

Section 1

Project Overview

1.1 Background

Central Valley Salinity Alternatives for Long Term Sustainability (CV-SALTS) is developing a comprehensive regulatory and programmatic approach to the management of salt and nitrate in the Central Valley that is consistent with the State Recycled Water Policy (SRWP). This work is being done with the Central Valley Regional Water Quality Control Board (Regional Board), the State Water Resources Control Board (State Board), the Central Valley Salinity Coalition and Stakeholders. As stated in the CV-SALTS Strategy and Framework document, the strategy to achieve this outcome is to adopt a Central Valley Salt Nutrient Management Plan (SNMP) and revise the Basin Plans applicable to the Central Valley to facilitate implementation of the SNMP. Fulfillment of this strategy will establish the basis for short and long-term management of salt and nitrate across the Central Valley.

Among other requirements, the SRWP requires that development of the SNMP include the following two elements (SRWP, Section 6):

- 6.b.3(d) - Salt and nutrient source identification, basin/sub-basin assimilative capacity and loading estimates, together with fate and transport of salts and nutrients.
- 6.b.3(e) - Implementation measures to manage salt and nutrient loading in the basin on a sustainable basis.

To develop a Central Valley SNMP and address these requirements, CV-SALTS adopted a 5-year workplan that includes (a) technical studies to develop information to understand salt and nutrient sources, assimilative capacity and loads; and (b) implementation planning activities to establish the basis for the management of salts and nutrients on a sustainable basis. CV-SALTS is conducting work in these two areas (technical studies and implementation planning) in parallel. Key technical studies under development include:

- Geographic Information System (GIS) of beneficial uses, water quality objectives and water quality data for surface water and groundwater within the Central Valley to provide a baseline for analyzing and evaluating existing information, identifying priority areas of concern and comparing management alternatives (“GIS Framework”).
- Conceptual Model to provide the technical basis to unify data and modeled information from across the Central Valley to understand salt and nitrate characteristics at various geographic scales and support salt and nutrient management planning activities, including preparation of the SNMP. Conducted in phases, the initial phase conceptual model (IPCM) will establish management zones, methods for analyzing salt and nitrate characteristics within management zones, and ultimately describe the sources and sinks of salt and nitrate throughout the Central Valley.

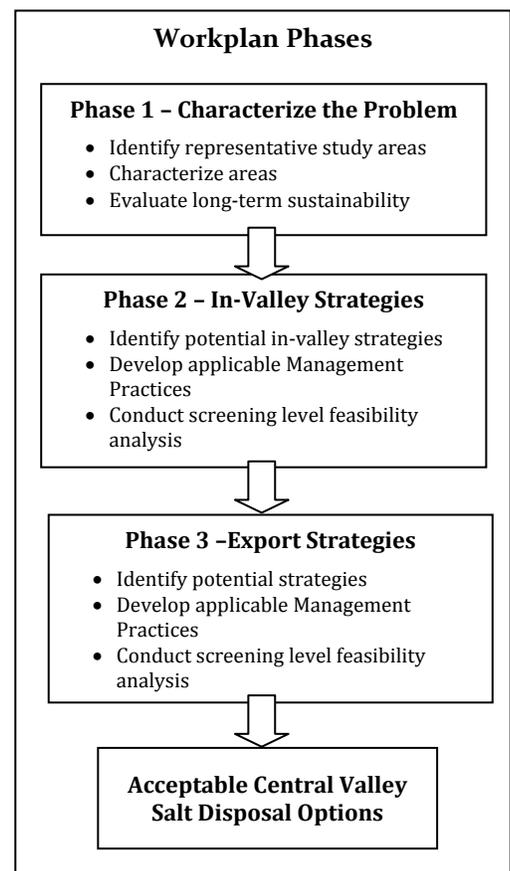
In parallel with the technical studies described above, CV-SALTS has begun work in the area of implementation planning with regards to salt management through initiation of the Strategic Salt Accumulation Land and Transportation Study (SSALTS). In contrast to the technical studies which provide information about the Central Valley as a whole, SSALTS is intended to be more selective and strategic. Specifically SSALTS will identify areas where salt is accumulating either intentionally or unintentionally and provide the basis for CV-SALTS policymakers to begin consideration of salt disposal solutions to achieve the SNMP requirement to manage salt in the Central Valley in a sustainable manner. Specifically, by identifying and characterizing a representative cross-section of salt management concerns, completion of SSALTS will assist CV-SALTS stakeholders begin to envision the range of potential management alternatives to dispose of salt. Developing understanding in this area early in the SNMP process will support efforts to develop an SNMP that is practicable and implementable.

1.2 Workplan Purpose

The CV-SALTS Executive Committee has requested development of a Workplan to execute SSALTS. The deliverables from this study will provide CV-SALTS with timely, strategic identification of existing salt accumulation areas and potential alternatives for future salt disposal in a manner that is sustainable over the long term. Potential alternatives for salt disposal range from expanded use of existing salt disposal areas, establishment of new salt disposal areas within the Central Valley, the export or transport of salt out of the Central Valley, or some combination of the above.

SSALTS will be conducted in phases, for the most part concurrent with the development of the Conceptual Model, as summarized below.

- *Phase 1, Identify and Characterize Existing Salt Accumulation Study Areas* - SSALTS will identify and characterize prototype areas that are key examples of existing salt accumulation areas in the Central Valley. SSALTS Phase 1 is not an attempt to identify all potential locations; instead, it will provide (a) a representative cross-section of situational examples or settings where salts accumulate, and (b) provide information regarding why salts accumulate in these areas. Characterization of the representative study areas will include an analysis of the capacity, longevity, and costs associated with continued salt accumulation in these areas and provide a forecast regarding the likelihood that these areas will remain viable for continued salt accumulation over a 50-year planning period. Phase 1 will utilize existing studies and data and will be coordinated closely with development of the CV-SALTS GIS Framework, Conceptual Model, and any other related, ongoing CV-SALTS salinity management efforts.
- *Phase 2, Develop and Evaluate In-Valley Salt Storage Management Strategies* - SSALTS will analyze the Phase 1 study areas to determine if these areas can be expanded to increase the opportunity for their continued use for salt



disposal, and identify potential new areas that can serve as additional, intentional salt disposal areas for the Central Valley. The Phase 2 analysis will include identifying and evaluating strategies for continued management of existing salt storage areas using existing methods or other in-valley alternatives and identification of potential new areas for intentional salt disposal. Phase 2 will also include an analysis of regulatory and institutional barriers to implementation of in-valley salt management alternatives to provide early identification of key policy issues that should be considered by the Executive Committee to facilitate SNMP development.

- *Phase 3, Develop and Evaluate Salt Export/Transport Management Strategies* – SSALTS will develop and assess strategies to export or transport salt out of the Central Valley. Strategy development will build cumulatively on the Phase 2 findings and may include development of alternatives that combine in-valley salt disposal methods with methods that focus on the export or transport of salt out of the Central Valley, i.e., hybrid approaches to salt disposal. Phase 3 will include an evaluation of the feasibility of various potential alternatives, including an analysis of regulatory and institutional barriers to implementation to provide early identification of key policy issues that should be considered by the Executive Committee to facilitate SNMP development.

To meet the goals of the SSALTS, this Workplan will focus on fulfilling the following objectives:

1. Complete the technical tasks associated with each of the three SSALTS project phases, as described above.
2. Work cooperatively and synergistically with other CV-SALTS technical activities, e.g., development of the Conceptual Model and preparation of study results consistent with the CV-SALTS GIS Framework.
3. Identify representative study areas where salt accumulation is occurring and use these areas as “strawmen” for additional analyses, including the viability of the continued use of these areas for salt disposal.
4. Develop list of potential in-valley and/or out-of-valley salt disposal strategies as example Management Practices (MP) that have the potential to serve as long-term sustainable salt disposal methods. In this regard, “sustainable” means implementation of solutions over a 50 year period, and may include (a) implementing salt management strategies that result in no net gain or reduction in salt within a given area; (b) allowing for acceptable salt accumulation within a given area using approved management strategies; or (c) some combination of both.
5. Using feasibility criteria, screen potential MPs as potential alternatives for long-term salt disposal to create a prioritized list of salt disposal options for the Central Valley.
6. Provide support for the development of the SNMP by providing a list of MPs that can be used as a menu for salt disposal, which can help guide the development of salt disposal alternatives for specific management zones.

Section 2

Workplan Tasks and Schedule

2.1 Workplan Tasks

SSALTS will be conducted in three phases and will selectively and strategically build on and, in some cases, guide, ongoing or upcoming CV-SALTS studies. This Workplan addresses the objectives described in Section 1.2 through the completion of four key tasks. Phase 1 tasks are described in detail below. Work to be conducted under Phases 2 and 3 tasks is also described, but with the proviso that the Workplan for these tasks may be modified where appropriate to take into account Phase 1 findings or findings made as part of other CV-SALTS projects. The need to revisit the scope of work contained Phases 2 and 3 will be evaluated as part of the review of the reports completed under each phase.

The following text describes the work to be completed under each of the SSALTS phases and tasks. Section 2.2 describes the deliverables for each task, including linkages to other ongoing CV-SALTS projects, and Section 2.3 provides a general schedule to complete the SSALTS project.

- *Task 1, Coordination Activities* – Task 1 activities will occur throughout all phases of the project. This project will need to coordinate with ongoing Executive Committee policy discussions and CV-SALTS technical studies. Accordingly, this project will implement the following coordination activities:
 - *Task 1.1, CV-SALTS Executive Committee Coordination* – Provide periodic updates on SSALTS project progress to the CV-SALTS Executive Committee to ensure consistency of project deliverables with CV-SALTS policies and discussion needs.
 - *Task 1.2, CV-SALTS Technical Advisory Committee (TAC) Coordination* - Coordinate with the TAC to (a) identify the appropriate format and repository for data gathered or developed by this project; and (b) provide opportunity for the CV-SALTS TAC to review SSALTS project deliverables to ensure that appropriate technical input and review occurs during project execution and that project activities are technically consistent with other CV-SALTS technical studies.
 - *Task 1.3, CV-SALTS SNMP Support* – Based on approved project deliverables, prepare appropriate documentation, where needed, to support development of the Central Valley SNMP.
 - *Task 1.4, Technical/Regulatory Project Coordination* – Participate in coordination activities with other CV-SALTS projects or personnel to ensure collaborative development of project deliverables.

Phase 1

Task 2 – Identify and Characterize Existing Salt Accumulation Areas – Under Phase 1, SSALTS will identify representative study areas where salt is accumulating either intentionally (e.g., industrial or municipal activities) or unintentionally (e.g. natural occurrences or non-point sources). The representative study areas will serve as prototypes for the development of salt management strategies under various situations or scenarios. Phase 1 will start with review of previous CV-SALTS studies and recent literature. The review will focus on identifying areas where available data and mass balance estimates indicate that salt is accumulating within the Central Valley. Following completion of this review, selected areas will be characterized in sufficient detail to allow a high level screening analysis of the potential for these areas to continue to accumulate salt over the long-term. To complete this effort, the following tasks will be executed:

- *Task 2.1, Review of Studies or Literature Regarding Salt Accumulation in the Central Valley* – Available CV-SALTS studies and recent relevant literature will be reviewed to document baseline salt accumulation information or data applicable to the Central Valley. Preparation of this Workplan included an initial review of the following (in order of publication date):
 - *CV-SALTS Management Practice Screening Tool Outline: Preliminary Draft*, prepared by the BMP Subcommittee, December 2011
 - *CV-SALTS Salt and Nitrate Sources Pilot Implementation Study Report* (“Pilot Study”), prepared by Larry Walker Associates (LWA), February, 2010
 - *The Economic Impacts of Central Valley Salinity*. University of California Davis Final Report to the State Water Resources Control Board, Contract 05-417-150-0, March, 2009
 - *California Water Plan Update 2009, Volume 2. Resource Management Strategies Chapter 18, Salt and Salinity Management*, California Department of Water Resources, 2009
 - *Salinity in the Central Valley: An Overview*, Central Valley Regional Water Quality Control Board, May, 2006
 - *San Luis Drainage Feature Re-evaluation Final Environmental Impact Statement*, U.S. Bureau of Reclamation, May 2006
 - *A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley*, San Joaquin Valley Drainage Program, September, 1990
 - *Water Quality for Agriculture. Food and Agriculture Organization (FAO) of the United Nations Irrigation and Drainage Paper 29 Rev. 1*, Ayers, R. S. and D. W. Westcot, 1985

Identification of additional relevant studies or literature for review under this task will include a query to CV-SALTS participants (e.g., Executive Committee, TAC, Regional Board Staff, stakeholders). Based on the study/literature review, the deliverable for this task will be a tabular summary of documents reviewed and their relevance to SSALTS (if any) and, if relevant, brief summary of key findings. This summary will be submitted to the TAC review and comment.

- *Task 2.2, Select Representative Salt Accumulation Study Areas* – The outcome from this task will be a list of up to ten (10) representative salt accumulation study areas for further analysis

under subsequent tasks and project phases. For the purposes of this task, salt accumulation areas are defined areas where the total input of salt exceeds the total output.

Initially, a preliminary list of potential study areas will be developed for consideration. This list will be generated from the findings of Task 2.2 and input that will be requested from the Executive Committee, TAC, Regional Board staff, and other stakeholders, as deemed necessary. To the extent practicable, development of this preliminary list of study areas will consider available data and modeling analyses, previous or ongoing studies, and geographic coverage of the major Central Valley hydrologic basins (Sacramento River, San Joaquin River, and Tulare Lake). The preliminary list will be submitted to the TAC for review and comment. Following revision, as needed, the recommendations will be submitted to the Executive Committee for review, revision (if needed), and approval.

The list of preliminary study areas will be fully evaluated to develop a final list of recommended areas for inclusion in the SSALTS analysis. The intent is to develop a final list that includes study areas representative of a range of types of land cover and activities (e.g. municipal, industrial, natural, non-point source) that affect salt accumulation. Accordingly, the preliminary list of study areas will be chosen to include a range of major land cover or water use sectors such as:

- Agriculture (e.g., irrigated crops, orchard, and dairies),
- Industrial (e.g., food processors, oil and gas extraction),
- Municipal (e.g., POTWs, septic systems), and
- Non-urban (e.g., grasslands, rangeland).

Table 2-1 presents a summary of ongoing salt management efforts compiled by CV-SALTS and summarized on the Regional Board's website¹. These salt management efforts represent a cross section of land cover or water use sectors and will be used as a starting point for identifying representative salt accumulation areas for this phase and evaluation of salt disposal alternatives in subsequent project phases. Many of the projects and programs listed in **Table 2-1** incorporate combined management approaches, including both in-valley salt disposal and out of basin export/transport of salt.

Although these land cover categories are primarily associated with salt sources, it will be important to correlate land cover/water use sectors with long term options for salt storage and accumulation. While the above list identifies the primary land cover categories expected to be considered under this task, other categories may be included as appropriate.

¹ http://www.swrcb.ca.gov/rwqcb5/water_issues/salinity/salt_management_efforts/index.shtml. Website provides a list projects and programs previously identified by Regional Board staff in the Central Valley and Delta regions with salt (including nitrate) management as either a primary goal or as a beneficial side effect of actions taken for some other reason (e.g. selenium management). These locations can provide insight into and lessons learned about salt management/disposal management practices being implemented in the region.

Each of the salt accumulation study areas will be further characterized to identify the primary “sinks” for salt in the selected areas. To be consistent with the CV-SALTS Pilot Study, (LWA, February 2010), this characterization will be based on the following categories where salt accumulates:

Table 2-1. Ongoing Salt Management Efforts in the Central Valley

Central Valley Basin Planning Area	Project/Program	Description
Tulare Lake Basin	City of Fresno Outreach Program	Implementation of a source control education program to reduce the cost of treatment to remove salts
	Red Rock Ranch Farm Drainage Management System	Implementation of salt management strategies that include relocation and storage; planning for implementation of treatment strategy
San Joaquin River Basin	Westside Drainage Plan	Combination of salt management strategies in use that include land retirement, groundwater management, source control and regional reuse; planning for use of drainage treatment or salt disposal MPs
	Grassland Bypass Project	Combination of salt management strategies in use that include movement of salt out of the basin and in-basin displacement and storage; planning for implementation of treatment, collection and in-basin salt storage
	Hilmar Cheese Waste Management Project	Implementation of salt management strategy to treat and dispose of saline wastewater
	Stevinson Water District Wetland Project	Combination of salt management strategies in use that include salt displacement, source control and out of basin disposal; planning for implementation of real-time management strategy
	San Joaquin River Restoration Program	Implementation of salt management strategies that involve surface water dilution and out of basin export
Sacramento River Basin	City of Dixon Salt and Sodium Reduction Program	Implementation of a source control education program to reduce the cost of treatment to remove salts
	City of Woodland Salt Minimization Project	Implementation of source control salt management; developing an alternate water supply that is a secure and reliable source of lower salinity water
Industry-Specific	Almond Board’s Outreach for Orchard Management	Implementation of education of and outreach salt management strategy
	Wine Industry Recommended Practices	Development and implementation of MPs for managing salt in discharges

- *Surface Waters and Land Surfaces* - Land application areas, evaporation ponds, other standing surface waters
- *Near Surface Groundwater* – Subsurface water down to the depth where it can potentially interact with surface water via lateral flow and seepage.
- *Deep Groundwater* - The portion of the aquifer system underlying the “near-surface groundwater.”

Use of these categories is consistent with the approach used by the Pilot Study to develop mass balance estimates and will provide a basis for discussion and understanding of potential salt accumulation strategies.

Finally, the evaluation of the preliminary list of study areas will document any relevant technical, regulatory or institutional factors that may have bearing on subsequent salt management analyses.

Based on the completed evaluation, a final list of up to 10 recommended study areas, along with the basis for the recommendations, will be submitted to the TAC for review and comment. Following revision, as needed, the recommendations will be submitted to the Executive Committee for review and approval. Subsequent Phase 1 tasks will begin after approval of this site list.

- *Task 2.3, Characterize Salt Accumulation Study Areas* - Task 2.3 will characterize the study areas identified under Task 2.2, based on available data/reports, discussions with affected stakeholders and reasonable extrapolations. No new data collection will be performed. However, as needed, Task 2.3 will be closely coordinated with other CV-SALTS technical studies with regards to their ongoing data collection efforts so that where there are opportunities to obtain data through those efforts within the time frame of this task, the data is provided, reviewed and incorporated in this task effort. Task 2.3 will characterize each selected location by completing the following steps:
 - Step 1: Characterize the Attributes of Each Study Area:
 - *Physical Attributes:* Water balance (e.g., surface and groundwater hydrology), land cover, soils, topography, and other relevant physical features. **Table 2.2** provides a summary of potential data sources. In addition, surface water/groundwater model outputs (e.g., WARMF, MODFLO, IGSM, CVHM) developed under the Pilot Study and new data being developed as part of the IPCM will be mined to provide additional information to characterize each location.
 - *Land Cover Attributes:* Cropping and irrigation practices, industrial processes or dairy operations, urban uses that affect salt accumulation, e.g., use of water softeners.
 - *Institutional, Economic and Regulatory Attributes:* The overlying institutional, economic and regulatory attributes of each study location will be evaluated. Understanding these attributes will be important for evaluating whether existing salt accumulation areas have potential for long-term sustainable operations. Relevant information associated with each type of attribute includes:
 - *Institutional* – Municipal wastewater collection systems, water management districts, agricultural irrigation districts, flood control districts, city/county planning and zoning agencies.
 - *Economic* – Economic impacts of changes in water quality, water supply, production of goods and services, income, and employment due to salinity in various economic sectors including municipal and industrial water treatment, food processing, confined animal feeding operations, and agriculture.

- *Regulatory* - Discharge permit requirements, compliance with beneficial uses, water quality objectives, water rights, or other regulatory factors that potentially impact a specific location.
- Step 2 - Characterize Sources of Salt to Each Study Area: As noted in Salinity in the Central Valley (Central Valley Regional Board, 2006), sources can be categorized according to their origin using the following four general groupings:
 - Evapoconcentrated from directly applied supply water;
 - Added through the dissolution of naturally occurring salts;
 - Through the direct addition of salts, e.g., fertilizers or in food processing; or water softeners; addition of salt in municipal wastewater; and
 - Through the importation of salts via water supply deliveries.

The origin of salt sources to the selected salt accumulation study areas will be derived from a review of previous CV-SALTS studies, including the Pilot Study, input from stakeholders and TAC, and information developed during execution of the IPCM.

- Step 3 – Characterize the Capacity of Each Study Area: The limiting capacity of each salt accumulation area will be estimated in order to forecast the likelihood of achieving long-term sustainable conditions or not. This information will be of particular value during subsequent project phases. Capacity may be measured directly or indirectly using indicator parameters. Under this task, only the capacity of each study area for salt accumulation will be evaluated; under subsequent tasks in Phases 2 and 3, SSALTS will examine possible alternatives for long-term, expanded salt disposal in or near each study area, such as use of evaporation ponds, or possibly allowing localized subsurface areas or sub-basins to increase in salinity; or implementing opportunities for export or transport of salt out of the area.

The approach used to characterize the capacity of a study area for additional salt accumulation may be site specific. For example, the capacity of irrigated agriculture to accumulate salts can be assessed by the impact on crop yield. If salt accumulations become excessive, losses in yield will result. To prevent yield loss, salts in the soil must be controlled at a concentration below that which might affect yield. In this type of example, SSALTS will utilize the steady-state modeling results of crop salt tolerance developed by Hoffman, 2010 (Salt Tolerance of Crops in the Southern Sacramento-San Joaquin Delta, January 5, 2010)². The Hoffman report considered various representative crops (e.g., alfalfa, bean, and almonds), soil leaching fractions, and annual precipitation amounts to estimate the soil water salinity impacts on relative yield thresholds. Hoffman’s approach can be used to estimate increases in salt loads that would still be protective of all of the crops normally grown in each area. These increased salt loads would provide additional capacity for salt t accumulations. Ultimately, potentially available capacity and the ability to use that capacity may require implementation of specific salt management practices,

² This report includes salt tolerance thresholds for a range of crops (e.g., alfalfa, bean, almonds), various irrigation methods (e.g., furrow, flood, sprinkler, drip), leaching fractions, and irrigation water salinities.

including, e.g., switching to more salt tolerant crops, implementation of Integrated On-Farm Drainage Management (IDFM) practices, or fallowing.

The above scenario is an example of how the capacity of a given study area for additional salt accumulation may be evaluated. Other approaches may be developed based on the characterization of the study areas. Prior to characterizing the salt accumulation capacity of each study area, the project team will review the analysis methods with the TAC to obtain their technical input.

- Step 4 – Characterize the Cost/Benefits of Continued Salt Accumulation for Each Study Area: The analysis will include a relative assessment of the cost and benefits of continued salt accumulation in each study area. Since actual data describing costs and benefits is expected to be limited and not site-specific, it is expected that, for the most part, this analysis will necessarily be qualitative (e.g., providing a relative assessment using terms such as low, medium, or high).
- Step 5 – Characterize Institutional/Regulatory Barriers for Each Study Area: Given the site attributes identified under Step 1 above, this step will summarize likely or potential institutional/regulatory barriers for implementation of a strategy that allows long term accumulation of salt at a study area. Identification of these barriers will be developed based on feedback from the CV-SALTS TAC and other stakeholders.

The deliverable for this task will be a Technical Memorandum(TM) that provides a completed characterization for each of the up to 10 salt accumulation study areas. Each site characterization will be supported by GIS-based maps (using the CV-SALTS GIS Framework), with data tables and figures, where needed, to fully describe the area's attributes, salinity characteristics, existing salt sources, and long-term capacity for salt accumulation, including results of cost/benefit assessment and institutional/regulatory barriers. If appropriate, information for each study area may be prepared in a "fact sheet" type format. A draft TM will be provided to the TAC for review and comment. TAC comments will be addressed when the information from this draft TM is incorporated into a Phase 1 Report.

- *Task 2.4, Perform Screening-Level Analysis of Long-Term Sustainability of Representative Study Areas* - Each of the salt accumulation study areas characterized in Task 2.3 will be analyzed to assess their longevity and sustainability over a 50-year planning horizon. The analysis will rely on initial mass balance estimates and expected loadings given what is known regarding existing and potential future salt loadings. This analysis will rely on information developed in coordination with the development of the IPCM.

The intent of the Task 2.4 analysis is to provide high-level planning information that can be used to support SSALTS Phase 2 and 3 analyses and CV-SALTS discussions regarding likely alternatives for salt disposal to be considered for incorporation into the SNMP. As such, the Task 2.4 results will be useful for making relative comparisons among alternatives (e.g., the disposal method at one study area is generally more cost-effective than at another) as opposed to making absolute projections based on capacity or cost. In some cases, long-term sustainability may be based simply on the relative increase or decrease of estimates in salt loads.

In order to prepare screening level forecasts, known trends relative to historic, current, and future conditions at each study area will be linearly extrapolated over a 50-year planning horizon (e.g., population growth, potential land cover changes, crop/irrigation practices, water demands, etc.). Where feasible, the screening analysis results will be normalized (e.g., per acre or per capita) in order to facilitate comparisons among areas. Similarly, planning level costs, operating and capital, will be estimated. Average annual unit costs will be derived (e.g. \$/million gallons of water treated or \$/lb of salt removed) based on available data.

The screening analysis of long-term sustainability will be summarized in graphical and tabular formats with all underlying assumptions and data sources clearly identified. The analysis will be implemented within a spreadsheet format so that “what if” questions can be addressed. The Task 2.4 analysis is not expected to provide definitive answers to these types of questions; however, the results can be used to guide CV-SALTS to strategically identify cases where a more detailed and refined modeling analysis is warranted or where important data gaps exist that should be addressed prior to development of the SNMP.

The deliverable for this task will be a TM that provides the results of the analysis of the long-term sustainability of salt accumulation at each of the up to 10 salt accumulation study areas. The TM will be supported by GIS-based maps, figures or tabular summaries, where needed. A draft TM will be provided to the TAC for review and comment. TAC comments will be addressed when the information from this draft TM is incorporated into a Phase 1 Report.

- *Task 2.5, Prepare Phase 1 SSALTS Report* - A Phase 1 Report will be prepared that includes the following: (a) description of the process performed to identify and characterize salt accumulation study areas; (b) summary of the background studies and literature reviewed; (c) final versions of the TM’s prepared under Tasks 2.3 and 2.4 (either as is or edited as needed to conform to a report style format); (d) conclusions and recommendations based on the work completed in Task 2 (Phase 1); and (e) if necessary, recommendations for modifications to this Workplan for Task 3 (Phase 2) and/or Task 4 (Phase 3) based on the findings during Phase 1. A Draft Phase 1 Report will be prepared and reviewed by the TAC. Once revised, a Final Draft Phase 1 Report will be submitted to the Executive Committee for review and comment. A Final Phase 1 Report will be prepared based on Executive Committee comments.

Phase 2

- *Task 3 – Develop and Evaluate In-Valley Salt Storage Management Strategies* - Phase 2 of SSALTS is a continuation and expansion of the Phase 1 analysis of the previously selected salt accumulation study areas as well as identification of potential new areas for salt disposal within the Central Valley. Phase 2 will not be initiated without Executive Committee approval. Under Phase 2, the analysis focuses on in-valley solutions, e.g., on whether the representative study areas characterized in Phase 1 can be expanded or otherwise re-configured to accommodate additional salt accumulation, while continuing to meet the same uses. In addition, the project team will identify potential new salt disposal strategies or areas for consideration within the Central Valley.
 - *Task 3.1, Identify In-Valley Salt Management Strategies* - The objective of this task is to develop a list of salt storage strategies that may be appropriate for expanding salt accumulation in the Central Valley, including at or near existing salt accumulation study areas or at potential new areas to be identified. The steps for identifying these strategies include:

- Develop in-valley salt disposal concepts (expansion of existing locations or identification of new locations) by conducting interviews with selected stakeholders (e.g., managers or operators of study locations) and regional technical experts and reviewing additional documents/literature, if needed, regarding known practices to manage salt.
- Eliminate any potential strategies to expand existing salt storage areas or establish new areas that are not deemed feasible. Document the basis for elimination.
- Develop a preliminary list of salt management strategies for the Central Valley. Development of the list will include a detailed description of the salt management strategy and a description of any institutional, economic or regulatory considerations or barriers that may affect implementation.
- Solicit TAC and stakeholder comment on the preliminary list of location-specific salt management strategies. As needed, revise the preliminary list of strategies to create a final list to be considered further under subsequent Phase 2 tasks.

The deliverable for this task will be a final list of potentially feasible in-valley salt management strategies. These strategies will be further developed as in-valley salt management alternatives and analyzed in subsequent Phase 2 tasks.

- *Task 3.2, Develop Alternative In-Valley Salt Storage Management Strategies* – Based on the outcome of Task 3.1, this task will focus on developing the various in-valley salt storage management strategies that may be deployed in the Central Valley. The analysis will evaluate combinations of various source and treatment controls, as well as disposal/storage practices and technologies relevant to agricultural, municipal, and industrial salt sources, including:
 - Agricultural
 - Irrigation BMPs
 - Fertilizer use BMPs
 - Evaporation ponds
 - IFDM practices
 - Land retirement
 - Municipal
 - Water softener control (ordinance and/or rebates)
 - Industrial discharge controls (local pretreatment limits)
 - Recycled water demineralization treatment
 - Household salinity source reduction BMPs
 - Landscape irrigation BMPs
 - Landscape fertilizer use BMPs
 - Industrial
 - Mechanical evaporation

- Desalters using reverse osmosis and ultra-filtration technologies
- Deep well injection
- Applied/Imported Water
 - Source load diversion (e.g., Grasslands Bypass Project)
 - Source water salinity controls (e.g., City of Fresno Public Education Program)
 - Source water demineralization (e.g., brackish groundwater desalination)
 - Modified ratios of local or imported water sources (e.g., blending)

Under this task, regional collaborative projects within the Central Valley will also be considered. Examples of regional collaborative projects might include:

- Regional reuse
- Regional groundwater management
- Regional evaporation/treatment facilities

Certain types of regional approaches to managing salt may also include combinations of interim in-valley salt accumulation combined with export or transport out of Central Valley, e.g.:

- Real-time management,
- Regional salt storage or conveyance systems,
- Water or salt trading.

These types of combined salt management strategies will be evaluated under Task 4 (Phase 3).

The deliverable for Task 3.2 will be fact sheet summaries prepared for each of the in-valley MPs evaluated for feasibility under this task. To the extent that information is available, the format of each fact sheet will be based on the Management Practice Screening Tool Checklist developed by the CV-SALTS Management Practices Subcommittee (**Table 2-3**). These fact sheets will be submitted to the TAC for review and comment. Revised fact sheets based on TAC comments will be incorporated into the Phase 2 Report prepared below under Task 3.4.

- *Task 3.3, Perform Screening-Level Analysis of Long-Term Sustainability of In-Valley Salt Management Practices* – Under this task, the project team will evaluate individual and/or combinations of in-valley alternatives by conducting a screening level feasibility analysis of the long-term sustainability of various in-valley salt management strategies. The feasibility analysis will use screening criteria to evaluate each alternative. Potential screening criteria will be developed for the following categories or types: engineering/technical, economic, environmental, and regulatory/institutional. Consideration will also be given to the potential for an identified salt MP to have wide applicability in the Central Valle or only be useful within a narrow range of circumstances. The project team will work with the TAC to develop specific screening and the approach for their application to the alternatives.

Table 2-3. Planned In-Valley Salt Disposal Management Practices Fact Sheets

Section	Planned Content
Description	Brief description of the MP to summarize the practice, applicable industries, and other important relevant information.
Constituent Salts or Nutrients Managed	Identification of the primary and secondary salinity constituents treated, reduced or managed by this practice and how they are reduced or managed.
Applicability	Description of (a) documented application of this practice; (b) where, how, and how extensively the practice has been implemented; and (c) the conditions or circumstances that limit the application of this practice.
Practice Benefits and Impacts	Description of the documented benefits and impacts of implementing the practice, e.g., air quality, energy use, water supply, etc.
Effectiveness Documentation	Description of the documented effectiveness of implementing the practice and summary of critical factors or limitations to effectiveness.
Supporting Documentation	Summary of relevant source material that provides information regarding the MP.
Implementation: Planning Level Costs	Summary of planning level costs (in units that may be used for comparison with other MPs) for implementation, including capital and annual operation & maintenance costs.
Implementation: Status and Potential	Description of historic and current level of implementation; describe potential for full implementation of this practice. This would include the extent that the practice may be applicable across the entire valley (e.g., widespread vs. highly location-specific)
Implementation: Monitoring Documentation	Description of the level of monitoring and documentation available to support the practice. Describe additional monitoring needs, if known.
Implementation: Other Regulatory Approvals or Requirements	Summarize what is known regarding regulatory or government agency approval of the MP or certification of the MP by industry or other standard-setting entity.

The deliverable for Task 3.3 will be a TM that describes (a) the selected feasibility criteria and the process for developing them; (b) the results of the analysis after application of the feasibility criteria; and (c) a prioritized list of in-valley salt management strategies (Note: this prioritized list is based solely on application of in-valley strategies; under Task 4 (Phase 3), potential in-valley strategies will be evaluated for implementation in combination with export/transport salt management strategies). The TM will be supported by GIS-based maps, figures or tabular summaries, where needed. A draft TM will be provided to the TAC for review and comment. TAC comments will be addressed when the information from this draft TM is incorporated into a Phase 2 Report.

- *Task 3.4, Prepare Phase 2 SSALTS Report* - The Phase 2 Report will be a cumulative extension of the Phase 1 Report. The Report will (a) summarize work completed to date under Phase 1, (b) incorporate the Task 3.2 MP fact sheets; (c) provide the results of the screening level analysis completed under Task 3.3; (d) conclusions and recommendations based on the work completed in this task; and (e) if necessary, recommendations for modifications to this Workplan for Task 4 (Phase 3) based on the findings from this task. A Draft Phase 2 Report will be prepared and reviewed by the TAC. Once revised, a Final Draft Phase 2 Report will be submitted to the Executive Committee for review and comment. A Final Phase 2 Report will be prepared based on Executive Committee comments.

Phase 3

- *Task 4 – Develop and Evaluate Salt Export/Transport Management Strategies* – Phase 3 builds upon the work completed under previous phase and adds a review and evaluation of salt export strategies. Under this phase, SSALTS will develop and assess strategies to export or transport salt out of the Central Valley. Strategy development will build cumulatively on the Phase 2 findings by considering alternatives that combine in in-valley and export approaches to salt management, i.e., analysis of likely combinations of alternatives which can be synergistically implemented.

- *Task 4.1 – Identify Strategies to Export/Transport Salt Out of the Central Valley* - The objective of this task is to develop a list of near-term salt export/transport strategies that result in the disposal of salt outside of the Central Valley. The steps for identifying these strategies include:

- Develop salt disposal concepts that involve the export or transport of salt out of the Central Valley by conducting interviews with selected stakeholders and regional technical experts and reviewing documents and literature, if needed, regarding known practices for collecting and moving salt among basins or to the ocean.
- Eliminate any potential salt export/transport management strategies that are not deemed feasible at any representative location. Document the basis for elimination.
- Develop a preliminary list of alternative salt export/transport management strategies that may be feasible. Development of the list will include a detailed description of the salt management strategy and a description of any institutional, economic or regulatory considerations that may affect implementation.
- Solicit TAC and stakeholder comment on the preliminary list of salt export/transport management strategies; as needed, revise the list of strategies to be considered further under subsequent tasks.

The deliverable for this task will be a final list of export/transport potentially feasible salt management strategies. These strategies will be further developed as salt management alternatives and analyzed in subsequent Phase 3 tasks.

- *Task 4.2 – Develop Alternative Salt Export/Transport Management Strategies* – Based on the outcome of Task 4.1, this task will focus on developing the alternative export/transport salt management strategies for subsequent analysis. At a minimum, the types of export/transport management strategies expected to be developed under this task include:

- *Real-Time Management*- A real-time management program would utilize the available assimilative capacity in the San Joaquin River to dispose of salt loads into surface waters. Under a real time management program, discharges from wetland and agricultural drainage areas would be controlled and timed to coincide with periods when in river dilution flows are sufficient to meet Vernalis salinity objectives. By increasing the frequency of meeting Vernalis electrical conductivity (EC) objectives, a real time management program could reduce the number and/or magnitude of high quality releases of low TDS water (e.g., releases of Stanislaus River flows from New Melones Reservoir) to meet Vernalis EC objectives.

Under Task 4.2, SSALTS will evaluate the potential for a Real Time Management program to remove salts from the basin. Requisite elements of a Real Time Management Program include:

- Flow and water quality control infrastructure;
 - Development and maintenance of a real-time drainage discharge and water quality monitoring system; and
 - Establishment of institutions responsible for long-term stakeholder cooperation and coordination to continuously match real-time contaminant loads with assimilative capacity.
- *Out-of Valley Salt Disposal*- The San Luis Drainage Feature Re-evaluation (SLDFR) Final EIS analyzed three “Out of Valley” alternatives for salt disposal:
 - Ocean Disposal;
 - Delta-Chippis Island Disposal; and
 - Delta-Carquinez Strait Disposal.

The alternatives analysis presented in the SLDFR EIS, related to the ocean and delta disposal alternatives also included “in valley” (e.g., as planned for this Workplan under Phase 2) salt disposal elements: on-farm and in-district actions, drain water collection systems, Delta-Mendota Canal Drain, regional reuse facilities, and land retirement. Reused drain water would be collected from reuse facilities and transported by pipelines and tunnels to the Pacific Ocean or Delta for disposal. Each alternative analyzed included conveyance pipelines/canals and outfall/diffusers. Major areas of concern identified for the ocean disposal alternative were:

- Impacts to ecology and tourism from drainage discharge to the Pacific Ocean;
- Impacts to sensitive habitats from pipeline construction; and
- Impacts from pipeline failure.

The primary areas of concern for the “Out of Valley” Delta disposal alternatives were:

- Impacts to drinking water supplies from salt discharge;
- Impacts to birds and fish in the Delta from selenium bioaccumulation; and
- Technical and economic feasibility of selenium treatment.

The deliverable for Task 4.2 will be fact sheet summaries of each alternative developed under this task. For the examples provided above, the project team will summarize work already completed or performed to date. To the extent appropriate, the fact sheets will be similar in format to those prepared under Task 3.2, and, in particular include information regarding the cost and benefits of the alternative, estimates of the salt load removal capacity, and institutional and regulatory barriers to implementation. These fact sheets will be

submitted to the TAC for review and comment. Revised fact sheets based on TAC comments will be incorporated into the Phase 3 Report prepared below under Task 4.4.

In addition to preparation of these fact sheets, the project team will review the in-valley salt management strategies developed under Phase 2 (Task 3) to determine the potential to combine selected in-valley and export/transport salt management strategies to create hybrid strategies. If any such strategies are identified, a TM will be prepared that describes the hybrid combinations and their potential application to manage salt disposal in the Central Valley. The TM will be supported by GIS-based maps, figures or tabular summaries, where needed. A draft TM will be provided to the TAC for review and comment. TAC comments will be addressed when the information from this draft TM is incorporated into a Phase 3 Report.

- *Task 4.3, Perform Screening-Level Analysis of Long-Term Sustainability of Salt Management Practices* – Under this task, the project team will evaluate individual and/or combinations of in-valley and export/transport salt management alternatives by conducting a screening level feasibility analysis of the long-term sustainability of various strategies developed under Task 4.2. The feasibility analysis will rely on the screening criteria and methodology developed in collaboration with the TAC under Task 3.3. At this time, it is expected that that the feasibility criteria used for Task 3.3 will also be applied to this task. However, the need for additional feasibility criteria will be evaluated as part of this task. The TM will be supported by GIS-based maps, figures or tabular summaries, where needed. A draft TM will be provided to the TAC for review and comment. TAC comments will be addressed when the information from this draft TM is incorporated into a Phase 3 Report.

The deliverable for Task 4.3 will be a TM that describes (a) the selected feasibility criteria and the process for developing them (if any new criteria added since Task 3.3); (b) the results of the analysis after application of the feasibility criteria; and (c) a prioritized list of salt management strategies considering both export/transport and hybrid strategies. The TM will be supported by GIS-based maps, figures or tabular summaries, where needed. A draft TM will be provided to the TAC for review and comment. TAC comments will be addressed when the information from this draft TM is incorporated into a Phase 3 Report.

- *Task 4.4, Prepare Phase 3 SSALTS Report* - The Phase 3 Report will be a cumulative extension of the Phase 1 and 2 Reports. The Report will (a) summarize work completed to date under Phases 1 and 2, (b) incorporate the Task 4.2 MP fact sheets; (c) provide the results of the screening level analysis of export/transport management practices developed under this Phase and combined in-valley and export/transport alternatives for salt disposal; (d) conclusions and recommendations based on the work completed in Phase 3; and (e) as appropriate, recommendations for salt management alternatives for inclusion in the SNMP. A Draft Phase 3 Report will be prepared and reviewed by the TAC. Once revised, a Final Draft Phase 3 Report will be submitted to the Executive Committee for review and comment. A Final Phase 3 Report will be prepared based on Executive Committee comments.

Additional Services (Post-Phase 3)

- *Task 5, Support SNMP Development (Optional)* - As directed by CV-SALTS, ongoing support will be provided for the development of the SNMP. Support could include further development of alternatives for inclusion in the SNMP, development of information for inclusion in the Basin Plan

Amendment and supporting documentation. The recommendations prepared under Tasks 3.4 and 4.4 would be used as the basis for defining the level of support and areas of focus.

2.3 Workplan Deliverables and Schedule

Table 2-3 summarizes the primary task deliverables and review requirements associated with the implementation of the tasks in this Workplan. **Figure 2-2** provides the schedule for completion of Workplan tasks. The schedule assumes the following:

- The current general schedule planned for development of the CV-SALTS GIS Framework and completion of the initial phase of the Conceptual Model is maintained.
- The project start date is August 20, 2012. Phase 1 is to be completed by January 18, 2013; Phase 2 will be completed by June 21, 2013; and Phase 3 will be completed by November 29, 2013. Because development of the final report for each phase includes recommendations for any modifications to the scope of work for subsequent phases, it has been assumed that with completion of the final report, no gap will occur between project phases.

Table 2-3: Workplan Tasks and Deliverables

Tasks	Subtasks	Primary Deliverable(s)	Primary Review Requirements
Task 1 – Coordination Activities	1.1 – CV-SALTS Executive Committee Coordination	Briefings, handouts, as requested	Not Applicable
	1.2 – CV-SALTS TAC Coordination	<ul style="list-style-type: none"> Establish data compilation format and repository Briefings, handouts, as requested 	
	1.3 – CV-SALTS SNMP Support	Templates, procedures for comparable studies for inclusion in the SNMP	
	1.4 – Technical/Regulatory Coordination	Coordination meetings and teleconferences, as needed, to coordinate technical and regulatory project elements of this Workplan	
Task 2 – Phase 1 SSALTS	2.1 – Review of Studies or Literature	Tabular summary of documents reviewed and relevance to SSALTS (if any)	TAC review and comment
	2.2 – Select Representative Salt Accumulation Study Areas	<ul style="list-style-type: none"> Preliminary list of representative study areas for additional evaluation Final list of up to 10 recommended study areas, along with the basis for the recommendations, for inclusion in the Phase 1 analysis 	TAC and Executive Committee review and approval
	2.3 – Characterize Salt Accumulation Study Areas	Draft TM that provides a completed characterization for each of the up to 10 salt accumulation study areas (comments to be addressed as part of Task 2.5)	TAC review and comment
	2.4 - Perform Screening-Level Analysis	Draft TM that provides the results of the analysis of the long term sustainability of salt accumulation at each of up to 10 salt accumulation study areas (comments to be addressed as part of Task 2.5)	TAC review and comment
	2.5- Prepare Phase 1 SSALTS Report	<ul style="list-style-type: none"> Draft Phase 1 SSALTS Report Final Draft Phase 1 SSALTS Report Final Phase 1 SSALTS Report 	TAC review of draft report; Executive Committee review of final draft report
Task 3 – Phase 2 SSALTS	3.1 - Identify Strategies to Expand Salt Storage at Representative Study Areas	<ul style="list-style-type: none"> Preliminary list of in-valley salt management strategies Final list of in-valley salt management strategies 	TAC review and comment
	3.2 - Evaluate Alternative In-Valley Salt Storage Management Strategies	Draft fact sheet summaries for each of the in-valley Management Practices developed under this task (comments to be addressed as part of Task 3.4)	TAC review and comment
	3.3 - Perform Screening-Level Analysis of Long-Term Sustainability of Salt Management Practices	<ul style="list-style-type: none"> Screening criteria and method of application Draft TM that describes (comments on draft to be addressed as part of Task 3.4): <ul style="list-style-type: none"> Selected feasibility criteria and the process for developing them; Results of the analysis after application of the feasibility criteria; and Prioritized list of in-valley salt management strategies. 	TAC review and comment
	3.4 - Prepare Phase 2 SSALTS Report	<ul style="list-style-type: none"> Draft Phase 2 SSALTS Report Final Draft Phase 2 SSALTS Report Final Phase 2 SSALTS Report 	TAC review of draft report; Executive Committee review of final draft report

Table 2-3: Workplan Tasks and Deliverables

Tasks	Subtasks	Primary Deliverable(s)	Primary Review Requirements
Task 4 – Phase 3 SSALTS	4.1 - Identify Strategies to Export/Transport Salt Out of the Central Valley	<ul style="list-style-type: none"> • Preliminary list of export/transport salt management strategies • Final list of export/transport salt management strategies 	TAC review and comment
	4.2 - Develop Alternative Salt Export/Transport Management Strategies	<ul style="list-style-type: none"> • Draft fact sheet summaries for each of the export/transport salt management strategies developed under this task (comments to be addressed as part of Task 4.4) • TM that describes hybrid combinations (export/transport strategies coupled with in-valley management strategies) and their potential application to manage salt disposal in the Central Valley 	TAC review and comment
	4.3 - Perform Screening-Level Analysis of Long-Term Sustainability of Salt Management Practices	<ul style="list-style-type: none"> • Screening criteria and method of application • Draft TM that describes (comments on draft to be addressed as part of Task 4.4): <ul style="list-style-type: none"> • Selected feasibility criteria and the process for developing them (if any new criteria added since Task 3.3); • Results of the analysis after application of the feasibility criteria; and • Prioritized list of salt management strategies considering both export/transport and hybrid strategies 	TAC review and comment
	4.4 - Prepare Phase 3 SSALTS Report	<ul style="list-style-type: none"> • Draft Phase 3 SSALTS Report • Final Draft Phase 3 SSALTS Report • Final Phase 3 SSALTS Report 	TAC review of draft report; Executive Committee review of final draft report
Task 5 – Support SNMP Development	Additional Services, if requested	To be determined	To be determined

INSERT SCHEDULE

Section 3

Workplan Execution

3.1 Project Team

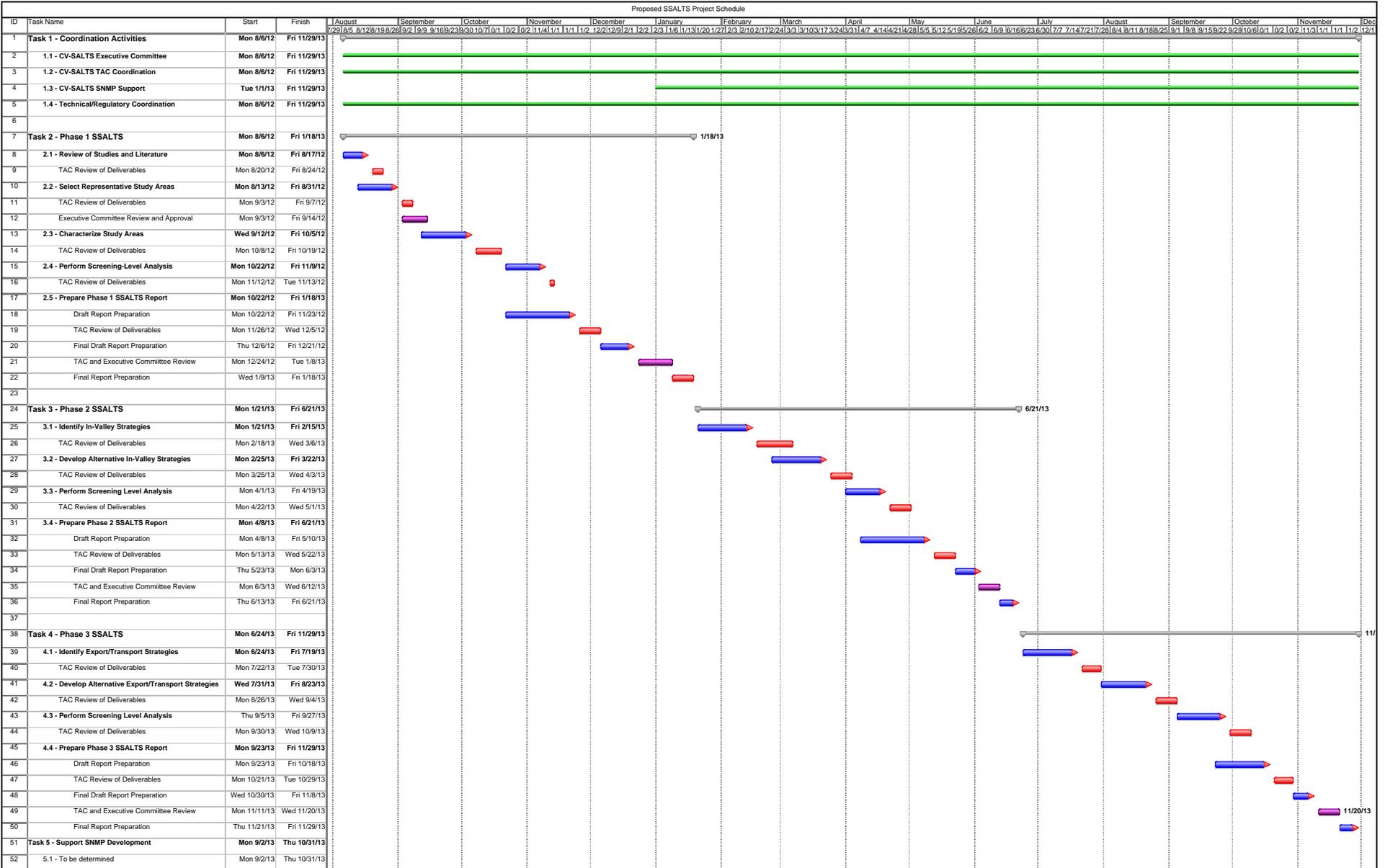
To be provided in the final Workplan.

Section 4

Workplan Budget

4.1 Task Budgets

To be developed in the next draft based on comments on Version 1



**Alternative
Workflow for
Discussion**

