CENTRAL VALLEY REGIONAL
WATER QUALITY CONTROL BOARD

RESPONSES TO WRITTEN PUBLIC COMMENTS ON THE
MARCH 2010 DRAFT STAFF REPORT TITLED:

SALT TOLERANCE OF CROPS IN THE LOWER SAN JOAQUIN RIVER (STANISLAUS TO MERCED RIVER REACHES)

April 2016

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

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Introduction

In March 2010, the California Central Valley Regional Water Quality Control Board (Central Valley Water Board) staff posted a draft of the report titled *Salt Tolerance of Crops in the Lower San Joaquin River (Stanislaus to Merced River Reaches)* (Salt Tolerance Report) onto the Central Valley Water Board's internet site (Central Valley Regional Water Quality Control Board) with public notice given through a subscription-email-list-service. The report was prepared to support an amendment to the Salt and Boron Control Program within the Central Valley Water Board's Water Quality Control Plan for the Sacramento River Basin and the San Joaquin River Basin (Basin Plan). The amendment to the Basin Plan will establish electrical conductivity water quality objectives (WQOs) for protection of the salt-sensitive agricultural beneficial use of the LSJR from the Airport Way bridge near Vernalis to the mouth of the Merced River.

The draft Salt Tolerance Report identified the area of agricultural land irrigated all, or in part by water from the Lower San Joaquin River (LSJR), referred to as the LSJR Irrigation Use Area. The Irrigation Use Area extends from the mouth of the Merced River at the southeastern end of the use area to southern San Joaquin County near the mouth of the Stanislaus River at the northwestern end of the use area. The report presented a review of salt-sensitive crop acreages in the LSJR Irrigation Use Area and the results of crop salt sensitivity modeling. Also, the report identified the most salt-sensitive crops requiring protection in the Irrigation Use Area.

On 11 March 2010 staff delivered a presentation of the draft Salt Tolerance Report to a joint meeting of the Central Valley Salinity Alternatives for Long-Term Sustainability (CV- SALTS) Executive and Technical Advisory Committees. In April, May, and June of 2010, staff received five public comment letters, which were also posted on the internet site. The letters contained a total of 92 comments. Table 1 presents a list of the five comment letters with corresponding numbered comments.

Table 1: List of Public Comment Letters

Letter Source	Letter Date	Comment Numbers
U.S. Bureau of Reclamation	May 25, 2010[1]	1-12
City of Tracy	April 10, 2010	13-16
Central Valley Clean Water Association	May 19, 2010	17-27
Eco Logic Engineers	May 19, 2010	28-56
San Joaquin River Group Authority	June 4, 2010	57-92

[1]Recieved via electronic mail

Each of the 92 comments was assigned one of the following three response categories: 1) Comment Noted or Addressed, 2) Policy, or 3) Technical. There were 42 comments assigned to the Comment Noted or Addressed category which were considered by the Central Valley Water Board's staff during preparation of a revised draft Salt Tolerance Report posted on the internet site in June 2010, with public notice again given through the subscription-email-list-service. Attachment 1 presents a matrix of those comments and the staff responses.

Due to public concerns that assumptions made during soil salinity modeling presented in the draft Salt Tolerance Report may unduly restrict the beneficial uses of the river, responsibility for addressing the Technical and the Policy category comments was transferred to the Lower San Joaquin River Committee (LSJR Committee). This committee was formed by the Executive Committee of CV-SALTS on 13 May 2010. The LSJR Committee is composed of stakeholders which include members of irrigation, water, and resource conservation districts, city, county, state and federal agencies, producers, growers, irrigators, water quality and watershed coalitions, drainage authorities, clean water and wastewater associations, consultants of various organizations and other interested parties.

The LSJR Committee stakeholders evaluated 35 technical comments and 15 policy comments. Attachment 2 presents a matrix of technical comments and stakeholder responses; Attachment 3 presents a matrix of policy comments and stakeholder responses. The final comments matrixes were delivered to the Central Valley Water Board at the end of 2015. The LSJR Committee organized the technical comment category into eleven sub-categories presented in Table 2 and the policy comment category into nine sub-categories presented in Table 3.

The Technical and Policy category comments and responses presented in Attachments 2 and 3 are organized by the sub-categories presented in Tables 2 and 3, respectively. The attachments incorporate the majority of comment materials submitted to the Central Valley Water Board, but it is not all-inclusive. Central Valley Water Board staff and LSJR Committee stakeholders have made their best efforts to identify, evaluate, and address all of the pertinent comments that were submitted. In most cases introductory and closing remarks have been omitted.

Table 2: Technical Comment Sub-Categories

Name
Models
Leaching Fraction
Planting and Harvesting Dates
Soil Water Uptake Patterns
Temporal and Spatial Scales
Cropping Patterns
Effective Rainfall
Pre-irrigation
Groundwater
Soils
Follow-up Studies

Table 3: Policy Comment Sub-Categories

Name
MUN Beneficial Use
Crop Protection
Precipitation
Point of Compliance
Integrated Approach
Temporal Scale
Water Rights
Other Water Sources
Boron Analysis

Summary

After the Central Valley Water Board received the responses to public comments provided by the LSJR Committee, staff completed an amended and finalized report titled *Final Revisions to the 2010 Salt Tolerance of Crops in the Lower San Joaquin River (Merced to Stanislaus River Reaches) and 2016 Addendum*. The 2016 addendum incorporates additional crop salt tolerance modeling that utilized recommended technical and policy parameters vetted by LSJR Irrigation Use Area stakeholders and by the CV-SALTS Executive Committee. The resulting EC water quality criteria determined by the modeling will be considered during development of a Basin Plan Amendment to establish EC WQOs for protection of the agricultural beneficial use in the LSJR.

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Attachment 1

Public Comments
Noted or Addressed by the
Central Valley Water Board
June 2010

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Public Comments Noted or Addressed by Central Valley Water Board Responses in June 2010

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Comment No.	Author[1]	Comment	Central Valley Water Board Staff Comment Response	
			Proposed Change	Response Note
7	U. S. Bureau of Reclamation	"Cropping patterns in general are most likely driven by economic factors, and not water quality factors."		Comment Noted
8	U. S. Bureau of Reclamation	"The information in Section 3.13.2 is base on a two year study with limited sample size (1-3)."		Comment Noted
12	U. S. Bureau of Reclamation	"On page 67, the last sentence of the third paragraph, 'If the salt concentration ... full crop productivity' is repeated in the following paragraph."	Pg. 67, Par. 3, change made in Report.	
13	City of Tracy	"The City wholeheartedly supports reconsideration of the applicable salinity objectives based on more recent science and studies."		Comment Noted
19	Central Valley Clean Water Association	The climate conditions at Riverside including daily, minimum, and maximum temperature, and relative humidity are more strenuous, which result in lower salt tolerance for crops than would result in the climate of the southern Delta.		This information is presented in the Draft Report (See Section 3.10.2)
23	Central Valley Clean Water Association	"Currently, the report focuses on the summer irrigation season of beans. The report should be expanded to also consider what are reasonable water quality objectives for winter irrigation of alfalfa."		This is covered in current report
28	Ecologic Engineering	"Page 6 Section 2.2.2 Sodicity -- The second sentence is erroneous as written, and the first sentence does not apply to sodicity. Sodicity is a measure of exchangeable sodium in a soil relative to the entire cation exchange capacity of a soil, as opposed to salinity which is a measure of salt content."	Page 6 Section 2.2.2: Language was clarified in Study Report.	
29	Ecologic Engineering	"Page 6 Section 2.2.2 Sodicity -- Further, sodic soils are characterized by an exchangeable sodium percentage greater than 15 percent."		Page 6 Section 2.2.2: Staff discussed sodic soils in the context of SAR vallues. While ESP is an acceptable indicator of sodicity, it was not covered in the scope of this Report
30	Ecologic Engineering	"Page 6 Section 2.2.2 Sodicity -- [The context of SAR] needs to be provided to interpret Table 2.0 water quality data, since the table does not report soil sodicity."		Page 6 Section 2.2.2: Interpretation of SAR values in Table 2.0 has been provided based on standard thresholds from the USDA Handbook
31	Ecologic Engineering	"Page 6 Section 2.2.2 Sodicity -- There are two forms sodium affected soils, typical Sodic soils which require cation replacement and Saline Sodic which may only require removal of soluble salts."		Comment Noted
32	Ecologic Engineering	"Page 11 4th and 5th line -- Hydrologic group does not describe characteristics of a fully saturated soil, rather it is based on physical factors that affect hydraulic properties of a soil. The Ksat is hydraulic conductivity under saturated soil conditions."	Page 11, 2nd Paragraph:Clarifying language added to Staff Report	

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Comment No.	Author[1]	Comment	Central Valley Water Board Staff Comment Response	
33	Ecologic Engineering	"Pages 13 - 16 Table 2.1. -- Ksat values exceed typical ranges of these soils, even for surface horizons."	Pages 13 - 16 Table 2.1: Staff made the necessary changes. Model results are not affected by these changes. The Units previously given in the draft Report were meant to be um/s, and were incorrectly called in/hr. Right conversion from um/s to in/hr has been made. Previous figures in the report have been multiplied by a factor 0.1417	
35	Ecologic Engineering	"Page 28 first paragraph -- The percentages are somewhat confusing, please clarify using total acres (i.e. not reduced for mixed cropping) planted to beans in each decade."	Page 28 first paragraph: Issued addressed in revised Report	
37	Ecologic Engineering	"Page 34 Section 3.3.2 -- Many of the soils in the irrigation use area naturally have low permeability in the subsoil and are susceptible to poor drainage. Further, much of the area on the west side of the river requires artificial drainage to minimize salt build up in the root zone as well as prevent water logging the soil. Thus, soil salinity in the area is related to the quality of irrigation water, the San Joaquin River, and the need for subsurface drainage. Moreover, widespread use of San Joaquin River water and subsurface drainage has likely resulted in lower soil salinity in the use area."		Comment Noted
38	Ecologic Engineering	"Page 34 Section 3.3.2 -- In addition to being problematic, sodic soils are indicative of soil conditions susceptible to extreme salinization, either naturally or anthropogenically induced. Their presence in the use are indicates the need for a higher level of salt management, including the potential that irrigation water could have too low of salinity. It should be noted that sodic soils generally develop where drainage is limited and evapotranspiration exceeds water applied, and sodicity can occur even with very low sodium content and SAR waters."		Comment Noted
39	Ecologic Engineering	"Page 40 Section 3.4.2 -- Soil survey reference needs to be checked, as it appears the 2002 Stanislaus County, Western Part Soil Survey was also used."	Page 40 Section 3.4.2: Issued addressed in revised Report	
40	Ecologic Engineering	"Page 40 Section 3.4.2 -- Based on Figure 3.9a, it appears that the 1964 Soil Survey was not used for this determination."	Page 40 Section 3.4.2: Comment is correct. Staff did not use the 1964 Soil Survey. Staff's assessment found that it was more appropriate to use both the 1992 and 2002 surveys over the 1964 survey.	

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Comment No.	Author[1]	Comment	Central Valley Water Board Staff Comment Response	
42	Ecologic Engineering	"Page 40 Section 3.4.2 -- It is unlikely that the extent of shrink swell potential in the use area was overestimated. Shrink-swell potential is a factor of total clay content and clay mineralogy. Neither of which is anticipated to change significantly within a single soil series, such as the Capay. Further, the Capay is classified as a Vertisol, a soil order defined by shrink-swell processes."		Comment Noted
44	Ecologic Engineering	"Page 42 Table 3.5 -- Check Ksat values presented."	Page 42 Table 3.5: Staff made the necessary changes. Model results are not affected by these changes. The Units previously given in the draft Report were meant to be um/s, and were incorrectly called in/hr. Right conversion from um/s to in/hr has been made. Previous figures in the report have been multiplied by a factor 0.1417	
46	Ecologic Engineering	"Page 50 Section 3.6.2 -- The area irrigated by furrow irrigation is not shown in Table 3.7. However, based on the preponderance of gravity irrigation and the types of crops grown, furrow irrigation is widespread across the use area."		Page 50 Section 3.6.2: DWR data only identified 'gravity irrigation' of which furrow irrigation is a component. This was stated in the Report as a footnote for Table 3.7.
47	Ecologic Engineering	"Page 53 Section 3.10.2 -- It should be noted that during May and June, crop salinity stress is potentially greater in Patterson than in Riverside. This would likely have a considerable effect on early stage growth of bean; However, little is known about salt tolerance of bean throughout the growing season."	Page 53 Section 3.10.2, last paragraph: Report was revised accordingly.	
48	Ecologic Engineering	"Page 58 Section 3.11.2 -- The WATSUIT model was developed by the USDA salinity lab and is public domain available at http://www.ars.usda.gov/services/software/download.htm?softwareid=107"	Page 58 Section 3.11.2: Report revised accordingly	
49	Ecologic Engineering	"It should be noted that the dissolution of salts in the soil will increase the salinity of drainage waters discharged back to the San Joaquin River."		Comment Noted
52	Ecologic Engineering	"Page 64 Section 3.13.2 -- What basis is there for the higher (0.7 dS/m) and lower (0.5 dS/m) salinity irrigation water in calculating the leaching fraction?"	Page 64 Section 3.13.2, third paragraph: This has was addressed in the Report.	
53	Ecologic Engineering	"Page 64 Section 3.13.2 -- Unless Hoffman reviewed the calculated leaching fractions for the LSJR and discussed them in his 2010 Report, the last sentence should be modified to present the range of Lr's in the South Delta, which are similar to those found for the LSJR."	Page 64 Section 3.13.2, last paragraph: Comment noted and Report revised accordingly.	
54	Ecologic Engineering	"Section 4 -- Nothing new or site specific is added to this section beyond the Hoffman Report."		Comment Noted

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Comment No.	Author[1]	Comment	Central Valley Water Board Staff Comment Response	
67	San Joaquin River Group Authority	Page 1, Paragraph 1, final sentence: Neither Turlock or Modesto IDs have any rights to the San Joaquin River and would not be using water from the SJR. They should be removed from the sentence.	Page 1, Paragraph 1, final sentence: Comment addressed. IDs were omitted from Report	
68	San Joaquin River Group Authority	Page 1, Paragraph 3, fourth sentence: It is unclear what dairies and feedlots mean. Does this include the dairy milk barns and corrals or the reuse areas as well? This should be explained as the reuse areas could be significant areas.		Page 1, Paragraph 3, fourth sentence: The term dairies and feedlots was used in reference to constructed areas primarily used for dairy production as presented in the GIS data from DWR. THe DWR data source does not explain details related to milk barns, corrals and reuse areas.
69	San Joaquin River Group Authority	Page 1, Paragraph 3, fifth sentence: Normally river descriptions are from upstream to downstream. Suggest the two river names be reversed here and throughout the document.	On pages i, iii, iv, 2,5,83,120122 and 123: Comment noted and revisions made throughout the Report	
71	San Joaquin River Group Authority	Page 5, Paragraph 1, final sentence: This sentence should be referenced as (Ayers and Westcot, 1985).	Page 5, Paragraph 1, final sentence: Comment addressed in revised Report	
72	San Joaquin River Group Authority	Page 5, Paragraph 3, second sentence: The words “of units” should be taken out.	Page 5, Paragraph 3, second sentence: Comment addressed in revised Report	
73	San Joaquin River Group Authority	Page 5, Paragraph 3, final sentence: The units of millimho per centimeter are not outdated. The units of dS/m are being used to be consistent with the international SI units.	Page 5, Paragraph 3, final sentence:Comment addressed in revised Report. Staff deleted "an outdated unit of measure for electrical conductivity".	
75	San Joaquin River Group Authority	Page 6, Second Paragraph, first sentence. Recommend that you strike the words “on soil sodicity”.	Page 6, Second Paragraph, first sentence:Comment addressed in revised Report; issued revised from prior comments	
77	San Joaquin River Group Authority	Page 10, Final Paragraph. Suggest that you break this into two separate paragraphs as they are two distinctly different thoughts. The break should occur after the third sentence.		Comment addressed in revised Report
82	San Joaquin River Group Authority	Page 34, Fourth Paragraph, final sentence. It is unclear what this sentence means. A sodic soil is not likely to impact water quality as the only way sodium would leave the sodic soils is by reclamation with a calcium source and the sodium would then go to groundwater, not to surface water. This sentence should be stricken from the report.	Page 34, Fourth Paragraph, final sentence: Comment addressed in revised Report. Staff deleted sentence from Report.	

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Comment No.	Author[1]	Comment	Central Valley Water Board Staff Comment Response	
83	San Joaquin River Group Authority	Page 40, Figure 3.8. Although not prominent, this figure is very illustrative. What it says is that present irrigation and leaching practices along with present water quality are good enough to allow moderately sensitive crops to be grown extensively on saline soils in the LSJR area. This should be a strong indicator that present water quality is not impacting yields or these crops would not be grown on saline lands which would only complicate a water quality problem.		Comment Noted
84	San Joaquin River Group Authority	Page 50, Second Paragraph, Second Sentence. The second sentence implies that wheat and barley are irrigated by furrow. This is not true; it is flood or basin irrigation. Have you ever tried to harvest wheat or barley with a combine in a furrow irrigated field? The bumps and jarring would destroy a combine and at close to $1 million each, I don't think they would risk this equipment to furrows.	Page 50, Second Paragraph, Second Sentence: Comment addressed in revised Report	
85	San Joaquin River Group Authority	Page 51, Final Paragraph. The word "Chlorine" is used twice in the paragraph and it should be "chloride".	Comment addressed in revised Report	
86	San Joaquin River Group Authority	Page 52, First Full Paragraph. We are unsure what this paragraph is suppose to say and recommend that it be eliminated from the report.		Page 52, First Full Paragraph: This sentence is a continuation of text from pg. 51 and further elaborates on Table 3.8. It should not be eliminated from the Report.
87	San Joaquin River Group Authority	Page 67, Last Line in the Third Paragraph and the First Line in the Fourth Paragraph. These two sentences read exactly the same. Should one come out?	Page 67, Last Line in the Third Paragraph and the First Line in the Fourth Paragraph: Comment addressed in revised Report	
88	San Joaquin River Group Authority	Page 73, Second Paragraph, Third Sentence. It implies that not having the 5% estimated salt dissolution in the model is a negative. In fact it is not. If you assume a 5% estimated salt dissolution, you can also figure approximately the same level of salt extracted by the plant (crop) that is also not accounted for in a steady state model. Both of these would likely cancel each other out.		Comment Noted
91	San Joaquin River Group Authority	Page 89, First Paragraph, Line 10: Westcott should be "Westcot".	Page 89, First Paragraph, Line 10: Comment addressed in revised Report	

[1] U.S. Bureau of Reclamation letter dated May 25, 2010
City of Tracy letter dated April 20, 2010
Central Valley Clean Water Association letter dated June 4, 2010
Eco Logic Engineers letter dated May 19, 2010
San Joaquin River Group Authority letter dated May 19, 2010

Attachment 2

Technical Public Comments and
Lower San Joaquin River Committee
Responses

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Comment Subcategory	Comment No.	Comment Author	Comment	Comment Responses From Central Valley Water Board (2010)	Comment Responses From the LSJRC	April 2016 Central Valley Water Board Comments
Models	18	Central Valley Clean Water Association	"Therefore, the final report should clearly separate the two major recommendations: the first being the recommended model for use in the State Water Board's current revaluation of salinity objectives, and the second being the additional study and investigation required to address uncertainty of model inputs and the validity of alternate models to determine the most appropriate models for evaluating salinity objectives." **See Water Board end note No. 1.**	Refer to CV-SALTS.	Separate references regarding models, inputs, and assumptions are provided to outline these sorts of questions. Where possible, relevant literature has been quoted and cited. Technical performance is the focus of this summary, and should help CV-SALTS to decide among technical options in these regards. It should be recognized that technical information cannot finally resolve policy-based questions and choices. For example, after the levels of conservatism and risk related to alternative technical approaches has been clearly defined, the question of which level of conservatism and certainty is needed or desirable must be answered before a preferred approach can be selected.	This CVCWA comment is on Dr. Hoffman's 2009 draft South Delta Crop Tolerance Report recommendations. Although the LSJR report did not make recommendations, Dr. Hoffman's response to the comment was included in his final report, dated January 5, 2010.
Models	20	Central Valley Clean Water Association	"CVCWA is concerned with the levels of conservatism that may be embodied in the final model. It is entirely appropriate to review the available information to develop the model inputs and select appropriately conservative values." **See Water Board end note No. 1.**	Refer to CV-SALTS.	See response to comment 18.	
Models	21	Central Valley Clean Water Association	"Finally, the use of a steady state model over a transient model will result in a conservative salinity objective for equivalent inputs. CVCWA recommends adding a list of the conservative assumptions made in selecting model parameters, so there will be confidence that the modeled result will be protective of the irrigation use with out being needlessly stringent." **See Water Board end note No. 1.**	Ultimate model selection to develop a new WQO is outside the scope of this Report but it's an issue that the CV-SALTS committee can evaluate further.	See response to comment 18.	Steady-state and transient model assumptions are presented in Chapter 5 of the LSJR Crop Tolerance Report..
Models	24	Central Valley Clean Water Association	"The transient modeling approach should be utilized in the evaluation of the salinity objective. Information listed in the Hoffman Report and presented at the August 13, 2009 workshop point toward the ability of transient models to accurately replicate irrigation practices and crop responses to more robustly calculate the proper salinity objective. The steady state models calculate more conservative salinity requirements due to the fact that they cannot account for the natural variations that occur in the growing cycle. In the event the State Water Board determines the use of a steady state model is appropriate for the current salinity objective evaluation, the specific model should be carefully selected." **See Water Board end note No. 1.**	The Draft Report was only intended to present modeling results from a steady-state model. This is an issue that CV-SALTS may pursue further.	See response to comment 18.	
Models	26	Central Valley Clean Water Association	"…it seems appropriate to clearly define why the recommended model is selected and why other models were not selected." **See Water Board end note No. 1.**	This report was only intended to present results from a steady state model, not to make a final decision about what model should be used to develop a new WQO.	See response to comment 18.	Model selection will be addressed in the staff report in support of the proposed amendments to the Basin Plan Control Program for Salt and Boron Discharges into the Lower San Joaquin River.
Leaching Fractions	9	U. S. Bureau of Reclamation	"Using [the data in Section 3.13.2] to calculate leaching fraction and to draw conclusions about irrigation management is a premature. Given the uncertainty in the leaching factor assumption, and the significance of this assumption in determining water quality objectives, CVSC should consider funding studies to reduce this uncertainty."	The additional studies suggested here would have to approved/coordinated with CV-SALTS.	See response to comment 18. Leaching fraction is an important factor in determining actual sensitivity since it mediates the relationship between applied water and soil salinities. Several of the issues around this parameter include: 1) whether or not leaching by precipitation is considered; 2) how to handle the consideration that leaching can be modified by irrigation management to avoid or reduce yield impacts of salinity on sensitive crops; 3) salinity of water taken up by the crop at a given leaching fraction can be calculated, but the results depend heavily on the assumed distribution of water uptake; the 40-30-20-10 distribution that is often employed is now thought to significantly exaggerate the level of salinity to which the crop is actually exposed; 4) irrigation systems influence leaching relationships; for example, drip irrigated soils contain zones where roots can tap water whose salinity is often approximately that of the applied water.	The choice of an appropriate leaching fraction for modeling in the absence of site-specific data was a policy decision made by stakeholders of the LSJR Committee and vetted with the CV-SALTS Executive Committee.
Leaching Fractions	59	San Joaquin River Group Authority	**Unrealistic leaching assumptions:** A portion of the modeling is done with unrealistic assumptions regarding leaching. The study uses leaching fractions of 0.10 or less for modeling production of almonds and alfalfa. A leaching fraction of 0.10 or less is impossible to achieve without very sophisticated irrigation technology that is presently not available in the study area.	Comment Noted. A given party could use leaching fractions that are applicable for their site specific conditions using the current model framework. However,	Comment and response are sound. We would add that when it comes to practices, it would be helpful to know what irrigators do, and what they could/would do, since irrigation practices are not static. See response to comment 18.	Results when a leaching fraction of 10 or less was modeled have been retained for the original report calculations.
Leaching Fractions	63	San Joaquin River Group Authority	**Actual leaching fractions may be higher than assumed:** The Study Report needs to take a closer look at actual leaching fractions (LF) in Western Stanislaus County. The tile drainage data presented in the Study Report shows that it may be 25% or higher and this is consistent with findings in the South Delta. Unfortunately the data upon which this conclusion is based is not a valid data set and the SJRGA is recommending the use of additional data that is in the Regional Board files. This new data will likely show that these high leaching fractions do exist as a result of present irrigation practices.	Comment noted. Staff appreciates efforts taken by SJRGA to share additional data sources for the tile drainage analysis. Additional data provided by the SJRGA was analyzed independently and compared to data from the Chilcott et al 1988 study. It should also be noted that not all data provided by the SJRGA was used, only drains within the LSJR Use Area were considered. Considering irrigation water salinity of 0.59 ds/m, average leaching fractions from the SJRGA data set was 0.22, the Chilcott study was 0.29 and when both data sets were pooled together the leaching fraction was 0.24. This additional analysis is attached as Attachment 1 to the Draft Report.(Could be pursued further by CV-SALTS).	Comment sound. No comment on response, as the underlying data are currently not available to our project team.	Evaluation of data found in Central Valley Water Board files has not supported the use of a higher leaching fraction assumption for modeling. These estimates in studies by Chicot, et al., which range from 0.13 to 0.84 in the LSJR Irrigation Use Area are dependent upon the salinity of applied water and tile drainage discharge and carry a low degree of certainty due to the lack of information regarding source of water present in the subsurface drainage. Therefore, policy decision of a leaching fraction of 0.15 vetted by the CV-SALTS Executive Committee, which is near the lower end of values estimated in those studies, has been retained.
Leaching Fractions	66	San Joaquin River Group Authority	**Water management practices for dry bean production will not change as water conservation measures are introduced:** One of the factors of that will need to consider in reviewing the water quality objectives for Lower San Joaquin River is the State mandate for increased water conservation by both urban and agricultural users. Mandated water conservation needs will not likely change the water management practices for dry bean production. The present production returns on dry beans will not allow the level of investment needed for improved irrigation practices. As dry beans are planted for various reasons, including soil fertility improvement, it is unlikely that farmers will switch to a higher income cropping pattern. It is unlikely that water conservation will significantly change the leaching fraction. The primary reason is the continued need to pre-irrigate and the continued use of furrow irrigation. In water conservation efforts, the first and easiest water losses to control are those of surface water runoff. As these are a big component of the irrigation practices in Western Stanislaus County, they are likely to be the first to be controlled. This will leave deep percolation in the same range as it is now, in the range of 20-25%. This is the leaching fraction that should be assumed in future modeling when water conservation is assumed to occur.	Refer to CV-SALTS.	Generally agree with the commenter. A minor point that could be added is that, in certain circumstances (such as when beans are rotated with crops providing higher returns), it is possible that the higher efficiency irrigation system installed for the higher-return crop would also be used to irrigate the beans. In this instance, the leaching fraction might be reduced from that observed under furrow irrigation. However, it has been shown that the quantity of leaching should be interpreted differently when (for example) drip irrigation is employed. The wetted zone in which crops take up water can sometimes be maintained at about the same pore water salinity as that if the applied water. As a result, an equivalent level of salinity is less likely to reduce the yield of a sensitive crop. Thus, even where conversions in irrigation method are implemented, it would be incorrect to assume that this would render the cropping system more sensitive to salinity in applied water.	See April 2016 Water Board response to Comment No. 66.

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Comment Subcategory	Comment No.	Comment Author	Comment	Comment Responses From Central Valley Water Board (2010)	Comment Responses From the LSJRC	April 2016 Central Valley Water Board Comments
Leaching Fractions	92	San Joaquin River Group Authority	Page 96, Alfalfa Write-up. The analysis shows that at no time would a yield loss occur at .15 LF even under the most extreme conditions and EC levels near 2.0 dS/m. This is consistent with the production practices in the Imperial Valley of California where similar conditions exist and no yield losses occur. There is extensive discussion however about high evaporative demand and not being able to get enough water into the soil to meet both ET and LF. This does occur during short periods in the hottest summer periods but stored soil water normally meets all crop demands during this period. The impact of salinity is not short-term; it is a buildup of salts over a season or several seasons. This does not occur in the San Joaquin Valley due to soil conditions and irrigation practices. The alternative LFs of .07 and.10 are unreasonable and unachievable with present technology and irrigation practices in the San Joaquin Valley. LF is likely to be closer to 0.20 and should have been included in the modeling effort results presented in Table 6.1. We recommend that the .20 LF model results be presented in Chapter 6 as a large portion of the alfalfa is grown on or near the high water table lands in the LSJR area. Table 3.10 shows that these lands are well drained and likely to have LF closer to .20 than to .07.	The current model framework allows for choice of different leaching fractions based on site specific conditions.	Commenter observations are consistent with our own. Agree with response that the current model framework accommodates alternative inputs. However, previous comments and responses regarding conservatism inherent in assumptions and models should also be taken into account before additional resources are invested in model runs.	
Planting and Harvesting Dates	57	San Joaquin River Group Authority	The Study Report needs to clarify the timing and cultural practices used for dry bean production in the Lower San Joaquin River to reflect present-day practices. Two issues are critical to this analysis: **Planting Dates:** 1. Dry-beans are not planted before the first weeks of May yet they are assumed to be planted as early as April 1st.	Page 86, Table 5.3: The Report acknowledges that there are three possible planting dates with corresponding crop coefficients for the San Joaquin Valley. One of the example planting dates is May 1st as shown in Table 5.2. In addition, model output scenarios (exponential distribution) associated with each of the three planting dates at three varying leaching fractions are given in Table 5.3. Moving forward, CV-SALTS could choose any of the suggested dates as they see fit.	See response to comment 92.	
Planting and Harvesting Dates	89	San Joaquin River Group Authority	Page 74, Third Paragraph. This assumes that the first cutting of alfalfa occurs by March 13th. This needs to be confirmed with the growers in the area as this seems very early for this growing area. An early date like this may be applicable to the Southern San Joaquin Valley, but not here. It is unlikely also that any irrigations would take place prior to the middle of March as the ground is still wet from the winter and putting on additional irrigation water at this time would delay the soil warming up from the winter period and this is most important to an alfalfa grower.	Comment Noted. Staff endeavored to follow a similar approach to Dr. Hoffman based on dates given by Goldhammer and Snyder, 1989. As noted by the commenter, additional information from alfalfa growers could be helpful and can be pursued should CV-SALTS consider it necessary.	See response to comment 92.	CV-SALTS current policy is to provide target crop protection in all but the fifth percentile of dry years. This implies that climatic regimes analyzed would include statistical droughts, during which the influence of salinity might be more severe. One of the ways that this would play out would be the potential for earlier planting, and earlier irrigation during drought years.
Planting and Harvesting Dates	90	San Joaquin River Group Authority	Page 74, Fourth Paragraph. The dates for almond production need to be confirmed with growers on the Westside of the San Joaquin River. An almond tree begins to shut down with the onset of short days and colder night time temperatures. The largest change in night time lows occurs in October and it could be assumed that little crop growth or water use would occur after October 15th. It is also unlikely that an almond grower would irrigate his trees prior to the first two weeks of April. Because of winter rains and cold soil temperatures, irrigating prior to this time may cause root oxygen stress that could cause fruit drop or fruit delay due to the cold soil temperatures. It takes a wet soil much longer to warm up than one that is dryer. While you can define the growing season (and it does vary from year-to-year), you need to focus the steady-state modeling on the irrigation season which will normally not start until April 1st and will likely end by October 15th even though growth will be occurring outside that period. The irrigation period is when San Joaquin River water may be used.	Comment Noted. Staff endeavored to follow a similar approach to Dr. Hoffman based on dates given by Goldhammer and Snyder, 1989. As noted by the commenter, additional information from almond growers could be helpful and can be pursued should CV-SALTS consider it necessary. Staff notes that modeling of alfalfa presents a bigger challenge than bean or almond due to the numerous harvest cycles. Consultant with Dr. Hoffman may be necessary should CV-SALTS want to pursue this further.	See response to comment 89.	Confirmed by stakeholders of the LSJR Committee.
Soil Water Uptake Patterns	25	Central Valley Clean Water Association	"Because of the demonstrated large variability in ability to replicate validation tests (depending on conditions, either greatly overestimating or greatly underestimating salinity requirements), the 40-30-20-10 model used in the Ayres and Westcott United Nations work does not appear as well suited to determine the salinity objectives in the southern Delta as the exponential model developed by Hoffman and van Genuchten, which replicated the validation data reasonably well. All parameters for the recommended model should be tabularized in the report, including the recommended values for the parameters specific for the critical crops in the southern Delta." **See Water Board end note No. 1.**	In Section 5.2, the results from both uptake models are presented in the Report. An additional tabular presentartion of results from the exponential model is presented in Table 6.1 (Pg. 122).	The comment appears to align well with literature on the topic. See response to comment 9. The full display of work and results in the report is helpful to reviewers. For a good combination of concision and thorough documentation, it is sometimes helpful to write the body of the report as clearly and visually as practicable, and to reference appendices in which data are presented more comprehensively.	
Soil Water Uptake Patterns	65	San Joaquin River Group Authority	**Need to recommend the use of the exponential model:** The SJRGA supports the development of a transient model for evaluating the crop tolerance of crops in Western Stanislaus County but in the absence of a valid transient model, the Study Report should recommend the use of the exponential steady state model over the 40-30-20-10 steady-state model. The 40-30-20-10 model does not represent the present state of knowledge regarding crop water uptake and would only compound the Study Report shortcomings since present crop tolerance data used in the model is over 50 years old.	The study Report recommends use of the exponential model (See Section 6.2.1).	Comment and response are sound. See response to comment 9. Transient models exist and have been reviewed in the literature (see Letey et al, 2011). These would appear to be options to be explored.	The report Addendum applies the exponential uptake pattern for additional Hoffman model runs.
Temporal Scale	74	San Joaquin River Group Authority	Page 5, Final Paragraph describes a figure on water quality for a series of years. It would be more helpful if this analysis was conducted by water year types to see whether the water quality differences shown are related to the water year type. This would require a larger data set than used here.	Page 5, Final Paragraph: Comment Noted. Staff endeavored to follow a similar approach to Dr. Hoffman which was by calendar year. As noted by the commenter, consideration of water year could be helpful and can be pursued should CV-SALTS consider it necessary.	Current CV-SALTS policy post-dates comments and responses, and suggests that, in the same way that the most sensitive crop in a locale might drive thresholds, so might dry years. See response to comment 89.	Figure 2.1 on page 5 was presented to show the cyclic nature of salinity concentration in the LSJR. The relationship between water year type/precipitation and salinity is documented in the modeling results of the study report presented in Chapter 5.
Temporal Scale	76	San Joaquin River Group Authority	Page 8. It would be helpful if a similar presentation could be done based on water year types as the cropping pattern likely also varies by water year type.	Comment Noted. Staff endeavored to follow a similar approach to Dr. Hoffman which was by calendar year. As noted by the commenter, consideration of water year could be helpful and can be pursued should CV-SALTS consider it necessary.	See response to comment 74.	Figure 2.2 on page 8 was presented to show the cyclic nature of salinity concentration in the LSJR. The relationship between water year type/precipitation and salinity is documented in the modeling results of the study report presented in Chapter 5.
Spatial Scale	78	San Joaquin River Group Authority	Page 17, Third Paragraph. There is no reason to spend additional time on developing the information for San Joaquin County as it makes up less than 2% of the total area.	Page 17, Third Paragraph: This Report addresses only the protection of one beneficial use agriculture (irrigation) of the many listed in the Basin Plan for the LSJR. Protection of each of the beneficial uses must be evaluated as part of the development of site specific water quality objectives. Thus irrespective of it's small size, adequate information needs to be developed for San Joaquin County not to inadvertently overlook any vital issue.	DWR crop cover data has now been joined into a Central-Valley-wide spatial layer, at least for the most contemporary surveys. Thus, county lines are immaterial when employing these data. On the narrower point of representation note that CV-SALTS' policy now holds that crops must occupy >5% of a crop sensitivity zone to be considered "major" and therefore to warrant automatic consideration in such an analysis. This policy post-dates the study in question. The 2% of the area represented by a minority county could conceptually tip the balance for a key crop. The GIS 5.2 report suggests that the location of sensitive major crops is important, since it is discharges flowing into irrigation supply recharge areas that are of interest. Thus, even if the 2% tips no acreage balance, the location of sensitive crops within this small area could be significant. This report and its findings are still not final.	Here is the "policy change" referenced in the LSJR Committee response to Comment No. 76: The 2010 draft report assumed that sensitive crops requiring salinity protection must cover at least one percent of the LSJR Use Area; the 2016 addendum implements the LSJR Committee's policy that sensitive crops requiring salinity protection must cover more than five percent of the use area.

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Comment Subcategory	Comment No.	Comment Author	Comment	Comment Responses From Central Valley Water Board (2010)	Comment Responses From the LSJRC	April 2016 Central Valley Water Board Comments
Cropping Patterns	79	San Joaquin River Group Authority	Page 18, Final Paragraph. The discussion shows an 8% decline in moderately sensitive crops and an 8% increase in moderately tolerant crops in 2000. In looking at the data in the table, you need to be careful in making too many interpretations from only two surveys. In 2000, the tomato processing plants were shifting to overseas and there was a serious reduction in tomato production. This may account for the changes in cropping patterns when only looking at two distinct years. The tomato production has since recovered in California. It may have been more helpful to look at the crop production figures complied by the individual water districts as these are done annually. To keep the amount of effort in perspective, the SJRGA recommends this be done for the three crops analyzed in this report.	Page 18, Final Paragraph: Comment Noted. Staff endeavored to follow a similar approach to Dr. Hoffman. However, as noted by the commenter, should CV-SALTS consider it necessary, further data could be solicited from individual water districts.	Crop data are published by water districts on an annual basis. They are helpful for examining inter-annual trends. DWR data are valuable because they show the location of crops, which these reports do not. However, DWR crop mapping is completed on a rotational basis, approximately each 7 years in each county. There is a discussion of the use of crop data for these analyses in the CV-SALTS GIS Task 5.2 report. One of the points made, after some discussion with producers, is that contemporary (the most recent) crop mapping is the most indicative of probable future land cover. This is because farmers integrate more variables than we can model in planting decisions, and are very up-to-date. Also, changes in cropping patterns at a macro (not field) level is more directional than cyclic, because this is the manner in which market, infrastructure, and environmental changes occur. Nevertheless, future changes need to be monitored and accommodated. It is just that they cannot be reliably predicted by looking at past fluctuations. This discussion too postdates the report and comments. It is also possible to map more current crop distributions by employing publicly available data, and an effort like this is being considered for inclusion in the CV-SALTS ICM Phase 2 workplan.	The LSJR Committee response to Comment No. 79 mentions one of the points made by producers is that contemporary (the most recent) crop mapping is the most indicative of probable future land cover. The study report addendum utilizes a crop survey conducted by the LSJR Committee in 2014.
Cropping Patterns	80	San Joaquin River Group Authority	Page 26, First Full Paragraph. This same comment applies here. This decision may be based on economics, water supply availability and a variety of other factors none of which may be related to water quality. This is the short comings of using a survey that was only conducted once every ten years.	Comment Noted. Staff endeavored to follow a similar approach to Dr. Hoffman. However, as noted by the commenter, should CV-SALTS consider it necessary, further data could be solicited from individual water districts.	See response to comment 79.	See April 2016 Water Board response to Comment No. 79.
Cropping Patterns	81	San Joaquin River Group Authority	Page 28, First Full Paragraph and Figure 3.5b on page 31. The reduction in dry beans could be related to tomato prices, water availability or a number of factors. It is doubtful that it was related to water quality as bean production like many field crops in the Westside is cyclic and primarily based on economics, not water quality. Again this is the difficulty of using two surveys which were often conducted ten years apart.	Refer to CV-SALTS.	See response to comment 79. Cyclic changes such as those mentioned may best be captured by examining Ag Commissioner or water district crop reports. They are not spatially presented, but do show acreage trends for a region.	See April 2016 Water Board response to Comment No. 79.
Effective Rainfall	55	Ecologic Engineering	"Page 79 Section 5.1.4 -- Surface evaporation would be reduced when soil surface is dry and there is no precipitation (i.e. August, September, and potentially October), which would increase Peff and decrease the resultant soil salinity. Bypass flow and surface (or sub surface) run off would reduce Peff and increase soil salinity."	Comment Noted. The scenarios mentioned by the commenter are feasible but may require doing some modifications to the steady state model to investigate their occurrence. Should CV-SALTS want to investigate this further, it's advisable to contact Dr. Glenn Hoffman before any Steady State Model modifications are performed.	Although adjustments could be made to a steady-state model to reflect these exceptional conditions, transient conditions such as those cited are probably best captured in a transient model.	Refer to Water Board 2010 response to this comment.
Effective Rainfall	60	San Joaquin River Group Authority	**Winter Rainfall assumptions used in crop models are extremely conservative:** The modeling conducted as part of this study is being done with extreme conservatism in the assumptions used. These need to be corrected. Two assumptions illustrate this: 1. Estimate of effective rainfall using soil evaporation rates that do not reflect reality during the winter period.	Page 48, Figure 3.11: Comment Noted: Soil evaportation is function of the crop coefficient and estimated bare soil evaporation and is a component of effective precipitation. CV-SALTS may modify soil evaporation rates to reflect reality during the winter period. However this would need modifications to the current model settings. Staff advises to contact Dr. Hoffman.	Methods for estimating effective rainfall probably warrant review relative to literature, given their importance to these types of calculations. Dr. Hoffman and other experts like him are good resources.	Refer to Water Board 2010 response to this comment.
Effective Rainfall	61	San Joaquin River Group Authority	**Winter Rainfall assumptions used in crop models are extremely conservative:** Effective rainfall is assumed to be part of crop ET while in reality it also plays a major role in salinity control in any Mediterranean climate. This role of effective rainfall during the winter irrigation season has been left out of the report. This analysis needs to be conducted and the impact of winter rains on leaching and salt control needs to be fully evaluated. The lack of this analysis further validates the need for development of a transient model	In the model, effective rainfall is not assumed to be part of crop ET. Effective rainfall is a function of growing season precipitation, non-growing season precipitation less the bare soil evaporation. Crop ET is a product of the crop coefficient and reference evaporation. As illustrated in Table 5.1, the model computes (for both exponential and 40-30-20-10) "I2" which is the amount of irrigation required to maitain a given leaching fraction, considered in this computation is the crop ET and effective precipitation. Hence, the role of effective rainfall during the winter irrigation season was not left out of this Report. (can be pursued further by CV-SALTS).	It may be useful to clarify parameters that influence the amount of leaching accomplished by winter rainfall. Among these parameters are percentage of precipitation that infiltrates, and a clear statement about the fate of infiltrating water NOT partitioned to satisfy ET, and how this is presumed to alter soil salinity.	Refer to Water Board 2010 response to this comment.
Pre-irrigation	58	San Joaquin River Group Authority	**Cultural Practices:** 2.Need to verify and consider that present-day cultural practices include pre-irrigations, which minimize or eliminate any potential salinity impacts during germination and seedling emergence as well as greatly reduce salinity control throughout the growing season.	Comment Noted: This would need potential adjustments to current model settings. E.g. for the "I2" term: amount of irrigation required to maintain the leaching fraction (also accounts for precipitation:See Table 5.2), consideration has to be made to exisitng soil mositure conditions resulting from pre-irrigation. Staff advises further discussion with Dr. Hoffman before making model modifications.	Timed flushing of the upper root zone before establishment is not captured in steady-state models. Thus, transient approaches should also be considered among the options to resolve this issue.	
Groundwater	50	Ecologic Engineering	"Page 59 Section 3.12.2 -- Well level data from the DWR is collected from wells with several purposes, and generally the wells are used for production. A production well will likely be screened at deeper interval than that associated with shallow groundwater. Therefore, data from these wells may not reflect the depth to shallow groundwater."	Page 59 Section 3.12.2: Groundwater basins throughout Northern California are monitored to determine water quality and related factors affecting beneficial uses. The DWR wells referenced in this study are not production wells. The DWR data source clearly states that the wells are for monitoring shallow groundwater. DWR conducts comprehensive assessments on a 3 to 4 year rotation to determine general chemical characteristics, including mineral, nutrient, heavy metal concentrations, organic and bacterial concentrations. Most of the sampled wells are either irrigation, stock, or domestic wells.	In work that post-dates this report and previous comments, CV-SALTS has compiled a relatively thorough database of groundwater data, and some water quality coalitions have done the same for their locales. These data can be screened to focus on wells that best represent shallow groundwater, but details regarding screened intervals may yet be lacking.	Groundwater basins throughout Northern California are monitored to determine water quality and related factors affecting beneficial uses. The DWR wells referenced in this study are not production wells. The DWR data source clearly states that the wells are for monitoring shallow groundwater.
Groundwater	51	Ecologic Engineering	"Page 64 Section 3.13.2 -- There is no discussion with respect to depth of groundwater (Figure 3-17) nor the design or depth of the drains."	Page 64 Section 3.13.2: There is no discussion with respect to depth of groundwater because the study that this Report relied upon (Chilcott et al, 1988) specifically noted that data on shallow groundwater was not reported since the focus of the study was to monitor only actively discharging subsurface tile drainage systems. The Chilcott study further notes that previous studies (Deverel et al., 1984) have shown that shallow groundwater quality is closely associated with the differing soils and topographic position in the basin, however, the data collected in their study was not analyzed for this association. Staff's review of the Chilcott study did not reveal details on drain designs or depth.	Tile and open drain systems and operation, and resulting soil drainage conditions, influence water flow to layers below the root zone, and therefore the ability to effectively remove salts. Further, if saline shallow groundwater exists at shallow depth, then it can contribute salt.	Refer to Water Board 2010 response to this comment.
Soils	34	Ecologic Engineering	"Pages 13 - 16 Table 2.1. -- Moreover, for purposes relevant to soil salinity, limiting layer (slowest) saturated hydraulic conductivity should be reported."	Pages 13 - 16 Table 2.1: Comment Noted. However due to limited data range, SSURGO data base does not provide data on limiting layer. There may be additional sources of data, but they may be difficult to integrate with the SSURGO data unless they are geo-referenced.	The following soil surveys cover most of the area and appear to be available as downloads from SSURGO: Madera Area, Fresno County, Merced County, Merced Area, Stanislaus County, Western and Eastern parts. Minor areas are in San Joaquin and Stanislaus Northern Part. Normally profile features such as limiting layers, although not called out explicitly, can be extracted with Soil Data Viewer, but the queries may be more complex. Once extracted, they can be mapped and used in analyses.	

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Comment Subcategory	Comment No.	Comment Author	Comment	Comment Responses From Central Valley Water Board (2010)	Comment Responses From the LSJRC	April 2016 Central Valley Water Board Comments
Soils	36	Ecologic Engineering	"Page 34 Section 3.3.2 -- The depiction of saline and/or sodic soils appears to be a relic of the Soil Survey's used. Saline and sodic soils all occur in the Eastern Stanislaus Area Soil Survey, which was mapped prior to being published in 1964, and incorporated salinity classes into map units. The 1992 San Joaquin Soil Survey and 2002 Stanislaus County, Western Part Soil Survey did not incorporate salinity classes into the map units. The lack of salinity classes in the later survey's is largely attributable to high variability in the salinity of a soil series associated with irrigation water source and management (e.g. Fresno slightly saline vs. Fresno strongly saline, same soil different salinity) and to advances in surface water supply and engineered drainage in the area since the 1960's. Soil chemical data collected and provided with the later soil surveys should be reviewed to determine if there are potentially saline and/or sodic soils in this greater portion of the irrigation use area."	Page 34 Section 3.3.2: Soil chemical data collected and provided with the later soil surveys wasreviewed to determine if there are potentially saline and/or sodic soils in the greater portion of the irrigation use area as suggested by the commenter. However, since the information provided by NRCS is not geo-referenced, it's challenging to translate any specific information to the LSJR Irrigation Use Area.	Soil survey data is tied to mapping units, which are normally in shape files. Therefore, it is possible to associate soil properties with locations, and in this sense (and others) soil survey data is geo-referenced. However, these associations are determined on typical mapping units at particular locations, then extrapolated to all areas that fall within that mapping unit, whether actual measurements were made there or not. Salinity is indeed strongly influenced by water management, and thus can go different directions in the same mapping unit, depending on whether and how it is irrigated and drained. Rather than using soil salinity data as a single parameter taken at face value, it may be more helpful to look at it in conjunction with other indicators of how salinity might have changed. Some of these are crops grown, salinity of water supply, presence or absence of subsurface drainage facilities, and type of irrigation system. Factors like limiting layers and drainage class can also be helpful. There is a more basic question of how saline soils affect interpretation of AGR narrative standards. If a soil is already saline, is it determined that fresh water is needed to reclaim it, or is it assumed that since soil reclamation has not been maintained, the land is going to be saline no matter the irrigation water quality? Both cases probably exist, and might be distinguished by examining the factors just listed. More broadly, saline soils were mapped along a sliver of the eastern margin of the study area, and therefore do not seem to play much into the analysis. Due to their small acreage, trends associated with their use might not provide much insight.	
Soils	41	Ecologic Engineering	"Page 40 Section 3.4.2 -- Review of the coefficient of linear extensibility (COLE) for soils mapped in 1964 would allow for evaluation of shrink-swell potential."	Page 40 Section 3.4.2: Staff's initial assessment found that it was more appropriate to use the shrink-swell rationale provided by NRCS for Merced (1990), San Joaquin (1992) and Stanislaus (1992 and 2002). Staff found the Eastern Stanislaus Soil Survey for 1964 and review of this survey did not yield any information related to the COLE index. In addition, Staff's ability to relate any information to the LSJR Irrigation Use Area would be limited since this data is not geo-referenced. However, this is an issue that CV-SALTS can take for further investigation to verify shrink-swell soils in the Irrigation Use Area.	Normally there are data in a soil survey such as those cited regarding clays of this type.	Refer to Water Board 2010 response to this comment.
Soils	43	Ecologic Engineering	"Page 40 Section 3.4.2 -- Shrink-swell and bypass flow are a major process affecting water movement in the use area and needs to be addressed with respect to irrigation and soil salinity management. There is potential that high shrink-swell potential soils may require increased leaching fractions when compared to low shrink-swell soils to allow for leaching salts from the entire root zone. However, bypass flow in soil cracks may actually be beneficial to controlling soil salinity (see Crescimanno and Garofalo, 2006. Soil Science Society of America Journal 70: 1774-1787)."	Page 40 Section 3.4.2: Comment Noted. Addressing high shrink-swell soils through increasing leaching fractions for the LSJR Irrigation Use Area when compared to low shrink-swell soils to allow for leaching of salts from the entire root zone is a major decision that CV-SALTS could address as is necessary.	We do not have access to Dr. Hoffman's piece (Appendix A) on shrink-swell soils. It would be helpful to review it. Where it can be demonstrated that higher leaching fractions are in fact required to maintain a given level of root zone soil salinity, this should be taken into account.	
Soils	45	Ecologic Engineering	"Page 46 Section 3.5.2 -- Based on widespread shrink swell potential in the use area, there is great potential that initial rainy season storms will be largely ineffective in providing moisture to the root zone. Additionally, high clay content and low hydraulic conductivities of the soils may increase surface runoff and reduce effective precipitation. Further, subsurface drains may remove precipitation that would otherwise be stored in the root zone. Figure 3.11 shows at least five years where Png is below the Es, and several years have Png below 10 inches, the level necessary to reduce irrigation requirement by 4 inches."	Page 46 Section 3.5.2: We don't have actual field soil moisture data available. Such data would be helpful in confirming the scenarios noted by the commenter. The scenarios given by the commenter are potentially feasible but site specific data would have to be collected to confirm them. CV-SALTS could follow up on these issues in case field studies are conducted in the LSJR Irrigation Use Area.	The types of processes discussed are better handled in a transient model.	The scenarios given by the commenter are potentially feasible but site specific data would have to be collected to confirm them. CV-SALTS could follow up on these issues in case field studies are conducted in the LSJR Irrigation Use Area. CV-SALTS did not perform case field studies.
Follow-up Studies	27	Central Valley Clean Water Association	"Additionally, the recommendation should clearly include: (1) additional studies necessary to provide confidence in other models or approaches, and (2) provisions for the objectives to be reconsidered when new information becomes available from the recommended studies and transient models or CV-SALTS, possibly through the triennial review process." **See Water Board end note No. 1.**	Refer to CV-SALTS.	See response to comment 18. When and if models and inputs are evaluated for potential use, it will be very helpful to those performing the evaluation if CV-SALTS can provide framing policy decisions first. Potential policy questions might include, 1) the level of precision required on various classes of results, 2) the desired level of conservatism, 3) the degree to which up-to-date literature supporting the approach should be collected and used to support recommendations, 4) general guidelines on how to balance technical complexity of analysis with the need to get the right answer, and 5) the importance of avoiding false positives, or collateral damage, but implementing regulatory limits that are more stringent than actually necessary to protect crop yields. It might also be the case that a one-size-fits-all technical framework is unnecessary, and that, based on local needs and conditions, some groups might reasonably opt for simple tools with relatively broad margins of error, while others might find it worthwhile to invest more to achieve greater precision, so that they are more sure that regulatory limits are nearer to the minimum that provide adequate protection to the BU.	See April 2016 Water Board response to Comment No. 18.
Follow-up Studies	56	Ecologic Engineering	"Page 123 Section 7 -- Additional future evaluations should include the following: 1. Field studies of bean should be accompanied by comparison of uptake models to determine if one more closely predicts bean water uptake. 2. Potential leaching fractions should be evaluated as well as actual leaching fractions in the LSJR area to determine possible potential salinity control measures. 3. The extent of subsurface drains in the LSJR area should be evaluated, since several soils could not be properly managed for salinity if artificial drainage was not provided. 4. Further, the effects of soil salinity management on LSJR salinity should be evaluated."	Page 123 Section 7: Section 6.2.1 of the Report notes that actual selection of a salinity threshold(s) protective of the agriculture (irrigation) beneficial use will involve a number of policy considerations some of which are mentioned by the commenter such as leaching fractions. In addition, to the degree that the requested studies go beyond date what is stated in the draft report, CV-SALTS and Regional Board staff may evaluate appropriateness of inclusion.	Special studies can be useful but also relatively costly and time consuming. It is therefore best to exhaust existing literature and knowledge (for example, of similar studies), and then to focus on the remaining, unresolved, yet important questions.	Refer to Water Board 2010 response to this comment.
Follow-up Studies	64	San Joaquin River Group Authority	**Present crop tolerance curves for dry beans may be overly conservative due to the database being used:** The study report is based on the 100%-yield potential defined by the 1977 Mass and Hoffman analysis that established crop tolerance curves for major crops. Unfortunately, the dry bean data used for this analysis is now over 50 years old and does not represent more salt tolerant varieties used today and is likely over conservative. It is recommended that the Study Report strongly advise against the continued use of these data and it recommend that a new curve be established for dry beans.	Comment Noted. In Section 7. "Next Steps", the Study Report recommends updated field studies for relevant cultivars of dry beans that span the entire bean growth cycle. The study Report can not recommend against the continued use of the 1977 Mass and Hoffman analysis with no current peer reveiwed study in place (with updated curves) that suggests otherwise.	USDA Salinity Lab should have apparatus and ability to perform yield reduction/salt tolerance studies with modern cultivars, if needed. Other field studies could be planned carefully with investigators to meet CV-SALTS needs as efficiently as possible.	Refer to Water Board 2010 response to this comment.

End Note No. 1: This comment and the others that Central Valley Clean Water Association submitted were actually for the State Water Board's draft report titled "Salt Tolerance of Crops in the Southern Sacramento-San Joaquin Delta", prepared by Dr. Glenn J. Hoffman.

Attachment 3

Policy Public Comments and
Lower San Joaquin River Committee
Responses

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Comment Subcategory	Comment No.	Author[1]	Comment	LSJRC Response
MUN Beneficial Use	1	U. S. Bureau of Reclamation	"Salinity is regulated in the South Delta and the Lower San Joaquin River solely for the protection of agricultural beneficial uses. Drinking water is protected as a beneficial use in the western Delta at Delta intakes, at a higher salinity than the most protective existing agricultural standards. (Note, the Rock Slough chloride standard was set to protect a historic industrial beneficial use, and remains as a surrogate for bromide). There are no existing drinking water uses of the South Delta or Lower San Joaquin River, which would require permission from the California Department of Public Health."	Comment noted. All existing and potential beneficial uses will be reviewed when the Central Valley Water Board considers adoption of proposed amendments to the Basin Plan Control Program for Salt and Boron Discharges into the Lower San Joaquin River (LSJR).
Integrated Approach	2	U. S. Bureau of Reclamation	"The management of salinity in the San Joaquin basin should not be approached merely from a traditional Clean Water Act, one pollutant loading perspective. Water supply, environmental regulations, beneficial use needs, and especially economics should be fully determined and analyzed for the benefits, costs, and trade-offs of salinity regulation. CVSC should also consider the impacts/benefits of proposed actions on dissolved oxygen in the Delta."	Comment noted. Such considerations will be addressed by the Central Valley Water Board when it considers adoption of a proposed amendments to the Basin Plan's Control Program for Salt and Boron Discharges into the LSJR.
Temporal Scale	3	U. S. Bureau of Reclamation	"Unlike many other constituents, salinity impairment is neither permanent nor irreversible. The water supplies of the San Joaquin basin are prioritized to provide water supplies and to meet other environmental flow and water quality objectives. Periodic wet years already flush out these salts, and the system could be operated/regulated (through the WQCP process) to make salinity regulation a higher priority if important beneficial use protection is needed in the future."	The LSJR is on the CWA Section 303(d) list of impaired water due to elevated concentrations of salt and boron. Revised State Water Right Decision 1641 directed the Central Valley Water Board to promptly develop and adopt salinity water quality objectives for the LSJR Changes to this approach have not been recommended by the LSJRC.
Water Rights	4	U. S. Bureau of Reclamation	"In Section 1.1, the report identifies a list of water agencies that utilize San Joaquin River water. Unlike in the Hoffman Report, this report identifies water agencies that most likely have access to multiple water supplies. Because of the potential economic and environmental impacts, any regulation should carefully identify what actual water rights exist and under what circumstances those rights can be exercised. This information is crucial to interpreting this Draft Report. Existing water rights should not be expanded to include stored water as a result of salinity regulation."	Pg. 1 of the Study Report: "Staff's purpose in developing the LSJR Irrigation Use Area was to provide a general sense of the areas that may use irrigation water rather than an exact determination of use. Staff feels that this coarse level of assessment is acceptable for the purposes of this Report, and caveats that it is not intended to confirm any party's existing or potential water rights." Changes to this approach have not been recommended by the LSJRC.
Precipitation	5	U. S. Bureau of Reclamation	"In regards to riparian water rights on the Lower San Joaquin River, protections against crop yield reductions during drought years (low precipitation) are not warranted if the only source of flow during these time periods is stored flows. The precipitation value should be selected based on the conditions at which flow is available to riparian water right holders. These water right holders may have obtained other water supplies to improve their supply reliability. In general, protections against crop yield reductions during drought periods are not warranted if all crops within the region are suffering from drought conditions."	The LSJRC addressed the problem of yield reductions during a period of drought or low precipitation years by recommending an alternate EC WQO during such periods. See the Addendum to the Crop Tolerance Report for specific details. Also, see response to Comment No. 22.
Other Water Sources	6	U. S. Bureau of Reclamation	"This Draft Report only models the application of Lower San Joaquin River water to crop types. How does the periodic use of other (higher quality) water supplies on the same crops effect their long-term yields?"	It is beyond the scope of the Study Report to model use of other water supplies. The LSJR Committee agreed that the approach taken by the Salt Tolerance Report is reasonable because there are agricultural users of LSJR water that do not have access to other water supplies.
Precipitation	10	U. S. Bureau of Reclamation	"Similar to the existing salinity and boron TMDL, a more adaptively managed approach should be considered in any regulation. Given the sensitivity to precipitation, objectives that vary with precipitation levels could be explored, in order to minimize unnecessary impacts on water supplies."	For a discussion of a WQO that varies during extended dry periods, see response to Comment No. 5.

Comment Subcategory	Comment No.	Author[1]	Comment	LSJRC Response
Crop Protection	11	U. S. Bureau of Reclamation	"Again, the Regional Water Board and CVSC should carefully consider the economic underpinnings of salinity regulation. For example, should salinity regulations be established to protect water-intensive crops in a region with low water supply reliability, and who should bear the risk/cost of that decision?"	The salinity objectives proposed by the LSJRC are based on selection of the most sensitive crop in Reach 83 that is grown on at least five percent of the LSJR Irrigation Use Area. This is a policy decision that was vetted with the CV-SALTS Executive Committee.
Point of Compliance	14	City of Tracy	"As the Regional Board contemplates the proper salinity objectives for the lower San Joaquin River and southern Delta, the City would like to point out that hundreds of millions of dollars will be needed around the Delta for many of the municipal dischargers to consistently meet an end-of-pipe effluent limits that equate to the water quality objectives, even if those objectives are raised from current levels. Similarly, if all agricultural discharges currently regulated under the waiver need to meet these same objectives, the costs to farmers will be huge. At the same time, the City, as a water purveyor, strives to supply the cleanest drinking water available since that water, after usage by the community, ends up as influent to its wastewater treatment plant and is ultimately discharged back into the Delta. For these reasons, the City requests that the Regional Board carefully consider and balance each of the factors in Water Code section 13241 when establishing a revised Electrical Conductivity ("EC") objective for this region. Once reasonable EC objectives are determined, the Regional Board's main focus should then be on the implementation of these objectives as required by Water Code section 13242."	The comment seems to be directed toward the future proposed Basin Plan Amendment rather than the Salt Tolerance Report. However, the LSJR Committee recommended that the proposed Basin Plan Amendment allow for establishment of alternative compliance strategies that do not require end-of-pipe effluent limitations. (It should be noted that the city of Tracy and other municipal waste dischargers to the Delta do not discharge to the LSJR.)
Point of Compliance	15	City of Tracy	"Because the long term average values for EC have been demonstrated by years of data to maintained over time and because these objectives are not set to protect against short-term acute effects, the objectives should be set to apply only at identified, permitted water diversion points that are used to extract water from the River or Delta for irrigation or municipal supply purposes. Setting EC objectives to apply throughout the water body is unnecessary since these objectives are being set for off-stream use protection, not for instream uses such as aquatic life protection or recreational uses. This would provide dischargers (both point and non-point) with some level of dilution and mixing credit while still ensuring that the compliance points maintain the needed water quality to protect the AGR and MUN uses, where applicable. Alternatively, explicit mixing zones, dilution credit, or other variance provisions should be included in Basin Plan amendments incorporating the revised objectives."	The approach described by the commenter was considered by the LSJRC, but not recommended by a majority of the Committee's stakeholders. However, the Committee recommended that the proposed Basin Plan Amendment allow for establishment of alternative compliance strategies that do not require end-of-pipe effluent limitations.
Point of Compliance	16	City of Tracy	"Since there is no evidence that municipal discharges have caused the average values in the local waterway (outside a mixing zone) to exceed the currently applicable EC objectives, there is no need to over-regulate these sources of salinity as they have not been demonstrated to be the major drivers of salinity in the Delta. With a thoughtful and reasonable implementation policy, which does not require end-of-pipe effluent limitations equivalent to the objectives themselves, all uses can be protected while also reasonably regulating discharges to the River and Delta. In this financially difficult time for municipalities, the City urges the Regional Board to incorporate regulatory flexibility into any salinity objective adoption process."	This was an issue that received considerable attention of the LSJRC during development of recommendations for the Central Valley Water Board. The comment seems to be directed toward the future proposed Basin Plan Amendment rather than the Salt Tolerance Report. However, the Committee recommended that the proposed Basin Plan Amendment allow for establishment of alternative compliance strategies that do not require end-of-pipe effluent limitations.
Integrated Approach	17	Central Valley Clean Water Association	"As a preliminary matter, CVCWA encourages the State Water Board to coordinate this process for the development of South Delta objectives with the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) process. It is likely that information from the Hoffman Report will be evaluated and considered by CV-SALTS and it is imperative that the Hoffman Report not foreclose the use of other scientifically valid models by CV-SALTS."	The Hoffman report was the only available peer-reviewed soil salinity model available to the Central Valley Water Board or to the LSJRC. Furthermore, time and budget constraints prevented the use of transient models. The selection of the Hoffman model for the development of the EC WQOs in the LSJR does not preclude the use of other models in the future.

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Crop Protection	22	Central Valley Clean Water Association	"Additionally, the endpoint selected for the model is currently 100% yield of the target crops. Due to the variability in the natural environment, it is not reasonable to expect 100% yield for all conditions. Basing the objectives on 100% yield 100% of the time is analogous to setting an aquatic life or human health criteria value based on zero risk of impact, which is not reasonable. Moreover, the Porter Cologne Water Quality Control Act (Porter-Cologne) requires water quality objectives be set at a level that provides for reasonable protection of the beneficial use. (See Wat. Code §§ 13000, 13050(h), 13241.) Thus consideration should be given to determination of a reasonable yield target that reflects some level of risk. When considering a transient model, it may be appropriate to perform a continuous simulation using historical conditions, whereby the model may generate yields less than 100% due to conditions unrelated to the irrigation water quality. The historical yield generated by the model for conditions where the irrigation water quality is not a factor should be the benchmark for the yield."	The EC WQO proposed by the LSJRC for protection of the AGR beneficial was established using the Hoffman model and assuming the following CV-SALTS policies: must have at least a crop yield of 95 percent (for almond in this case), annual precipitation amount at least as much as a fifth percentile rainfall year, and the irrigation leaching fraction must be at least 15 percent.
Boron Analysis	62	San Joaquin River Group Authority	**There is no need for an independent analysis of Boron impacts**: The present study report cites the need to conduct an analysis of water quality impacts from boron in the Lower San Joaquin River. The SJRGA feel this would be a complete waste of resources. The entire study area is known to be a boron enriched area since the soils were developed from marine formations that line the western edge of the study area. In addition, it is well know that boron sensitivity is most pronounced in orchard crops including apricots, walnuts and stone fruits. The entire Western Stanislaus County is being converted to orchard crops and Patterson is known as the “Apricot Capital of the World”. These two factors alone should provide sufficient evidence that a problem does not exist in the area.	Even if boron impacts on agriculture have not occurred, there are boron WQOs for the LSJR in the Basin Plan . Therefore, a boron analysis will need to be included in the future proposed amendments to the Basin Plan's Control Program for Salt and Boron Discharges into the LSJR. A boron analysis was outside of the scope of the Crop Salt Tolerance Report.
Boron Analysis	70	San Joaquin River Group Authority	Page 2, Paragraph 2, second, third and fourth sentences: It is unclear what the inconsistencies were. When is the boron analysis scheduled and what will it include? Will it be done on a separate track from this effort? This same comment applies to Page 9, Paragraph 2. Also see our comments above on there not being a need for a boron analysis	Boron monitoring will be addressed in the monitoring and reporting section of the future proposed amendments to the Basin Plan's Control Program for Salt and Boron Discharges into the LSJR. Also, see the response to Comment No. 62.