- develop information at appropriate scales for region-specific salinity problems to enable prioritization of management efforts throughout the Central Valley groundwater Basins and watersheds;
- provide data that can be utilized in the development of Salt/Nutrient Management Plans required by the Recycled Water Policy;
- provide technical support for basin plan amendments; and
- provide a starting point for regulated regions' implementation activities.

Studies can vary in scope, depending on encountered technical and political factors such as priority and urgency of salinity/nitrate issues, the availability and quality of data, funding availability, and cooperation of stakeholders.

STUDY PROCESS

Studies should be conducted in a phased approach to promote cost-effective evaluations and provide opportunity for stakeholder input. All studies should include completion of Steps 1 through 4.

Depending on encountered technical and political factors, certain salt/nitrate source identification studies may require additional data collection or analysis, as outlined in Step 5.

Step 1: The first step in a Salt/Nitrate Identification Study is the **description of study area characteristics and clear delineation of the study region**. All studies should employ a clearly defined control volume to accomplish a regional water budget and salt/nitrate load balances. Study area characteristics should include climate, physiography, geology, hydrology, and hydrogeology. Delineation considerations may include natural and political boundaries such as natural hydrological boundaries (watersheds and groundwater basins), water supply and wastewater infrastructure, existing salinity/nitrate regulation endpoints², land use, water district or other political boundaries, and data availability, coverage and format. Study regions should be primarily defined by natural boundaries because use of political boundaries will complicate the development of water budgets and salt/nitrate mass balances.

Step 2: The second step in a salt/nitrate identification study is **the development of a water budget**.³ A water budget is the characterization and accounting of inputs (water sources), outputs (water sinks), and changes in water volume (e.g., groundwater table elevation changes, volume of surface water in a reservoir) within a defined study region. Water sources and sinks may include natural and artificial infiltration (recharge), , uncontrolled water pathways, controlled pathways of irrigated return water and treated municipal and storm waters, and other water loss pathways (evapotranspiration, biomass). The study also may need to identify constraints to the water budget (permit terms, environmental regulations, risk management, etc.). Data sources should be described and quality assessed and assumptions documented (see principles). The development of an accurate water budget is the foundation of salt and nitrate characterizations.

Step 3: The third step in a salt/nitrate identification study is **the development of salt and nitrate mass balances**. All salt and nitrate sources and sinks are identified with appropriate quantitative, location, and land use data. Salt and nitrate information is applied to elements of the water budget and spreadsheet mass balances are developed. Significant salt/nitrate sources and sinks are highlighted.

As with the water budget, the data relied upon to conduct the salt and nitrate mass balances must be clearly identified. The accuracy of the water budget and salt/nitrate mass balances is largely dependent upon data completeness and accuracy. Data completeness and accuracy varies broadly throughout the Central Valley. Incomplete or conflicting data should be described, and actions taken to address such circumstances should be documented with other assumptions (preferably supported by references) needed to develop salt/nitrate mass balances.

Step 4: The fourth step in a salt/nitrate identification study is to **synthesize and create visualizations of water budget and salt/nitrate mass balance information** so stakeholders can determine if the studies are sufficient to inform salt/nitrate management efforts with regions, while ensuring regional Salt and

² The regulatory endpoints are used to inform temporal scales of the water budgets.

³ More than one water budget may need to be developed to capture shifts in water or wastewater management due to factors like hydrology (dry versus wet year water management).

Nitrate Management Plans fit together to achieve overall Regional Water Quality Control Board Basin Plan objectives.

The transformation of data into information should be done in consideration of salinity issue(s) and regulatory endpoints. The salt/nitrate identification studies should be essentially the “common language” between regional Salt and Nitrate Management Plans, so as to allow for some surety that regional management efforts will be coordinated and not acting at cross-purposes to one another. The salt/nitrate identification studies must allow for consistent descriptions and quantifications of salt/nitrate sources and sinks throughout the Central Valley.

Step 5: The fifth step in a salt/nitrate identification study is to **develop additional information needed to support effective management practices and alternatives**. If stakeholders determine in Step 4 that the salt/nitrate identification study is not sufficient to develop a Salt and Nitrate Management Plan then further data collection or analysis may be required. Additional investigations or computer modeling may be needed to more accurately characterize salt/nitrate loadings, salt/nitrate concentration temporal trends, salt/nitrate fate and transport, salt/nitrate groundwater plume movement, or other data to inform strategic priorities related to regulatory endpoints.

Participants: Over the past year, the Knowledge Gained Subcommittee has included:

- Lisa Holm
- Mona Shulman
- Michael Nordstrom
- Nigel Quinn
- David Cory
- Joe DiGiorgio
- Linda Dorn
- Debbie Webster
- Bob Braun
- Melissa Turner
- Michael Johnson
- Robert Smith
- John Dickey
- Michael Steiger
- Andrew Safford
- Rudy Schnagl
- Jim Martin
- Jeanne Chilcott
- Daniel Cozad

(SOME RECOMMEND DELETING THE SECTION BELOW – WITH THE EDITS ABOVE ALL OF THESE POINTS ARE INCLUDED ABOVE, EXCEPT FOR THE POINT ABOUT DEFAULT ASSUMPTIONS, WHICH SOME COMMENTERS DISAGREED WITH)

Data availability: The accuracy of water and salt/nitrate budgets is largely dependent on the availability of accurate data. The availability of data varies broadly throughout the Central Valley. Available data should be supplemented by documented assumptions (preferably supported by references) where needed to develop budgets.

Data quality: The highest priority is to use data that is supported by quality assurance/quality control processes. Other data should be used after they are reviewed for obvious quality issues, and such data should be clearly documented as of lower quality. The quality of data varies broadly throughout the Central Valley. Uncertainty analyses should be conducted to determine whether improved data would improve budgets.

Default assumptions: CV-SALTS should develop a set of default assumptions for use in areas where data is not available. Sensitivity tests can be used to determine where areas should consider replacing default assumptions through data collection to improve budgets.

Clearly defined control volumes: Studies should employ a clearly defined control volume to accomplish a regional water budget and salt/nitrate load balances.