

Task 2 - Workplan

Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
2	1	09/04/12	Erler & Kalinowski, Inc. (EKI)	Draft Workplan	The budget and time-frame should be increased <u>or</u> the vision and goals of the ICM should be re-defined and the scope of work modified to meet these goals.	The LWA Team responded to the scope and time-frame requested by CV-SALTS in the ICM RFP and recommended some modifications. The CV-SALTS selection committee approved the adjusted budget and schedule as proposed by the LWA Team. If the scope of work as described in the Work Plan is modified, the budget and time frame will need to be modified accordingly.
2	2	09/04/12	EKI	Draft Workplan	What is the overall vision of the ICM and what will it accomplish: Should there be a broader vision for what the ICM should accomplish?	The LWA Team responded to the vision for the ICM as identified by CV-SALTS within the ICM RFP. The LWA Team members have also been involved in various CV-SALTS Committees and work efforts and will continue to identify how the ICM work can be informed by and can inform other CV-SALTS initiatives. The vision and context for the ICM is described in the Work Plan. The content of the ICM will be further refined within the various task deliverables. In addition to developing analysis methodologies (Task 3, 4, 5, and 7), the ICM will provide a high-level analysis of salt and nitrate conditions throughout the Central Valley (Task 6 and 8) to address the questions developed by the Technical Committee. (See Attachment 2 to the Conceptual Model Summary Description).
2	3	09/04/12	EKI	Draft Workplan	What is the overall vision of the ICM and what will it accomplish: Should the ICM help stakeholders and other interested parties understand the magnitude of salt and nitrate issues facing the Central Valley?	Yes. The ICM Report (Task 8) and associated work efforts and deliverables will assist stakeholders and others in understanding the relative, Central Valley-wide magnitude of salt and nitrate issues. In addition in later phases, (a) stakeholder outreach and additional work will need to be completed at the management zone level in order to provide the specificity that will be desired by area stakeholders; and (b) stakeholder outreach and additional work will need to be completed at the local level in order to provide the specificity that will be desired by local stakeholders.
2	4	09/04/12	EKI	Draft Workplan	What is the overall vision of the ICM and what will it accomplish: Should the ICM provide an understanding of which portions of the Central Valley are, and are not, achieving sustainable salt and nitrate mass balances?	Yes, as requested in the ICM RFP, this information will be provided at a conceptual level for the entire Central Valley as a part of Tasks 6 and 8. (See questions 1,4,6,8 in Attachment F of Workplan)
2	5	09/04/12	EKI	Draft Workplan	What is the overall vision of the ICM and what will it accomplish: Does the ICM need to support CV-SALTS in its efforts to communicate the issues and garner stakeholder and government funding and support?	Yes. The ICM work will support CV-SALTS with these efforts, however, CV-SALTS is the lead for these outreach efforts. The ICM work will support CV-SALTS in two primary ways: (1) The LWA Team will communicate regularly with the CV-SALTS TPM and Project Committee so that they understand the issues in-depth and can communicate them to others (Task 1); and (2) The ICM Report (Task 8) and associated work will assist stakeholders and others in understanding the salt and nitrate issues.
2	6	09/04/12	EKI	Draft Workplan	What is the overall vision of the ICM and what will it accomplish: Can the ICM be used to evaluate whether local management practices, such as alternative irrigation methods, are sufficient to achieve sustainable salt and nitrate mass balances, or whether large-scale management practices are likely needed to achieve sustainable salt and nitrate mass balances?	The LWA Team will coordinate with CV-SALTS on related technical projects or analyses, such as SSALTS and the archetype projects, to promote efficiencies and information exchange (Task 1.3). In addition in later phases, (a) The applicability and effectiveness of large-scale regional management practices will be addressed in Phases 2 and 3 through coordination as appropriate with applicable Implementation Planning Efforts (see questions 13, 19 in Attachment F); (b) the applicability and effectiveness of local management practices will be addressed during development of local SNMPs (see questions 13, 19 in Attachment F); and (c) the applicability and effectiveness of local and large-scale regional management practices will be addressed as part of Implementation Planning Efforts i.e. Effective Management Practices Evaluation (see 5-Year Work Plan and questions 13, 19 in Attachment F).
2	7	09/04/12	EKI	Draft Workplan	Should the proposed ICM methodology be used for subsequent studies, including local SNMPs: Will CV-SALTS or local stakeholder groups control development of local SNMPs?	The ICM will provide high level, conceptual information to assist local stakeholder groups. In addition, in later phases: (a) Phases 2 and 3 will provide information to provide a framework to support local stakeholder groups; (b) local stakeholders will ultimately control development of local SNMPs; and (c) increased local involvement in SNMP development will be addressed by appropriate CV-SALTS committee(s).
2	8	09/04/12	EKI	Draft Workplan	Should the proposed ICM methodology be used for subsequent studies, including local SNMPs: Should CV-SALTS encourage a flexible approach in the CV-SNMP, which allows local stakeholder groups to use the models and methodologies for which they are most familiar?	The ICM is being developed based on the CVHM modeling platform so that the Initial Analysis Zones (IAZs) may be readily defined to any dimension that suits the objectives of the future SNMP efforts at the regional and/or local scales. The ICM also involves the development of analysis methods which may inform future SNMP efforts. In addition, in later phases: (a) Coordinate as appropriate with appropriate CV-SALTS committees to address this issue during the development of the CV-SNMP Master Plan; (b) Issue to be addressed by appropriate CV-SALTS committee(s).

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2	9	09/04/12	EKI	Draft Workplan	What are the goals of developing prototype templates: Is the grid-size of the model likely to be the most important factor pertaining to implementation of local SNMPs, or will other factors be more important (e.g., coordination amongst stakeholders, management practices that must be implemented)?	It is likely that many factors will be equally important for the development and effective implementation of the local SNMPs. The results of Task 7 will help to inform the answer to this question. This will be addressed within the Subarea Analysis Memo (Task 7). Additional work will be done Phases 2 and 3.
2	10	09/04/12	EKI	Draft Workplan	What are the goals of developing prototype templates: Should the prototypes focus on those factors that are anticipated to be most challenging to implementation of local SNMPs?	The approach for the prototype analysis (as detailed in Task 7) was developed in accordance with the scope requested in the ICM RFP. The results of Task 7 will assist in identifying, on a conceptual level, what some of the challenging factors may be for the effective implementation of the local SNMPs. This will be addressed within the Subarea Analysis Memo (Task 7). Additional work will be done Phases 2 and 3.
2	11	09/04/12	EKI	Draft Workplan	What are the goals of developing prototype templates: Will the prototypes proposed in the Work Plan show that the resulting salt and nitrate mass balances are more accurate or representative than those obtained by the ICM?	The different purposes and scales of work to be conducted as part of Tasks 6 and 7 are described in the ICM Work Plan. Although the Task 7 prototypes will utilize more detail with a finer grid compared to the Task 6 analyses, the results of those analyses can be compared at that time in order to help answer this question. The results of Tasks 7 will inform Phases 2 and 3. In addition, as a part of Task 3, the data gaps identified as a part of the ICM will be documented along with action items to address them in Phases 2 and 3.
2	12	09/04/12	EKI	Draft Workplan	How will ICM soil, water, salt, and nitrate concentrations based on WARMF water budget be demonstrated to be consistent with the CVHM water budget: The ICM Work Plan should include a task to confirm the WARMF water budget reasonably agrees with that of CVHM.....(see comment letter for full text of comment)	The ICM Work Plan preliminarily describes the step that will be taken to check recharge values from WARMF with CVHM results. Specifically, Attachment B describes how the WARMF model output of net recharge rates will be checked with the recharge values from the Zonebudget results from CVHM for each IAZ to ensure consistency. Task 5 will further describe the methodology that will be used for Tasks 6 and 7. The proposed methodologies for Task 6 will be presented in detail at the fall Workshop and in a Task 5 tech memo.
2	13	09/04/12	EKI	Draft Workplan	How will different groundwater zones be defined and used in the ICM: Does this depth (the upper 100 feet of the aquifer) conform to CV-SALTS Executive Committee's policy examination of establishing differing water quality objectives for shallow groundwater and underlying production zones?	As described in Task 5 and Attachment B, Task 6 will utilize the upper part of the aquifer system for the purpose of initially identifying areas where salt and nitrate are in balance, accumulating or depleting, and to prioritize those areas for more intensive evaluation in Phases 2 and 3. The Task 7 prototypes use the entire modeled aquifer system for the analysis of salt and nitrate transport. (See questions 1,2, 3, 4, 6, 8 in Attachment F). Application of ICM results to establish water quality objectives may be addressed by the appropriate CV-SALTS committee(s).
2	14	09/04/12	EKI	Draft Workplan	How will different groundwater zones be defined and used in the ICM: Are production zones sufficiently uniform throughout the Central Valley that a uniform thickness of 100 feet can be assumed for shallow groundwater?	Task 5 describes the use of the upper part of the aquifer system for purposes of addressing the part of the system potentially used for domestic well production. Task 5 further describes the CVHM layers to be considered; the layers are not exactly equivalent to a uniform thickness of 100 ft, i.e, the thickness for each IAZ will vary according to the physical basis for the layering in the CVHM.
2	15	09/04/12	EKI	Draft Workplan	How will different groundwater zones be defined and used in the ICM: Is the upper 100 feet of the aquifer consistent with near-surface groundwater as defined in the CV SALTS Salt and Nitrate Sources Pilot Implementation Study (SNSPIS)?	Yes, the approach described in Task 5 is consistent with the Pilot Study.
2	16	09/04/12	EKI	Draft Workplan	How will different groundwater zones be defined and used in the ICM: Does the ICM need to calculate salt and nitrate mass balances for near-surface groundwater besides the upper 100 feet?	No. As described above, Task 6 will utilize the upper part of the aquifer system for the purpose of initially identifying areas where salt and nitrate are in balance, accumulating or depleting, and to prioritize those areas for more intensive evaluation in Phases 2 and 3.
2	17	09/04/12	EKI	Draft Workplan	What sources and sinks will be incorporated into the mass balances for the ICM: Consideration should be given to identifying the lakes, streams, rivers, and wetlands for which salt and nitrate balances will be calculated.	Surface water bodies included in CVHM will be incorporated into the ICM in Tasks 6 and 7.

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2	18	09/04/12	EKI	Draft Workplan	What sources and sinks will be incorporated into the mass balances for the ICM: Should salt and nitrate balances be calculated for soil water and deep groundwater to be consistent with the SSALTS Work Plan?	Salt and nitrate in "soil water" as calculated in WARMF in the net salt and nitrate recharge from the root zone (see ICM Work Plan, Attachment B) will be included in Task 6. Task 7 incorporates salt and nitrate transport (to and from) deeper groundwater. In addition, in Phases 2 and 3: (a) additional coordination with SSALTS and related efforts will occur as appropriate in Phase 2 and 3; and (b) Additional coordination with SSALTS and related efforts will occur as appropriate in development of local SNMPs (see question 23 in Attachment F).
2	19	09/04/12	EKI	Draft Workplan	What sources and sinks will be incorporated into the mass balances for the ICM: Will mass balances include all sources and sinks like in Table ES-1 of the CV-SALTS Salt and Nitrate Sources Pilot Implementation Study (SNSPIS) that were used in the WARMF simulations?	Yes, where WARMF domains exist and to the extent applicable, these sources and sinks will be incorporated in the calculation of the root-zone concentrations in WARMF.
2	20	09/04/12	EKI	Draft Workplan	What level of land-use detail is needed in WARMF and CVHM: What level of land-use detail needs to be included in WARMF and CVHM?	Existing CVHM land-use layers will be used in the ICM and are considered appropriate for the level of detail targeted in the ICM model.
2	21	09/04/12	EKI	Draft Workplan	What level of land-use detail is needed in WARMF and CVHM: Can the assumed land-use in the models differ and still provide representative results?	Yes. This issue will be addressed in Tasks 3 and 5 and in the Task 8 ICM Report
2	22	09/04/12	EKI	Draft Workplan	What are the goals of compiling all of the data identified in the ICM Work Plan: Given limitations in data completeness and quality, will compiling the data identified in the ICM Work Plan lead to appreciably better salt and nitrate mass balances <i>in later phases of work (italics added to clarify the commenter's question)</i> than those obtained by the ICM?	The ICM will rely on available CVHM and WARMF model outputs and available data to create an initial snapshot of conditions in the Central Valley at an IAZ level of analysis. The ICM will describe the use of existing data and assumptions made to deal with data gaps. The purpose of compiling the data identified in the Work Plan into a geodatabase is to provide a publicly accessible storage location for the data used to complete the individual ICM Work Plan and GIS Work Plan Tasks so that the data will be available to inform future CV-SALTS work. In addition, in Phases 2 and 3: it is anticipated that (a) refinement of data at the regional level will lead to better balances; and (b) refinement of data at the local level will lead to better balances as part of the local SNMP efforts.
2	23	09/04/12	EKI	Draft Workplan	What are the goals of compiling all of the data identified in the ICM Work Plan: How will more detailed salt and nitrate mass balances be completed using information in the geodatabase, given CVHM simulates agricultural supply well pumping rates rather than using actual data?	The ICM will be completed using the existing CVHM framework. CVHM simulates agricultural pumping largely because very limited data (if any) exists for most areas in the Central Valley. Spatial information such as the location of agricultural supply wells may be available from CVHM for use as a part of the GIS Work Plan Task 3 and 4. In addition in Phases 2 and 3: (a) more detailed salt and nitrate balances may be achieved in Phase 2 and 3 through refined grid spacing, use of revised CVHM modeling codes, and use of additional refined data; and (b) more detailed salt and nitrate balances may be achieved in at the local SNMP level through further refined grid spacing, use of revised CVHM modeling and transport codes, and use of additional refined data.
2	24	09/04/12	EKI	Draft Workplan	What are the goals of compiling all of the data identified in the ICM Work Plan: The ICM and GIS Work Plans are unclear as to specific data that will be added to the geodatabase.	The Work Plans describe a number of the data sources that will be used/examined. The spatial data used to complete the tasks outlined in the GIS and ICM Work Plans will be compiled and stored in a publicly accessible geodatabase. Task 3 in the ICM Work Plan and Tasks 3 and 4 in the GIS Work Plan will provide documentation of specific data added to the geodatabase.
2	25	09/04/12	EKI	Draft Workplan	Will mineral dissolution be included in the mass balances: It is unclear if mineral dissolution will be omitted from the mass balances?	Similar to the Pilot Study, WARMF simulations include mineral weathering and reaction products (i.e., dissolution) in the root zone.
2	26	09/04/12	EKI	Draft Workplan	Are the management practices assumed in CVHM appropriate for the ICM: Do the data in CVHM sufficiently reflect the management practices being employed?	Data on management practices currently included in CVHM are considered sufficient for the level of detail required in the ICM. In addition, in Phases 2 and 3: (a) additional or updated data reflecting management practices at the management zone level may be incorporated as part of Phase 2 and 3; and (b) additional or updated data reflecting local management practices will likely be included in future local-scale SNMP development
2	27	09/04/12	EKI	Draft Workplan	What methods will be used to estimate representative salt and nitrate surface water concentrations: Should the ICM estimate representative salt and nitrate groundwater concentrations using a consistent method so uncertainty introduced by the data analysis is limited? (see page 27 of ICM Work Plan)?	The methods used will be tailored so that the analysis will be appropriate based on the available data. All analysis methods will be documented and potential limitations presented in a workshop and technical memorandum as part of Task 5 deliverables.

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2	28	09/04/12	EKI	Draft Workplan	What methods will be used to estimate representative salt and nitrate surface water concentrations: Will the findings obtained by comparing IAZ salt and nitrate mass balances be more reasonable if a consistent method is used?	The methods used will be tailored so that the analysis will be appropriate based on the available data. All analysis methods will be documented and potential limitations presented in a workshop and technical memorandum as part of Task 5 deliverables.
2	29	09/04/12	EKI	Draft Workplan	How and when will stakeholders have input on ICM parameters: The ICM Work Plan does not appear to provide an opportunity for the stakeholders to comment on or modify the input parameters before the IAZ salt and nitrate mass balances are generated.	The purpose of the ICM is to provide a 30,000 foot-level analysis of salt and nitrate issues in the Central Valley to identify which regions will need to be prioritized for more detailed analysis. Once this initial analysis is completed, stakeholder outreach in priority areas can be more efficiently coordinated. In addition, in Phases 2 and 3: (a) targeted stakeholder outreach will be coordinated to refine modeling and analysis; and (b) local stakeholder input will be important for future local-scale SNMP development, when local-scale salt and nitrate balances will be evaluated.
2	30	09/04/12	EKI	Draft Workplan	How and when will stakeholders have input on ICM parameters: Do stakeholders agree with the input parameters that were employed in the existing WARMF and CVHM simulations?	CV-SALTS directed use of the CVHM model for the ICM effort. WARMF has been proposed by the LWA team as the best available information to accomplish the ICM tasks under the schedule requirements established by CV-SALTS. In addition, in Phases 2 and 3: (a) targeted stakeholder outreach will be coordinated to refine modeling and analysis; and (b) local stakeholder input will be important for future local-scale SNMP development, when local-scale salt and nitrate balances will be evaluated.
2	31	09/04/12	EKI	Draft Workplan	How and when will stakeholders have input on ICM parameters: Stakeholders may have access to more complete data than those used in WARMF and CVHM, which could improve the accuracy of salt and nitrate mass balances.	Based on the scope, schedule, and budget for the ICM work, the ICM will use existing CVHM and WARMF simulations and will not incorporate new data beyond that identified in Task 3. In addition, in Phases 2 and 3: (a) targeted stakeholder outreach will be coordinated to refine modeling and analysis; and (b) local stakeholder input will be important for future local-scale SNMP development, when local-scale salt and nitrate balances will be evaluated.
2	32	09/04/12	EKI	Draft Workplan	Will salt mass balances be updated to incorporate CV-SALTS agricultural zoning mapping?	This is not part of the scope of the ICM. Instead, this is being addressed within the scope of the GIS Technical Services (Task 5). Pursuant to direction from the Selection Committee, a separate Work Plan is being developed for Task 5. This Work Plan is under development and will be submitted to CV-SALTS by the end of September.

Task 3.2

Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
3.2	1	09/27/12	Clay Rodgers	Draft TM	Just a minor comment that it appears Geotracker GAMA is listed as a data source. There may be additional data available for some of the categories in the non-GAMA Geotracker database and the California Integrated Water Quality System (CIWQS).	Table 1 of the Task 3 Data Source List has been updated to add details of the data sets to be retrieved from Geotracker. CIWQS provides data that would be considered for SNMP Master Plan (Phases 2 and 3) and would particularly be of interest for local SNMP development.
3.2	2	09/28/12	Thomas Harter	Draft TM	I am not familiar with the details of your conceptual model. But here are some additional data sources to consider (see cells below):	The team appreciates the extensive suggestions related to the areas studied as part of the SBX2-1 work and related reports. Specific responses are provided below.
					In the below I make reference to our SBX2 1 Technical Report on Nitrate Loading to Groundwater, published by Viers et al., 2012. The report is available at: http://groundwaternitrate.ucdavis.edu/files/139110.pdf . The report includes an extensive set of maps with components of Nitrogen Loading, Nitrogen Harvest, and groundwater Nitrogen Leaching, for 1945, 1960, 1975, 1990, 2005,2050 (methods described in the above report). These appendix figures are available in a separate file at: http://groundwaternitrate.ucdavis.edu/files/149916.pdf	Very helpful information relating to Nitrate Loading. The responses below indicate where the team finds applicability for the ICM work, the SNMP Master Plan and/or for local SNMPS.
					Water Supply: (1) DWR's C2VSIM groundwater model provides additional water supply data that can be compared to CVHM; (2) CH2MHill has a Sacramento Valley groundwater and surface water model, SCAFEM, that provides additional water supply data that can be compared to CVHM; (3) CALVIN - Jay Lund at UC Davis (Director, Watershed Sciences Center) has a statewide water supply model that is continuously being updated; (4) Sacramento and San Joaquin Valley SWAT models - Minghua Zhang at UC Davis (Dept Land, Air, and Water Resources) has two SWAT models used for nitrate and pesticide tracking, primarily in surface waters, which can be compared to WARMF outcome for validation; (5) Groundwater pumping location and volume: see note above on C2VSIM and SCAFEM	The data included in additional modeling efforts would be considered for the SNMP Master Plan and local SNMPS. For the ICM, the focus will be on the current version of the CVHM. It is recognized that water supply information can be fine-tuned locally in various areas of the CV. Water supply data from CVHM in the Kings Subbasin will be compared with water supply data used in the IGSM model for that area. We understand a review of several model platforms, including CVHM, C2VSIM and Hydrogeosphere is underway. The results of this review would help inform needs for the SNMP Master Plan, and would be of particular interest to local SNMPS, but will not be addressed in the ICM phase of work.
					Water Quality: UC Davis SBX2 1 project (Nitrate in Drinking Water) has compiled 1950 - current nitrate data from counties, dairy program (2007-2009), other programs (does not include salt data); data will be available in Geotracker by 2nd quarter of 2014. Contact: Thomas Harter, thharter@ucdavis.edu	It is very helpful to be aware of these additional data. Since it is indicated that these data will be available in Geotracker by 2nd Quarter 2014, it would be helpful to know if these data are available from the SBX2-1 project team in advance of the posting of these data on the Geotracker website.
					Land Cover: UC Davis Information Center for the Environment (Jim Quinn, Director) has a combined landuse map compiled from DWR records, Farm Mapping and Monitoring Program, and other sources. It is referred to as the California Augmented Multisource Landcover (CAML). It is likely similar to the CVHM landuse map. It was the basis for the groundwater nitrate loading analysis of the UC Davis SBX2 1 project. See Section 3.2.1.1 in Viers et al. (2012) (first link above)	Very helpful information relating to Land Use maps. The ICM effort will focus on use of such data as included in the current CVHM. Refinements to land cover would be considered for the SNMP Master Plan and/or for local SNMPS. The geographic extent of the CAML would also be helpful to document relative to its use in the Central Valley beyond the SBX2 1 study area.
					Subsurface Characteristics: C2VSIM and SCAFEM should be used at least to contrast the potential range in estimates	Comment acknowledged. It is outside the scope of the ICM to conduct cross comparisons of the CVHM with other models, of which there may be many that cover local or more regional applications throughout the Central Valley. Cross comparisons of the CVHM model to other models will be limited to comparison of the water supply data in the CVHM to the IGSM model for the Kings Subbasin.

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					Applied Materials: We have shared with John Dickey digital information used in the UC Davis SBX2 1 study describing Typical Applied Fertilizer N for California crops, categorized into about 58 crop designations. Discussion with John is ongoing. It is unlikely (in my opinion) that a regional breakdown will be feasible in the near future (without additional data collection, mostly using intensive surveys). Details are describe in Viers et al., 2012, section 3.2.2 and Appendix Table 7 (see first link above)	Very helpful comment on typical fertilizer application. The citation has been revised in Table 1 of the Task 3 Data Source List.
					A map of typical N fertilizer applied, for the Tulare Lake Basin, is shown in Appendix Figure 23 in the Appendix to Viers et al., 2012 (see second link above). Similarly, we have compiled and mapped nitrate in irrigation water applied to agricultural land, see Appendix Figure 15 in the appendix to Viers et al., 2012 (see second link above). The method is explained on page 69 of Viers et al., 2012, data are shown in Table 9 on page 70.	Very helpful comment on nitrate concentrations in irrigation water; this data may be used to augment information in WARMF-coverage areas and will likely serve as a primary data source in areas without WARMF coverage. The citation has been revised in Table 1 of the Task 3 Data Source List.
					Atmospheric Deposition: The California Nitrogen Assessment used recently modeled nitrogen deposition data. These were also used in the UCD SBX2 1 study. See Viers et al., 2012, Chapter 7 (first link above). For examples, see Appendix Figures 3 to 10 in the Appendix to Viers et al., 2012 (see second link above)	The citation has been revised in Table 1 of the Task 3 Data Source List.
					Uptake and Losses: Harvested Materials: For the UCD SBX2 1 Study, we used county ag commissioner reports for 2003-2007 in Fresno, Tulare, Kings, Kern, and Monterey County to determine yields and we used the USGS nutrient tool to estimate nitrogen in harvested materials. Digital data have been shared with John Dickey. Details are described in Viers et al., 2012, section 3.2.3 and Appendix Table 7 (see first link above).	Very helpful comment on nitrogen uptake and losses. The citation has been revised in Table 1 of the Task 3 Data Source List.
					A map for the Tulare Lake Basin (resolution ~ 1 acre) is shown in Appendix Figure 73, Appendix to Viers et al. (2012) (see second link above).	Comment acknowledged.
					Point Sources and Urban Non-point Sources: Point sources and non-point sources of nitrogen (other than dairies) are described, mapped, and tabularized in detail for the Tulare Lake Basin in the UCD SBX2 1 study, Viers et al., 2012, chapters 4, 5, and 6 (see first link above), with a summary map (on a ~ 1 acre basis) shown in the Appendix Figure 47 (WWTP and Food Processors), Figure 81 (Septic systems) (see second link above).	Comment acknowledged. This data on point sources and urban non point sources would be useful to the SNMP Master Plan and/or local SNMPs.
					Dairies and manure distribution are described in Viers et al., 2012, Chapter 4. We simulated several manure export scenarios, since the actual manure export from dairies is unknown. The amount of manure exported off dairies affects the amount of synthetic fertilizer applied (e.g., Appendix Figure 39). Manure nitrogen applications to cropland are shown in Appendix Figures 52 and 57, Viers et al., 2012 (see second link above)	Very helpful comment on manure distribution. This data source would be useful to the SNMP Master Plan and/or local SNMPS.
					Leaching Water and Constituents: Prof. Minghua Zhang (Dept. Land, Air, and Water Resources) has estimated pesticide and nitrate loading to groundwater and to surface water for the Sacramento Valley and for the San Joaquin Valley, using the SWAT model. I believe her work was published in peer-reviewed scientific journals	Very helpful comment on nitrogen loading. Literature values will be considered in the estimation of leaching water and constituents. Note that pesticides are not being considered as part of the ICM, nor are they planned to be as part of the SNMP Master Plan.

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					The UCD SBX2 1 study has made estimates of nitrate leaching to groundwater using leaching studies (Viers et al., Section 3.1.2), literature values and literature value-based leaching estimates for various non-agricultural sources (Viers et al., Sections 4, 5, 6, 7, 8, 9 - summary of the approach used is outlined at the end of each Section), and a rigorous mass balance approach for cropland, described in Viers et al., Section 2.6 (see first link above). Maps of groundwater nitrate leaching are shown in the Appendix Figures 89, 97, 102, 107, 112, 117 of Viers et al., 2012 (see second link above).	Very helpful comment on estimated nitrate leaching. The citation has been revised in Table 1 of the Task 3 Data Source List.
					Results of the nitrogen mass balance for Fresno, Kings, Tulare, and Kern County (also Monterey County), for the various crops, and for the SBX2 1 study area (Tulare Lake Basin and Salinas Valley) are summarized in Chapter 1 of Viers et al., 2012 (see first link above).	Very helpful comment on nitrogen mass balances in specific counties. The citation has been revised in Table 1 of the Task 3 Data Source List.
					We are currently in the process of compiling Ag Commissioner Report and dairy data for the remaining Central Valley counties. We currently do not have the resources to assess WWTPs and Food Processors in the Sacramento and San Joaquin Valley, but will compile a similarly detailed nitrogen mass balance to estimate groundwater leaching in the entire Central Valley by mid-2013.	Comment acknowledged. The information in the process of being compiled would be useful to the SNMP Master Plan and/or local SNMPS.
					The mass balance modeling approach described in Section 2.6 of Viers et al, (2012) could be applied similarly to salts, but the UCD SBX2 1 team or the UCD California Nitrogen Assessment team currently do not have those data. Similarly, the groundwater nitrate transport modeling approach described in chapter 7 of Dylan et al., (2012) can be applied elsewhere in the Central Valley and is also applicable to salts. We are considering to develop the model for at least parts of the San Joaquin Valley, if not the entire Central Valley.	Comment acknowledged. The information in the process of being compiled would be useful to the SNMP Master Plan and/or local SNMPS.
3.2	3	09/29/12	Thomas Harter	Draft TM	I forgot to mention that a detailed Table of all individual WWTPs and Food Processors (FPs) in the Tulare Lake Basin, and their N output either to percolation basins or to land application is given in Appendix Table 8 on page 313ff. of Viers et al., 2012 (http://groundwaternitrate.ucdavis.edu/files/139110.pdf)	Comment acknowledged. The information in the process of being compiled would be useful to the SNMP Master Plan and/or local SNMPS.
3.2	4	10/15/12	Nigel Quinn	Final TM	The only other data source that was mentioned at the ICM Project Review meeting was the WADE model - which was an integrated groundwater flow and salinity model developed during the Drainage Program (citation below) in 1989. It should probably be looked at - given that the approach taken of dividing the west-side of the San Joaquin Basin into management units is very similar. The integrated model was based on a comprehensive surface water, groundwater and salinity budgets - several models such as APSIDE were spawned by this effort (mostly developed within Richard Howitt's research group). Salinity was considered in the model as a constraint on agricultural production and a driver for investments in irrigation and drainage technology and land retirement decisions. The west side of the Valley is a different animal than the other watersheds. The WADE model divided up the aquifer into four zones (root zone, shallow semi-confined, deep semiconfined and sub-Corcoran) that corresponded to the USGS Regional Flow Model (Belitz et al., 1990) that was the basis for CVHM in the San Joaquin Basin. Given that this topic is likely to be the subject of ongoing discussion between the Project Team and the Review Panel - the report provides useful background material on the west-side conceptual model chosen. Quinn N.W.T et al. 1990. Overview of the use of the Westside Agricultural Drainage Economics Model (WADE) for plan evaluation. Technical Information Record. October 1989/August 1990. San Joaquin Valley Drainage Program, Sacramento, CA 95825	The conceptualization of the WADE model will be considered for ICM Task 6 (relevant areas), particularly the salinity budget used in the WADE model.

Task 3.2

Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
3.2	5	10/15/12	Randy Hanson	Final TM	I'm not sure what all sources of data are being considered for this. There are some historical estimates of actual ET and an ongoing study by the USGS and DWR through a NASA grant to systematically map fallow lands. I think having higher frequency land use data may be needed to related to the temporal detail of other land-based data. Some of this is published and other data types will be developed for on-line retrieval or tools for estimation by investigators	This is an issue where the information may be further considered as a part of the Phase 2 effort and or with the development of the future local SNMPs. It might possibly be a Phase 2 consideration, but perhaps locally constrained based on the priority area results for the ICM. We are not sure if there is enough time in the schedule to apply updated land uses to the entire Central Valley during Phase 2.

Task 3 Report

Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 3	1	12/10/12	Roger Reynolds	Draft Task 3 Report	The primary question I have relates to the Figures listed in Appendix B which shows the location of wells color coded for the various datasets (Dairy, CDPH, DWR, USGS, and Geotracker Gama). It was my understanding the Geotracker Gama dataset incorporated all of the available datasets. Their web site states it " Brings together and standardizes datasets from California state agencies including: Public Health, Water Resources, and Pesticide Regulation as well as from the US Geological Survey. " Based on this comment it would be helpful to have an explanation of why all the datasets are not all in Geotracker. And, is there any possible duplication of wells and available data?	Geotracker GAMA is a publicly available dataset that compiles different datasets from California state agencies including: DPH, DWR, the Department of Pesticide Regulation, and USGS. The Geotracker GAMA dataset is not unique, in that there are entries in the USGS dataset, for example, that occur in Geotracker GAMA, but then there are also some public supply well entries in Geotracker GAMA with the source label 'DPH' that do not occur in the DPH database downloaded from the DPH website. Geotracker GAMA provides some overlap, but also fills in some gaps from the data retrieval process. The nature and resolution of duplicates between datasets will be discussed further in the Task 8 Report.
Task 3	2	12/11/12	Robert Busby & Clay Rodgers	Draft Task 3 Report	I reviewed the draft ICM Task 3 report (Data Summary and Data Gaps) and have not substantive comments.	Comment noted
Task 3	3	12/18/12	Nigel Quinn	Draft Task 3 Report	I've reviewed both GIS and ICM Chapter 3 reports. Both seem fine though I suggest using the convention (though not strictly grammatical) of using the definite article with the model acronym when followed by the word model and no preceding definite article when using the acronym by itself. Hence.. CVHM is a model of and ... the CVHM model was developed It isn't perfect grammar but is how these descriptors are used in speech and makes for better readability.	Comment noted
Task 3	4	12/31/12	Thomas Harter	Final Task 3 Report	The document has no page numbers. I suggest to add those.	Acknowledged.
Task 3	5	12/31/12	Thomas Harter	Final Task 3 Report	With regards to "Water Supply" section under "Data Overview" - Because salts and nutrient data will be variably as concentration or as mass per unit area or mass per unit time throughout this ICM process, it is important to always identify, whether any water quality constituent data are (as I assume) given as a concentration, or as a mass per unit time, or something else. To avoid confusion, I suggest to identify, throughout the documentation, the correct units, e.g. (capitalized added here only for emphasis): "Surface water quality data (TDS, chloride, and nitrate (as N) CONCENTRATIONS [mg/L]) are available from...." or "Surface water quality data (TDS, chloride, and nitrate (as N) MASS LOADS [tons/year]) are available from...."	Good comment. Noted for Task 8 report.
Task 3	6	12/31/12	Thomas Harter	Final Task 3 Report	With regards to "subsurface characteristics data" - also available from CDPH http://cdpr.ca.gov/docs/emon/grndwtr/vasmnt.htm , and specifically the last reference on that page: http://cdpr.ca.gov/docs/emon/pubs/ehapreps/eh0002.pdf	Thank you for the reference to this guidance document for developing a depth to groundwater database including geostatistical analysis and gridding to calculate average subsurface properties (in the reference it is concerned with depth to groundwater).
Task 3	7	12/31/12	Thomas Harter	Final Task 3 Report	With regards to Table 2 - Will there ultimately a more detailed description of exactly what these datasets represent? For example, I was not aware (based on our communications with RB5) that dairy water quality data were available for dairies north of Madera County. Barb Dahlgish and I discussed this briefly. If I understood correctly, she may have data that were obtained from the industry rather than RB5? All to indicate that, at some point, an exact description of the source and nature of these data would be helpful.	No, all of the data for the dairy portion of groundwater data originated from the RWQCB. All of the other data originates from their defined entity (CDPH, DWR, USGS, etc.).
Task 3	8	12/31/12	Thomas Harter	Final Task 3 Report	With regards to "dairy data from General Waste Discharge Requirements" as discussed in the section "Mass Loadings for non Non-WARMF Covered Areas" - Explain with a couple extra sentences: to my knowledge, these data only exist on paper. For Madera, Fresno, Kern, Kings, Tulare, RB5 has in fact a digital data layer that identifies the APNs (assessor parcel numbers) under the management of each dairy. But I am not aware of a similar digital layer north of Madera County. Are those areas mapped in C-10 in fact simulated by WARMF based on landuse as in the original pilot study?	A revision of the Appendix C content will be included in the Task 8 report, and this comment will be addressed in that revision.
Task 3	9	12/31/12	Thomas Harter	Final Task 3 Report	Attachment C, Figure C-1 - y-axis needs a label (kg/ha or lb/ac).	A revision of the Appendix C content will be included in the Task 8 report, and this comment will be addressed in that revision.
Task 3	10	12/31/12	Thomas Harter	Final Task 3 Report	Attachment C, Figure C-1 - Identify the year(s) represented by this graph. I believe this is 2003-2007. Also mention that the UC Davis estimates are based on County Agricultural Commissioner annual reports, which provide yields and acreages of individual crops. A comment to John Dickey (LWA Team): are you sure you want to use the county data separately? I wonder whether there is enough precision in the county records to justify a differential rate for each county. In our SBX2 1 study, we combined the yields and acreages of the five counties and used a single N uptake rate for each crop, across all five counties.	A revision of the Appendix C content will be included in the Task 8 report, and this comment will be addressed in that revision.

Task 3 Report

Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 3	11	12/31/12	Thomas Harter	Final Task 3 Report	Attachment C, Figure C-1 - a comment to John: are you sure you want to use the county data separately? I wonder whether there is enough precision in the county records to justify a differential rate for each county. In our SBX2 1 study, we combined the yields and acreages of the five counties and used a single N uptake rate for each crop, across all five counties.	A revision of the Appendix C content will be included in the Task 8 report, and this comment will be addressed in that revision.
Task 3	12	12/31/12	Thomas Harter	Final Task 3 Report	Attachment C, Figure C-2 - Use a bar graph instead of a line graph	A revision of the Appendix C content will be included in the Task 8 report, and this comment will be addressed in that revision.
Task 3	13	12/31/12	Thomas Harter	Final Task 3 Report	Attachment C, Figure C-2 - Define N use efficiency and explicitly state that this is a partial nitrogen balance that does not include manure or other organic applications of N above rates typically used with fertilizer. It does also not include atmospheric deposition of N, or N in irrigation water.	A revision of the Appendix C content will be included in the Task 8 report, and this comment will be addressed in that revision.
Task 3	14	12/31/12	Thomas Harter	Final Task 3 Report	Attachment C, Figure C-2 - I get slightly different numbers, when I use Viers et al., 2012 (SBX2 1 Technical Report 2) and divide the values for 2005 in Table 24 (N harvested) with those in Table 22 (N applied). I assume that the method used here is slightly different - perhaps differently weighted? Should be explained.	A revision of the Appendix C content will be included in the Task 8 report, and this comment will be addressed in that revision.
Task 3	15	12/31/12	Thomas Harter	Final Task 3 Report	Table C-1 - What is "Zone basis" as opposed to WARMF? Explain in the Figure caption (although it is also in the text).	A revision of the Appendix C content will be included in the Task 8 report, and this comment will be addressed in that revision.
Task 3	16	12/31/12	Thomas Harter	Final Task 3 Report	Figure C-5 - Since C-4 does not suggest a strong regional trend for silage and corn, I suggest that there be no adjustment made to the dairy land classes for N applied.	Uptake and application rates were scaled to reported levels of productivity. In correctly managed systems (and as required under the Dairy General Order), this very type of adjustment to application rates is required. It is therefore most reasonable to conclude that, on the average, application and uptake rates scale to levels of productivity, as assumed in this analysis. We note that, unlike the recent N mass balance performed by the UC Davis team, this analysis is prospective, not retrospective. Thus, contemporary land management systems are held constant for the analysis period (in WARMF), while historic climatic data time series are employed. Thus, requirements of the Dairy General Order would be presumed to be in effect throughout the analysis.
Task 3	17	12/31/12	Thomas Harter	Final Task 3 Report	Figure C-5 - Will there be a check between total manure N applied on rotating, constrained, and unconstrained dairy land relative to the total manure N available from the herds excretion (perhaps by IAZ)?	Application rates for these classes were developed with Dairy Industry manure management planners/analysts, rather than taking the N mass balance approach employed by UC Davis in a recent study. See the previous response relative to the prospective nature of this analysis, which makes such consultation on Dairy Industry land application practices an appropriate way to identify land application rates anticipated under the General Order. Each approach to estimating dairy land application rates has shortcomings and strengths. For example, the relationship between herd size and manure production is approximate; between milk and manure production somewhat better. Several comparisons will be made in the Task 8 report: County-by-county mass loading to land application in WARMF compared to estimated manure production; WARMF land application acres compared to General Order land application acres; and assumed loading rates compared with estimated manure production divided by land application area reported under the General Order.
Task 3	18	12/31/12	Thomas Harter	Final Task 3 Report	Figure C-6 - See comment on Figure C-5 re dairy landuse classes. Same comment applies to this figure	A revision of the Appendix C content will be included in the Task 8 report, and this comment will be addressed in that revision.
Task 3	19	12/31/12	Thomas Harter	Final Task 3 Report	Figure C-10 - In the figure caption, identify the source of the "dairy parcels" data.	A revision of the Appendix C content will be included in the Task 8 report, and this comment will be addressed in that revision.
Task 3	20	12/31/12	Thomas Harter	Final Task 3 Report	Figure C-10 - In the Figure caption, identify the source of numbers "Counties-dairy N_applied".	A revision of the Appendix C content will be included in the Task 8 report, and this comment will be addressed in that revision.

Task 4 Report

Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 4	1	11/7/12	Randy Hanson	Draft Report	p. 5 – Summary: Definition of groundwater basins by DWR should be subject to review and potential revision. Several other basins defined through Bulletin 118 are not consistent with modern studies carried out by the USGS or others. We are redefining the extent of some basins in other ongoing studies and the extent of these basins has implications for monitoring (ex. GASGEM) and regulation.	A footnote has been added to the document in Section 6 to discuss DWR's initial definition of groundwater basins and how the USGS and others have reviewed and redefined the extent of some basins.
Task 4	2	11/7/12	Randy Hanson	Draft Report	p.7 - DWR/CVHM Water Balance Subregion Boundaries –C2Vsim does not explicitly simulate individual wells or land use so only the more refined grid version starts to approximate the "computational grid" of CVHM with MF-FMP. Also the Diversions are a mixture of approximations, estimations, and reported data some of which are measured. A legitimate network of measured diversions (with EC, nitrate, temperature and salinity monitoring) are desperately needed for all models and for CVSALTS. Several irrigation systems have SCADA systems to automate diversions and deliveries. These regions should be IAZs where we could get funding to implement a monitoring network.	A footnote has been added to the document that states that C2VSIM does not explicitly simulate individual wells or land use, so only the more refined grid version begins to approximate the "computational grid" of CVHM with the FMP. The footnote also notes that the diversions included in C2VSIM include a mixture of approximations, estimations, and recorded data.
Task 4	3	11/7/12	Randy Hanson	Draft Report	p. 13 – Periodic updates of CVHM-2 and related input data streams for both CVHM-2 and CVSALTS such as diversion flows, returnflows, and related salinity and nitrate would be very helpful for this process and later phases of CVSALTS. Funding will be required for data networks and updates of the model to keep it current.	At the end of Section 5, further discussion was inserted to the text regarding periodic updates to CVHM-2 (and later versions) benefiting from additional data (measured diversion flows, return flows, tile drain locations, etc. along with corresponding water quality monitoring data), and how this would benefit future phases of CV-SALTS for long-term planning needs.
Task 4	4	11/7/12	Randy Hanson	Draft Report	p. 18 – The definition of watershed may want to include a description of the level of definition. Will these be subwatershed at the HUC-12 delineation as is now being developed by NHDPlus by the USGS? Or will there be another level of delineation?	Additional text was added further discussing the various levels of watersheds from the WBD document. This additional discussion serves to complement the WARMF watershed discussion and does not intend to assign any HUC-level of delineation.
Task 4	5	11/7/12	Randy Hanson	Draft Report	p. 20 – We can also anticipate that child or embedded models that are more refined could be used for SNMP or other forms of detailed analysis. MF-FMP has the capability to facilitate this type of scaling or linkages if needed.	An additional bullet was entered into the text to reflect to potential of the FMP to facilitate scaling and/or linkages for local model (i.e. "child" or embedded model) purposes.
Task 4	6	12/12/12	Roger Reynolds	Final Report	I have no comments on the Final Task 4 report.	
Task 4	7	12/18/12	Nigel Quinn	Final Report	p 7 - Need to distinguish between the model code IWFM and the model application C2VSIM. Similarly between the code IGSM and the application CVGSM.	The discussion on this page was to summarize DWR's efforts to compile information on water deliveries and diversions and how this is related to the USGS' choice of subregions for the original CVHM.
Task 4	8	12/18/12	Nigel Quinn	Final Report	p. 8 - I suggested breaking exiting subregions into smaller subareas based on the salinity and boron TMDL. This TMDL separated the Grasslands and North-West side on the west-side of the San Joaquin Basin. These have distinctive and very different hydrologies - the former mostly an area of p salt accumulation, the latter an area in salt balance.	Acknowledged.
Task 4	9	12/18/12	Nigel Quinn	Final Report	p. 8 - regarding "...in dilution of mass loadings." Not clear how this occurs. Explain! Also clear that there is much heterogeneity in conditions leading to multiple vertical depths of penetration in 20 years both within and between subareas.	The sentence relating to dilution is to convey the importance of constraining the volume used for the mixing analysis. Upon implementing the 20-year travel calculation, it was found that this was somewhat more complicated than anticipated to establish the depth of travel and corresponding CVHM layers for each IAZ. This will be further explained and illustrated in the Task 8 report.

Task 4 Report

Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 4	10	12/18/12	Nigel Quinn	Final Report	p.11 - Regarding statement: "Analysis of salt and nitrate masses and movement in and between IAZs, including accumulation, depletion and overall balance, will be facilitated through the integration of WARMF and CVHM outputs within a database model": Outputs not integrated - rather they are combined to develop average hydrology informed by both models. Since mass loadings from WARMF already contain an estimate of associated hydrology there is a need to reconcile WARMF flows with those of CVHM. It isn't merely a matter of additive hydrology.	The word "integrate" as used here is intended to mean the same thing as "combined", i.e., integrate means "blend into a unified whole or unite with something else" and similarly combine means "to cause to unite, or to intermix or blend". As described in the Task 5 report, selected WARMF and CVHM hydrologies will be compared and the results of those comparisons summarized in the Task 8 report. For the ICM, it is not intended that WARMF flows will be reconciled with those in the CVHM.
Task 4	11	12/18/12	Nigel Quinn	Final Report	p. 12 - Regarding 2nd full paragraph: The westside model SJWHM is based on the same basin disaggregation as WESTSIM. Even though the model simulates the westside the model will contain more subareas (farms) than CVHM2 given that the Delta and Eastside will be part of SJWHM but not part of the simulation. This has to do with selection of appropriate boundary conditions for the SJWHM model.	Acknowledged.
Task 4	12	12/18/12	Nigel Quinn	Final Report	pp. 19 - 21, several comments for clarification of text; address grammar issues	Acknowledged. As applicable, clarifying text/explanations will be included in the Task 8 report.
Task 4	13	12/31/12	Thomas Harter	Final Report	<p>p. 8, 2nd paragraph under "IAZ Vertical Dimensions and Saturated Volumes" - This paragraph is contradictory. On one hand it defines a definitive vertical extend (20-year travel time), on the other hand, it correctly identifies the depth selection as a critical process that needs to be given significant consideration. I agree with the latter part of the paragraph. That means that the 20-year depth selection needs to be justified. What are the formal criteria used to identify 20 years as the critical time to establish the depth of the IAZ? Why is it not, e.g., 60 years, or 10 years? [BTW, the physical calculation given in the footnote makes sense. The question here is about the number of years chosen]. A strong justification is critical, as the depth selection has possible large consequences on the outcome.</p> <p>Here is another thought that needs to be addressed: Given that the depth of the IAZ is equal to the vertical travel time of groundwater, which in turn is driven by landscape (diffuse) recharge, does the concentration really "dilute", whether the IAZ is 2 years deep or 40 years deep? In either case, the concentration reflects the average of the time period considered: The water throughout the depth of the IAZ consists entirely of recharge (and salts/nitrate loading) from that period. Does the procedure effectively amount to averaging of the recharge concentration over the 20 year period?</p> <p>If I remember correctly, one justification given for the 20 years was that the loading algorithm only represents present conditions, which at most are representative of the last 20 years.</p> <p>Please clarify/justify.</p>	<p>The LWA Team initially proposed to do a 10-year simulation period for the water, salt, and nitrate balance calculation. Input from CV-SALTS at the Team's July 10, 2012 presentation increased that to a 20-year period. The most recent 20-year time period in CVHM is 1983 to 2003, so that is the significance of that time period, which still allows for the inclusion of all hydrologic year types (dry, wet, normal).</p> <p>Yes, mass loading occurs to the shallow zone of the mixing model over the 20-year period. The appropriate depth of the shallow part of the aquifer system is important; it helps avoid too much dilution of the mass if the IAZ is too deep (or concentration if it is too shallow).</p>

Task 4 Report

Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 4	14	12/31/12	Thomas Harter	Final Report	p. 11, regarding "Assimilative Capacity" - Can include a reference to a document that defines this term in the context of CV SALTS? Is there a CV SALTS document on this?	The intent of the inclusion of consideration of assimilative capacity is because of its use in the SWRCB recycled water policy, including the preparation of salt and nutrient management plans. While the recycled water policy refers to assimilative capacity, an explicit definition is not provided in that guidance document. For ICM purposes, assimilative capacity is defined as the amount of a constituent (contaminant load) that can be discharged to the aquifer system (especially that part of the aquifer system that provides actual or probable beneficial uses) without exceeding water quality standards and/or Basin Plan water quality objectives. Additionally, this term describes the difference between the water quality standards/objectives and average ambient shallow groundwater quality in the basin/subbasin/IAZ/MZ (where shallow does not necessarily mean the uppermost part of the saturated zone directly at the water table, rather "shallow" means the part of the aquifer system that provides actual or probable beneficial uses).
Task 4	15	12/31/12	Thomas Harter	Final Report	p. 12, 3rd full paragraph - For reasons that are buried in the conceptual details of the Farm Package, even CVHM2 will be taking many important input parameters determining water flows only at the "farm scale", which is effectively the IAZ scale. As we discussed in the workshop, the spatial resolution of CVHM and CVHM2 will be largely be the same except on the Westside (in the area of the SJWHM). Be clear that there should not be an expectation of a better high resolution model covering the entire valley. (Check with Randy Hanson, USGS).	Acknowledged. In addition to the added Westside subregions in CVHM2, there are other model updates in CVHM2. It is anticipated that these will be comprehensively described in the documentation that accompanies the model update.
Task 4	16	12/31/12	Thomas Harter	Final Report	p. 12, 4th full paragraph - See previous comment. I believe that higher resolution in CVHM2 is, in effect, only achieved for the Westside. Most IAZs would have not further information in CVHM2 (and for Phase 2 CV-SNMP) than they have in the ICM. This is fundamentally in conflict with objective 1 above "Expand spatial resolution of groundwater and surface water model". This looks like a potential dilemma for Phase 2, given the timing! It may mean that Phase 2 gets somewhat redefined? Something to discuss as we move forward with the ICM.	The LWA Team is not aware of the extent to which the USGS may have made updates to parameters in other areas of the CVHM (i.e., additional local data received from applications of the CVHM). In any case, there is a difference between the basis of the IAZ computations for the water, salt and nitrate balances (IAZ aggregated scale of analysis) and the spatial resolution that would be retained for Phase 2 types of analyses. Phase 2 could proceed with the 1-mile grid resolution of CVHM (current version), or could use CVHM-2 to recognize model updates (if that version is available).
Task 4	17	12/31/12	Thomas Harter	Final Report	pp. 12 (bottom) and 13 (top) - strongly suggest that CHVM/WARMF not be endorsed here for the work that local groups may do later. Instead emphasize that local models may be available to local entities. Many of these exist in the Central Valley. For example: http://www.cwemf.org/workshops/GWWorkshop/ This raises a more fundamental question: Does RB5 or the Technical Committee or CV-SALTS want to pursue a one-size-fits-all approach or encourage diversity of tools? Can that be clarified here and elsewhere?	The CVHM/WARMF approach is merely suggested as an option for consideration. Section 6 describes what Local entities may wish to consider as they develop SNMPs, including using models that have already been developed in their area for other purposes.
Task 4	18	12/31/12	Thomas Harter	Final Report	p. 13, Section "Criteria for IAZ/MZ Delineation for Phase 2 CV-SNMP", 5th bullet - Not true, see above comments on CVHM2	The 5th bullet states that for purposes of Phase 2 and the recommended CVHM2 direction that it would " <i>preliminarily</i> address local issues and needs (Section 6 describes approach for further refinements for Local SNMPs)" (italics added). The comment about this not being "true" is unclear.
Task 4	19	12/31/12	Thomas Harter	Final Report	p. 20, 1st full paragraph - You are suggesting that the local MZ somehow needs to obtain information from CVHM. What is the reason, if any to refer back to CVHM? In other words, can the Kings River Authority, for example, do its own analysis based solely on its Upper Kings River Basin groundwater model and never ever refer to the ICM or the Phase 2 work, except perhaps the landuse specific loading rates? This issue should be clarified.	See response to comment 17 above.

Task 4 Report

Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 4	20	12/31/12	Thomas Harter	Final Report	p. 20, 2nd full paragraph - See comment above: Is there a reason to be CVHM centric?	See response to comment 17 above.
Task 4	21	12/31/12	Thomas Harter	Final Report	p. 20, 5th bullet at bottom of page - Would the local model be required to be consistent with the ICM or the Phase-2 implementation in terms of the total salt / N loading to surface water and groundwater across its total area? In other words, does RB5 or CV-SALTS require that mass fluxes (water, salt, nitrate) across a "local" model area are consistent with the ICM or Phase-2 fluxes? Worth a discussion, perhaps?	It is anticipated that Local entities would in fact be able to refine the inputs incorporated into SNMPs developed at the Local scale, pending the availability of datasets that provide for additional resolution at the local scale. So, it would not be reasonable to require that a local model be consistent with the ICM. The ICM is on an aggregated scale for purposes of evaluating overall IAZ trends in salt and nitrate fluxes (accumulation, depletion or generally in balance).
Task 4	22	12/31/12	Thomas Harter	Final Report	p. 21, 2nd full paragraph under "Summary and Considerations for Future Local SNMPs" See above comments. Is there a rationale behind recommending that CVHM be used?	See response to comment 17 above.
Task 4	23	12/31/12	Thomas Harter	Final Report	p. 24, 5th bullet under "Phase 2 CV-SNMP Criteria for Delineating IAZs/MZs" - As mentioned above, not really true. See above comment.	See response to comment 18 above.

Task 5 Report

Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 5	1	11/27/12	Randy Hanson	Draft Report	p. 7 - Requests for irrigation water quality data could be checked against the pesticide permitting database of the state to see how pesticides are being applied in conjunction with irrigation.	Unfortunately the request for irrigation water quality data will not allow for receipt of data that would be usable for the ICM effort. This text was removed from the document. Otherwise, pesticides are not the focus of CV-SALTS and are purposely not addressed in the ICM.
Task 5	2	11/27/12	Randy Hanson	Draft Report	p. 9 - Figure 3a. Gridded approach could probably get the shape files from GAMA project to use their irregularly shaped gridding polygons. Figure 3b. May want to consider spline interpolations or cokriging if data distributions are problematic.	We will be creating our own grids for the gridded approach, based on locations of all of the different types of wells that we have collected data for in Task 3. This is a different dataset from what GAMA worked with, and so using their grids, while helpful for educational purposes, will not be pursued for the ICM work. Additional text has been added to a footnote regarding the possibility of using spline interpolations or cokriging as an option when data distributions are problematic.
Task 5	3	11/27/12	Randy Hanson	Draft Report	p. 20 - IAZ Delineation: What is the basis for the 20 year period?? Is the 1983-2003 period just a convenient period that overlaps the most recent period simulation of CVHM and/or WARMF?	The LWA Team initially proposed to do a 10-year simulation period for the water, salt, and nitrate balance calculation. Input from CV-SALTS at the Team's July 10, 2012 presentation increased that to a 20-year period. The most recent 20-year time period in CVHM is 1983 to 2003, so that is the significance of that time period, which still allows for the inclusion of all hydrologic year types (dry, wet, normal)
Task 5	4	11/27/12	Randy Hanson	Draft Report	p.29 - Lateral surface-water leakage? from CVHM. This is best captured as inefficient runoff from precipitation and irrigation which can be retrieved from the secondary SFR output file and summed up as the runoff component that is being added back into stream reaches.	A footnote has been inserted to discuss the difference between terminology - WARMF uses lateral flow as the main category for stream leakage, while CVHM actually has a water budget component named 'stream leakage.' Another form of lateral flow to surface water from CVHM is the runoff component from precip and irrigation, values for which will be extracted from the SFR output file.
Task 5	5	11/27/12	Randy Hanson	Draft Report	p. 31 - Mass Components and potential discrepancies between CVHM and WARMF. The percent of cell area for the major land use within each cell are available for delineating the mass application with respect to acreage in CVHM. This may help identify, along with the cell assignments by land use, which cells and how much of the cells are being used versus the WARMF acreage specifications.	A footnote has been added addressing the possible availability of this percent land use information from CVHM acreages.
Task 5	6	11/27/12	Randy Hanson	Draft Report	p. 33 - Does WARMF explicitly simulate tile drainage of water coming from above and/or below the root zone? (fig. 10). CVHM1 does not but does have additional runoff to compensate for this feature for selected crops. There will be drains in selected regions of CVHM2.	WARMF simulates tile drainage using a layer of high conductivity to move water laterally to surface water. A footnote has been added discussing the two methods of accommodating tile drainage and notes that the apportioning mechanism for allocating mass to vertical flow vs. horizontal flow will be engaged when necessary.
Task 5	7	11/27/12	Randy Hanson	Draft Report	p. 41 - Surface-water Mixing model: The amount of water diverted and nonrouted deliveries do not necessarily represent the amount of water applied as irrigation. Nonrouted and semirouted deliveries may be reduced to the amount calculated by FMP as the TFDR. If additional NRD water occurs, it is not delivered under option 0 and if more water is diverted than is needed for TFDR the additional water goes back into the stream network. Thus mixing models need to be reviewed carefully.	A footnote has been added to address this subtlety in the surface water mixing model components. Very helpful comment - thank you for the insight.

Task 5 Report

Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 5	8	12/19/12	Nigel Quinn	Final Report	this is a difficult chapter to write and explain since the approach that had to be taken is unconventional. The major problems with the chapter in my opinion relate to terminology and lack of adequate explanation.	The Task 5 methodology was challenging to write as the approach is unique. To our knowledge, there has been no previous effort to quantify, over a period of years (e.g. 20 years, as is the case for the ICM), the transport of salt and nitrate mass fluxes in surface water and groundwater for the entire Central Valley. The Task 7 TM and Task 8 report will elaborate on the implementation of the methods presented in the Task 5 report.
Task 5	9	12/19/12	Nigel Quinn	Final Report	The terms mass loading and volumetric component are used - sometimes without the qualifier "salt and nitrate". This should be corrected throughout the text. Need to know what the mass is that is being described - although it is assumed that it is always salt and nitrate. Volumetric component is a problem since it isn't directly related to these constituents. Volumetric flux would be better - referring to the flow portion of the mass balance of salt and nitrate - this implies an associated volume of water per unit time.	The Task 5 report headings/subheadings often include reference to both salt and nitrate; the assumption is correct that mass loading refers only to salt and nitrate. Additional qualifiers will be added as appropriate to ensure clarity in the Task 8 report. Similarly volumetric flux will be used where appropriate. For the discussion pertaining to WARMF net recharge, the mass flux is the driver not the associated net recharge volume.
Task 5	10	12/19/12	Nigel Quinn	Final Report	Though it is clear that it is only recharge that is used from WARMF in the volumetric flux and mass flux computations of salt and nitrate - no reasoning is provided why this was done and what the implications are for hydrology and salinity budgets. It is stated that the recharge volumetric fluxes from WARMF and CVHM will be compared but no explanation of what will happen after this is done. Will adjustments be made or is this potential discrepancy merely recorded?	The WARMF and CVHM comparisons are described in Section 4.3. Assumptions for purposes of the ICM are also explained. The WARMF and CVHM comparisons will be summarized and discussed in the Task 8 report. Volumetric flux values will always be used from CVHM for recharge amounts and leakage to streams to maintain consistency for the water balance calculations. WARMF provides mass loadings for the recharge and stream leakage components as well as surface water quality (concentration) data. The methodology used to map WARMF calculated mass fluxes onto CVHM hydrology is documented in the addendum to the Task 5 report. The comparison between WARMF and CVHM flows will be used to assess the error in the model linkage.
Task 5	11	12/19/12	Nigel Quinn	Final Report	Table 2 is confusing. It isn't clear under the mass source column how these figures are determined. How is the stream leakage salt mass flux "calculated" for WARMF. Is it calculated within the model - if so where does the volumetric flux component come from - CVHM or internal to WARMF. This is a good idea for a table but not easy to understand. May want to use color coding to indicate whether the quantity comes from CVHM or WARMF and how it is used to determine the mass flux of salt.	We will plan to include a refined/revised table in the Task 8 report. All of the info in the right hand column of the table relates to the calculation of salt and nitrate masses. The stream leakage mass fluxes are calculated using in-stream concentrations calculated by WARMF and leakage volumes from streams calculated by CVHM.
Task 5	12	12/19/12	Nigel Quinn	Final Report	On page 29 it is suggested that the concentration of salt in recharge is higher than the underlying aquifer concentration. This is not true for the west-side where the shallow groundwater can be 3 or 4 times the concentration of the recharge due to refluxing of salts and high water tables. Not sure what "standard" means - referring to volumetric "fluxes".	The comment does not correctly capture the intent of this discussion. The report gives an example of where this is the case. We agree that this is not always the case and acknowledge differences in the Westside area and elsewhere. "Standard" refers to the assumption in Section 4 that the CVHM hydrology is correct.
Task 5	13	12/19/12	Nigel Quinn	Final Report	Section 4.1.3 needs further work - not that clear what calculations are being performed. It is a bit abstract.	Within the WARMF model domains, ambient surface water quality is calculated as a flow-weighted average of WARMF simulated concentrations in all river segments within each IAZ. The document "Description of the WARMF-CVHM Linkage.doc" has more information about how the mass fluxes are calculated.
Task 5	14	12/19/12	Nigel Quinn	Final Report	Need a separate GIS map of the Kings Subbasin - not sufficient to refer reader back to the "farm" map of the Central Valley.	More detailed maps will be provided in the Task 7 TM.

Task 5 Report

Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 5	15	12/19/12	Nigel Quinn	Final Report	A pity the areas chosen do not provide a robust test of the model linkage. Even though there is some drainage in the Kings sub-basin CVHM does not deal with drainage explicitly (is included in CVHM2 and SJWHM. Also no discussion of the handling of managed seasonal wetlands in the model linkage. These issues may need to be discussed and worked out ahead of the release of CVHM2 and SJWHM - that way they can be incorporated directly in the new model. Not clear from the chapter if the linkage is robust enough to deal with this	The selected subareas are per the request of the RFP and the Executive Committee. The wetlands question was previously addressed under Workshop comments and responses.
Task 5	16	12/19/12	Nigel Quinn	Final Report	More detailed comments and weak sections highlighted in attachment. See subsequent comments (only key comments included; editorial/grammatical type comments in pdf file):	Acknowledged.
Task 5	17	12/19/12	Nigel Quinn	Final Report	p. 11-12 - Note than TDS/EC ratios change seasonally and annually. May need to address this assumption with data to show that this is an appropriate ratio to use	The TDS/EC ratio related question was previously addressed in the Workshop/Task 3 responses to comments.
Task 5	18	12/19/12	Nigel Quinn	Final Report	p. 18 - Regarding statement: "The mass outputs from the WARMF model will be used to provide the mass loadings of salt and nitrate for those IAZs that are within the WARMF domain." - This is not strictly true from what follows - WARMF salinity mass loading used just for recharge - groundwater model flow budget used for rest of hydrology inputs/outputs.	The sentence is correct as stated; the sentence specifically relates to salt and nitrate mass loadings. "Volumetric component" was used in reference to the CVHM to differentiate the use of CVHM as compared to the use of WARMF output since there are no salt or nitrate masses associated with CVHM. Refer to the addendum to the Task 5 report for clarification of the mechanisms of the WARMF-CVHM linkage.
Task 5	19	12/19/12	Nigel Quinn	Final Report	p. 19-20 - Regarding first paragraph under Section 4.1 - Use mass and volumetric flux - easier to understand. Need to explain why this is being done and potential problems it creates.	The Task 8 report will include the flux terminology as appropriate.
Task 5	20	12/19/12	Nigel Quinn	Final Report	p. 29 - Regarding third full paragraph and subject of recharge and water quality - Typically the opposite on the west-side	See above comment (No. 12).
Task 5	21	12/19/12	Nigel Quinn	Final Report	p. 31 - Regarding statement: "It is not necessary for the recharge volumes to match exactly in WARMF and CVHM." - Why not?	See above comment (No. 10).
Task 5	22	12/19/12	Nigel Quinn	Final Report	p. 31 - Regarding bullets "Mass associated with...." - Mass of what?	As explained in the first sentence of this section, this section is about salt and nitrate masses. The Task 8 report will be more explicit as appropriate.

Task 5 Report

Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 5	23	12/19/12	Nigel Quinn	Final Report	p. 52 - Regarding statement: "The results will preliminarily assess the concept of assimilative capacity in a part of the aquifer system that provides actual or probable beneficial uses. The zone of influence of major sources and sinks will also be illustrated." - Explain. Not clear how you are defining assimilative capacity.	The intent of the inclusion of consideration of assimilative capacity is because of its use in the SWRCB recycled water policy, including the preparation of salt and nutrient management plans. While the recycled water policy refers to assimilative capacity, an explicit definition is not provided in that guidance document. For ICM purposes, assimilative capacity is defined as the amount of a constituent (contaminant load) that can be discharged to the aquifer system (especially that part of the aquifer system that provides actual or probable beneficial uses) without exceeding water quality standards and/or Basin Plan water quality objectives. Additionally, this term describes the difference between the water quality standards/objectives and average ambient shallow groundwater quality in the basin/subbasin/IAZ/MZ (where shallow does not necessarily mean the uppermost part of the saturated zone directly at the water table, rather "shallow" means the part of the aquifer system that provides actual or probable beneficial uses).
Task 5	24	12/31/12	Thomas Harter	Final Report	Figure 2 - The Modesto model is shown correctly, but the active cells in the model do not include any land areas west of the San Joaquin River. I suggest to show only the active area of the Modesto model. See Figures 12-15 in Phillips et al, USGS SIR 2007-5009.	Acknowledged.
Task 5	25	12/31/12	Thomas Harter	Final Report	p. 6, 3rd full paragraph, regarding statement "Each IAZ will have its own dataset for groundwater and surface water quality data" - Will data not be declustered? If not, why not? If yes, how? We used the USGS equal area approach for the SBX2 1 study area. See Boyle et al. (2012), Technical Report 4 of the SBX2 1 Study, Section 5.1.2 (page 100) and following for an example of how declustering can be done. The USGS GAMA program also has literature on this issue. Also see Belitz et al., Water Resources Research: Belitz, K., Jurgens, B., Landon, M.K., Fram, M.S., and Johnson, T. (2010) Estimation of aquifer scale proportion using equal area grids: Assessment of regional scale groundwater quality, Water Resour. Res., 46, W11550, doi:10.1029/2010WR009321.	Clustering will be accounted for by using kriging. This method places less weight on individual wells where clusters of wells exist, and more weight on individual wells when few are available. The USGS method is used for estimating proportions of an aquifer that contain concentrations of a constituent that are greater than a given threshold. The ICM Task 6 is somewhat different in that we are estimating the volume average concentration for each IAZ. The USGS methods do not provide the result required for the input to the mixing model.
Task 5	26	12/31/12	Thomas Harter	Final Report	p. 7, last paragraph before Section 2.2.1, regarding data bias/data gaps - How will it be overcome? Is this "as described below"?	For the purpose of establishing ambient groundwater quality, kriging methods will interpolate values in IAZs that contain little or no wells. This is done by using a sufficiently large search radius to capture wells in neighboring IAZs. For IAZs containing data, greater weight will be placed on the data which is near the point of interpolation, placing little or no weight on data captured far away by the kriging search domain. When data gaps exist in time, linear interpolation will be used to estimate values for unknown time periods.
Task 5	27	12/31/12	Thomas Harter	Final Report	p.8, regarding limitations on locating water supply wells in the CDPH database - Can you get a security clearance for doing the analysis with the actual locations. You would still only be reporting aggregated data, so this should be ok.	We have not attempted to pursue this, as the approximated locations are sufficient for the ICM. This could be considered for future phases where more detailed locations are necessary.
Task 5	28	12/31/12	Thomas Harter	Final Report	p. 9, Section 2.3.1, 2nd full paragraph from bottom of page - This entire paragraph is too vague for review. The information given here is insufficient to determine, whether or not the methods that will be applied in Task 6 are in fact appropriate.	This paragraph serves to outline the approach for determining ambient groundwater quality for the shallow (20-year travel distance) and deep vertical zones. Some uncertainty is associated with assigning particular wells to either the shallow or deep zone. The paragraph indicates that the actual method chosen for determining the ambient groundwater quality (for both shallow and deep) will be dictated by the nature of the available data. More details on the approach and methodology will be provided in the Task 8 report.

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 5	29	12/31/12	Thomas Harter	Final Report	<p>p. 9, Section 2.3.1, last full paragraph at bottom of page - Same comment as above. This is very non-specific and not sufficient for technical review to determine, whether in fact the declustering methods are appropriate.</p> <p>Words of caution: (1) Nitrate concentrations tend to be log-normally distributed. Means and standard deviations are best computed for log-transformed data. See Boyle et al. (2012), Section 5, http://groundwater.nitrates.ucdavis.edu/files/139106.pdf; (2) I am not convinced that the geostatistical mapping using kriging gains any advantage over the declustering method using equal areas. It should definitely not be done as the only method.</p>	<p>Log (base 10) transformed values are used when kriging. The final result for each IAZ is then back transformed to obtain the original unit of measurement.</p> <p>Additional methods for obtaining volume average concentrations can be explored in Task 7, or Phase 2, where greater resolution will be required, and compared with the results obtained using the kriging method.</p>
Task 5	30	12/31/12	Thomas Harter	Final Report	<p>p. 16, regarding term "worsening trends", item 1.b under Section 3.2 - How are trends determined? Trend analysis is not a trivial matter and subject to much current research. The report does not contain any description of trend analysis. Again, see Boyle et al. (2012) for an example.</p>	<p>Trends for the IAZs are determined using the results of the mixing model rather than a statistical analysis of the dataset. A statistical temporal trend analysis of the dataset is not within the scope of this project. This could be part of the scope for Phase 2 when more detailed analysis is explored.</p>
Task 5	31	12/31/12	Thomas Harter	Final Report	<p>p. 18-19, general comments regarding WARMF - I downloaded the technical reference for WARMF from the EPA website per instructions given in the text above. Some key questions about the consistency of WARMF with CVHM and with some fundamental processes related to nitrate and salt loading: (1) I did not find any explanation of crop-specific ET rates. It appears, based on Section 3-5 of that document, that all crops transpire the full potential ET. This would lead to much higher water demands than actual; (2) Has WARMF been reviewed for some basic consistency with the concepts in CVHM? From the later text, it appears that such comparisons will be made in Task 8? I anticipate potentially major discrepancies between WARMF and CVHM fluxes. Are you prepared to address those given the timeline? (3) What will happen if the fluxes in WARMF and CVHM are massively different? (4) Will individual flux components (water, salt, nitrate) be compared between CVHM and WARMF and tables shown? (5) How does WARMF deal with gypsum and other salts added through agronomic practices? (6) How does WARMF deal with precipitation and dissolution of gypsum in the soil, especially on the Westside?</p>	<p>1) ET in WARMF is calculated as a function of potential ET but is also a function of soil moisture. WARMF approaches ET and demand from the opposite direction of an agricultural model. Rather than calculate demand, it is an input via the amount of irrigation water applied. With more irrigation water comes more soil moisture and more simulated ET. 2) We will be comparing CVHM flows against WARMF flows, but mass fluxes cannot be compared because CVHM does not simulate water quality. 3) We will make a note of divergent flow scenarios and describe how it affects the Phase I analysis. 4) We can only compare flow since CVHM does not simulate water quality. 5) Gypsum application is included in WARMF's land application along with fertilizer use. 6) The San Joaquin River application of WARMF includes gypsum as one of the minerals whose dissolution is simulated. We do not believe mineral dissolution is an important source of salt in the near-surface zone simulated by WARMF because the flux of salts in the surface water is accounted for by known inputs, primarily irrigation.</p>
Task 5	32	12/31/12	Thomas Harter	Final Report	<p>Table 2, regarding time step size - Due to the explicitly coupling, I suggest that a sensitivity analysis be performed to determine, whether the time step size has an influence on the results. Shorter time-steps should give better results. At some point the solution converges (hopefully).</p>	<p>There are three main conflicting timesteps associated with the inflow and outflow components: 1) those associated with WARMF output (daily timesteps); 2) those associated with CVHM output (monthly timesteps); and 3) those associated with the measured water quality data (various timesteps but much coarser than monthly on the IAZ and Central Valley scale). Taking the goals of the ICM and the nature of the available data to perform the balance calculations, the smallest and most reasonable timestep to do the balance calculations is quarterly (3 months). This should be sufficient for the ICM, where shorter timesteps do not seem to be meaningful (more interpolations would have to be made to get down to month/week/day for both ambient quality data and CVHM flow data), while shorter time steps (aka monthly) could be considered for Task 7 and future phases as data are available.</p>
Task 5	33	12/31/12	Thomas Harter	Final Report	<p>Table 2 - Errors in column 1: (1) a losing stream is flux FROM the stream TO groundwater; and (2) a gaining stream is flux FROM groundwater TO the stream</p>	<p>Agreed and acknowledged.</p>
Task 5	34	12/31/12	Thomas Harter	Final Report	<p>Table 2, regarding groundwater pumpage - WARMF may have much higher pumping demand than CVHM, since CVHM has significant groundwater uptake directly into the plants, which - if I remember correctly - WARMF does not include. How do you address the fundamental difference in conceptualization of these fluxes between CVHM and WARMF?</p>	<p>Demand is not calculated by WARMF but rather is an input. Crop demand for each land use in WARMF is first satisfied with available surface water supplies and then the remainder of the demand is assumed to be satisfied with groundwater pumping.</p>

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 5	35	12/31/12	Thomas Harter	Final Report	<p>p. 29, Section "Lateral Flow To/From Surface Water (Stream Leakage)" - In WARMF, water from a subwatershed principally has four potential fates: ET, runoff, shallow lateral flow to streams, or groundwater recharge. CVHM does not have the shallow lateral flow - in CVHM that is part of groundwater flow.</p> <p>Let's look at a hypothetical salt problem: An IAZ has 100 tons of salt input to its land surface and 100 acre-feet of water input to the land surface. Let's say, WARMF computes the fluxes on the land surface and in the root zone and determines these fluxes:</p> <p>Precipitation and Irrigation: water - 100 acre-feet, salt - 100 tons ET: water - 50 acre-feet, salt - 0 tons Runoff: water - 10 acre-feet, salt - 0 tons (0 tons/acre-foot) Shallow leakage to surface water: 38 acre-feet, salt - 95 tons (2.5 tons/acre-foot) Recharge to gw: water - 2 acre-feet, salt 5 tons (2.5 tons/acre-foot)</p> <p>For the same IAZ, CVHM has the following water fluxes:</p> <p>Precip and Irrigation: 100 acre-feet ET: 30 acre-feet Runoff: 5 acre-feet Recharge: 65 acre-feet</p> <p>Question: What happens with the 95 tons of salt assigned to shallow leakage to surface water in WARMF when it gets transferred to CVHM?</p> <p>I am assuming that those 95 tons go to groundwater in CVHM, in addition to the 5 tons that WARMF has attributed to groundwater leaching (total: 100 tons). Then the concentration in recharge is 100 tons / 65 acre-feet = 1.4 tons/acre-foot, about half the concentration in WARMF. Is this correct?</p> <p>Also, streamflow would be affected much later and not as directly as in WARMF due to the mixing in the groundwater "box", which is the size of the entire IAZ. In this case, this means that the stream transport significantly less salt and more is allocated to groundwater over time than in WARMF. Is this an acceptable conceptual bias?</p>	<p>The Leakage To Stream accounting in the zonebudget output of CVHM is assumed to be the equivalent of the shallow lateral flow to streams simulated by WARMF. The net outflux from each IAZ as simulated by WARMF is maintained after the substitution of CVHM hydrology. The linked models will produce different proportions of mass fluxes to surface water and groundwater recharge if their simulated flows are different, but the lateral flow to surface water is maintained in the CVHM-WARMF linkage using the Leakage to Stream component of the CVHM zonebudget output.</p>
Task 5	36	12/31/12	Thomas Harter	Final Report	<p>p. 34, regarding Section, "Mass Associated with Groundwater Pumpage" - How is pumping partitioned between shallow (i.e., 20 year travel time) and deep aquifer?</p>	<p>Zonebudget output separates groundwater pumping (both municipal and agricultural) for the shallower layers in the IAZ and the deeper layers below it. This output allows for partitioning the groundwater pumpage associated with both vertical zones.</p>
Task 5	37	12/31/12	Thomas Harter	Final Report	<p>p. 34-35, regarding Section, "Apportioning Mechanism for Cross Check" - I am still not clear how WARMF root zone fluxes to surface water are apportioned in CVHM (see question above). Are they apportioned to CVHM recharge or to CVHM runoff?</p>	<p>In the CVHM-WARMF linkage, the Leakage to Stream term of the CVHM zonebudget is used to account for root zone fluxes to surface water.</p>
Task 5	38	12/31/12	Thomas Harter	Final Report	<p>p. 38, Section 4.2.1, 1st bullet - This may be a question to Randy: Does the zonebudget for CVHM give the fluxes between individual IAZ? Or only the total lateral inflow and the total lateral outflow to/from each IAZ? A student of ours ran into this issue earlier this year. She was able to get the total inflow and total outflow, e.g., to/from IAZ 14. But she was not able to find out how much was, e.g., from/to IAZ 13.</p>	<p>Zonebudget output does allow for the delineation of flow to and from particular IAZs, so this is not an issue.</p>
Task 5	39	12/31/12	Thomas Harter	Final Report	<p>p. 38, Section 4.2.1, last bullet - quarterly = 3 months? As I mentioned earlier, it may be worth to perform a sensitivity analysis with smaller and much smaller time-steps (month, week, or day) to confirm that the time-stepping is small enough to make results insensitive to the explicit coupling.</p>	<p>Yes, quarterly is 3 months. Please see response to earlier comment above (No. 32).</p>

Task 5 Report

Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 5	40	12/31/12	Thomas Harter	Final Report	p. 44, Section 4.3.2 - How was this parameterized in WARMF (Denitrification, mineral weathering/dissolution, precipitation)? And how were the results validated? Since WARMF was originally designed to be surface water centric, is the parameter choice/validation reasonable for groundwater recharge fluxes? How so?	The parameters within WARMF were calibrated so that simulated flow and water quality matched the measured flow and water quality in surface water. Calibrating to low flow and high flow conditions requires us to adjust parameters to approximate the concentrations in the lowest layer of our soil domain (which would be the source of groundwater recharge) and in the entire root zone / shallow groundwater profile.
Task 5	41	12/31/12	Thomas Harter	Final Report	p. 47, Section 5.2.1, 3rd full paragraph - The active model area does not extend west of the San Joaquin River. See Figures 12-15 in Philips et al., 2007. Make the correction in your Figure here.	Acknowledged.
Task 5	42	12/31/12	Thomas Harter	Final Report	p. 51, Section 5.3.1, regarding "WARMF Salt and Nitrate Applications in Prototype Areas" - Can you be specific about the spatial resolution at which salt and nitrate fluxes will be computed for this task?	The existing San Joaquin River WARMF application includes 83 catchments in the Merced/Stanslaus subarea. There is no existing WARMF application in the Kings River subarea.

Task 5 Report Addendum

Note that comments numbers 1 - 4 reflect a sequence of email exchanges; response is common to all.

Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 5 Report Addendum	1	2/18/13	Nigel Quinn	Supplemental to Task 5 Report (Project Committee Request)	I've gone through the latest draft and though it is somewhat improved - I still think it needs some cleaning up and rethinking to really capture the issues we are struggling with related to information exchange between the models. The flowchart is confusing - mainly because it doesn't "flow". It isn't clear the sequence of steps in performing the information exchange because there is no single point of entry to the flowchart.	Further discussion of the WARMF and CVHM linkage and clarification of that linkage occurred during the preparation of the Final Task 7/8 Report (June to September 2013). Section 5 of the Final Task 7/8 Report refines the description of and illustrates the WARMF/CVHM linkage. The Task 5 Addendum should remain in draft form and should be replaced by the Final task 7/8 Report (i.e., it is recommended that the Addendum not be attached to the Task 5 Report).
Task 5 Report Addendum	2	2/18/13	Richard Meyerhoff	Supplemental to Task 5 Report (Project Committee Request)	Per your note (Comment 1 above), my understanding is that the method is not in dispute, but rather how it is explained (i.e., as in the addendum) needs to be cleaned up (e.g., sequence of steps and the like). Given the project schedule and push to keep the ICM project moving forward, how about the following....we work alongside the LWA Team to get this cleaned up and more clear with the purpose of it being included in the Task 8 report as an attachment (in other words extend its use as a Task 5 addendum). Will that work?	
Task 5 Report Addendum	3	2/19/13	Nigel Quinn	Supplemental to Task 5 Report (Project Committee Request)	That's correct - although the team's inability to clearly describe the model linkage begs the question as to whether it is valid. I still think Thomas's numerical example approach is worth considering. However I understand the need to keep moving ahead and keeping on schedule.	
Task 5 Report Addendum	4	2/23/13	Thomas Harter	Supplemental to Task 5 Report (Project Committee Request)	I concur with Nigel. This is very critical and this will also be the piece that most folks will examine most closely. Thanks for keeping this important piece on the front burner.	

Task 7 & 8 Report (Project Report)

Note: Original Project Workplan had two separate deliverables for Tasks 7 and 8. During project execution it was agree to have these reports combined into a single project deliverable						
Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	1	7/29/13	Rob Busby (via Pam Buford)	Tasks 7 & 8 Draft Report	Two main comments: (1) technical aspect was fine, the second; (2) issue is clarity of the report for the intended user. The report should be written so that it gives an objective and honest discussion of the assumptions and limitations of the model (tool). This point should be focused on the "non-modeling" technical staff. Just as important to describe what it does NOT cover. May want to summarize the correct way to use it and also how it should not be used.	This comment is addressed via the edits that have been made throughout the report.
Task 7 & 8 Report	2	8/1/13	Jeanne Chilcott	Tasks 7 & 8 Draft Report	Please remember as you describe the archetypes and prototypes (the case studies) that they are all under the umbrella of CVSalts and results will be used to help inform the SNMP (these studies include the beneficial use evaluations AND the LSJR project). I tried to include some wording to reflect this nuance, but am not sure that I succeeded	The recommended text was accepted and additional changes made as necessary.
Task 7 & 8 Report	3	8/1/13	Jeanne Chilcott	Tasks 7 & 8 Draft Report	I noticed a comment that WARMF was peer reviewed in 2000 by UCSB. A reference to that may address some of the questions that I noted in the document. Primarily, there is a detailed discussion of how overlapping and/or questionable data was handled for ground water--but there is no corresponding discussion for the surface water contained in WARMF. Nor is there a discussion on how the simulations for data gaps is conducted. As the basis for the SNMP, this report will be peer reviewed and those will be key concerns. If a peer review for WARMF has already been completed, that information should be clearly noted in the document.	The Keller (2000) reference has been added to the end of the document.
Task 7 & 8 Report	4	8/1/13	Jeanne Chilcott	Tasks 7 & 8 Draft Report	I did not see much discussion on transport between zones. Is there a summary in the document that identifies whether such transport is significant between any of the IAZs?	Horizontal movement between IAZs does occur, however, it is a very small fraction of the total movement of water, salt, and nitrate. This is shown in Appendix D the Groundwater Results appendix. For each IAZ and each NUE Scenario, the total amount of TDS and N mass moving to adjacent IAZs is shown.
Task 7 & 8 Report	5	8/1/13	Jeanne Chilcott	Tasks 7 & 8 Draft Report	Table 2-1: it would help to know the total number of cells and or % of the total called out in each IAZ. Just listing the number of cells doesn't provide much perspective.	Text was added to the heading on the table that indicates the number of cells in each IAZ (since each cell is 1 square mile, the column heading "Area of IAZ (square miles)" also indicates the number of cell.
Task 7 & 8 Report	6	8/1/13	Jeanne Chilcott	Tasks 7 & 8 Draft Report	Starting with Table 4-5, most of the remaining Tables and many figures appear blurry and I cannot read the content (though I just may have a low resolution monitor).	Most of the tables and figures have been updated with the original native file to improve the clarity.

Task 7 & 8 Report (Project Report)

Note: Original Project Workplan had two separate deliverables for Tasks 7 and 8. During project execution it was agree to have these reports combined into a single project deliverable						
Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	7	8/1/13	Jeanne Chilcott	Tasks 7 & 8 Draft Report	<p>Tile Drains. I'm still not entirely clear how they were treated. Section 3 has a paragraph identifying that tile drains are unique, but it is not clear to me how they were treated within the data set. Were they only utilized to measure surface discharge? Were they used to identify shallow groundwater concentrations? Were they culled from the data set? There is a sentence later in the report mentioning tile lines in DWR's data set. It is not clear how much data was available or utilized. The use of the water quality information from the tile lines is extremely valuable to this effort since they truly represent the shallow groundwater quality. I'm concerned that they may be a missed piece of information when I look at the summary figures--especially the summary figure showing TDS hot spots. It is very difficult for me to comprehend how the westside of the LSJR does NOT show up as a hot spot. Portions do show up as high priority areas, but the data just seems too slim in the "hot spot" figure. Part of the issue may be with the limited data set; part may also be with merging all the data in areas that are distinctly separated by the Corcoran clay and where most of the available data came from deeper wells. I'm curious if the data set includes the DWR information depicted in the annual maps at the following website: http://water.ca.gov/drainage/sgwec/index.cfm</p>	<p>Tile drain water quality data was considered for use of shallow groundwater quality especially in the Delta area, but these data were ultimately used only for comparing other groundwater values in tile drain areas. For stream concentrations in areas without WARMF coverage, tile drains were not included as representative stream sites since the focus was for obtaining concentrations for CVHM represented streams.</p>
Task 7 & 8 Report	8	8/1/13	Jeanne Chilcott	Tasks 7 & 8 Draft Report	<p>Table 10-1 and associated text must be revised. As currently depicted and written, they do not represent the current CV-SALTS workplan for the three phases of the Conceptual Model</p>	<p>The following footnote was added: For the purposes of this Report, Phase III includes the following items from the CV-SALTS Workplan budget: Phase III (surveillance and implementation 13242, economic analysis, antidegradation analysis) and Documentation Basin Plan Amendment (CEQA equivalent SED and Basin Plan Staff Report, Final SNMP documentation and changes).</p>
Task 7 & 8 Report	9	8/1/13	Jeanne Chilcott	Tasks 7 & 8 Draft Report	<p>Section 1 - Word file provided with recommended track changes on selected pages in Section 1</p>	<p>The suggested changes were incorporated.</p>
Task 7 & 8 Report	10	8/1/13	Jeanne Chilcott	Tasks 7 & 8 Draft Report	<p>Section 2.1, ICM Horizontal Delineation Subsection: Wasn't there some particular reason's for the split rather than just a discussion? I thought it was because of anticipated CVHM updates that would recognize the distinct areas and also somehow account for the tile lines?</p>	<p>There was discussion of the utility of the split (for purposes of the IAZs) because of different hydrology and water quality in this CVHM Subregion. At the time of the decision to proceed with two IAZs, tile lines were not a factor in that decision.</p>
Task 7 & 8 Report	11	8/1/13	Jeanne Chilcott	Tasks 7 & 8 Draft Report	<p>Section 3.2, IAZs With WARMF Coverage Subsection: The previous section was very detailed in its description of potential duplicate data and data entry errors. Is there a reference methodology that documents how the same issues are dealt with in WARMF? Is there a reference document that identifies how the simulated results that fill data gaps are calculated? Both will be needed for peer review (unless already covered in a UCSB 2000 peer review?)</p>	<p>Text was added to the section 3.2 text to describe the data sources in the WARMF database and the process used to find transcription errors and errors in the original databases.</p>

Task 7 & 8 Report (Project Report)

Note: Original Project Workplan had two separate deliverables for Tasks 7 and 8. During project execution it was agree to have these reports combined into a single project deliverable						
Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	12	8/1/13	Jeanne Chilcott	Tasks 7 & 8 Draft Report	Section 4.2, Estimating Initial Shallow Groundwater Quality Subsection: I'm not understanding this last sentence and how taking an average over all years gives you an initial concentration. What am I missing?	Very limited amounts of shallow groundwater quality data were available around the initial time period of the model (1983) for all IAZs. Shallow groundwater is also highly variable (often spanning several orders of magnitude in the case of nitrate), and therefore averaging with these small sample sizes resulted in large variances. Initially, the starting mass was calculated using only groundwater quality data from around the 1983 starting period. This resulted in many of the estimated initial masses to be either very large, or very small, as the calculations were based only a handful of data. Including data from all time periods resulted in initial masses that better reflected the overall water quality for each IAZ, and provided an appropriate initial starting point for the mixing model.
Task 7 & 8 Report	13	8/1/13	Jeanne Chilcott	Tasks 7 & 8 Draft Report	Section 4.7, Data/Decision Matrix Sub-section: Tables 4-5 and 4-6 seem pretty critical and are VERY hard to read. I can't make out most components.	Noted and made higher resolution
Task 7 & 8 Report	14	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	General: There is no documentation (or no reference to documentation) of the detailed methodology used to group DWR landuse classes, to derive N application rates, to derive salt application rates, to derive N and salt uptake into crops, and what these numbers are for the landuse groups used. Without a clear description of how values were obtained and what values were obtained, this report is incomplete.	The work was done with 3 existing WARMF models. Although these models were described in general and their original documentation cited, detailed new documentation of them is out of scope. Nevertheless, some of this documentation has been copied into this report for the readers' convenience (see responses to later comments for specific items). The emphasis in the methods description was on the few aspects of the original WARMF model that were modified, including fertilization rates. This section has been checked and improved in response to this comment. Also, fertilization rates considered as part of the sensitivity analysis were described in that section. Further, original documentation and in-depth study of WARMF inputs, if of interest, might be considered for inclusion among Phase 2 activities.
Task 7 & 8 Report	15	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	General: The methodology of coupling WARMF with CVHM remains unclear as discussed in our committee meeting. A key piece that was not clear to me until our discussion is that the "system" for which the mass balance is computed is actually the entire soil thickness across the catchment PLUS the stream bodies within the catchment. Overland runoff and lateral outflow is effectively to the surface water outlet of the catchment.	Addressed in updated Section 5 text.
Task 7 & 8 Report	16	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	General: Consider removing the density maps in the "hot spot" analysis. A density analysis is highly biased by the data availability. In areas with few data, we cannot "see" hotspots because we don't have data. Here, for practically all rural areas, the hot spot analysis is entirely biased by the dairy dataset, the only dataset that expands into rural areas and includes large amounts of shallower domestic wells. Outside of regions with dairies, there are no such datasets and we cannot "see" hotspots. I am attaching a paper (provided to LWA Team) that will be published this month that shows, for example, that the citrus belt's impact in Tulare County on nitrate is significantly stronger than the dairy's impact. Yet your hotspot map does not show the citrus belt due to the relative lack of data.	Although the density analysis is biased by the spatial extend of the data, and possibly also by the inclusion of dairy data which may over represent water quality in rural environments, it is felt that the maps still provide a useful visualization of water quality trends at a large scale. It also provides a visualization of where data is lacking. The density analysis was not used in the prioritization/ranking of IAZs. Text in report has been modified to identify the limitations of this analysis.

Task 7 & 8 Report (Project Report)

Note: Original Project Workplan had two separate deliverables for Tasks 7 and 8. During project execution it was agree to have these reports combined into a single project deliverable						
Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	17	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 2.1, Methodology for IAZ Depth (Vertical) Delineation Subsection, 1st para: Water at the water table cannot move upward except through capillary forces and plant uptake or evaporation	Removed the text "downward or upward" to clarify this.
Task 7 & 8 Report	18	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 2.1, Methodology for IAZ Depth (Vertical) Delineation Subsection, 2nd para: Are you saying that there is no vertical movement in layers 2,3 and so on? See comment to the next figure (Figure 2-1)	No, that is not what this is saying - CVHM layer thicknesses are not set in stone for each IAZ, and they do vary on a cell-by-cell basis. However, the majority of the calculated 20-year travel distances over the entire CV are between 10 and 150 feet.
Task 7 & 8 Report	19	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Figure 2-1: This map suggests that large parts of the TLB and the margins of most of the CV do NOT have a 20 year travel zone. Reading up to this point, it is not clear to me, what happens if the first one or two or three layers are inactive. Asked another way around: why are you omitting the travel distance depth, when Layer 1 is inactive? If you want to show where Layer 1 (or 2, or 3) is inactive, make a separate map.	This figure was updated to reflect the actual 20-year travel distance, regardless of the uppermost active layer.
Task 7 & 8 Report	20	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 2.1, Methodology for IAZ Depth (Vertical) Delineation Subsection, following Figure 2-1 in the very last sub-bullet that states: "If the difference between the saturated thickness and the 20-year travel zone divided by the thickness of the next deep layer is greater than 50%, then that next deep layer is included": Write out as formula. I don't understand. Are you saying that the entire layer is included, IF the 20 year travel depth encompasses more than half of the deepest layer in the 20 year zone?	Yes, that is what this says. More text to illuminate this is added.
Task 7 & 8 Report	21	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 2.1, Methodology for IAZ Depth (Vertical) Delineation Subsection, in the first paragraph of the last part, "Summary of IAZ Area and Depth Information": In regards to footnote 17, I have a CRITICAL CONCEPTUAL question that may have major impact on the interpretation of the results: BUT IS THE UPWARD MOVEMENT INTO THE UPPERMOST LAYER BECAUSE OF PUMPING IN THAT UPPERMOST LAYER OR BECAUSE OF MOMVENT INTO THE UNSATURATED ZONE FROM THE UPPERMOST LAYER? THIS IS CONCEPTUALLY AN IMPORTANT DIFFERENCE!!!! IN THE FIRST CASE, NITRATE FROM THE ROOT ZONE STILL MIXES WITH WATER THAT GETS INTO THE TOP LAYER FROM BELOW AND DISCHARGES TO A WELL (BENEFICIAL USE). IN THE SECOND CASE, NO NITRATE/SALT REACHES GROUNDWATER. (CAPs in the original comment)	The negative vertical travel distance indicates that groundwater is being utilized by the FARM package – so the water level is high enough that it is in the root zone and the FARM package is allowed to use it for ET. For the ICM mixing model, when cells in an IAZ had a negative travel distance the cell in the uppermost active layer is used for the balance calculations. The negative travel distance shows up in the mixing model calculations in the form of negative recharge. This is how the FARM package deals with groundwater contributions to the farm demands. We did not assign any mass associated with this movement of water.
Task 7 & 8 Report	22	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 2.1, Methodology for IAZ Depth (Vertical) Delineation Subsection, in the first paragraph of the last part, "Summary of IAZ Area and Depth Information": In the same context (per previous comment), discuss what it means for the later salt/nitrate impact computation, when a cell has a negative travel distance value. Or at least refer to the section of the report that discusses that consequences of that.	
Task 7 & 8 Report	23	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Figure 2-3: It is unclear how, for example, IAZ 4, which has an average negative travel distance depth, ends up with most cells having a travel distance depth from the ground surface of 25-100 feet. In IAZ4, I imagine that the water table is close the land surface. Please explain.	The table and figure have been updated, making this observation not entirely accurate. IAZ 4 has a range of 20-year calculated travel distances from -22 to 145 with an average of 2ft over its 560 model cells.
Task 7 & 8 Report	24	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Figure 2-4: Please explain here that, where layer 6 is the deepest layer, there is no Corcoran Clay.	Addressed in text.

Task 7 & 8 Report (Project Report)

Note: Original Project Workplan had two separate deliverables for Tasks 7 and 8. During project execution it was agree to have these reports combined into a single project deliverable						
Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	25	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 3.3, Land Cover Classes in the WARMF Models Subsection, 2nd para: Regarding "to delineate dairy sites and their corresponding land application areas", Either refer to the report that describes the details of this processing work or describe it in a section here	The delineation of dairy sites and corresponding land application areas was performed for the CV-SALTS Pilot Implementation Study. A reference to that project's report was added.
Task 7 & 8 Report	26	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 3.3, Land Cover Classes in the WARMF Models Subsection, 3rd para: Regarding "30 classes", Provide table listing the classes, preferably with a key that links it to corresponding DWR landuse codes	This table has been added. General response to this series of comments: A detailed description of many of these methodological points was provided as part of the methodological documentation required as part of previous reports. It was thus omitted from the original draft. Many of these tables and figures, along with some explanation, will now be copied into an appendix to this document, and referenced. Direct incorporation of this methodological detail into this report would likely make it less readable to most, but for readers requiring such detail, it will now be readily available in the appendix.
Task 7 & 8 Report	27	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 3.3, Land Cover Classes in the WARMF Models Subsection, 3rd para: Regarding "and urban areas with similar intensity of landscaping are also in a single class", In the table suggested in the previous comment, please also add information that provides the basic rationale for combining classes (e.g., "these crops predominantly flood irrigated with surface water, low fertilizer requirements")	See previous comment, and comment 14. Language on the general rationale was provided in the draft section 3.3, as follows: "Classes were originally selected to reflect the breadth of activities and environments in each area, and therefore differ slightly among the Sacramento Valley, San Joaquin River, and Tule River models. However, in all cases, the classes collect areas with like conditions from the standpoint of salt and nitrate loading. For example, agricultural crops that are irrigated and fertilized in similar ways are contained in one class, and urban areas with similar intensity of landscaping are also in a single class."
Task 7 & 8 Report	28	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 3.3, Land Application Mass Loadings in WARMF Model Subsection, 2nd para: Regarding "and were determined as part of WARMF model development as part of previous projects", Please provide detailed references that make it easy to look up the methodology employed. Ideally, insert a table here that has the key numbers, e.g., fertilizer application, crop uptake, salt application.	Salt and fertilizer rate tables have been added. WARMF model documentation is referenced.
Task 7 & 8 Report	29	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 3.3, Land Application Mass Loadings in WARMF Model Subsection: Regarding this introductory text: "Both of these points are described in greater detail later in this report " - Which Section? Provide Reference	Reference has been added.
Task 7 & 8 Report	30	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 3.3, Land Application Mass Loadings in WARMF Model Subsection, Solid Salt Part: Regarding text, "Inputs from previous models were retained" References (ideally with weblink). If the references are unpublished reports, the LWA must make them available publically on a permanent website, e.g., through CV-SALTS. These are important pieces of this ICM model documentation.	See response 28, Unpublished reports have been provided to CV-SALTS.
Task 7 & 8 Report	31	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 3.3, Land Application Mass Loadings in WARMF Model Subsection, Solid Salt Part: Regarding text, "...and thus such data were unavailable at the time of this analysis", add: "The data used, represent the currently best available estimate of actual fertilizer and crop uptake data."	Added.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	32	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 3.3, Land Application Mass Loadings in WARMF Model Subsection, Nitrogen from Fertilizer Part, 1st para: Regarding text, "These were compared with crop classes and rates employed in WARMF models, and used to replace existing N input parameters (which had been less extensively researched and documented) where classes aligned well", Table needed for detailed documentation of values used	Tables provided in appendix.
Task 7 & 8 Report	33	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 3.3, Land Application Mass Loadings in WARMF Model Subsection, Nitrogen from Fertilizer Part, 2nd para: Regarding text, "Based on the notions that a) fertilization is generally adjusted in proportion to anticipated crop yield, and that b) uptake is proportional to yield levels, crop fertilization and uptake rates were adjusted to match production data in each of 5 zones", If I remember correctly, the details of the statistical analysis were either presented at one of our meetings or in an earlier document. If the latter, please insert reference to that. If the former, please add a section that explains this in more detail and with the appropriate data support	Tables and figures added.
Task 7 & 8 Report	34	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Footnote to Table 3-3:and how much nitrogen and salt comes with the flow? Please include in the table. Identify how much goes to direct percolation, to land application, to biosolids, and to surface water	Mean discharge load of total nitrogen and total dissolved solids was added to the table.
Task 7 & 8 Report	35	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 3.3, Land Application Mass Loadings in WARMF Model Subsection, Irrigation Water Part, last para: Regarding text, "USGS well data are used to estimate the quality of groundwater used for irrigation", Needs more detailed methodology. Described later?	The methodology was described in more detail: each catchment's groundwater quality for irrigation was the average of well concentrations from within the catchment.
Task 7 & 8 Report	36	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 3.3, Point Sources Subsection, 1st para: Regarding text, "There are many additional permitted dischargers for which there are no data", Section 3.3 is technically unacceptable. There is no description at all here of the salt inputs. How much salt is input on a dairy? At a WWTP site? At a food processor site? Biosolids application? Lawn? Where is waste applied (direct percolation/land application/surface water discharge/biosolids?) There is an entire report missing here. This section is one of the most critical pieces of the ICM (the source determination). Without detailed description (or references to publically available documentation that can be reviewed), the ICM is technically unacceptable. As a reviewer, I am not in a position to endorse this part of the ICM. I mentioned this briefly and incompletely at the conference call (July 18, 2013).	Average nitrogen and TDS loads were added to Tables 3-3 and 3-4 listing point sources with data in the WARMF model. References to reports of the WARMF model applications were added in the section on land application. Surface water dischargers are listed in Table 3-4.
Task 7 & 8 Report	37	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Footnote to Table 3-4: Include salt and total nitrogen discharged from each facility and information on where it goes: direct percolation, land application, biosolids application, surface water discharge.	Average nitrogen and TDS loads were added to the table for each discharger. Since this table is specifically surface water dischargers, the various modes of land application do not apply.
Task 7 & 8 Report	38	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 4.2, Declustering the Data Using the CVHM Grid Subsection, 2nd para: Regarding text, "Therefore, grid cells containing well data were assigned annual concentration values, and statistics were then performed on the annual grid cell values, rather than the wells", How did you assign the value? Median? Average? We find that it is best to use the median due to the skewed distribution of nitrate.	Yes, the next paragraph mentions that median values were selected. First the median value for each well was determined, then the median of the well medians was determined. This was done on an annual basis.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	39	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Figure 4-3, Nice!	Yes, the transformation worked very nicely!
Task 7 & 8 Report	40	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 4.2, Estimating Initial Shallow Groundwater Quality Subsection: Regarding text, "The initial concentration for shallow groundwater was estimated by taking the average of the shallow annual CVHM grid cell median concentrations for each IAZ over all time periods", Initial = which year? 1983? Why not all data UP to that year? If the ICM model needs a starting value, to then add the last 20 years of inputs to get an ending value, there is an inherent logical error, if your "initial value" is the average of the same 20 year period measured in the field. If you already used all the data as "initial value", how would you calibrate your model output?	The shallow groundwater volume used in the ICM mixing model was established based on the estimated 20-year vertical travel distance that solute masses would travel in shallow groundwater. Therefore, theoretically the final mass calculated from the mixing model should be a reflection of only the recent masses introduced to the system in the past 20 years. When calculations of the initial mass of the shallow groundwater system were based only on a data from around the 1983 (and even including the sparse data from earlier time periods), the number of tests was very limited and resulted in very large or very small masses, which did not accurately reflect groundwater quality for most of the IAZs. Including all data provided a much more realistic starting point for the model. The model was not calibrated, however several loading scenarios were developed and compared to ambient data
Task 7 & 8 Report	41	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 4.3, Introductory Subsection, 2nd para: Regarding text, "Using cell-by-cell stream flow volumes obtained from CVHM, a flow-weighted average concentration representing the overall ambient surface water quality was calculated over the entire IAZ," Ok.	comments provided are fine
Task 7 & 8 Report	42	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 4.4, Areas with Pre-existing WARMF Runs Subsection: Note editorial comments provided as track changes.	The editorial comments provided are fine.
Task 7 & 8 Report	43	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Figure 4-8: What is missing here is a concept that shows where overland flow and lateral flow go: into the stream that leaves the catchment. Each catchment is, by definition, associated with one stream outlet out of the catchment (at its lowest point).	The editorial comments above are immediately before Figure 4-8 and clarify that these flows exiting the catchment horizontally go to the stream associated with the catchment.
Task 7 & 8 Report	44	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 4.4, Areas with Pre-existing WARMF Runs Subsection, Re-weighting of Outputs Part: Regarding text, "In this way, WARMF output from a reference WARMF area was employed to generate load estimates for each area lacking WARMF model coverage", Provide formulas used for the re-weighting (mathematical equations), especially showing how the dairy loading was taken into account.	An appendix with the algebra has been added.
Task 7 & 8 Report	45	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 4.4, Areas with Pre-existing WARMF Runs Subsection, Quantification of Permitted (POTW) Land Application Part: Regarding text, "Estimated loads were scaled over the data period based on published demographic (population growth) rates for the municipalities associated with the POTWs", It would be helpful to outline the exact methodology using equations. Technically, it cannot be evaluated without those details. Or refer to existing public documentation.	The tabular data and assumptions have been added in appendix.
Task 7 & 8 Report	46	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 4.5, 1st para: Regarding text, "the elevation of the bottom of the lower-most CVHM layer included in the 20-year travel zone", You may want to include a reference to the previous section where that depth is computed.	Text was added to reflect this reference.
Task 7 & 8 Report	47	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 4.6, Introductory paragraph: Regarding "movement" in the 1st sentence: Groundwater movement. I assume not surface water?	No, actually refers to both groundwater and surface water movement, as the surface water movement was used for the surface water mixing model.

Task 7 & 8 Report (Project Report)

Note: Original Project Workplan had two separate deliverables for Tasks 7 and 8. During project execution it was agree to have these reports combined into a single project deliverable						
Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	48	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 4.6, Zonebudget Input Files Subsection, 1st para: "Using the depths from the calculations described in Section 3", Where in Section 3? I do not see depths reported in Section 3. Do you mean Section 2?	Yes – it should be Section 2 - text updated to reflect change.
Task 7 & 8 Report	49	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 5, Introductory text, 3rd para.: Note editorial comment provided as a track change	Noted.
Task 7 & 8 Report	50	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Figure 5-1: This figure is missing an important conceptual element: the catchment and, importantly, the catchment surface (inflow and) outflow points, which are important part of the WARMF catchment mass balance.	Text added and additional figure added.
Task 7 & 8 Report	51	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Figure 5-1: Why do you assume that recharge goes straight to the river? I don't understand the rationale. In CVHM, the connection between recharge location and stream location may route water and chemicals through many cells subject to mixing, dispersion, and perhaps reactions.	Recharge does not go to the river in WARMF, only surface runoff and lateral flow.
Task 7 & 8 Report	52	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 5.3, Theory Subsection, 1st para: Regarding "system" in the last sentence": But exactly what is the "system"? It appears to me that the system is the COMBINED soil box AND the streams within each catchment. The mass inputs (water and solutes) are: (a) Stream inflows into the catchment streams; (b) Rainfall/atmospheric deposition; (c) Irrigation/fertilization/salt applications. The mass outputs (water and solutes) are: (a) Recharge to groundwater; (b) Lateral outflow to the stream that leaves the catchment; (c) Runoff to the stream that leaves the catchment; (d) Stream losses to the groundwater; (e) The portion of the stream inflow into catchment streams that is not lost to diversions or direct loss to groundwater. Only then I can understand this equation. And it does not seem complete. Please clarify.	Text added and additional figure added.
Task 7 & 8 Report	53	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 5.3, Theory Subsection, 1st equation following 1st para: What is the reference volume for this mass balance? IAZ total? Aquifer? Soil? Land-atmosphere?	Addressed in updated Section 5 text.
Task 7 & 8 Report	54	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Figure 5-4: IAZ average concentrations: weighted averages according to fluxes? Or according to catchment size?	This figure was ultimately removed and the text was updated to describe the processes.
Task 7 & 8 Report	55	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Figure 5-4: Regarding text "Note to reviewer: the figure above will be modified", Thank you!	Ok.
Task 7 & 8 Report	56	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 5.3, Theory Subsection, 2nd para following Figure 5-4: Regarding text, "Mass fluxes for non-WARMF areas were scaled to CVHM flows, with some modification to account for the more dilute nature of surface runoff ", The modifications are those described next? Or is that something different? If the latter, please specify/describe. Start new paragraph after this section.	Addressed in updated Section 5 text.
Task 7 & 8 Report	57	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 5.3, Theory Subsection: Regarding "Scenario 1": My comments on these scenarios were discussed at the committee call (July 18). I will review this part again once it is rewritten.	Ok.
Task 7 & 8 Report	58	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 5.3, Theory Subsection, Paragraph following "WARMF - Gaining Stream Conditions" under "Scenario 1": Note editorial comment provided as a track change	Ok.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	59	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 5.3, Theory Subsection, Paragraph following "WARMF - Gaining Stream Conditions" under "Scenario 1", last sentence: What about the lateral flux?	The figure depicts lateral flux being delivered to the stream.
Task 7 & 8 Report	60	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 5.3, Theory Subsection, Paragraph following "WARMF - Gaining Stream Conditions" under "Scenario 4", last sentence: And leave the IAZ as stream flow?	If that is its ultimate destination to leave the IAZ through surface water flow, then yes.
Task 7 & 8 Report	61	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 7.5, Ambient Concentrations Subsection: Regarding text, "First, all CVHM grid cells that contained well data were selected", I assume this is just wells with depth information that are known to be in the shallow (20 yr travel time) zone? Please clarify in the text.	For this analysis, all well data were used.
Task 7 & 8 Report	62	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Figure 7-15: I suspect that these density maps are strongly biased due to the inclusion of the dairy well datasets. There is no similar data density in the southwestern TLB and in the Sac Valley. While these density maps are very cool looking maps, they contain a serious spatial bias: hot spots have a much higher likelihood to develop, where you have a lot of cells with ANY data. In areas with few data, even if there was a hot spot, you would not see it. It can be argued that the density of CVHM cells with ANY measurement represents the distribution of groundwater use. However, this is not the case. The dairy dataset is the only dataset here that spans into predominantly non-urban, rural areas. Where you don't have dairies reporting, you don't have data. But we know, for example that eastern Tulare County has just as many or more domestic wells than the western part, where all the dairies are. And nitrate contamination there is even worse (Lockhart et al., Jo Contam Hydrolo., 2013). I therefore suggest not to include these density maps.	See response to similar comment #16. Text in report has been updated to reflect
Task 7 & 8 Report	63	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 7.5, Simulated Concentrations, Identifying Priority Basins and Hot Spots Subsection: Regarding text, "Section 4 provides a detailed explanation of how multiple nitrate and TDS loading scenarios were generated", I don't remember reading about this?	That's because it doesn't show up until Section 8... Text has been modified. Section 8.2 "sensitivity analysis" describes how these were developed
Task 7 & 8 Report	64	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 7.5, Simulated Concentrations, Identifying Priority Basins and Hot Spots Subsection: Regarding text, "The simulation results 1983 to 2003) are compared to the Shallow ambient data (blue squares), the linear regression (green line) with confidence intervals (dashed red lines) of the estimated Deep ambient quality for 1980-2012, and the median Shallow concentration (green circle) with the 25 th and 75 th percentiles (red dashes) of Shallow ambient data from 2003-2012": (a) If you describe colors and symbols here, do so also for the "results"; (b) Sentence doesn't make any sense?	This section has been rewritten in order to make the description of the symbols more clear.
Task 7 & 8 Report	65	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Figure 7-17: I could neither understand what is shown nor can I read the graphs (resolution).	Figures updated to 11 x17 and resolution improved
Task 7 & 8 Report	66	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 7.5, Identifying Priority Basins Subsection, 3rd bullet under "For nitrate the following four criteria were used": Estimation = simulation, at least that could be the interpretation. You may want to choose a more succinct description of "aggregated measured data" and "simulated data". Also, make that distinction consistently throughout the report text/figures/tables. Also, any time any concentration is measured, identify "total", "shallow", or "deep", otherwise the reader always is second-guessing	Good suggestion. Thank you.

Task 7 & 8 Report (Project Report)

Note: Original Project Workplan had two separate deliverables for Tasks 7 and 8. During project execution it was agree to have these reports combined into a single project deliverable						
Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	67	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 7.5, Identifying Priority Basins Subsection, 4th bullet under "For nitrate the following four criteria were used": Regarding text, "3 simulations", hat do you mean by 3 simulations? What constitutes a simulation? Why couldn't you repeat the second criterion, at the CVHM grid cell level, for the simulated data?	Simulations refer to the different scenarios used in the mixing model. Mass loadings were provided only at the aggregated IAZ scale. Refinement is not possible with the data used for the ICM mixing model analysis. Task 7 presents a cell by cell analysis for the two prototype areas.
Task 7 & 8 Report	68	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Figure 7-18: Nice table, especially with the bar graphs included in the first four columns	Thanks!
Task 7 & 8 Report	69	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 7.6, Introductory Text, 1st sentence: See comment above. "Estimated" is an ambivalent term and may refer to your statistical estimates derived from measured data or to simulation results. Use more succinct terms through the report.	Good suggestion. Thank you.
Task 7 & 8 Report	70	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 7.6, Refined Assimilative Capacity for Prototype Areas Subsection: Regarding Kriging interpolation: Why did you not also use the simulated results to define assimilative capacity at the CVHM grid cell? Then you wouldn't have to interpolate. I would add that map. Also for comparison to measured data (at the CVHM grid cell resolution). Do for both detailed study areas.	That map does not exist. The results from the Kings analysis suggests that the scale of 20 years is not enough time to see any drastic changes in groundwater quality, and therefore assimilative capacity. The simulated groundwater concentrations are based on the movement of particles with measured or interpolated salt/nitrate concentrations, so we are presenting the measured/interpolated concentrations used for determining the AC.
Task 7 & 8 Report	71	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Section 7.6, Kings Model Area (4th figure, figures not labeled) (also last figure before Section 7.7): Those are very few data points to make such sweeping interpolations. I strongly suggest not to show interpolated results in ANY of these maps. Instead show SIMULATED results at the CVHM grid cell resolution.	Simulated results at a cell by cell scale are provided only for the two prototype areas. The purpose of the kriging examples are to demonstrate that the IAZ scale determination of assimilative capacity is insufficient for developing a final SNMP that would be sufficient at the local scale (discharge permits etc.). We thought that this would best be accomplished by showing that while an entire IAZ may have no assimilative capacity when viewed as a whole, that locally there may be areas with better water quality. The converse it also true in that IAZs with seemingly plenty of assimilative capacity may have local areas that are affected and further inputs to the system should be limited.
Task 7 & 8 Report	72	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Figure 9-8: See earlier comment on the bias of density maps.	Text has been updated to recognize the biases in this analysis
Task 7 & 8 Report	73	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Figure 9-24: kg in 20 years per cell? Kg/ha per 20 years? Kg/ha/year?	Kg/square mile/quarter. Figure caption is updated to reflect accurate units.
Task 7 & 8 Report	74	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Figure 9-25: See comment on previous figure	Kg/square mile/quarter. Figure caption is updated to reflect accurate units.
Task 7 & 8 Report	75	8/1/13	Thomas Harter	Tasks 7 & 8 Draft Report	Figure 9-26: Given the low density of well data, and the high variability of nitrate, I don't think that kriging is the appropriate interpolation tool – or that, in fact, any interpolation is appropriate. We simply do not know! This would show, if you had showed the confidence limits on the kriged values. This comment applies equally to all maps shown in this chapter. The maps should only contain measured data, but no interpolation.	See response to similar comment #71

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	76	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	The IAZs are referenced throughout the document. It is difficult to identify where each individual IAZ is from a geographical sense without seeing some cities, rivers and major highways, etc. located. It is suggested a larger map of the IAZs be added which provides this information.	Good suggestion.
Task 7 & 8 Report	77	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	In the Executive Summary, page iv, under Data Summary and Data Gaps there is a brief discussion that groundwater quality data were collected for the whole Central Valley Region. Footnote 8 mentions EC data was converted to TDS using the ratio TDS/EC = 0.64. This ratio has been used for many years as a broad brush average. Our work in Tulare Lake and on the West Side of the SJ Valley indicates this ratio can vary from approximately 0.55 to 0.85. If you are only measuring EC and then estimating TDS then this can add a significant uncertainty on the estimated TDS values. A comment clarifying this should be added. Page 4-65 does provide some additional comments regarding this ratio for the State Water Project supplies at the Harvey Banks pumping Plant.	The TDS/EC conversion variability was noted whenever EC was used in place of TDS. EC was only used if TDS data was unavailable and not using EC would cause a significant data gap. If site specific data was available, such as at Harvey Banks pumping plant, then that was used. Otherwise, all we had to work with was the average, literature accepted value.
Task 7 & 8 Report	78	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	Page x of the Executive Summary provides a brief description of the Prototype Areas selected to further refine the analyses. Under the section Ambient Groundwater Quality Was Established, one comment states "In the Kings Subbasin, ambient groundwater quality was established for model layers 1-2, 3, and 6-10 based on well types and, when available, well depths (layers 4-5 were placeholders for the Corcoran Clay)". I am still concerned about how accurate the model will be when the Corcoran Clay is present. The vast majority of the Kings Subbasin is outside of the limits of the Corcoran Clay. So there really is no ability to field check the model results with actual groundwater quality analyses both above and below the Corcoran Clay. How would this model work in the Central part of the Tulare Lake Bed and south into Kern County and in the Central and West side of the San Joaquin Valley where the Corcoran Clay is present?	Well completion information (well depth and screen depths) would be more critical to this analysis where determining quality above and below the Corcoran Clay is necessary. This type of detail on well construction is not publicly available and takes quite an effort to incorporate when acquired.
Task 7 & 8 Report	79	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	Page xi of the Executive Summary describes the Prototype Areas Simulation Results and the Preliminary Assimilative Capacities developed based on the Ambient Shallow Groundwater Quality. The uncertainty of the Simulation Results are described in the following sentences: "The simulated N03-N concentrations were low compared to the measured N03-N concentrations in the USGS observation wells. The simulated TDS concentrations compared better to the measured TDS concentrations in the USGS observation wells." The uncertainty of the Assimilative Capacities analyses is summarized in the following sentences: "The results for the assimilative capacities at the finer resolution were found to be quite different than those estimated for an entire IAZ. ... The results showed that there can be areas that have no assimilative capacity, while there may also be areas that have greater assimilative capacity compared to the IAZ as a whole." This summary of the results does not confirm the accuracy of the 30,000 foot IAZ analyses or provide a strong statement that the prototype area model studies can really help refine those analyses in the future without a significant amount of additional work.	The comparison of results at the 30,000 foot level of analysis with the prototype area analyses are intended to be informative with respect to what should not be expected at the 30,000 foot level of analysis. The much greater spatial resolution offered with the approach used for the prototype analyses will be much more useful to the implementation of future regional and local SNMPs. Whether a detailed prototype-analysis is warranted for the local SNMP scale can be evaluated based on other actual observations such as existing groundwater quality data that are sufficiently spatially distributed relative to hydrogeologic conditions, land use and population; the intensity of existing and/or projected land use; the density and distribution of population; the current and projected future reliance on groundwater; the potential for dependence of groundwater availability on water year types that provide for groundwater replenishment on a year-to-year basis; and the availability of other sources of supply to be conjunctively used with groundwater.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	80	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	Also on Page xi of the Executive Summary under Summary of Phase 1 Foundational Work and Recommendations for Phase II the following comments are made: "It is also important to recognize the benefits and limitations of simulations made at this aggregated or coarser IAZ scale. For example, any apparent trends indicated at the IAZ scale are subject to change based on the limited data that are available. In most IAZs, the addition of a few dozen well tests from new wells has the possibility to change an analysis significantly." If the addition of a few dozen well tests could change the IAZ analyses significantly then it seems something is wrong in the assumptions and procedures being utilized. And yet, on page xii there is a comment that "The available groundwater quality data were generally adequate for purposes of the ICM."	The limitations of the aggregated IAZ analyses are acknowledged and illustrated in the Report. The limitations of the IAZ-scale of analysis were a key factor in scoping the "proof of concept" prototype analyses.
Task 7 & 8 Report	81	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	Many uncertainties related to water quality data are mentioned. On page 4-41, under QA/QC there is a comment there is uncertainty on the exact well location for wells in CDPH datasets. It mentions that if the well could not be accurately located "the center of the county the water was associated with" was used. This could really skew the data for an IAZ if a lot of well data are located at the center of a given county.	Fortunately this dilemma was only encountered for 9 water systems across the entire Central Valley, and so did not add much uncertainty to the entire analysis.
Task 7 & 8 Report	82	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	On page 4-61 under Estimating Initial Shallow Groundwater Quality a comment is made that shallow groundwater quality data is sparse and thus within an IAZ all shallow groundwater quality data were included in estimating the mixing model. What inaccuracies does this bring into the analyses? A definition on what is meant by shallow and deep groundwater quality is provided later in the report, but this needs to be clearly defined, particularly in agricultural areas where the Corcoran Clay exists. The Corcoran Clay provides a barrier to the normal vertical flow of groundwater.	Yes, the Corcoran Clay is a steadfast rule in this analysis that separates "shallow" groundwater from deeper groundwater. The term "shallow" in the IAZ analysis refers to the reconciliation of the calculated 20-year travel distance (the distance water will travel from the water table in 20 years) and the CVHM model layering.
Task 7 & 8 Report	83	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	Table 4-5 on page 4-79 states this table is a Matrix to Summarize Availability of Ambient Groundwater and Surface Water Data. Why is no surface water quality data listed? A legend for the coloring is needed.	Surface water data added
Task 7 & 8 Report	84	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	Apportioning Mechanism, page 7-82, describes the CVHM and WARMF Models and why they are used. The statement is made that "The assumptions and hydrologic calibration of the models differ, however, so care must be taken when linking the water quality of WARMF with the hydrology of CVHM." This is a critical concern regarding the model. Has enough cross checking of model results with actual water quality in the field been made to confirm the models are providing reasonably accurate estimates? With all the cautions provided this is a concern.	There is no water quality associated with the USGS CVHM integrated hydrologic model. WARMF is calibrated to surface water quality. Calibration was not possible for non-WARMF area mass loading estimates. The scenarios developed for the salt and nitrate mass loadings cover the potential possibilities.
Task 7 & 8 Report	85	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	At the bottom of page 7-82 there is a summary of the data needed to calibrate the CVHM. How did you get groundwater pumpage quantities for each IAZ? Was this an estimated average over several years, a reasonable guess, or how much work really went into determining the quantity of groundwater pumped for each IAZ? Depending on the water year the quantity of groundwater pumped can change significantly from year to year. Wouldn't this affect the overall concentration of the mass fluxes calculated in the models.	CVHM used reported groundwater pumping rates from DWR for municipal wells. The agricultural pumping was estimated using the FARM Process, which considers variables including crop demand and surface water deliveries to determine the remaining demand being provided by groundwater pumping. Groundwater pumping in CVHM is variable year to year, and so is the mass loadings from WARMF.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	86	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	The calculations on Mass Fluxes and the different calculations for the Gaining and Losing Stream conditions are difficult to follow in Section 5. To confirm the assumptions made are correct there still needs to be an ability to field confirm the results to verify the assumptions being utilized in the models estimate a correct water quality. A field test of some type is needed to allow verification that the models are providing reasonably accurate results.	Agreed, but out of scope for ICM.
Task 7 & 8 Report	87	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	In Section 6, how is the mixing model utilized in IAZs which have shallow clays creating a perched water situation where shallow water cannot be utilized easily? Page 7-93 states "...specific analyses were added to the originally planned work to bracket uncertainty regarding loading inputs into the mixing model." This is still very complicated to analyze and then confirm in the field.	On an IAZ scale, this is not addressed as a critical issue.
Task 7 & 8 Report	88	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	On page 7-105, in Section 7 Water, Salt, and Nitrate Balance Calculation Results, there is a statement saying "... results show that the higher the magnitude of loading from the surface, the higher the magnitude of mass leaving shallow groundwater. ... Results indicate that the largest fluxes of mass from shallow groundwater occur in the southern Central valley for both nitrate and TDS, and this is due largely to downward flow to deep groundwater, and to a lesser degree well pumpage." (Highlighting mine). As already mentioned, areas where the Corcoran Clay is present prevents the ability of shallow groundwater flowing downward to the deep groundwater. I am defining deep groundwater as being below the Corcoran Clay. This is particularly evident in Figure 7-15 where in IAZ 14 and the south half of IAZ 15, to the West and directly below the Kings Subbasin Analysis area, areas where the Corcoran Clay is present, show a minimal number of cells Containing a Well Over 10 mg/L (N03-N). The Corcoran Clay inhibits flow to deeper aquifers and the water quality in the deeper aquifers is not showing a significant increase in TDS and Nitrate in the deep aquifer.	CVHM simulates the Corcoran Clay, and it is not a steadfast rule that it prevents any groundwater from flowing to deeper parts of the aquifer. There is evidence that shallow groundwater reaches deeper groundwater where the Corcoran Clay exists, be it through borehole seepage or other pathways down. It is definitely something to understand better, especially if its inability to move vertically and penetrate the Corcoran Clay means that salt and nitrate mass is essentially getting stuck in the shallow aquifer (which is not what the CVHM model shows on an IAZ scale).
Task 7 & 8 Report	89	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	Regarding page 7-138, is the maximum contaminant level (MCL) for nitrate really an acceptable or appropriate level to use for the assimilative capacity for an area?	This is a good policy related question to be further addressed by the CV-SALTS Policy Committee. For purposes of the ICM and the preliminary assimilative capacity analyses, the primary MCL for nitrate is considered reasonable as a comparative indicator.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	90	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	The Section 7 Summary on page 10-147 presents an unwelcome caution when it states, "Considerable variability exists in Shallow groundwater, both in time and space. The analyses presented at the IAZ scale are clearly not adequate enough to characterize the large regions, and certainly do not provide sufficient detail to facilitate salt and nitrate management planning at a local scale." This is a disconcerting statement about the ICM work. Can a model be developed and used for the purposes intended that is accurate to within 100% of actual field conditions?	The ICM, and particularly the IAZ analyses, provide the intended 30,000 foot level view of the Central Valley wide salt and nitrate issues. On the aggregated scale, the intent of the IAZ computations was to understand the transport of salt and nitrate on the valley wide scale. The prototype analyses were "proof of concept" demonstrations of the nature of the additional level of detail that can be developed with analyses that involve greater spatial resolution and also link quantity tools with quality tools. Eileen Poeter (former Executive Director of the International Groundwater Modeling Center and former NGWA Darcy Lecturer) gave her lecture internationally at dozens of locations; her lecture was titled "All Models are Wrong: How Do We Know Which Are Useful?" It is important to know the objectives for a modeling effort and whether or not the proposed model can accomplish the intended objectives. Most models, regional models in particular, are unlikely to achieve accuracy to "100% of actual field conditions". Models are tools to help inform and make decisions. The more complex the system is that is being modeled, the more useful it can be to have a model to aid in very complicated computations. Models are also useful to identify where input parameters are limited by data gaps and where additional data gathering efforts would likely improve the correlation between simulated and observed results. Additionally, models are useful tools for purposes of assessing future scenarios which can also be very complex with many variables leading to uncertain future outcomes. This is the type of application that is anticipated to be of high utility to regional and local entities in evaluating the potential effectiveness of management actions to control salt and nitrate impacts.
Task 7 & 8 Report	91	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	Page 10-149, Uncertainty Analysis, provides a discouraging statement when it says "...there are far too many inputs to perform a comprehensive analysis."	The paragraph was modified to indicate that for most inputs a comprehensive sensitivity analysis is unnecessary because they have little effect on the results of the ICM.
Task 7 & 8 Report	92	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	Page 10-178 says WARMF provides better TDS mass loading compared to nitrate, but looking at Figures 9-15 and 9-16 it really doesn't look that much better.	True - there is still much variability between simulated and observed concentrations for TDS.
Task 7 & 8 Report	93	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	The Site Specific Analyses for the Modesto and the Kings River Subbasin areas were different. Yet it states the Kings River analysis required a much greater level of detail. How much more work was involved? Was there any belief that one model was more accurate or viable in modeling the actual field situation for either site?	They were really two very different approaches. The Modesto area was more concerned with surface loading and groundwater recharge concentrations, whereas the Kings Subbasin detailed each and every model cell's concentration every quarter for a twenty year period. There is no assumption either way as to which is a more accurate modeling effort, although the Modesto model approach allows for more field-scaled groundwater recharge concentrations, which would greatly improve its implementation. The same could be said for the cell-by-cell movement approach (used in the Kings Subbasin), except that for the cell-by-cell approach accurate groundwater quality samples would be desired at each cell for each model layer. Either method relies completely on the hydrology (water budget components and movement) of the groundwater flow model, which also has its own limitations.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	94	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	Table 9-4 on page 10-203 summarizes for the Kings Subbasin the vertical movement of all particles. Is there any way to field check the calibrated movement in the model with what records show has occurred?	There are vertical flow meter tests that can be performed in long-screened wells. Further analysis of the vertical transport might be possible with the development of additional information on the correlation between actual groundwater quality observations and the part of the aquifer system that those observations represent (i.e., linking well construction information to monitored wells and the results).
Task 7 & 8 Report	95	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	Following Tables 9-6 and 9-7 on pages 10-207 and 10-208 there is the following statement: "These time series comparisons show the movement and impact of groundwater recharge particles and associated concentrations in the shallow upper model layers (Layers 1, 2, and 3), and then very little impact on the deeper model layers (6 through 10)." Does this imply the model shows the movement of salts and N03 are not a problem in the deeper layers?	It shows that the movement occurs on a much greater time scale compared to the shallow layers.
Task 7 & 8 Report	96	8/1/13	Roger Reynolds	Tasks 7 & 8 Draft Report	On page 10-243 is the bullet, The Simulations Identified the Dominate Groundwater Hydrologic Mechanisms Throughout the Central Valley Floor. Following are a few summarizing comments: (1) Outflow from shallow groundwater for all IAZs is largely composed of downward vertical flow to deep groundwater and groundwater pumping; and (2) Following a comment on hydrologic mechanisms in the Northern Central Valley there is the statement, "However, for most other IAZs, the cumulative mass recharged to the shallow aquifer is very similar to the cumulative mass transported via downward vertical flows to the deeper part of the aquifer system. Are these correct statements for IAZs located where the Corcoran Clay is present?"	Yes. Appendix D shows the groundwater results, which includes a series of plots showing the comparison of surface recharge mass to vertical flow to deeper aquifer units.
Task 7 & 8 Report	97	8/5/13	Nigel Quinn	Tasks 7 & 8 Draft Report	General formatting comment: bold all table and figure references in the text.	Completed
Task 7 & 8 Report	98	8/5/13	Nigel Quinn	Tasks 7 & 8 Draft Report	Section 2.1, Methodology for IAZ Depth (Vertical) Delineation Subsection, first para., last sentence: Comment regarding grammar needs to be looked at	Attempt made to address this comment.
Task 7 & 8 Report	99	8/5/13	Nigel Quinn	Tasks 7 & 8 Draft Report	Section 2.1, Methodology for IAZ Depth (Vertical) Delineation Subsection, regarding "Delta-Mendota - Grassland" in next to last sentence: Most of the Basin experiences vertical downward flow - very little upflow.	There are some cells that have vertical flow in that basin as seen by the gray cells in the figure.
Task 7 & 8 Report	100	8/5/13	Nigel Quinn	Tasks 7 & 8 Draft Report	Section 2.1, Methodology for IAZ Depth (Vertical) Delineation Subsection, 2nd para., last sentence: Comment regarding grammar needs to be looked at	Attempt made to address this comment.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	101	8/5/13	Nigel Quinn	Tasks 7 & 8 Draft Report	Section 3.1, Assigning Depth Class to Wells Subsection, 1st para, regarding sentence, "For wells lacking a well depth, the well type was used to infer the depth": Give an example.	Added text to address this.
Task 7 & 8 Report	102	8/5/13	Nigel Quinn	Tasks 7 & 8 Draft Report	Figure 3-3: Not that easy to see WARMF boundaries	Figure added to document with better WARMF boundary overlay.
Task 7 & 8 Report	103	8/5/13	Nigel Quinn	Tasks 7 & 8 Draft Report	Section 3.2, IAZs With WARMF Coverage Subsection, General Comment: Should list those regions in the same way as you do with regions without WARMF coverage, i.e., northern San Joaquin Valley (IAZ's 9-14) etc.	(need to be added to report)
Task 7 & 8 Report	104	8/5/13	Nigel Quinn	Tasks 7 & 8 Draft Report	Section 3.3, Land Cover Classes in the WARMF Models Subsection, 2nd para, regarding "GIS processing replaced the DWR land use database with county level data in urban areas": Not clear	Covered in comment 14
Task 7 & 8 Report	105	8/5/13	Nigel Quinn	Tasks 7 & 8 Draft Report	Section 4.3, 1st introductory para, last sentence about TDS/EC conversion: EC/TDS ratio is highly variable depending on the ion mix in surface water. WARMF is limited to using a single ratio whereas this should ideally be specified per watershed	See comment response # 77.
Task 7 & 8 Report	106	8/5/13	Nigel Quinn	Tasks 7 & 8 Draft Report	Section 4.3, Areas with WARMF Coverage Subsection, 1st para.: May want to use a figure to illustrate this.	Noted
Task 7 & 8 Report	107	8/5/13	Nigel Quinn	Tasks 7 & 8 Draft Report	Figure 5-3: I assume IAZ's with no bars are not covered by the WARMF model	That is correct.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	108	8/5/13	Nigel Quinn	Tasks 7 & 8 Draft Report	Figure 5-4. Still difficult to fully comprehend the flux linkage between the two models from this figure. Needs re-working	Addressed in updated Section 5 text.
Task 7 & 8 Report	109	8/5/13	Nigel Quinn	Tasks 7 & 8 Draft Report	Section 5.3, Theory Subsection, 1st para below Figure 5.4, regarding sentence, "Mass fluxes for non-WARMF areas were scaled to CVHM flows, with some modification to account for the more dilute nature of surface runoff": Clarification of this statement needed.	Addressed in updated Section 5 text.
Task 7 & 8 Report	110	8/5/13	Nigel Quinn	Tasks 7 & 8 Draft Report	Section 5.3, Theory Subsection, 1st para below Figure 5.5, regarding sentence, "Tile drains prevent lateral flow and mass from entering the groundwater body by intercepting and shuttling the flow and mass directly to the stream": Tile drains operate on the shallow groundwater system - water is already in the groundwater "body". Can intercept a portion of groundwater flow to stream.	Addressed in updated Section 5 text.
Task 7 & 8 Report	111	8/5/13	Nigel Quinn	Tasks 7 & 8 Draft Report	Section 5.3, Theory Subsection, Scenario 4, WARMF - Gaining Stream Conditions paragraph, regarding phrase in last sentence, "be captured by its inherent surface water quality concentration": Clarification of text needed.	Mass entering the surface water body will become evident and represented in the resultant surface water quality. Text edited.
Task 7 & 8 Report	112	8/5/13	Nigel Quinn	Tasks 7 & 8 Draft Report	Section 6.2, General Comment: Figure would help to show combined inputs and outputs from mixing model.	figure added.
Task 7 & 8 Report	113	8/5/13	Nigel Quinn	Tasks 7 & 8 Draft Report	Section 6.2, Tables and Queries Subsection, Item 7.a, regarding last sentence, "...the quarter date of the concentration value that needs to be associated with it's the volume parameter, and lastly the IAZ number associated with that concentration": Clarification of text needed.	text added.
Task 7 & 8 Report	114	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 1.1, General Comment: I think you should have an additional section the briefly lists other activities that are not being coordinated and/or could be affected by this type of analysis and related SNMP. For example, the regulation and siting of Managed Aquifer Recharge or ASR facilities/projects	This is a good comment, and you are correct that the SNMP-related efforts will need to be developed within the context of and/or coordinated with a number of other related efforts that are on-going within the region. However, due to the number of activities and the fact that it will likely vary in different regions of the Valley, we inserted a footnote in Section 1 and 10, but did not add another section.
Task 7 & 8 Report	115	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 2.1, Methodology for IAZ Depth (Vertical) Delineation Subsection, 1st para., 1st sentence: The basis of the time period is not explicitly stated here. You state the range of distances later so that's good.	text added.
Task 7 & 8 Report	116	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Figure 2-1: Based on a cell by cell Darcian Velocity from CVHM?	yes, text added to caption.
Task 7 & 8 Report	117	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Figure 2-3: How about adding a pie chart of percentages to help reader understand spatial and overall proportions?	Good suggestion. Figure added.
Task 7 & 8 Report	118	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 3.2, IAZs without WARMF Coverage Subsection, IAZ14 to 21 Part, regarding "tile drains and irrigation canals" in 4th sentence: I hope these data were used somewhere as the represent some of the "end members" of salt & nitrate loads returning to rivers.	They were considered for use of shallow groundwater quality especially in the Delta area, but were ultimately used only for comparing other groundwater values in tile drain areas.
Task 7 & 8 Report	119	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 3.3, Land Cover Classes in the WARMF Models Subsection, 2nd para., regarding, "Land cover was derived primarily from the DWR land cover database, which has spatially detailed information about agricultural land uses distinguishing between individual crop types.": For what year or range of years? Please make reference to the specific land-use maps used as we did in the CVHM report.	Appendix

Task 7 & 8 Report (Project Report)

Note: Original Project Workplan had two separate deliverables for Tasks 7 and 8. During project execution it was agree to have these reports combined into a single project deliverable						
Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	120	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 3.3, Land Application Mass Loadings in WARMF Model, Solid Salt Part, regarding 2nd bullet, "Soluble, non-volatile portions of other salts (amendments) added, including soluble salts in manure": Also gypsum? I would just make a list of the major amendments here	Noted
Task 7 & 8 Report	121	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 4.1, Volume and Mass Budget Components, general comment regarding para.: CVHM uses an integrated hydrologic model MF-FMP that has other flows that can be used besides the groundwater components. I hope that you went into FB-Details.out and checked the runoff components as well as the semi-routed return flow flows from the SFR-FMP connection and checked these against the runoffs estimated by WARMF. If you didn't this would be critically important.	Although the runoff components are generally similar between the models in the aggregate, there were significant differences in the quarterly flows. The linkage between the models was designed to accommodate the differences in flow regimes.
Task 7 & 8 Report	122	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 4.2, Transforming the Data Subsection, 1st para., general comment regarding para.: Could have just used the geometric mean which is the arithmetic mean in log space.	Ok, but we had other things we needed to do with the log-transformed data – aka the linear regression..

Task 7 & 8 Report (Project Report)

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Task 7 & 8 Report	123	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 4.2, Transforming the Data Subsection, 2nd para., regarding "The fitted normal distribution...": Why do you require a normal distribution? Could have been gamma or poisson. This makes assumptions about the distribution which may not be valid. In the future you may want to try other approaches....lots of literature on this for contaminants and ore deposits that would be analogous relationships to spatial/temporal distributions. Yu may want to cite a reference as to why this was a valid or reasonable assumption.	When calculating central tendencies of the data, we assumed the data required a normal distribution. Other distributions (gamma, poisson) were considered.
Task 7 & 8 Report	124	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Table 4-1: Suggest replace "upward" with "increasing"?	Text changed.
Task 7 & 8 Report	125	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 4.3, General comment: How were diversions for streamflow and return flows treated for WARMF and CVHM to assess loadings coming to and from agricultural regions of IAZ's? If they weren't I think you need to acknowledge this as a source that was not used.	In WARMF, the water quality of diversions is the water quality of the diversion source water. The loading to the land is a function of the irrigation water quality and the amount of irrigation water applied. Return flows were part of the mass flux leaving catchments in WARMF.
Task 7 & 8 Report	126	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 4.4, Areas with Pre-existing WARMF Runs Subsection, general comment regarding 1st para after Figure 4-7: Can you briefly also describe if this is done on a watershed or catchment basis like SWAT or on a computational grid like MF-FMP. Also how do you know how much groundwater to apply vs. surface water and where?	WARMF breaks the watershed into catchments following drainage boundaries, not a grid. Available surface water supplies are applied first for irrigation; unmet demand is then met with pumped groundwater.
Task 7 & 8 Report	127	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Figure 4-9: We had the actual subwatersheds for the entire state and perhaps for the IAZ studies this would have yielded better resolution than these large catchments. I think I offered them at the time that we reviewed this component. For the future work you may want to develop more detailed catchments using these.	Figure 4-9 does not show the WARMF catchments. The WARMF model has 479 catchments in the Sacramento/Delta eastside application, 260 catchments in the San Joaquin River watershed, and 63 catchments in the Tule River watershed.
Task 7 & 8 Report	128	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 4.5, paragraph before Table 4.2, regarding "...and porosity" in next to last sentence: Derived from our CVHM porosity and texture distributions? If not please briefly state source and catchment estimate method.	Yes, all from CVHM
Task 7 & 8 Report	129	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 4.6, Farm Package Output Files Subsection, general comment: Also is source of ag pumpage (FDS.OUT), so if you are trying to delineate this separate from other sources this is the pumpage you should have used. I think we went over this in the presentations. Zonebudget estimates won't differentiate between various sources of pumpage for MNW ag and urban wells.	OK. The differentiation between urban and ag pumping was not considered for the mass and volume balance calculations.
Task 7 & 8 Report	130	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Tables 4-5 and 4-6: Hard to read maybe split this into facing pages?	Pages should be on 11x17 landscape for the final report.
Task 7 & 8 Report	131	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5, Introductory text, 1st para., regarding "groundwater model" in 2nd sentence: This is not a groundwater model...it is an integrated hydrologic model that simulates the use and movement of water coupled between the landscape, surface water and groundwater. Please refer to it as a hydrologic model or integrated hydrologic model.	Text edited.
Task 7 & 8 Report	132	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5, Introductory text, 2nd para., regarding "near-surface groundwater" in 1st sentence: Is this really true or is it really only representing the soil zone above the groundwater? It also uses coarse catchments so the spatial detail is not as good as CVHM but it may have more detailed temporal detail. This should be briefly mentioned somewhere.	WARMF simulates the top 2-3 meters of soil in agricultural areas. WARMF has larger model units but those are broken down into many more detailed land uses.
Task 7 & 8 Report	133	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5, Introductory text, 2nd para., regarding last sentence: There are overlaps that could be used to assess the differences such as surface flows and ET consumption	Acknowledged.

Task 7 & 8 Report (Project Report)

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Task 7 & 8 Report	134	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5, Introductory text, 3rd para., regarding third sentence: For each catchment and for each day?	Flows and masses leaving the root zone are calculated for each catchment for each daily WARMF model time step.
Task 7 & 8 Report	135	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5, Introductory text, 3rd para., regarding 4th sentence: Crop type, percent canopy, etc.?	Surface and root zone processes are simulated for each individual land use within each catchment. The fluxes from each of the catchment's land uses are then aggregated to get the total catchment output.
Task 7 & 8 Report	136	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5, Introductory text, 3rd para., regarding last sentence: Did it also match historical surface-water diversions...these are essentially gages as well. Please include a description of how surface water diversions were used for simulation and calibration. We use them in CVHM in this fashion as a means of verifying conveyance and to simulate supply-constrained and demand driven deliveries of surface water for irrigation.	Historical surface water diversions are a time series input to WARMF.
Task 7 & 8 Report	137	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5, Introductory text, 4th para., regarding 1st sentence: And landscape components of E and T (six separate terms), runoff and deep percolation.	Text edited.
Task 7 & 8 Report	138	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5, Introductory text, 4th para., regarding 3rd sentence: This is incorrect. Precipitation and potential ET, Crop Coefficients, root depths, and fractions of cell area for transpiration along with psi pressures are input and irrigation demand is calculated.	True. Text edited.
Task 7 & 8 Report	139	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5, Introductory text, 4th para., regarding "evapotranspiration" in 4th sentence: Potential Evapotranspiration	Text edited.
Task 7 & 8 Report	140	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5, Introductory text, 4th para., regarding "Faunt et al., 2009" in 4th sentence: That were adjusted to match CIMIS data calculated with Pennman-Monteith	Text edited.
Task 7 & 8 Report	141	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5, Introductory text, 4th para., regarding "stream flows" in last sentence: Streamflows and diversions!	Text edited.
Task 7 & 8 Report	142	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5.1, 1st para., regarding, "...when the mass fluxes calculated by WARMF are overlaid with the hydrology produced by CVHM": Why weren't the simulated diversions of CVHM used as input for the WARMF surface-water deliveries? More linkage could have been achieved by using the models in concert as opposed to making adjustments.	There was insufficient time or budget to make modifications to the WARMF model.
Task 7 & 8 Report	143	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5.1, 2nd para., regarding, "Recharge and Leakage from Stream are the percolation down to groundwater from the land and rivers, respectively": How about rejected infiltration or water table at the surface? How is anoxia handled for riparian vegetation and crops? Are Nitrogen fixating vegetation handled differently in WARMF. This is an issue for Willows and legumes (for example mesquite type trees and bean crops).	WARMF dynamically simulates the water table elevation including ponding on the surface if the soil is saturated or above its infiltrative capacity. Dissolved oxygen concentrations are tracked based on the mass balance and consumption for reactions such as nitrification and organic matter decay, and anoxic conditions are simulated if all oxygen is consumed. The simulation of anoxia depends on the model inputs like litter fall rate, catchment slope, and reaction rates but is not specified specifically for certain land covers or crops. Nitrogen fixation is not simulated directly but may be indirectly addressed by a reduced amount of land application.
Task 7 & 8 Report	144	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5.2, Land Use Subsection, 1st para, general comment: But only in a generalized way that does not account for multiple cuttings or multiple croppings. How did you deal with this? How was cropped acreage dealt with within each catchment. This description is not parallel with the generalized description for MF-FMP below...please make them more similar. Does WARMF include direct uptake from groundwater and if not you should stat that limitation.	There are approximations inherent in the representation of land use, and combinations of different crops were not included. Each land use included a percent irrigated and a percent of area on which land application was applied. WARMF does not simulate uptake from below the root zone.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	145	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5.2, Land Use Subsection, 2nd para. general comment: We also specify time varying crop coefficients and differentiate between the six components of E and T, fractions of transpiration for precipitation and irrigation , fractions of runoff as inefficient losses, irrigation efficiencies, and other properties some of which are varied through time on a monthly basis. Please have a complete summary here as much as possible. We also apportion the sources of irrigation from sw and gw on a monthly basis...please see our Groundwater article (Hanson et al, 2010) for examples of this dynamic feature.	Text edited.
Task 7 & 8 Report	146	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5.2, Hydrology, last sentence of para, regarding, "...does not include recharge in others": Does not include or does not simulate? Why would this be the case...please explain.	WARMF simulates recharge with a prescribed time series of recharge flows. In some IAZs, there were no prescribed recharge flows included in the model inputs so the model did not simulate any recharge.
Task 7 & 8 Report	147	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5.3, Theory Subsection, 1st para., last sentence: I don't see a storage term here so this is a steady state mass balance approx.? If so You should state this or briefly describe if salts can accumulate in the soils and whether water is also stored in the "sand box" of the various soil layers.	The change in storage is assumed to be small. This is implied in the statement, "Since the near-surface groundwater zone has a relatively short residence time, over the long-term it is in equilibrium with mass fluxes input to the system plus production within the soil approximately equal to the mass outflux plus decay or gaseous loss within the soil for each constituent."
Task 7 & 8 Report	148	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5.3, Theory Subsection, 3rd para., last two sentences beginning with, "Note that these latter two flows..."But isn't this averaged over an entire catchment...and if so you don't really have that much detail without a computational grid. I think this is somewhat overstated and maybe misleading...you have some vertical detail that is then averaged over a large area right? Please be clear to the reader how you represent these features. Also remind them how you deal with submerged vegetation and direct phreatophytic uptake from groundwater which may bear on the regions with negative head gradients that you inventoried..	The outfluxes are aggregated over many catchments into totals for each IAZ. WARMF does not simulate submerged vegetation or uptake from below the root zone.
Task 7 & 8 Report	149	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Figure 5-4: Mass flux from WARMF is ET and runoff and lateral discharge and recharge?	Mass fluxes from WARMF are runoff, lateral flow, and recharge. ET is an outflux of water but carries no mass.
Task 7 & 8 Report	150	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Figure 5-4: Where is direct uptake form groundwater in the CVHM here? This is really only top down and part of the story.	Uptake is only taken from the root zone in WARMF.
Task 7 & 8 Report	151	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Figure 5-5: Please tag the diagram with variables used in the example calculation and have two diagrams as Thomas had suggested for gaining and losing stream conditions.	The example calculation illustrates in greater detail the gaining/gaining conditions from the original figure. Hopefully that helps clarify the variables.
Task 7 & 8 Report	152	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5.4, general comment: Example diagram with this calculation would help especially to highlight the exceptions of flows.	Addressed in updated Section 5 text.
Task 7 & 8 Report	153	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5.4, Step 1 Equation: Where is direct uptake or upward vertical flow from groundwater into the oil zone here?	Uptake is only taken from the root zone in WARMF.
Task 7 & 8 Report	154	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 5.4, Step 3, 1st Para.: Doesn't this ignore direct uptake from gw by CVHM? This was important in the northern parts of CV. Do you need to state this somewhere?	Net farm recharge represents the balance of recharge minus direct uptake from groundwater. The IAZ approach assumes a conservative approach where no mass is uptook by plants directly from the groundwater. This is a reasonable assumption for TDS because plant uptake of TDS would be minimal. It is also reasonable for nitrate, because most farmers are not aware of the nitrate concentration at the first-encountered water below their fields. Therefore they apply their nitrate based on fertilizer amendments (and possibly applied irrigation water quality).

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	155	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 6.2, Tables and Queries Subsection, 1st para.: Please add references or explanations as to where these data came from as necessary throughout this chapter	Text added.
Task 7 & 8 Report	156	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 7.1, 1st paragraph, 4th sentence, regarding "farm package": Please refer to FMP as the Farm Process. The difference between a package and a process is that a package supports a particular flow equation and a process is a separate flow equation. Also please reference our documentation (Schmid and Hanson, 2009) so that the reader knows where to go if they want to have more details.	"Farm Package" replaced with "Farm Process" throughout document. Added Schmid and Hanson 2009 reference.
Task 7 & 8 Report	157	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 7.1, 1st paragraph, 4th sentence, regarding "(farm recharge)": In zone budget this is "Farm Net Recharge" because it is deep percolation minus an y potential direct uptake from groundwater. Please use this term to be consistent with our terms.	Noted and text changed.
Task 7 & 8 Report	158	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 7.1, 1st paragraph, last sentence, regarding "...conditions" at end of paragraph: Also direct uptake of ground water as E and T.	Text added.
Task 7 & 8 Report	159	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Figure 7-1: Please note that in the Farm Net Recharge is also direct uptake from groundwater and E and T.	Text added.
Task 7 & 8 Report	160	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Figure 7-2: Please indicate that this is a net mass balance for the last 20 years of CVHM (1984-2003?) for this and other IAZ figures.	Actually, that's not the case – the title of the figure indicates the year and quarter each example is for.
Task 7 & 8 Report	161	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 7.2, 3rd para., regarding sentence, "However, upward vertical flow from deep groundwater provides a significant fraction of TDS mass to shallow groundwater in the northern Central Valley (IAZs 1-7).": Not the Delta too?	The Delta is only connected to one IAZ (IAZ-9), where yes it does provide a good fraction of TDS influx. Text added to identify this.
Task 7 & 8 Report	162	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 7.2, 6th para., last sentence: From runoff or return flows from precipitation or from irrigation? Please be more descriptive and specific here.	This speaks to the groundwater discharge to surface water in IAZ 4. Text added to clarify.
Task 7 & 8 Report	163	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Figure 7-6: Landscape mode?	Yes. Good suggestion.
Task 7 & 8 Report	164	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Figure 7-8: Please use consistent terms Initial and Final vs. Starting and ?????	Text adjusted.
Task 7 & 8 Report	165	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Figure 7-11: These are all wells above the Corcoran clay because I have a hard time believing that Westlands is so clean....not based on our monitoring wells in the Delta Mendota region that shallow water is nasty. Please qualify and check the estimates for this figure.	Checked, and accurate. This data contains both shallow and deep wells (above and below the Corcoran Clay). The data's in there with some high concentrations in the Delta Mendota area for shallow wells. This map is highlighting CVHM 1square mile cells that contain any well with a concentration of nitrate over 10 mg/L as N in recent times (2000s). It then determines what percent those highlighted cells represent over ALL cells in the entire IAZ containing data. Therefore, if many shallow poor quality wells are close to each other, they won't cover as many 1mi x 1mi cells.
Task 7 & 8 Report	166	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Figures 7-16 and 7-17: Really can't read that....can you??? Please consider another way of presenting this maybe split the valley into the three major regions	High resolution figure provided.
Task 7 & 8 Report	167	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Figure 7-18: If the colors mean something why not have an explanation for the table or add to the table caption.	Explanation added.
Task 7 & 8 Report	168	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 7.6, General comment: If MODPATH, MODPATH-OBS and other programs were used they should be referenced.	Modpath and Modpath OBS were not used for the IAZ analysis.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	169	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 7.6, 1st para, regarding "assimilative capacity" in first sentence: Does this need a brief definition or reference to a standard definition?	<p>"A definition of assimilative capacity for purposes of the ICM was defined in responses to comments on the Task 5 TM. That definition and the rationale are repeated below. There is no standard definition.</p> <p>""The intent of the inclusion of consideration of assimilative capacity is because of its use in the SWRCB recycled water policy, including the preparation of salt and nutrient management plans. While the recycled water policy refers to assimilative capacity, an explicit definition is not provided in that guidance document. For ICM purposes, assimilative capacity is defined as the amount of a constituent (contaminant load) that can be discharged to the aquifer system (especially that part of the aquifer system that provides actual or probable beneficial uses) without exceeding water quality standards and/or Basin Plan water quality objectives. Additionally, this term describes the difference between the water quality standards/objectives and average ambient shallow groundwater quality in the basin/subbasin/IAZ/MZ (where shallow does not necessarily mean the uppermost part of the saturated zone directly at the water table, rather ""shallow"" means the part of the aquifer system that provides actual or probable beneficial uses)."</p>
Task 7 & 8 Report	170	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 7.7, Introductory Subsection, 2nd para., 1st sentence: So we can also identify these regions of data deficiencies to the SRWQCB so that they could add additional wells or monitoring sites?	The RWQCB is actively involved in the CV-SALTS efforts and along with other stakeholders is developing further awareness of data gaps.
Task 7 & 8 Report	171	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 8.1, Other Data Needs Subsection, WARMF Model Error Part, 2nd para., regarding, "This issue is believed to be caused by input applied water rates for rice which are too low but could not be corrected during previous uses of the Sacramento WARMF model": Does it simulate ponded conditions and if not should you mention that here or in the earlier sections?	WARMF does simulate ponded conditions if water inflows are greater than outflows, evaporation, and transpiration such that water accumulates on the surface. The applied water rates for rice in WARMF are insufficient to simulate ponding to the extent that it actually occurs.
Task 7 & 8 Report	172	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 9.1, Introductory Subsection, 1st para.: It may be worth noting that a new MF-FMP transient model of Modesto area by USGS for MID is being completed and may be a better vehicle for analysis for transient effects.	Footnote added.
Task 7 & 8 Report	173	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 9.1, Establish and Quantify Transport Patterns and Simulate Concentrations of Salt and Nitrate in Wells Over Time in the Modesto Regional Area Subsection, 1st para. After Table 9-1, regarding "MODPATH-OBS": Please reference this. Hanson, R.T., Kauffman, L.K., Hill, M.C., Dickinson, J.E., and Mehl, S.W., 2013, Advective transport observations with MODPATH-OBS—Documentation of the MODPATH observation process, using four types of observations and Predictions: U.S. Geological Survey Techniques and Methods book 6—chap. A42, 94 p. (http://pubs.usgs.gov/tm/tm6a42/)	Reference has been added.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	174	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 9.2, Establish and Quantify Transport Patterns and Simulate Concentrations of Salt and Nitrate in Areas Over Time for the Kings Subbasin Subsection, 2nd para., regarding sentence, "Other high concentrations seen in the urban Fresno area might also be unreasonably high due to the low amount of CVHM recharge combined with the modest amount of nitrate and TDS mass for that area.": This seems conceptually inconsistent...why would an urban area have such high nitrates unless it is a relic of previous ag or an indication of widespread septic discharge? Please explain this more if possible.	No, this is from the proportional inconsistency between CVHM recharge and mass loadings. Additional text added to identify this.
Task 7 & 8 Report	175	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 9, series of figures beginning on page 10-205 of draft (comparison between 1984 and 2004) by layer: How about a "difference" map as third to show the simple difference between these two maps (1984 and 2004).	Great suggestion. Difference maps added.
Task 7 & 8 Report	176	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 9.2, Comparison of Two Groundwater Flow Models Subsection, last para.: I don't actually see a comparison here....is something missing? Please complete this section at least in a summary fashion. For example are the flows comparable is pumpage more or less between models? Etc. The one talk I saw on this model awhile back suggested that they performed pretty similar....but some discussion is needed to finish this section please.	no, I think this is from the proportional inconsistency between CVHM recharge and mass loadings. Additional text added to identify this.
Task 7 & 8 Report	177	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10.1, regarding 1st sentence in Recycled Water Policy quote: Isn't this a bit contrary to AB-599 that was trying to protect the aquifers and not just the beneficial uses? Perhaps a broader context needs to be set here by presenting both goals or at least acknowledging that other goals have been set.	This is a good comment, and you are correct that the SNMP-related efforts will need to be developed within the context of and/or coordinated with a number of other related efforts that are on-going within the region. However, due to the number of activities and the fact that it will likely vary in different regions of the Valley, we inserted a footnote in Section 1 and 10, but did not add another section.
Task 7 & 8 Report	178	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10.1, regarding "...imposing requirements solely on individual recycled water projects." in last sentence of quote from Recycled Water Policy: What about potential revisions to well standards, fertilizer permitting, septic density, ASR operations, or other activities that would impact this assessment and management plan? This seems potentially incomplete	This is a good comment, and you are correct that the SNMP-related efforts will need to be developed within the context of and/or coordinated with a number of other related efforts that are on-going within the region. However, due to the number of activities and the fact that it will likely vary in different regions of the Valley, we inserted a footnote in Section 1 and 10, but did not add another section.
Task 7 & 8 Report	179	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10.1, last of series of bullets regarding key elements of SNMP, i.e., "antidegradation analysis": Does this need a footnote with a definition?	A footnote was added to provide context.
Task 7 & 8 Report	180	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10.1, regarding "short and long-term management" in 2nd sentence of paragraph before bulleted conceptual model phase descriptions: What time-frames or range of periods would these represent? Please tell the reader what this may be even if not agreed upon yet.	In order to avoid confusion, the terms "short and long-term" were removed.
Task 7 & 8 Report	181	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10.1, last of series of bullets describing conceptual model phases, i.e., "Development of Local SNMPs": Won't there be some fundamental framework or conceptual elements that will be required of these and if so do these come from this initial study as a recommendation for a generalized framework even if they differ with different settings of land use and hydrology?	The Draft SNMP (described within the Report as Phase II) will include a framework and guidance for the development of the local SNMPs.
Task 7 & 8 Report	182	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Table 10-2: This is a new categorization of the Central Valley that differs from what many others have done to group the valley into 4 major subregions....please explain and justify this grouping or realign it with the previous four regions used by others.	The northern, central, and southern groupings were simply to broadly describe results in those three regions. The four major subregion alignment will be given consideration for future efforts.

Task 7 & 8 Report (Project Report)

Note: Original Project Workplan had two separate deliverables for Tasks 7 and 8. During project execution it was agree to have these reports combined into a single project deliverable						
Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	183	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10-2, Task 6 Highlights Subsection, 4th bullet in first series of bullets in this subsection, regarding text that begins, "As described in Section 2.....": These new regions are also better redefinition of water service areas with DWR so this was not just a modeling artifact but could be a part of future refinements along with using the new CVHM-2.	Acknowledged.
Task 7 & 8 Report	184	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10-2, Task 6 Highlights Subsection, bullet in second series of bullets in this Subsection regarding "The Hydrology and Mass Fluxes Between CVHM and WARMF Needed to be Considered and/or Reapportioned, last sentence that begins, "CVHM is a calibrated groundwater....": Are the surface water flows comparable and could they be used to rescale the WARMF flows? How do these flows in WARMF relate to reported diversions, return flows, and gaged streamflows?	CVHM and WARMF flows differ significantly, and the mass reapportionment mechanism was designed to accommodate those differences. Reported diversions are inputs to WARMF; return flows are calculated by WARMF, and its simulated flows are calibrated to measured streamflows.
Task 7 & 8 Report	185	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10-2, Task 6 Highlights Subsection, bullet in second series of bullets in this Subsection regarding "Ambient Conditions Contributed in Identifying Potential High Priority Areas": Hate to say this but High nitrate that gets recycled back for irrigation water may not all be bad as this could save farmers from applying more if they monitor the loads in the soil zone. This was certainly the case with our work in the cotton fields of Phoenix area. That is to say a simple duality may be too simple in developing a management plan.	Acknowledged.
Task 7 & 8 Report	186	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10-2, Task 6 Highlights Subsection, bullet in second series of bullets in this Subsection regarding "The Simulations Identified the Dominate Groundwater Hydrologic Mechanisms Throughout the Central Valley Floor ", 2nd sentence with phrase, "...deep groundwater (IAZ 4) and recharge from surface water (IAZ 9).": And direct uptake of groundwater as a source of water for ag so it's another source.	Acknowledged.
Task 7 & 8 Report	187	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10-2, Task 6 Highlights Subsection, bullet in second series of bullets in this Subsection regarding "The Simulations Identified the Dominate Groundwater Hydrologic Mechanisms Throughout the Central Valley Floor ", sentence that begins, "This lessens the potential for downward...": But what about the higher potential for lateral flow from the rice fields etc. back into the streams directly and then transported to other IAZ's? This level of interconnectivity of transport between IAZs should be discussed or at least acknowledged. This can't be just a groundwater centric analysis because its ultimately about conjunctive use and the policy development will need to be able to address this based on this analysis.	Acknowledged. See also surface water mixing model results.
Task 7 & 8 Report	188	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10-2, Task 6 Highlights Subsection, bullet in second series of bullets in this Subsection regarding "Southern Central Valley has a Relatively Greater Magnitude of Nitrate Loading", 3rd sentence that begins, "Groundwater recharge is....": From and when as shown in Hanson et al., 2010 there is bimodal recharge with deep percolation form ag and winter precip...so how does this play into this dynamic and how can it be managed within this dynamic for annual and climate cycles?	Recharge flows from CVHM are on a quarterly time step and thus include both winter and summer recharge modes.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	189	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10-2, Task 6 Highlights Subsection, bullet in second series of bullets in this Subsection regarding "• The Magnitude of the TDS Loadings Throughout the Valley are Relatively Similar ", last three sentences: Any idea of how much of this is being recaptured and reused through irrigation with groundwater for ag? This could be important part of any management plan where there are regions of high capture maybe regulations don't need to be so strict.	Acknowledged.
Task 7 & 8 Report	190	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Figure 10-6: If tile drain return flow was included I wonder if Westlands would also be high for Nitrate...is there any possibility of creating a combined gw and surface water indicator map?	This is a good suggestion. For the ICM analysis, we did not deal with prioritizing the surface water IAZs.
Task 7 & 8 Report	191	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Table 10-6: Color code these too	Updated table.
Task 7 & 8 Report	192	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10-2, Task 7 Highlights Subsection, first para., regarding "Hanson et al. 2012", in progress reference: Please update this reference as it has been released as Hanson et al., 2013	Completed.
Task 7 & 8 Report	193	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10-2, Task 7 Highlights Subsection, bullets with key findings, 4th bullet regarding "The Simulation Results were Evaluated": This is just one analysis with MODPATH-OBS it might have been good to also look at percents of source water from various sources to look at the assimilative capacity from the context of dilution or mixing from multiple sources of water.	This is a good suggestion for future efforts. However, it was beyond the scope for Task 7 to demonstrate "proof of concept" tools. Task 7 was not scoped to exhaustively evaluate sources of water and the potential contributions to and effects as a result
Task 7 & 8 Report	194	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10-2, Task 7 Highlights Subsection, last para., regarding last sentence, "The results showed that there can be areas that have no assimilative capacity, while there may also be areas that have greater assimilative capacity compared to the IAZ as a whole.": Did you gain any insight as to why these areas are high or low, for example is it a flow feature?	The report includes examples of the difference between the IAZ aggregated groundwater quality condition as compared to the Task 7 subareas with higher spatial resolution of groundwater quality. Qualitatively, this is a preliminary assessment of related e
Task 7 & 8 Report	195	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10-2, Summary of Key Findings From Phase I Subsection, 9th bullet, 2nd sentence regarding "Although, the utility of and applications with MODPATH-OBS are still in the process of being examined.": What is this based on? Did you not run the MODPATH-OBS for both regions. Your use of MODPATH-OBS was really limited so I'm not sure this was a rigorous application of the method or analysis with this software.....please see the previous work of Sanford for the Middle Rio Grande and Chesapeake Bay as broader examples of how the software can be used for analysis, The biggest limitation may be the limit to 20 years of simulation where travel distances are so short that the effects remain somewhat uncertain.	We were unable to get MODPATH-OBS to work with the Kings Subbasin cell-by-cell/layer-by-layer analysis within the short timeframe of this Task. Task 7, as presented, is a "proof of concept" and not a rigorous application of the method or analysis that COULD be used with MODPATH-OBS. Also, it's possible that other flow and transport (MT3D) methods might be more appropriate for certain applications.
Task 7 & 8 Report	196	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10-2, Summary of Key Findings From Phase I Subsection, 10th bullet, 1st sub-bullet, regarding "Refinement of applied water quality estimates, especially for non-WARMF areas. This necessitates coordination with and cooperation from local entities that may have gathered such data": How about reconciliation of surface flows such as diversions, return flows as well as streamflows and runoff?	The applied water quality in non-WARMF areas is based on the combination of surface water and groundwater sources used for irrigation. There is little data to verify these estimates.
Task 7 & 8 Report	197	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10-3, Land Cover and Soils Subsection, Item No. 1: Address multiple cropping too.	Acknowledged.
Task 7 & 8 Report	198	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10-3, Land Cover and Soils Subsection, Item No. 2: Address multiple cropping too.	Acknowledged.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	199	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10-3, Groundwater Flow and Quality Modeling Subsection, Item No. 3: Any chance that WARMF could further developed to be used on a "computational grid" instead of watersheds or at least use the sub watersheds to provide additional refinement?	WARMF uses drainage areas for its catchment boundaries rather than a grid based system. In some areas, the catchment boundaries have been modified to align with groundwater model grid cell boundaries. This could be expanded to other portions of the Central Valley watersheds.
Task 7 & 8 Report	200	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10-3, Groundwater Flow and Quality Modeling Subsection, Item No. 5, next to last sentence regarding "farm package": Process please.	Completed.
Task 7 & 8 Report	201	8/5/13	Randy Hanson	Tasks 7 & 8 Draft Report	Section 10-3, Groundwater Flow and Quality Modeling Subsection, Item No. 5, last sentence regarding "This would create a first order, fully-linked quality and quantity surface water/groundwater modeling tool": Also maybe better linkages with MODPATH-OBS and more MODPATH-OBS analysis of source waters and mixing.	Acknowledged.
Task 7 & 8 Report	202	8/5/13	Debbie Webster	Tasks 7 & 8 Draft Report	How does this model handle the reuse of water and the resulting gain of salts?	Recycled water reuse is not explicitly handled in the ICM, Task 6.
Task 7 & 8 Report	203	8/5/13	Debbie Webster	Tasks 7 & 8 Draft Report	It appears that the 500 mg/L for TDS was chosen because it was a SMCL, how was the 1000 mg/L chosen? How much effort is it to rerun the model if another TDS number is ultimately chosen?	The SMCL upper limit for TDS was selected as another comparative indicator parameter. The TDS water quality objectives are not part of the model, they are simply used for comparison with model results and also to ambient groundwater quality.
Task 7 & 8 Report	204	8/5/13	Debbie Webster	Tasks 7 & 8 Draft Report	The Executive Summary mentions that the numbers were generated quarterly – was this an average for the quarter, or are we looking at highs, a certain date, etc.	Typically water flows and mass fluxes are provided. In this case, they are multiplied by the number of days in each quarter to achieve a volume and mass representing the entire quarter time period.
Task 7 & 8 Report	205	8/5/13	Debbie Webster	Tasks 7 & 8 Draft Report	How will we be able to integrate this information with any of the ag salinity models that are chosen, especially if we take into account the needs of the plants on a time basis.	This would be an interesting analysis. One approach would be to begin with the map of sensitive crops and their irrigation water salinity requirements (in GIS 5.2), and overlay that with ambient groundwater supply (areas irrigated principally with groundwater [same report] and groundwater quality (7& 8 report). Note areas of potential conflict. Then look at likely salinity trends (from the ICM) throughout the same areas; sensitive crop areas would be at greatest risk where salinity trends are increasing, and where they are highly groundwater dependent. It is possible that sensitive crops tend, probably due to grower's planning choices, to be grown where high-quality (surface or ground) water is available, thus naturally minimizing the risk of these sorts of conflicts. Again, the most worrisome regions would be those where groundwater salinity is increasing AND groundwater is a principal source of supply.
Task 7 & 8 Report	206	8/22/2013 (originally 7/30/13)	Jeanne Chilcott	Tasks 7 & 8 Draft Report	I noticed on the slides that Tim used last Friday that the westside of the SJR Basin did NOT show up as a high priority salt area. Anyone who works in the Central Valley will challenge that finding. Do you know if the data/calculations for that area were ever revisited? I know the question was raised at the last policy meeting.	Any IAZs with a ranking of 3 or 4 are classified as "high priority" in our analysis. IAZs 10, 14, 22, and 19 are therefore all considered high priority, which includes the westside (IAZ 14).
Task 7 & 8 Report	207	8/22/13 (originally 8/5/13)	Randy Hanson	Tasks 7 & 8 Draft Report	Report needs to have more references about codes (WARMF and MF-FMP2), application of WARMF to CV, and CVHM I can provide some additional references if needed for our stuff.	Additional WARMF references have been added. Additional details about WARMF and CVHM are also presented in the Task 4 and Task 5 TMs.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	208	8/22/13 (originally 8/5/13)	Randy Hanson	Tasks 7 & 8 Draft Report	Other data types also lack adequate references and source discussion and presentation such as agricultural data, land use data, pesticide/fertilizer data, diversion data, streamflow data, WWTP discharge data, etc.	Two additional appendices have been added on "Methodology for Generating Mass Loading Inputs for Areas without Pre-Existing WARMF Model Runs" and "Details of Land Coverage and Loading Assumptions". Other sources of data are described in Section 3, including data sources described in earlier ICM Tech Memos.
Task 7 & 8 Report	209	8/22/13 (originally 8/5/13)	Randy Hanson	Tasks 7 & 8 Draft Report	I think that fundamentally 20 years was computationally feasible but this is not a feasible planning horizon for policy or infrastructure development. This should be a recommendation of future work. If there is a follow-up regionally and for selected IAZs there needs to be a better assessment of a proper planning horizon such as 60 – 70 years (~2 PDO climate cycles) or whatever criteria would give a better representation of how long it will take to affect "most" wells in the upper aquifers. This could be analyzed with particle tracking by extending the past into the future as we have done for Central Valley under Climate change projection 100 years or for Pajaro Valley using historical hydrology (34 years of past mirrored into the future).	Good suggestion.
Task 7 & 8 Report	210	8/22/13 (originally 8/5/13)	Randy Hanson	Tasks 7 & 8 Draft Report	For the IAZ's perhaps cumulative exceedance curves could help summarize the number of particles that penetrate the various layers or travel a total distance or x and y distances? Similar to plots in MODPATH-OBS from original Avra Valley particle tracking study. Exceedance curves are used by NRC so maybe you could adopt a similar metric for salt and nutrients.	Good suggestion - since this was more of a 'proof of concept' we did not pursue this avenue, but would be a great suggestion for when these tools are actually implemented in the future.
Task 7 & 8 Report	211	8/22/13 (originally 8/5/13)	Randy Hanson	Tasks 7 & 8 Draft Report	These tables of various particle summaries are ok but don't really allow the reader to assess if the flow systems and related constituents are vertically or laterally dominated flow systems....this will impact potential changes in management of either land use practices or maybe even well ordinances as was successful in Santa Clara Valley. Also recommend a third difference map of 2004-1984 concentrations for at least the upper layers....this would be much easier to see not only the magnitudes but the spatial change over the 20 years.	Good suggestion - a difference map was created and included in the report.
Task 7 & 8 Report	212	8/22/13 (originally 8/5/13)	Randy Hanson	Tasks 7 & 8 Draft Report	Tile Drains need to be included along with return flows of tailwater and diversions of surface water wherever possible.	Tile drain water quality data was considered for use of shallow groundwater quality especially in the Delta area, but these data ultimately were used only for comparing other groundwater values in tile drain areas. For stream concentrations in areas without WARMF coverage, tile drains were not included as representative stream sites since the focus was for obtaining concentrations for CVHM represented streams.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	213	8/22/13 (originally 8/5/13)	Randy Hanson	Tasks 7 & 8 Draft Report	I think the characterization of the two prototype regions needs to be better and more completely summarized (see for example Hanson et al., 2010). For example what are the dominant sources of water and uses, how/when/what source is recharge occurring and where, are the groundwater flow systems vertically or laterally dominated based on flowpath, hydrologic setting (layer properties), extent of tritium occurrence. What would be the potential additional uses of recycled water in these regions as ASR operations, supplemental ag water for irrigation, etc.?	The two focus areas were used for "proof of concept" to evaluate data evaluation methods and potential tools. The suggestions provided for these regions would be useful to future analysis as part of Phase II or Local SNMP activities.
Task 7 & 8 Report	214	8/22/2013	Thomas Harter	Tasks 7 & 8 Draft Report	<p>Original Thomas Comment: General: There is no documentation (or no reference to documentation) of the detailed methodology used to group DWR landuse classes, to derive N application rates, to derive salt application rates, to derive N and salt uptake into crops, and what these numbers are for the landuse groups used. Without a clear description of how values were obtained and what values were obtained, this report is incomplete.</p> <p>Response: The work was done with 3 existing WARMF models. Although these models were described in general and their original documentation cited, detailed new documentation of them is out of scope. Nevertheless, some of this documentation has been copied into this report for the readers' convenience (see responses to later comments for specific items). The emphasis in the methods description was on the few aspects of the original WARMF model that were modified, including fertilization rates. This section has been checked and improved in response to this comment. Also, fertilization rates considered as part of the sensitivity analysis were described in that section. Further, original documentation and in-depth study of WARMF inputs, if of interest, might be considered for inclusion among Phase 2 activities.</p> <p>Thomas' Response to Response: Appendix A is missing. (several comments referring to missing land use tables/figures that have presumably been provided now in an appendix?)</p>	Two additional appendices have been added on "Methodology for Generating Mass Loading Inputs for Areas without Pre-Existing WARMF Model Runs" and "Details of Land Coverage and Loading Assumptions". Other sources of data are described in Section 3, including data sources described in earlier ICM Tech Memos.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	215	8/22/2013	Thomas Harter	Tasks 7 & 8 Draft Report	<p>Original Thomas Comment: General: Consider removing the density maps in the "hot spot" analysis. A density analysis is highly biased by the data availability. In areas with few data, we cannot "see" hotspots because we don't have data. Here, for practically all rural areas, the hot spot analysis is entirely biased by the dairy dataset, the only dataset that expands into rural areas and includes large amounts of shallower domestic wells. Outside of regions with dairies, there are no such datasets and we cannot "see" hotspots. I am attaching a paper (provided to LWA Team) that will be published this month that shows, for example, that the citrus belt's impact in Tulare County on nitrate is significantly stronger than the dairy's impact. Yet your hotspot map does not show the citrus belt due to the relative lack of data.</p> <p>Response: Although the density analysis is biased by the spatial extend of the data, and possibly also by the inclusion of dairy data which may over represent water quality in rural environments, it is felt that the maps still provide a useful visualization of water quality trends at a large scale. It also provides a visualization of where data is lacking. The density analysis was not used in the prioritization/ranking of IAZs. Text in report has been modified to identify the limitations of this analysis.</p> <p>Thomas' Response to Response The density maps are, in my opinion, grossly misleading and therefore should not be included. I think Figure 7.12 and 7.13, depicted on a full page each, plus additional figures showing the wells above a threshold indicating anthropogenic influence (e.g., >4 mg N/L), would completely suffice the purpose of indicating known areas with issues. I think the current Figure 7.14 - 7.16 are politically too loaded. If I was the dairy industry, I would argue that these kind of misleading depictions based on the data that they report to RB5 is exactly why their data should be confidential (and the Irrigated Lands Coalitions may make a similar argument). I suggest that this report not put unnecessary fuel into that fire.... My five cents....!</p>	Density analysis has been removed from the figures. The figures are now left as a simple visualization of the spatial extent of data, rather than a hot spot analysis.

Task 7 & 8 Report (Project Report)

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Task 7 & 8 Report	216	8/22/2013	Thomas Harter	Tasks 7 & 8 Draft Report	<p>Thomas' original comment: Section 4.2, Estimating Initial Shallow Groundwater Quality Subsection: Regarding text, "The initial concentration for shallow groundwater was estimated by taking the average of the shallow annual CVHM grid cell median concentrations for each IAZ over all time periods", Initial = which year? 1983? Why not all data UP to that year? If the ICM model needs a starting value, to then add the last 20 years of inputs to get an ending value, there is an inherent logical error, if your "initial value" is the average of the same 20 year period measured in the field. If you already used all the data as "initial value", how would you calibrate your model output?</p> <p>Response: The shallow groundwater volume used in the ICM mixing model was established based on the estimated 20-year vertical travel distance that solute masses would travel in shallow groundwater. Therefore, theoretically the final mass calculated from the mixing model should be a reflection of only the recent masses introduced to the system in the past 20 years. When calculations of the initial mass of the shallow groundwater system were based only on a data from around the 1983 (and even including the sparse data from earlier time periods), the number of tests was very limited and resulted in very large or very small masses, which did not accurately reflect groundwater quality for most of the IAZs. Including all data provided a much more realistic starting point for the model. The model was not calibrated, however several loading scenarios were developed and compared to ambient data</p> <p>Thomas' Response to response: I understand the dilemma. Still, Using effectively current conditions as the starting point for 1983, given the increases in nitrate that have occurred since then (per your model results), this is a conceptual dilemma. I suggest to point this out in Section 8.</p>	Text was added in section 10.2 under "Task 6 Highlights" titled "Estimating Ambient Shallow Groundwater was Problematic Due to Limited Amount of Shallow Groundwater Data" with a brief description.
Task 7 & 8 Report	217	8/22/2013	Thomas Harter	Tasks 7 & 8 Draft Report	<p>Thomas' original comment: Section 7.5, Ambient Concentrations Subsection: Regarding text, "First, all CVHM grid cells that contained well data were selected", I assume this is just wells with depth information that are known to be in the shallow (20 yr travel time) zone? Please clarify in the text.</p> <p>Response: For this analysis, all well data were used.</p> <p>Thomas' Response to response: why not just use the wells that are within the shallow groundwater zone? Otherwise you may be comparing apples and oranges? That is, you are comparing average of old and young water ("all wells") with shallow water (simulated).</p>	Our criteria for ranking the IAZs was based on several analysis. One of the analyses is based on the shallow data (median of recent shallow data), one is based on the deep data (last (2012) year in the linear regression), and the last was based on the simulated data. We wanted to include an analysis that reflected all the data available for each IAZ, which is why all wells were used for this analysis.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	218	8/22/2013	Thomas Harter	Tasks 7 & 8 Draft Report	<p>Thomas' original comment: Section 2.1, Methodology for IAZ Depth (Vertical) Delineation Subsection, in the first paragraph of the last part, "Summary of IAZ Area and Depth Information": In regards to footnote 17, I have a CRITICAL CONCEPTUAL question that may have major impact on the interpretation of the results: BUT IS THE UPWARD MOVEMENT INTO THE UPPERMOST LAYER BECAUSE OF PUMPING IN THAT UPPERMOST LAYER OR BECAUSE OF MOMVENT INTO THE UNSATURATED ZONE FROM THE UPPERMOST LAYER? THIS IS CONCEPTUALLY AN IMPORTANT DIFFERENCE!!!! IN THE FIRST CASE, NITRATE FROM THE ROOT ZONE STILL MIXES WITH WATER THAT GETS INTO THE TOP LAYER FROM BELOW AND DISCHARGES TO A WELL (BENEFICIAL USE). IN THE SECOND CASE, NO NITRATE/SALT REACHES GROUNDWATER. (CAPs in the original comment)</p> <p>Response: The negative vertical travel distance indicates that groundwater is being utilized by the FARM package – so the water level is high enough that it is in the root zone and the FARM package is allowed to use it for ET. For the ICM mixing model, when cells in an IAZ had a negative travel distance the cell in the uppermost active layer is used for the balance calculations. The negative travel distance shows up in the mixing model calculations in the form of negative recharge. This is how the FARM package deals with groundwater contributions to the farm demands. We did not assign any mass associated with this movement of water.</p> <p>Thomas' response to response: I did not see this clarified in the text. Your explanation here is good. Can you put it into Section 2.1?</p>	Yes, text added.
Task 7 & 8 Report	219	11/27/2013	Debbie Webster	Tasks 7 & 8 Final Report	<p>Executive Summary, page xxvi, regarding key findings and outcomes - Just a couple of other important features that have been mentioned that don't seem to be incorporated are that (1) the areas outside of the IAZ's don't seem to be major contributors to areas within the four basins where there are issues, and (2) although the IAZ lines were chosen initially, there may be other ways of breaking up land areas to group areas in both small and larger subareas that make more sense.</p>	Acknowledge. The distinction between the Central Valley Floor and CVRWQCB Region 5 is made in the Task 4 Report and also in the Task 7/8 Report (beginning in Section 1.2). Additionally, some of the WARMF areas extend beyond the boundary of the Central Valley Floor and the USGS CVHM accounts for contributions from tributaries where headwaters are outside the Valley Floor. Importantly, Section 1 notes that groundwater data collected for the ICM encompassed the area covered by Region 5 and was not limited to only the Valley Floor. The Task 4 Report describes alternatives to the IAZ delineation for future local SNMPs.
Task 7 & 8 Report	220	11/27/2013	Debbie Webster	Tasks 7 & 8 Final Report	<p>Executive Summary, page xxvii, top paragraph - Where is the recognition of addressing areas outside the valley floor. We could recognize that these areas don't appear to be major contributors, but a plan, nevertheless, is needed.</p>	Acknowledge. See response to Comment 19. The Phase II draft Workplan describes some tasks, including Task 7 the Preliminary Phase II CV SNMP, that would apply to all of Region 5.

Task 7 & 8 Report (Project Report)

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Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	221	11/27/2013	Debbie Webster	Tasks 7 & 8 Final Report	Section 1, page 1-1, regarding Phase II bullet - Phase 2 will also need to address what to do with non-priority areas.	The Phase II-related bullet is very broad in that it implicitly refers to the use of the data collected as part of the ICM for purposes of Phase II. It further indicates that for some areas greater spatial resolution will be provided in Phase II. The draft Phase II Workplan describes the level of detail that may be provided within Region 5, the Central Valley Floor, and/or the Kings River area Archetype area, pending the final approved direction and scope for the Workplan.
Task 7 & 8 Report	222	11/27/2013	Debbie Webster	Tasks 7 & 8 Final Report	Section 3, page 3-18, regarding Permitted Land Application (POTWS) section - First note that your table [Table 3-3] contains both publically owned treatment works (POTWS) and food processors/industrial discharges. So you may want to change your title. This seems incomplete for POTWs that land discharge. Note there are a number that both irrigate and have surface water discharges that are missing.	Acknowledge. The Table describes the permitted facilities as permitted land dischargers. The search for POTWs for purposes of the ICM analyses was limited to POTWs > 5MGD.
Task 7 & 8 Report	223	11/27/2013	Debbie Webster	Tasks 7 & 8 Final Report	Section 3, page 3-20, general comment regarding Summary Section - You also may want to note some of the sources that are not included and the overall contributions are not known. Septics may or may not be a problem in the bigger scheme, but will be important when we look at nitrate in specific areas.	Acknowledge. This level of detail would be relevant to the Phase II Archetype analysis, pending the area selected. This level of detail is most relevant for future local SNMPs.
Task 7 & 8 Report	224	11/27/2013	Debbie Webster	Tasks 7 & 8 Final Report	Section 3, page 3-20, general comment regarding Summary Section - No assessment was made for areas outside the valley floor. Is it similar to floor areas, or do we have some major data gaps that would make the next steps an issue?	As noted in the response to Comment 219, groundwater data were collected for the area outside the Valley Floor and in Region 5. It is correct that no "assessment" of these data (overall trends or data gaps) was made of these data. The draft Phase II Workplan proposes to address the area outside the Valley Floor in the manner described in Workplan Tasks 4 and 6 (and reported on in Task 7), pending the final approved direction and scope for the Workplan.
Task 7 & 8 Report	225	11/27/2013	Debbie Webster	Tasks 7 & 8 Final Report	Section 4, page 4-11, Areas Without WARMF Coverage Section, regarding 1st sentence - Did this include outside valley floor?	As noted in the response to Comment 219, some WARMF domains extend outside the Valley Floor. The comment on this section that refers to areas without existing WARMF coverage only applies to the areas within the Valley Floor.
Task 7 & 8 Report	226	11/27/2013	Debbie Webster	Tasks 7 & 8 Final Report	Section 4, page 4-15, Section 4.4, Areas with Pre-Existing WARMF Runs, 1st sentence - This again looks like the floor. Please check document and make sure the Central Valley floor and Central Valley are differentiated properly where appropriate.	Figure 4-7 is specific to the results of the WARMF runs for the areas located within the Central Valley Floor. In the ICM report, the use of "Central Valley" almost always means the Central Valley Floor. The larger area that encompasses Region 5 is generally referred to with those descriptors, or as Central Valley region.
Task 7 & 8 Report	227	11/27/2013	Debbie Webster	Tasks 7 & 8 Final Report	Section 4, page 4-24, Figure 4-11 - Is this just a misprint in my version?	The legend in Figure 4-11 appears to have been distorted when the pdf was created.
Task 7 & 8 Report	228	11/27/2013	Debbie Webster	Tasks 7 & 8 Final Report	Section 7, page 7-30, regarding Identifying Priority Basins subsection - I am very on-board with addressing priority areas, but we will need to develop a regulatory mechanism that is the appropriate response for non-priority and medium priority areas.	Acknowledge. The Phase II draft Workplan describes some tasks, including Task 7 the Preliminary Phase II CV SNMP, that would apply to all of Region 5 (regardless of priority).
Task 7 & 8 Report	229	11/27/2013	Debbie Webster	Tasks 7 & 8 Final Report	Section 10, page 10-26, 1st sentence in third bullet under Summary of Key Findings from Phase I - I am a little confused, is the flow of groundwater south, or is it as you move geographically south the salinity concentration in groundwater increases.	The salt load increases in a southerly direction in the Valley (i.e., this is not a finding about the direction of groundwater flow).
Task 7 & 8 Report	230	11/27/2013	Debbie Webster	Tasks 7 & 8 Final Report	Section 10, page 10-27, regarding subbullets under fifth major bullet - Although you are hitting the big issues, I think there is going to need to be some refinement of areas with septic and the inclusion of more WWTPs.	See the response to Comment 223.
Task 7 & 8 Report	231	11/27/2013	Debbie Webster	Tasks 7 & 8 Final Report	Section 10, page 10-29, regarding item No. 1 under Other Model Data - Does not need to be in the report, but recommended for the next phase is also to identify areas where recycled water is being applied.	This locally specific-type of information is described for inclusion in the Phase II draft Workplan Task 5 for the Archetype area, as applicable.

Task 7 & 8 Report (Project Report)

Note: Original Project Workplan had two separate deliverables for Tasks 7 and 8. During project execution it was agree to have these reports combined into a single project deliverable						
Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Task 7 & 8 Report	232	11/27/2013	Debbie Webster	Tasks 7 & 8 Final Report	Section 10, pages 10-30 and 10-31, regarding Section 10.4 - As mentioned above, need to address what to do about areas outside of basin and non-priority areas.	Acknowledge. See response to Comment 228.

Modeler's Meeting Summary

Task	Comment No.	Date Received	Comment Source	Deliverable	Comment	Response
Modeler's Meeting	1	11/7/12	Nigel Quinn	Draft Meeting Summary	This is a very good summary of the meeting. There were some revelations that came out in the discussion that I was unaware of going in. I think you have hit on the majority of these. In the discussion about tile drainage I would quibble that WARMF explicitly simulates tile drainage. The methodology is more a calibration to achieve the same approximate volume of water removal. However since the layer extends over both tiled and non-tiled areas and there is nothing in the algorithm I would argue against the word "explicit". The revelation for me is that I was under the impression that the drainage package was invoked in CVHM-1 - it will be used in the SJWHM (westside model) that Claudia is finishing up for Reclamation and may not be available in time for use in the ICM study. So it appears that WARMF and CVHM may be using somewhat equivalent methods for estimating loss to tile drainage.	Text has been changed to reflect this concern regarding the term "explicit".
Modeler's Meeting	2	11/7/12	Thomas Harter	Draft Meeting Summary	This summary nicely hits all the important points. I thought this was an extremely helpful discussion	Comment Noted

Project Workshop

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Task	Action Item	Date Received	Source	Applicability	Action Item	Comments/Follow-Up
Workshop	1	11/29/30	LWA Team	Task 3	The LWA Team has identified a data gap for surface water quality for Los Gatos Creek. If you have data for this area or suggestions for data, please forward the information to Karen Ashby (karena@lwa.com).	[No data has been provided to the LWA Team to date - December 11, 2012]
Workshop	2	11/29/30	LWA Team	Task 3	As part of the Task 5, 6, and 7 work, the LWA Team will use temporal and site specific TDS-EC ratios where readily available for water quality sites and ratio's obtained from literature when a site specific ratio is unattainable.	As noted within the Task 5 Report, since TDS-EC ratios may vary spatially and temporally, site specific and inter-annual TDS-EC ratios will be used where readily available for water quality sites in non-WARMF areas . For example, as part of previous WARMF analyses, TDS-EC ratios have been compiled for the San Joaquin and South Delta diversions and for the Sacramento River/Delta Eastside for sites where concurrent data (i.e., measurements taken on the same day at the same monitoring location) exist. These ratios may be used to represent the relationship of TDS-EC as appropriate in the Delta areas without WARMF coverage (i.e., IAZ 6 and 9). Data used to compute these ratios will also be examined as a check for inter-annual variability of EC-TDS ratios in the Delta area. In areas with sparse temporal data coverage, such as the Southern San Joaquin Valley, it may not be possible to evaluate inter-annual variability of TDS-EC ratios. In areas where an appropriate site specific ratio is not readily available, ratios will instead be obtained from literature values.
Workshop	3	11/29/30	LWA Team	Task 3	The LWA Team will look into the tile drain sumps as a source of data for use in analyzing shallow groundwater quality.	Ag drainage and tile drainage water quality data has been requested and received from DWR as of 11/28/2012.
Workshop	4	11/29/30	LWA Team	Irrigation Water Data Request	The LWA Team will modify the data request and spreadsheet based on the feedback that was provided, and re-submit to Richard Meyerhoff for distribution as a letter signed by the Technical Advisory Committee Co-Chairs.	During the development of the ICM Workplan and related tasks, the LWA Team identified an approach for calculating the approximate ratio of groundwater to surface water applied to irrigated agriculture, the quality of the groundwater applied, and the quality of the surface water applied. During subsequent conversations with the CV-SALTS Executive Committee, the Team was requested to reach out to the key agricultural coalition participants to see if we could obtain local, site specific data. Also, during development of the GIS Task 5 scope, it became apparent that it would be useful to have more site-specific information on applied water quality, to be able to compare these to salinity targets developed under that task. Although this task was out of scope for the ICM work, the Team initiated the development of a data request. However, it became evident that the time necessary for the ag coalitions to compile and transmit the data would not coincide with the timeframe for the development of the ICM. As such, the Team has determined that the data request would be more appropriate from a budget and schedule standpoint as a part of the GIS Task 5 Work (Development of Crop Sensitivity Tools). Upon approval of the GIS Task 5 scope and budget, the Team will re-engage with the data request so that this can be transmitted in a timely manner to the key ag coalition stakeholders in CV-SALTS.
Workshop	5	11/29/30	LWA Team	Irrigation Water Data Request	The LWA Team will follow up the request with phone calls to key agricultural coalition participants within CV-SALTS.	
Workshop	6	11/29/30	LWA Team	Irrigation Water Data Request	Any data gaps noted as a part of this effort will be documented in the ICM Task 8 Report.	

Project Workshop

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Task	Action Item	Date Received	Source	Applicability	Action Item	Comments/Follow-Up
Workshop	7	11/29/30	LWA Team	Task 4	The LWA Team will note the distinction between the two model updates (SJWHM and CVHM-2) as needed within the Task 4, Task 5, and Task 8 ICM reports.	Consistent with the conversations and email exchanges with Randy Hanson and Nigel Quinn, the distinction between the two model updates was provided within the ICM Task 4 Report and will be incorporated into the ICM Task 8 Report. These edits are not necessary for the Task 5 Report.
Workshop	8	11/29/30	LWA Team	Task 4	Randy Hanson will follow up with Vicki Kretsinger regarding the CVHM-2 update	Barb Dalgish, Vicki Kretsinger, and Claudia Faunt have communicated regarding the CVHM-2 update. This information was incorporated into the ICM Task 4 and will also be incorporated in the ICM Task 8 Report.
Workshop	9	11/29/30	LWA Team	Task 4	Barbara Dalgish and Randy Hanson will discuss the use of nested models for the local refinements. This information will be described within the Task 8 ICM Report.	This will be described in the Task 7 Tech Memo.
Workshop	10	11/29/30	LWA Team	Task 4	The LWA Team will identify the uncertainty (either numerically or qualitatively) as well as the sensitivity of the models and approach within the Task 8 ICM Report.	This will be addressed in the ICM Task 8 Report.
Workshop	11	11/29/30	LWA Team	Task 5	The LWA Team will identify the analysis approach and assumptions used for the determination of ambient groundwater and surface water quality for each IAZ within the ICM Task 8 Report.	This will be addressed in the ICM Task 8 Report.

Project Workshop

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Task	Action Item	Date Received	Source	Applicability	Action Item	Comments/Follow-Up
Workshop	1	12/3/12	Nigel Quinn	Workshop Summary & Action Items	<p>I've reviewed the notes and it looks like a pretty fair summary of the main discussion. I noticed that the SJWHM and CVHM-2 distinction still appears a bit uncertain. SJWHM is a "child" model of CVHM-2 that just addresses the west-side. This model (SJWHM) has a more refined (1/4 mile) model mesh and increased layering in the above-Corcoran aquifer to address tile drainage and shallow aquifer pumping that affect water table response. The SJWHM uses the WESTSIM subareas as the unit of analysis called "farms" in the MODFLOW farm package. It isn't clear whether Claudia plans to keep the WESTSIM discretization for CVHM-2 (she has been talking of lumping some of the Districts). However CVHM-2 will be much more discretized on the west-side than the current CVHM model. Both models will use Randy Hanson's new deformable mesh grid and the latest algorithms used to simulate aquifer subsidence. I am already running a version of CVHM-2 and will be running SJWHM by the new year. I suspect SJWHM will be available to the public before CVHM-2 given that it was developed under a Reclamation contract and will not likely require the same level of review as CVHM-2. However this is just speculation. We have noted that CVHM ignores wetland hydrology and that Joel has a rudimentary conceptual model (I'd have preferred a bathtub analog be used) in WARMF for simulating wetlands (as a very slow moving river). How does the team plan to develop salt loads from seasonally managed wetland areas in both the San Joaquin (where they receive much higher salt concentrations) and in the Sacramento Basin. We are dealing with a sizable area in both Basins. One other note is that if it appears we have drift in EC/TDS ratios over time/season - we may need to re-run WARMF with these new time series factors in play. Since EC/TDS is critical to the computation of accurate (or at least good estimation) of salt loads - this is one thing that ought not be overlooked. In fact a separate side-bar analysis of this issue wouldn't be remiss. With some plan to address the EC/TDS transients and clarification on the simulation of seasonally managed wetland salt balance - I am OK with the LWA team moving into ICM Task 6.</p>	<p>The distinction between the two models (SJWHM and CVHM2) is presented in the Task 4 Report. WARMF directly calculates TDS, which is the constituent being analyzed for the ICM. Thus the EC/TDS ratio doesn't matter for analyses using WARMF. The WARMF wetland simulation uses the same mass balance principles and process simulations as other land covers in the Central Valley watersheds. Processes simulated in wetlands include ponding, surface evaporation, transpiration from the root zone, associated concentration of chemical constituents, nutrient cycling through biomass, dissolved oxygen concentrations in surface and soil, nitrification and denitrification processes, flow to surface waters from ponds and subsurface, and deep percolation to deep groundwater as applicable.</p>