# Seepage Management Plan Comments and Responses

A draft updated Seepage Management Plan was made available on January 10, 2017 for public review. Comments were due by February 6, 2017. Four comment letters were received and are included below, along with responses to the comments on the Seepage Management Plan and description of any changes made to the Seepage Management Plan in response to comments received.

FWA Comments on the Seepage Management Actions Draft Environmental Assessment (December 2016) (DEA)

1. Reclamation must include as part of the Proposed Action the steps it will take to quantify the quantity and areal extent of unexpected seepage from the Restoration Flows.

   The need for the Proposed Action is described in the DEA as follows:

   > "*1.1 Need for the Proposed Action*
   >
   > *As previously described, the release of Restoration Flows in accordance with the Settlement has the potential to cause seepage impacts to parcels in Reaches 2B, 3, 4A, and 4B of the San Joaquin River and the Eastside Bypass. Release of Restoration Flows is currently constrained by the potential for seepage impacts. The purpose of implementing the proposed seepage management actions is to account for these potential seepage impacts as authorized by the Act, and enable the release of Restoration Flows in a manner that is acceptable to landowners and is consistent with the Settlement, PEIS/R and Framework 5-Year Vision.*" [Page 1-4 of the DEA]

   In addition, the Proposed Action is described as including "*seepage easements or fee title land acquisitions on up to 11,519 acres of land along Reaches 2B, 3, 4A, and 4B of the San Joaquin River*." [Page 2-1 of the DEA] 1-1

   The Settlement includes the following requirements:

   > *"(c) In the event that the level of diversions (surface or underground) or seepage losses increase beyond those assumed in Exhibit B, the Secretary shall, subject to Paragraphs 13(c)(1) and 13(c)(2) relating to unexpected seepage losses, release water from Friant Dam in accordance with the guidelines provided in Paragraph 13(j) such that the volume and timing of the Restoration Flows are not otherwise impaired. With respect to seepage losses downstream of Gravelly Ford that exceed the assumptions in Exhibit B ("Unexpected Seepage Losses"), the Parties agree that any further releases or transfers within the hydrograph required by this Paragraph 13(c) and implementation of the measures set forth in Paragraphs 13(c)(1) and 13(c)(2) shall not increase the water delivery reductions to any Friant Division long-term contractor beyond that caused by releases made in accordance with the hydrographs (Exhibit B) and Buffer Flows…*" [Paragraph 13(c)]

   The only seepage losses assumed in Exhibit B of the Settlement downstream of Gravelly Ford are in Reach 2. No seepage losses are assumed in the other downstream reaches. However, the fact that "seepage management actions"

are required for the parcels being considered under the Proposed Action in Reaches 3, 4A, and 4B of the San Joaquin River by definition indicates that Unexpected Seepage Losses (USL) are anticipated in those areas.

The extent of USL must be determined as required by the Settlement, and the Secretary of the Interior (Secretary) is obligated to acquire water to replace the water lost in the areas where seepage was not anticipated in Exhibit B. The Proposed Action must include a description of the actions the Secretary intends to take in quantifying the extent of the seepage in all parcels that are subject to the seepage management actions.

2. In their seepage easements, Reclamation must retain jurisdiction over any landowner infrastructure improvements that have the potential to increase the quantity of the seepage caused by Restoration Flows.

   The DEA states the following:

   > "*With increased groundwater seepage occurring with Restoration Flows, agricultural productivity would likely decline due to increased (i.e., shallower) groundwater levels. Landowners and growers that continue to produce a crop on the property may take actions to improve productivity, such as installation of infrastructure to manage groundwater levels. At this time, it is unknown which, if any, landowners/growers would take actions and what activities the landowners/growers may conduct to improve productivity, as the specific options are highly dependent on local conditions and landowner preferences. Reclamation would have no discretion over and would not be involved in individual landowners' decisions regarding planning, design, environmental compliance, or construction of landowner infrastructure improvements. Landowners would need to comply with all applicable Federal, State, and local regulations related to any activities they decide to implement, including potential infrastructure improvements to manage groundwater.*
   >
   > *One example of potential infrastructure that landowners could decide to install are interceptor lines and lift pumps within agricultural fields. Interceptor lines are perforated pipelines installed in gravel to intercept sub-surface water that could enter the crop root zone. Collected seepage water would be discharged to the river, canals, and/or on-site drainage ditches, depending on the site-specific conditions and landowner discretion. Construction of interceptor lines would not change the classification of farmland under FMMP or Williamson Act contracts. Construction activities could temporarily take portions of land out of production during the construction period, but land would return to agricultural production after construction is complete. Installation of interceptor lines would help continue long-term agricultural use of the*

1-2

*land and maintain FMMP classifications*." [Pages 3-29 to 3-30 of the DEA]

If Reclamation is going to allow landowners of the lands on which a seepage easement is acquired to install interceptor lines to intercept seepage from the Restoration Flows, then Reclamation must require (and confirm) that any such installation does not increase the quantity of water that would be entering the sub-surface of those lands absent such interceptor lines. All seepage easements should include such a requirement. The requirement should include an analysis of the design of the interceptor line attesting that the design will not induce additional seepage, and a monthly reporting requirement of the volume of water intercepted for each easement must also be required. If Reclamation determines that additional seepage has been induced, the easement should require the amount of the induced seepage water be returned to the river, with Reclamation confirming the water is returned to the river.

**Response 1-1:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 1-2:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

February 6, 2017

Ms. Katrina Harrison
Program Engineer
San Joaquin River Restoration Program
San Joaquin River Restoration Program Office
MP-170, 2800 Cottage Way
Sacramento, California 95825-1898

**Re: Comments on 2017 Update to the Seepage Management Plan**

Dear Katrina:

I appreciate the effort that the Program is undertaking in revisiting the Seepage Management Plan (SMP) and attachments. The SMP was intended to be a "living" document, subject to updates and revisions based on new data, evidence, technical approaches or monitoring methods. Since the publication of the draft SMP in September of 2014, two-plus years of monitoring data alone justifies an update to the SMP. In addition, there is a need for the SMP to better accommodate operational realities of the San Joaquin River (SJR) system, including the need for Restoration pulse flows, accommodation of travel times of flows down the river below Sack Dam, and accommodation of transitions between flood control releases and Restoration Flows. 2-1

The 2014 SMP was very conservative (comments from Peer Review panel (PRP) at Section 5.3[1]) in a number of areas, only some of which (e.g. root zones and capillary fringe) are being addressed in the current Update . Conservative assumptions still pervade the SMP in numerous other areas, such as the use of 1:1 relationship of river stage and observation well, or the relatively limited use of historical well and crop data. As additional empirical groundwater data is collected (including current flood control release operations and forthcoming Restoration Flow operations), I am hopeful that increasingly sophisticated (and less deliberately conservative) techniques and relationships can be derived. Examples of more sophisticated techniques could include location-specific groundwater modeling capability, or baseline groundwater level maps based on water-year types. 2-2

It is a challenging undertaking to implement a seepage management protocol that will work effectively for 100 miles of river corridor and across numerous crop and soil types; however I am confident that the Program can further develop seepage management criteria that will: 2-3

- Reasonably protect landowner ability to continue agricultural operations
- Implement the Settlement in conformance with the Act
- Achieve the biological benefits of the Restoration Program
- Determine the incremental seepage impacts resulting from the release of restoration flows and develop the operational practices and projects to mitigate those impacts.

[1] Gurdack e. al. 2012. Peer Review of the San Joaquin River Restoration Program's Seepage Management Plan. SJRRP. http://www.restoresjr.net/wp-content/uploads/Groundwater/Seepage_Management_Docs/PeerReviewPanel_SMP_Draft_20121210.pdf

*Thomas R. Johnson LLC*

7090 Wells Ave, Loomis CA 95650 916-764-2268 Fax 916-652-0618 trjllc@zetabroadband.com

- Optimize the groundwater recharge benefits of Restoration Flows and contribute to reducing overdraft and subsidence along the River.

As the PRP noted: "The SMP provides reasonable measures to avoid the material adverse impacts from groundwater seepage but does not maximize the opportunities to release flows to the River" and I believe the current round of SMP updates are an important first step towards making the SMP more functional, and I look forward to working with the Program to develop and test the next round of data-driven SMP updates. 2-3

Regards,

Tom Johnson
Restoration Administrator

CC: Ali Forsythe, Program Manager, SJRRP
Chad Moore, Flows Coordinator, SJRRP
Regina Story, Civil Engineer, SJRRP
Emily Thomas, Hydrologic Engineer, SJRRP

**Response 2-1:** Thank you for your comments. Reclamation is committed to balancing the need to protect crops planted adjacent to the SJR from impacts due to Restoration Flows while also better accommodating operational realities of the San Joaquin River system. This Seepage Management Plan (SMP) update includes additional text in Section J.1.1.1 clarifying that unsteady HEC-RAS will be used to determine the increase in stage for pulse flows, which is less conservative than the steady-state model previously used and should better predict the increase in stage during pulse flows. Reclamation has also developed additional text in Section J.1.3 to clarify the two methods (1:1 stage method and drainage method) that may be used to evaluate Restoration Flow releases after flood control flows, when groundwater levels are anticipated to be above thresholds in many locations. The 1:1 stage method recognizes that there is a travel time as flood flows pass through the system, and evaluates the anticipated groundwater condition based on solely Restoration Flows. This section also allows for wells which exceed thresholds shortly following flood releases to not halt the release of Restoration Flows, provided that these wells are monitored daily, observed to drop in level, and approach a value below seepage thresholds.

**Response 2-2:** Reclamation recognizes that the SMP is conservative. As Restoration Flows continue to be released and additional data is collected, Reclamation will assess the potential to develop and use additional site-specific modeling tools or use data collected during flow release periods to predict groundwater levels without using 1:1 relationships. However, it will take time to develop a large enough dataset to conduct this analysis and remain confident that the SJRRP is avoiding material adverse impacts due to groundwater seepage of Restoration Flows.

**Response 2-3:** Thank you for your comment that the current round of SMP updates are an important first step towards making the SMP more functional. We look forward to working closely with you in the future.

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February 4, 2017

VIA E-MAIL

Ms. Becky Victorine
Bureau of Reclamation
2800 Cottage Way, MP-170
Sacramento, CA 95825
*rvictorine@usbr.gov*

**Re: Seepage Management Actions, Draft Environmental Assessment, San Joaquin River Restoration Program, December 2016.**

**Comments of the San Joaquin River Exchange Contractors Water Authority and San Joaquin River Resource Management Coalition**

Dear Ms. Victorine:

The following comments are submitted on behalf of the San Joaquin River Exchange Contractors Water Authority and the San Joaquin River Resource Management Coalition (referred to collectively herein for convenience as "Exchange Contractors"). The Exchange Contractors thank you for this opportunity to submit comments on the Draft Environmental Assessment (DEA) for the seepage management actions and Seepage Management Plan associated with the San Joaquin River Restoration Program (SJRRP).

The DEA proposes to increase restoration flows in the San Joaquin River to 1300 CFS as part of the San Joaquin River Restoration Program (SJRRP). The proposed action includes seepage management actions to compensate landowners for adverse impacts due to seepage caused by this increase in flows. (DEA, section 2.2) The only seepage management actions being assessed are what are considered realty actions, that is, the purchase of seepage easements or the

acquisition of some or all of the affected property. (Id). The DEA states that "most landowners with parcels that could be affected by groundwater seepage in the five-year vision have indicated an interest in Reclamation pursuing an easement as their preferred action to compensate for the potential effects of seepage in the resulting increase in groundwater levels on their parcels." (Id). Figure 2–1 on page 2–2 of the DEA sets forth a map of the area included in the proposed action. The area extends from a point somewhat below Mendota Dam to the Sand Slough Control Structure on the San Joaquin River.

If a seepage easement is acquired, it would be a permanent easement that would allow Reclamation to increase groundwater levels on all or a portion of the property. The easement would include the area of land predicted to be impacted by seepage caused by full restoration flows in accordance with settlement exhibit B (Restoration flow hydrographs). (Section 2.2, page 2–3) If Reclamation acquires fee-title, Reclamation would be able to increase restoration flows again to the full restoration hydrograph. Under either the easement or fee-title acquisition action, the property could remain in agricultural production or in the case of fee-title acquisition, Reclamation may retain the property for other uses.

In order to determine the extent to which a seepage easement must be acquired, Reclamation must consider the impact of seepage on the ability of the landowner to grow crops. In this regard, Reclamation has conducted a partial almond root zone study. Based on the studies conducted so far, Reclamation has recommended changes to the almond root zone as follows. The almond root zone depth would change from 9 feet to 6 feet. The capillary fringe buffer would change from a range of 0.5 inches-1 foot to a range of 0.5 inches-4 feet. As a result, the total groundwater threshold (the root zone depth plus capillary fringe thickness) would be revised from a range of 9.5-10 feet to a range of 6.5-10 feet with no change in the threshold in silt and clay type of soils. We understand this to mean that in silt and clay types soils the range would remain 9.5-10 feet. 3-1

The DEA mentions but does not analyze other seepage management measures that include but are not limited to the construction of slurry walls, seepage berms, drainage interceptor ditches or lines, or the installation of tile drains. (Id at pages 2-3, 2-4). The DEA states that project-specific environmental compliance will be completed as necessary for these other types of seepage management actions as they are identified as landowner-preferred options for specific parcels.

**Comments**

The Exchange Contractors have previously submitted comments to the PEIS/R. In those comments and in subsequent comments the Exchange Contractors established that there will be impacts from increased restoration flows of as much as three miles from the San Joaquin River. Those specific comments are incorporated herein by reference. 3-2

The Exchange Contractors have previously expressed concern regarding the segmentation or piecemealing of the restoration program. The seepage management approach taken in the DEA continues the concern regarding segmentation or piecemealing. The DEA only analyzes impacts of an increase in restoration flows up to 1,300 cfs. The logic is that this represents the next five year increment as set forth in the Revised Framework for Implementation (Framework). Yet, as the Framework sets forth, the program is a series of inter-related and inter-dependent actions. In order to successfully achieve the project purposes of establishing hydraulic connectivity and the restoration of Spring Run Chinook Salmon and Fall Run Chinook Salmon to the upper San Joaquin River, a series of actions are needed. Isolated actions taken alone will not achieve the project purposes. Contrary to Reclamation's assertion elsewhere, the isolated actions have no independent utility because they fail to fulfill any of the project purposes in and of themselves. The development of this project is akin to constructing a pipeline or other linear project where without the total interconnectedness of the project, the project fails. For this project to be a success, every link in the chain is needed. 3-3

Section 1.1 of the DEA describes that the need for seepage management actions is to enable the release of Restoration Flows in a manner that is acceptable to landowners and consistent with the Settlement, PEIS/R and Framework. As mentioned above, the only actions being considered in this DEA are realty actions including the acquisition of either easements or fee-title to land. Not included are physical actions that would actually protect land from the impacts of seepage. 3-4

The DEA proceeds on the premise that the only actions to be considered are the acquisition of seepage easements or fee-title on up to 11,519 acres of land along reaches 2b, 3, 4a, and 4b of the San Joaquin River. The DEA states that most landowners have indicated an interest in Reclamation pursuing an easement as their preferred action. Yet, Reclamation provides no citation or other evidence for this statement. Further, the Exchange Contractors are aware of landowners who would prefer to have their property protected rather than acquired. The protective measures include those that are mentioned in the DEA as physical actions. Further, the DEA fails to mention that Reclamation has entered into a contract with the Central California Irrigation District, a member agency of the Exchange Contractors, to develop three projects that would protect land from seepage impacts. To date, Reclamation has not given CCID permission to commence construction of those actions. The DEA fails to discuss this arrangement with CCID, the specific areas that are to be protected by these physical actions or the impacts that would result. Further, even if correct that a majority of 3-5

the landowners would prefer realty actions rather than physical protective measures, that does not provide a basis upon which to not analyze the impacts of the physical protective measures that will be necessary to protect property as flows are increased to 1300 CFS.

Reclamation states that where fee-title land is acquired, they would have the ability to increase groundwater levels on the property, thus being able to increase Restoration Flows in the San Joaquin River adjacent to the property. (*Id.*) Reclamation's premise is untested. What we do know is that seepage can extend well beyond the property adjacent to the river and effect properties as much as three miles away. Therefore, substantially raising the flow levels on a property that fronts the river where Reclamation has acquired fee-title could well result in flooding of adjacent lands that are down slope from the riverfront land. Prior to increasing flows beyond the most restrictive threshold level, Reclamation must develop a protocol for testing seepage impacts that extend well beyond the property for which Reclamation has acquired fee-title or a seepage easement. Damages could be fairly wide-spread under these circumstances. Reclamation should include in its environmental commitments the development of a monitoring program along with a 24-hour hotline, such as that which was included with the seepage management plan. 3-6

Another important consideration not addressed in the DEA is that flows at 1300 CFS will increase the width of the swath of impacts due to an enlarged floodplain. Lands that otherwise might not have experienced impacts at 1300 CFS will now Be exposed to new impact as a result of the wider floodplain. In other words, a floodplain at 1300 CFS of a far more prolonged flow results in very different impacts than the narrower floodplain. 3-7

A floodplain at 1300 CFS of sustained river flow results in very different impacts than the current flood conditions. The longer the "1300 CFS land" are flooded as compared to how they drain under historical flight patterns and flows, the further seepage will creep underground once it finds the sand strata to follow. The results will be impacts to adjacent land at new time intervals for longer of time. This is why the exchange contractors, and particularly the landowners and growers, have been pushing for regional projects to protect plans impacted at all flow regimes. It has been stated repeatedly that the local interest to not want A "hopscotch" approach to impacts. Altering the historic conditions create impacts that are currently unknown and will require new management practices. It is likely that impacted neighbors will sue the easement owners and reclamation unless interceptor lines are installed. 3-8

If Reclamation acquires fee-title to a particular property, it says it could lease the land back to a grower for agricultural production or retain the property for other uses. Reclamation has not identified any actions that could or would comprise the use of the property if it was retained for uses other than maintaining agricultural production. Reclamation should identify and analyze those foreseeable actions that would be among the actions taken should it acquire land in fee-title. 3-9

At DEA page 2-3, Reclamation describes the change that it's going to make in the almond root zone depth. Reclamation claims this change is based on best available science. What actions will Reclamation take if the threshold it is establishing proves to be inadequate? This inadequacy could occur with a property with a presumed threshold of 6.5 feet bgs, where soil circumstances dictate that a greater depth is needed than what would be presumed based on the crop being grown. It is possible that an easement could be acquired with the assumption that a 6.5 foot threshold was appropriate. Subsequently, when the river stage is increased and groundwater is brought to the 6.5 foot level, it could be discovered that due to specific soil characteristics, that a deeper threshold is needed. How will Reclamation address this issue? There is nothing in the DEA that discusses this circumstance. And of course, this circumstance could exist at the high end of the range for the threshold as, under certain soil characteristics, a 10 foot threshold could still prove to be inadequate. 3-10

Another factor that has not yet been analyzed is the rise in salts that will occur when seepage occurs. If flows in the river are maintained at levels that do not allow for adequate leaching of the soil, salt buildup will have adverse impacts on crops. This is one of the problems created as Reclamation is not taking a holistic approach to the entire growing environment for roots. While a broader range for a seepage threshold might sound reasonable, since some crops have a shallower roots zone than others, the fact is that the fields are all interconnected and seepage will find its way to various subterranean channels. 3-11

Salt management is an integral part of the equation that has not been fully addressed. Historically, farmers in this area have used a "rule of thumb" for planting of a backhoe pit to measure groundwater depth to ensure at least 10 to 13 feet in the Reach 3 area. While 10 feet might be "ideal", soil conditions are not ideal and site-specific characteristics will dictate the necessary level of safety.

Reclamation claims that the threshold of 6.5-10 feet is based on best available science. Yet, Reclamation provides no citation as to where that best available science supports a final conclusion of a threshold range of between 6.5 and 10 feet. 3-12

As part of the Seepage Management Plan (SMP) Reclamation has looked at thresholds at various monitoring wells. Appendix H to the January 2017 draft of the SMP contains tables setting forth thresholds for various crop types based on information at various monitoring wells. For example, in Table H-11, a threshold for palms was 10.9 feet. At the same time, at a different well but in the same reach of the river, the threshold for pistachios was believed to be 7.7 feet. Further down in the river, the threshold for almonds was 16.7 feet in one instance and 13.2 feet in another. (See results for monitoring wells at MW-09-55, 56, 8686, and MW-10-74). 3-13

As part of its review of the state of the science on appropriate root zone thresholds, a consultant for Reclamation, Land IQ, spoke with various experts on the question. For example, they spoke with Dr. Jan Hopmans from UC Davis who indicated it is difficult to

predict the extent of capillary rise in future field conditions. (Almond Field Study, Phase II: Draft Study Plan, July 2016, page B-1). Dr. Hopmans stated that doing field investigations might not refine or validate the capillary fringe based on published values for various soils because of within field variability. Dr. Hopmans opined that the best that could be expected would be to find a reasonable range based on published values and they would likely not be improved upon with field study. Yet, Dr. Hopmans opinion was not universally shared by the other experts. Further, there is no indication that Dr. Hopmans gave any particular value as a recommendation for a threshold.

Land IQ also spoke with Dr. Robert Hutmacher who also confirmed that measuring capillary rise and trying to determine a threshold will result in approximations because of field soils variability. He also did not provide any recommendation regarding a specific threshold.

Land IQ also talked with Dr. Charles Burt from Cal Poly. Dr. Burt indicated that the height of the capillary fringe could be different in the same soil with the same groundwater level because of a different evapotranspiration (ET). Due to this factor, Dr. Burt recommended doing field observations during the winter.

Land IQ also spoke with Dr. Mark Grismer from UC Davis. Dr. Grismer opined that capillary fringe can be a meter or more in fine soils. Dr. Grismer related some information about field study observations that he had made while working on fine soils in an orchard. Apparently river levels were rising and trees in some parts of the field were showing impacts, but others were not. He reported that observation cores had to go down as much as 15 feet to figure out what was going on. He cautioned that it is difficult to find specific thresholds to generally apply because of site-specific conditions. Like Dr. Burt, he recommended site-specific field investigation. 3-14

Land IQ also spoke with Mr. Jim Ayres of UDSA Parlier. Consistent with Dr. Burt, Mr. Ayres recommended that field studies should be done in winter when there is no ET in the orchards. He also agreed with Dr. Grismer that soil layering or stratification is very important to take into consideration. Due to this layering, while starting with a literature review is an acceptable place to start, differing field conditions make it much more difficult to figure out the overall effect on capillary rise due to that layering. (Almond Field Study, page B-5).

The literature review that was conducted supported the notion that even over a relatively small horizontal distance of as little as four meters in a medium soil the height of the capillary fringe could vary. (Almond Field Study, page A-7, citing *Ronen et al*. (2000)). Dr. Ronen's work was confirmed by *Cloke et al*. (2006) in their study of capillary fringe. (*Id*.)

It is evident that the height of capillary fringe can be quite variable. For example, Reclamation cited to the Roscoe Moss Company (1990) and their handbook of groundwater development which indicates that capillary fringe could be as much as 50 feet or more when

soils are composed primarily of fine particles that have a large surface area to volume ratio. (Almond Field Study, page A-6).

Finalization of the seepage management thresholds is contrary to the prior representations of Reclamation. Reclamation has not ascertained the actual appropriate seepage mansgemrnt thresholds applicable to growing and soil conditions in the reaches of the San Joaquin River where the Exchange Contractors customers are growing crops. As recently as the Phase II Almond Field Draft Study Plan in October 2016, Reclamation stated that site studies were going to be conducted and would be refined based on stakeholder input. Criteria that influenced capillary fringe was going to examine factors such as soil texture, groundwater elevation, soil type, pre-existing salinity or groundwater monitoring data, groundwater elevation, spatial distribution, the location of the site relative to orchards and irrigation, and other factors. These field studies were deemed necessary because Reclamation determined that the preliminary data review indicated that existing data does not represent deeper seepage threshold/groundwater depths. "Therefore, field soil investigations should encompass sites and soils with groundwater depths not represented by the existing data." (Almond Field Study, page 3-6). Reclamation also indicated that it was "clear from the literature review and preliminary expert consultation that published values for capillary rise in coarse soils is likely accurate, whereas published values for capillary rise in fine soils need field validation. Therefore, fine soils should be the primary focus of field validation experts, and should be represented in field studies if they are not already represented adequately by existing data." (Almond Field Study, page 3-6). In fact, Reclamation indicated that when field sampling cores are collected, soil types should be segregated by as small an increment as necessary so that soil types are known. Reclamation said a segregation of six inches or so was appropriate. (Almond Field Study, page 3-4). Finally, of key importance to fields with permanent crops, particularly trees, the Almond field study stated that "[l]iterature and preliminary expert review also indicate that tree roots affect capillary rise because of the action of water uptake. It is unclear at this time if capillary fringes are changed in thickness by the presence of tree roots. This may also vary with groundwater depth." (Page 3-6)

3-15

All of this uncertainty, plus the lack of field studies, together with the substantial risk of destroying permanent crops or even annual crops offer a wide area, militates towards the precautionary principle. In a discussion with representatives from Reclamation at the seepage management meeting on January 23, 2017 in Los Banos, California, Reclamation explicitly stated that it would reduce Restoration Flows even if only one landowner complained that its threshold was being exceeded. The uncertainty reflected by the experts and the literature suggests that there is a reasonably high likelihood that a threshold might be set at somewhere within the 6.5-10 foot range and be exceeded due to soil variation. Therefore, as urged above, it is essential that Reclamation provide for immediate reporting of these types of problems plus an opportunity to reopen the easement in the event that Reclamation has not provided a sufficient depth to groundwater threshold, including capillary rise, that is adequate to protect the landowner. Reclamation should allow for reconsideration of the threshold plus an

3-16

adjustment if in fact seepage damage has occurred at the threshold that was set for the given property.

A provision should be added to Section 2.3 of the DEA where among Reclamation's environmental commitments is the commitment to reduce Restoration Flows to a safe level if a landowner complains about impacts to his or her property due to rising groundwater levels or capillary rise impacts. 3-17

At page 3-1 of the DEA there is a citation to California Code, Sections 51290-51295. The reference should be to the California Government Code. 3-18

As part of the proposed action, Reclamation may be acquiring fee-title to property. To the extent that this property is inundated due to seepage, it could increase the salts in the soil. Reclamation has not identified any actions it will take to ensure that there is not a material salt buildup in the soils of lands that are no longer maintained for agricultural purposes. If these salts buildup, there is a likelihood that the salts will then be discharged to the San Joaquin River during some wet period. This could have adverse impacts on San Joaquin River water quality. 3-19

The DEA fails to analyze the environmental impacts of the seeping or flooding of properties on adjacent or distant properties. The DEA assumes a constant groundwater level and fails to analyze impact to other properties despite information from the PEIS comments of the Exchange Contractors that during high flow periods flooding can occur as mch as three miles away. Since the easements or fee-title are based on 4500 cfs flows, the DEA must analyze what is forseeable to occur when it utilizes the property it has acquired. 3-20

**Comments To Revised Appendix H of SMP Not Otherwise Included Above**

Section H.1.3. removed the reference to language concerning Reaches 4A, 4B, and the Eastside Bypass. The draft appendix (2016) indicated groundwater levels were reviewed based on the deepest groundwater conditions that existed from January-February 2012. Why was this reference removed? In its place was inserted new language that indicates for wells with ground water level measurement available from 2011-2016, without restoration or flood flows, the shallowist groundwater level over a 3-point moving average was used within that period. Please describe the differences between these two bases for comparison and the reason for the change. 3-21

Reference is made to the Reclamation Drainage Manual that generalizes a 2 foot depth for shallow rooted crops and a 6 foot depth for peach, walnut and avocado trees. Does the DEA rely on this generalized information to inform its decisions regarding an appropriate safe root zone for almond trees in the restoration area? 3-22

Section H.2.1.3 identifies some limitations to Reclamation's analysis. Among the limitations are soil type and irrigation methods; the effects of historically shallow water tables

on crop root depth or seasonal or long-term trends in the water table; no modification of the root zone buffer to adjust for the age of the crop; and that field crops are generally rotated each year which may require changing thresholds on an annual basis as cropping patterns change. Please comment on how these limitations affect the determinations made by Reclamation regarding the appropriate root zone depth. 3-23

Section H.2.2.3 contains an assumption regarding groundwater levels based on monitoring wells that the ground water remains the same for some 750 feet from the well. There is contrary information provided by the experts and literature as well as reported by local farmers that due to changes in soil characteristics, groundwater levels and capillary rise may change within a very short distance, as little as a few feet. 3-24

On page H-21, it is stated that capillary finge values used in the analysis include values from literature, input from university experts, and local observations. Did any of these local observations involve a study of almond root zones? If so, there is no identification of what analysis was made. 3-25

**Conclusion**

Thank you very much for this opportunity to comment. The Exchange Contractors strongly recommend that Reclamation not at this time set a final value for the threshold for seepage management purposes. Rather, the Exchange Contractors urge Reclamation to conduct the field studies that it has indicated to the landowners would be conducted. 3-26

Further, Reclamation should analyze physical actions where individual or groups of landowners have asked that physical actions be performed. Those should not be handled separately from this analysis. 3-27

Finally, the Exchange Contractors remain concerned that Reclamation is segmenting or piecemealing its actions and that by studying flows only to 1,300 cfs. and not all the way to 4,500 cfs., the impacts are being masked. The Exchange Contractors recommend that a more complete study be undertaken that includes the full range of Restoration Flows. 3-28

Respectfully yours,

Tom Berliner

Thomas M. Berliner
Duane Morris LLP

Attorneys for San Joaquin River Exchange Contractors Water Authority and San Joaquin River Resource Management Coalition

TMB/lvs

**Response 3-1:** Reclamation has conducted an almond root zone literature review and proposed changes to the almond root zone depth to 6 feet, the result of a 5 foot effective root zone and additional 1 foot buffer applied by Reclamation. The capillary fringe buffer is proposed to range from 0.5 feet to 3 feet depending on soil texture as listed in Table H-7 of the updated SMP. The net almond agricultural threshold change is from a range of 9.0-10.0 feet to a range of 6.5-9.0 feet. Please refer to Response 3-11.

Reclamation originally thought that a literature review would identify a capillary fringe up to 4 feet in depth in some soil types. However, after a literature review and interviews with experts, the maximum capillary fringe depth regularly identified was 3 feet. Reclamation recognizes that in some studies or locations capillary fringes up to 4 feet have been identified, but that this is rare. Reclamation will apply the site-specific capillary fringe when site-specific investigation identifies a deeper capillary fringe than Table H-7 of the updated SMP.

**Response 3-2:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 3-3:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 3-4:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 3-5:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 3-6:** Reclamation has a protocol to test seepage impacts that extend well beyond the property for which Reclamation has acquired fee-title or a seepage easement, and has clarified this in Section E.1.3 of the SMP. Reclamation has over 200 shallow groundwater monitoring wells, with priority wells identified as described in Appendix E of the SMP. These “priority” wells are used by Reclamation to guide operational decisions. The SJRRP makes weekly measurements in these wells and posts a “Weekly Groundwater Report” with the measurements from these wells at the end of each week. This report is posted to the SJRRP website at http://www.restoresjr.net/monitoring-data/groundwater-monitoring/. As easements are purchased, Reclamation revises the priority wells to determine which monitoring well is the next constraining, “priority” well. The next most constraining well could be another monitoring well just upstream adjacent to the river or a monitoring well miles away from the river in a sand stringer.

The last portion of this comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 3-7:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 3-8:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 3-9:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 3-10**: This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 3-11:** Reclamation's groundwater level thresholds are set to incorporate the effects of both root-zone salinity and waterlogging on crops. Section 3 of the SMP identifies the possible impacts of groundwater seepage on crops, which include root-zone salinity, waterlogging, as well as temperature and disease effects. The threshold values calculated using the agricultural method, which include both effective root zone depth and capillary fringe estimates, are intended to keep the anoxic portion of the capillary fringe out of crop roots to avoid waterlogging to allow growers to continue to manage for salts. This is one of the reasons the 1 foot buffer was added to the effective root zone of 5 feet to increase it to 6 feet. Reclamation has proposed capillary fringe values based on the anoxic portion of the capillary fringe because that is the portion that can be practically measured and is known to harm almond roots. However, because not all soil conditions are ideal and do not perfectly align with the soils from which the estimates were derived, Reclamation has added language to the SMP in Section H.2.3.2 that accounts for any future field studies and states, "The greater capillary fringe value (more protective) between Table H-7 and site specific results will be used in assigning the threshold." Reclamation will perform field studies in specific areas where requested by landowners to further inform the capillary fringe values on their fields.

According to the scientific literature and experts consulted by the SJRRP, the effective rooting depth for almonds, where over 90 percent of roots grow including those that are mainly structural, is three to five feet. The active root zone, where the majority of nutrient and water uptake and transpiration occurs, is two to three feet deep (SJRRP, 2015). The proposed draft groundwater thresholds include a 6 foot root zone for almonds (i.e., a one foot thick buffer below the effective rooting depth) and a capillary fringe buffer ranging from 0.5 to 3 feet thick, depending on soil texture. This allows for an unsaturated buffer that varies in thickness from 1.5 to 4 feet thick below the effective root zone. These buffers which are built into the proposed groundwater thresholds are intended to allow adequate space below the effective root zone of the almond orchard for salinity management (i.e., 1.5 feet in coarse textured soils and 4 feet in fine textured soils).

Groundwater level monitoring conducted in over 200 monitor wells near the SJR since 2009 indicates that the depth to groundwater varies considerably in time and space with seasonal low water levels occurring in the late fall and early winter after the irrigation season ends. The SJRRP restoration flow hydrograph consists of low level "base flows" of 350 cfs at Friant Dam during the late fall – early winter timeframe. These flows attenuate with distance downstream from the dam. The coincidence of the seasonal low groundwater hydrograph and the late-fall, winter SJRRP restoration "baseflow" hydrograph will generally allow space for salinity management (i.e. leaching) beneath the root zones of crops on the lands located adjacent to the river during the late-fall and winter seasons.

SJRRP Restoration Flows are composed primarily of water from the SJR watershed that is very low in salinity. Water quality data collected to date by SJRRP supports the conceptual model that the introduction of SJRRP restoration flows will result in improvements in shallow groundwater water quality and water quality of waters delivered for irrigation in the project area (SJRRP, 2015).

The SJRRP is actively engaged with landowners interested in implementing seepage control projects on their land, including interceptor drains. Compensation of landowners by way of seepage easements also does not preclude the construction and operation of interceptor drains by landowners on private property. Interceptor drains provide a means of managing salinity on lands in the project area. The SJRRP has facilitated discharge of seepage water related to SJRRP flows from interceptor drains by working cooperatively with the Central Valley Regional Water Quality Control Board (CVRWQCB, 2016).

**Response 3-12:** The proposed agricultural thresholds are based on the best available science found in scientific literature and as advised by regional experts as listed in Section H.2.3.1 of the SMP. Published documents both indicate a similar total threshold, and also support both the underlying root zone depth and capillary fringe buffer. Reclamation's Drainage Manual recommends an aerobic rootzone of 3 feet for shallow rooted crops and 5 feet for deep rooted crops. FAO Drainage Paper 29 (Water Quality for Agriculture), as well as the experts interviewed in the almond root zone study and discussed afterwards with a small group, support an almond root zone of 5 feet. Reclamation proposed 6 feet as an additional 1 foot buffer to be conservative. Published values for capillary fringe (Sumner, 1999) are based on data from 1,320 soils from 32 states, and are the best available estimates of capillary fringe in soils of various textures. Experts recommended capillary fringe values as proposed in Table H-7 of the SMP that is derived from this data. Thus, the best available science for root zones, plus the best available science for capillary fringe, and best available science indicating these two components should make up the groundwater level threshold, support that the proposed thresholds are the best available science.

**Response 3-13:** These values are correctly quoted from the proposed SMP in Table H-11. Different capillary fringe values and ground surface buffers (the difference between the ground at the well and in the field) result in different thresholds in wells even if they have the same crop type, as discussed in Appendix H of the SMP. Because capillary fringe values are based on soil type, capillary fringe will vary under the same crop if the soil are different textures. For example, a clay soil will have a deeper capillary fringe than a sandy soil. Scientific literature indicates that soil texture is the main driver of capillary fringe height.

**Response 3-14:** Reclamation agrees that capillary fringe is variable. However, it is not feasible for Reclamation to determine capillary fringe in every field or every portion of every field along the SJR. Recognizing this limitation, and as recommended by local experts, Land IQ identified published (peer reviewed by qualified researchers) capillary fringe estimates based on the extensive data from 1,320 soils in 32 states. Recognizing, also, that these values are the best information that is available but may not apply to every single field, Reclamation has added language to the SMP in Section H.2.3.2 that accounts for any future field studies and states, "The greater capillary fringe value (more protective) between Table H-7 and site specific results will

be used in assigning the threshold." Reclamation will perform field studies in specific areas where requested by landowners to further inform the capillary fringe values on their fields.

**Response 3-15:** Reclamation has been evaluating whether to conduct field studies over the last several years. Reclamation concluded that very little helpful information may be gained. Due to the large variability in field conditions that result from site-specific soil type, crop type, ET, salinity, and groundwater depth, in addition to uncertain factors such as frequency, duration and timing of seepage occurrences, a field investigation may lead to limited conclusions with regards to capillary fringe while expending substantial amount of federal taxpayer dollars. Reclamation did determine that the existing data collected by hand auger does not represent deeper groundwater depths in Section 3.4.2 of the Almond Field Study, Phase 2 Draft Study Plan (Reclamation, October 2016), "The preliminary data review indicates that the existing data does not represent deeper seepage threshold/groundwater depths." However, Reclamation does have some information from deeper groundwater depths – the monitoring well soil logs taken when each of Reclamation's monitoring wells was installed. These deeper logs were used to determine the capillary fringe buffers to apply for each well in the proposed SMP update.

**Response 3-16:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 3-17:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 3-18:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 3-19**: This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 3-20:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 3-21:** As discussed at the January 23, 2017 SCTFG Meeting, Reclamation proposed updates to the historical groundwater method as part of this update to the SMP taking into consideration information gained over the last 4 years without Restoration Flows downstream of Reach 2 of the San Joaquin River. Reclamation's goal was to improve the historical groundwater method C4 by utilizing the best available information. January/February 2012 was previously used in this historical threshold calculation because it was a period without Restoration Flows. The analysis period in the proposed SMP edits was replaced with December 2011 through January 2016. This period is a longer duration that also contained no Restoration Flows. The proposed method is more conservative, as it performs a 3-point moving average, instead of selecting the single shallowest observation from January/February 2012 as was used prior to the January 2017 updates.

**Response 3-22:** The Drainage Manual is simply one piece of information from a large literature review performed to determine the proposed 6 foot almond root zone.

**Response 3-23:** Reclamation recognizes that the root zone depths could change based on any of these factors. In soil types with hard layers, roots may be restricted. Drip irrigation may result in shallower roots versus flood irrigation. Historically shallow water tables would also restrict roots. Seasonal or long-term trends in the water table could result in shallower or deeper roots depending on the trends. Crop roots depend on the age of the crop, yet Reclamation chooses a root zone based on a mature crop. All of these factors could lead to shallower (smaller) root zones than Reclamation has proposed. As field crops rotate, the thresholds must change when crops change, which results in thresholds that change over time and is more work for Reclamation to manage. This is only a limitation in terms of the simplicity of the method, and not a limitation that could result in a shallower or deeper crop root zone.

**Response 3-24:** This section of the SMP discusses the ground surface buffer. To estimate the ground surface buffer, Reclamation determined the largest difference between the elevation of the ground surface at the monitoring well and the ground surface in the field within 750 feet of the well. Reclamation agrees that groundwater levels and particularly capillary rise may change within a very short distance.

**Response 3-25:** Over 150 capillary fringe observations have been made by SJRRP since 2009 for various purposes such as establishing project baseline soil salinity and interceptor drain design. Some of these observations have been made in almond orchards. Root depth was recorded on the soil log if roots were observed below a depth of 3 or 4 feet, however establishing almond rooting depth was not the primary purpose of these investigations. Please see the SJRRP website here: http://www.restoresjr.net/monitoring-data/data-reporting/, and refer to the study on changes in soil salinity to find the soil logs from the hand auger investigations.

**Response 3-26:** Reclamation has now included text in the SMP that allows for site-specific changes to the capillary rise based on field investigation, and provides a conservative approach by selecting the deepest of either the observed capillary fringe field investigation or the capillary fringe table.

**Response 3-27:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 3-28:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

Wonderfulorchards™

January 30, 2017

SENT VIA FIRST CLASS MAIL AND E-MAIL

Becky Victorine and Katrina Harrison
Bureau of Reclamation
MP-170, 2800 Cottage Way W-1727
Sacramento, CA 95825
rvictorine@usbr.gov
kharrison@usbr.gov

Re: Comments on the Draft Environmental Assessment for the San Joaquin River Restoration Program Seepage Management Actions and the Revised Seepage Management Plan

Dear Mses. Victorine and Harrison:

Wonderful Orchards (formerly Paramount Farming Company), on behalf of Wonderful Nut Orchards who owns New Columbia Ranch ("Wonderful"), submits the following comments on the San Joaquin River Restoration Program Seepage Management Actions Draft Environmental Assessment, December 23, 2016 ("Draft EA"), as well as the accompanying changes to the almond root zone threshold and capillary fringe buffer under the San Joaquin River Restoration Program Seepage Management Plan ("SMP").

New Columbia Ranch is located on the east side of Reach 2B of the San Joaquin River, upstream of the Mendota Pool between River Miles 205 and 216. Wonderful holds and exercises rights to divert the water of the San Joaquin River and its sloughs for the irrigation of its almond orchards, and will be directly affected by the implementation of the proposed actions in conjunction with changes to the groundwater seepage threshold for almonds. We appreciate the opportunity to submit the below general comments. 4-1

The Draft EA analyzes seepage management actions associated with the release of Restoration Flows in the San Joaquin River. The release of Restoration Flows is currently constrained to approximately 300 cubic feet per second, due to the potential for groundwater seepage impacts to parcels in Reaches 2B, 3, 4A, and 4B. Before the Bureau of Reclamation may increase Restoration Flows up to the Framework 5-Year Vision amount of 1,300 cubic feet per second, it must first account for its potential to cause seepage impacts to parcels within the project area. 4-2

Under the Seepage Management Plan, Reclamation proposes to negotiate with landowners for the purchase of easements to allow for the raising of groundwater levels, or fee-title acquisitions of adversely impacted parcels. However, the Draft EA fails to evaluate any physical measures to guard against seepage impacts during the first five years of increased flows.

As such, it also neglects to take into account the environmental impacts that may result from the future physical seepage management actions to be undertaken after easements or realty agreements are made. 4-3

Finally, Reclamation has concurrently reduced almond root zone thresholds across the board without adequate site-specific information, thereby limiting the acreage that would be eligible for easements or acquisition to mitigate the seepage impacts that are expected to occur. 4-4

**The Evaluated Actions**

The National Environmental Protection Act ("NEPA") establishes a duty "to stop actions that adversely impact the environment, that limit the choice of alternatives for the EIS, or that constitute an 'irreversible and irretrievable commitment of resources.'" *Conner v. Burford* (9th Cir. 1988) 848 F.2d 1441, 1446. The two actions considered in the Draft EA consist of the purchase of seepage easements to allow for higher groundwater tables beneath affected crops, or the outright purchase of lands that are impacted by groundwater seepage caused by increased Restoration Flows. Neither of the evaluated alternatives directly addresses seepage prevention. Wonderful is concerned that the lack of other seepage management actions in the Draft EA is at odds with the requirements of NEPA as well as previous statements as to how Reclamation would address seepage impacts within the SJRRP project area. 4-5

NEPA requires that an EA consider a reasonable range of alternatives to the proposed project that would achieve the project's purpose. *See* 42 U.S.C. § 4332(2)(E); 40 C.F.R. § 1508.9(b); *Native Ecosystem Council v. U.S. Forest Service* (9th Cir. 2005) 428 F.3d 1233, 1245-1246. The Draft EA fails to comply with NEPA because, although other reasonable alternatives exist, the Draft EA evaluates the potential impacts of only two proposed actions and the no-action alternative. 4-6

The 2014 Draft SMP included nine different projects it could implement to prevent seepage impacts, including cut-off walls, seepage plugs, interceptor drains and ditches, building up the land surface, and conveyance improvements. In a comment on the Draft Framework's 5- Y ear Vision, Wonderful noted the exclusion of almost every such physical improvement project from the Framework's project cost analysis. Wonderful stressed its preference for physical seepage management projects that would obviate any need for seepage easements or outright acquisitions of private lands adjacent to the River. Reclamation responded that other projects would be implemented; it merely used interceptor lines, seepage easements, and fee simple acquisition to represent costs because they were landowners' three most preferable actions. Revised Framework for Implementation, July 2015, Appendix J, Response 3.9.1. Now, under the Draft EA, interceptor lines have been similarly set aside so that the only available options for landowners in the next few years is to grant an easement and accept the impending seepage impacts, or sell their land. 4-7

As the Draft EA mentions, the SMP "includes a variety of other seepage management actions that could be implemented in the future, should landowners express an interest in pursuing them," but none of these projects are evaluated as alternatives in the Draft EA nor contemplated to begin during the 5-year period when Restoration Flows may reach 1,300 cfs. Draft EA, 2-3. Reclamation has a duty to consider "alternatives to the proposed action" and to "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." 42 U.S.C. §§ 4332(2)(C)(iii), 4332(2)(E); 40 C.F.R. § 1502.14(a). Additional alternatives should be evaluated 4-8

because "[ c ]learly, it is pointless to 'consider' environmental costs without also seriously considering action to avoid them." *Calvert Cliffs' Coordinating Comm., Inc. v. U.S. Atomic Energy Commn.* (D.C. Cir. 1971) 449 F.2d 1109, 1128. Wonderful requests that Reclamation commit to implementing seepage management actions that will prevent seepage impacts before they occur and leave the easements and land acquisition as last resorts. Those physical seepage management actions will, in turn, require further environmental compliance and analyses regarding potential impacts.

**Changes to the Almond Root Zone**

Groundwater seepage thresholds represent the depth at which adverse impacts to crops may occur due to elevated groundwater seepage. Reclamation intends to operate the SJRRP to maintain groundwater levels below seepage thresholds, such that "flow increases that would exceed a threshold will trigger a site visit and a response action." SMP Appendix H Groundwater Thresholds, January 2017, H-1. Prior to recent revisions, the SMP called for a 10-foot groundwater seepage threshold for almond trees, based on a 9-foot root zone and 1-foot capillary fringe, consistent with established agricultural practices. See SMP Appendix H Groundwater Tables, October, 2016, Table H-2. The Draft EA describes the change in seepage thresholds as follows:

> The almond root zone depth would change from 9 feet to 6 feet, and the capillary fringe buffer would change from a range of 0.5 inches to 1 foot, to a range of 0.5 to 4 feet depending on soil type. The groundwater threshold (the root zone depth plus the capillary fringe thickness) change would be revised from a range of 9 .5 to 10 feet to a range of 6.5 to 10 feet with no change in the threshold in silt and clay type soils.

Draft EA, 2-3.

4-9

Wonderful appreciates the SMP' s consideration of varying soil types, however, as one of the largest almond growers in the state, Wonderful has serious concerns about the reduction in seepage thresholds for almonds from the current depth of 10 feet. The revised approach under Appendix H of the SMP combines the reduced root zone depth with a capillary fringe estimate based on soil categories to determine a particular crop's groundwater seepage threshold. SMP Appendix H Groundwater Thresholds, January 2017, H-3. However, the new method does not allow for 10-foot thresholds. The revised threshold also fails to adequately account for the unique soil, salt, and other site-specific characteristics that lead to detrimental impacts and severe economic losses. *Id.* at H-24-H-25. Many site-specific conditions contribute to the impacts that varying water levels can have on almond tree health and must be analyzed on a case-by-case basis.

In response to previous comments on the change to the almond root zone, Reclamation stated that the increased capillary fringe buffer could compensate for the root zone reduction. See Almond Root Zone Study, Phase 1 Report, Responses to Comments, Response KB-01 ("[t]he threshold may stay the same for some properties, but the components would change (from 9 foot root zone plus 0.5 or 1 foot capillary fringe, to 6 foot root zone plus 0.5 to 4 foot capillary fringe)."). Reclamation also stated that "observed field variation in capillary fringe has exceeded values provided in Appendix H" in certain areas and that further evaluation of site-specific

4-10

factors would take place in Phase 2 of the Almond Zone Root Study. *Id.* However, the capillary fringe tables in the revised Appendix H do not reflect adjustments made due to site-specific factors. Although Phase 2 of the Study confirms that data gaps exist, it only recommends that capillary fringe estimates be refined from the soil observations that were already collected in the project area. Almond Field Study Phase 2: Draft Study Plan, October 2016, A-8.

Contrary to reassurances that thresholds may stay the same for certain properties, the estimated capillary fringe buffers have resulted in reduced groundwater thresholds for most crops in the project area; the deepest possible capillary fringe established for any soil type, including silt and clay type soils, throughout the entire project area is 3 feet. Draft Seepage Management Plan, January 2017, Appendix H, Tables H7, H-8. In fact, no crop within Reach 2B was assigned a capillary fringe greater than 17 feet, despite the wide variability in soil types and root depths that have been observed. See Almond Root Zone Study Phase 1, June 2015, Table 4-1 (describing parcels 169 through 195, which include Reach 2B, as "loams, silt loams, and fine sandy loams. Chino and Grangeville coarse loams are underlain by finer soils, such as silty clay loams and clays."). Although silt loams and fine sandy loams are associated with a 17 foot capillary fringe, silty clay loams and clay can sustain a capillary rise of 2.3 to 3 feet according to Table H-8. 4-11

Almonds are extremely sensitive crops whose health can be impacted by many factors, including water quality and soil types that can differ significantly among reaches of the San Joaquin River. Reclamation acknowledged the need for site-specific data early on, stating "thresholds are generalized, and adjustments may be required to account for on-site and/or seasonal conditions." Draft Seepage Management Plan, September 2014, 6-2. The importance of site-specific factors was also noted by the experts from UC Davis, UC Cooperative Extension (UCCE) and Cal Poly, and in the literature reviewed by Reclamation in its development of the SMP. Phase 1 Almond Root Zone Study, 2-9; 3-1. Consultation with UCCE experts in May 2016 confirmed the importance of soil variability and the need for site-specific measurements to obtain accurate capillary fringe measurements. For example, experts warned against using inadequate soil survey data that "only goes down to five feet" because "soils beneath that will influence capillary fringe and drainage; stratification affects capillary fringe in unknown and highly variable ways." Almond Field Study Phase 2: Draft Study Plan, October 2016, 3-4. Yet, the 85 soil samples taken in 2010 that serve as a primary basis for the revised root zone depths did not go deeper than five feet. See Soil Logs from Hand Augured Boreholes, 2010 (the maximum recorded depth for each well is 60 inches). 4-12

Furthermore, Appendix H notes that the field conditions from soil sampling sites were "mostly within Reaches 4A and 4B," which suggests very little, if any, data was taken from soils in New Columbia Ranch to understand the differences in soil or how Wonderful's crops would be impacted by the reduced threshold. 4-13

In assessing potential impacts, an EA need not "conform to all the requirements of an EIS, [but] it must be sufficient to establish the reasonableness of the decision not to prepare an EIS." *California Trout v. F.E.R.C.* (9th Cir. 2009) 572 F.3d 1003, 1007. 4-14

The broad conclusions drawn in the revised SMP are not adequately supported by actual observations. Accordingly, Wonderful requests that Reclamation conduct appropriate site-specific analyses within Reach 2B to obtain sufficient data on capillary fringe measurements and revise groundwater thresholds where appropriate. 4-15

Wonderful agrees Reclamation must continue to operate to avoid adverse effects to property within the project area and to restrict SJRRP releases when it anticipates that the groundwater thresholds identified in the SMP will be reached. Accordingly, Wonderful recommends that Reclamation incorporate additional seepage management actions designed to prevent such intrusions in the Draft EA and evaluate the potential environmental impacts of each. 4-16

It is equally important that the thresholds in the SMP are based on accurate data in light of the unique soil and crop characteristics throughout the project area. 4-17

Wonderful requests that Reclamation follow through with the objectives of the Almond Root Zone Study, conduct thorough investigations of the soils in reaches where data gaps remain, and adjust capillary fringe estimates to more accurately reflect field conditions. 4-18

Thank you for considering the above comments. Should you have questions, please contact me at any time.

Sincerely,

Kimberly M. Brown
Senior Director, Water Resources

**Response 4-1:** Reclamation agrees New Columbia Ranch will be directly affected by the implementation of changes to the groundwater seepage threshold for almonds, and looks forward to further coordination.

**Response 4-2:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 4-3:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 4-4:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 4-5:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 4-6:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 4-7:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 4-8:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 4-9:** Reclamation has added language to the SMP in Section H.2.3.2 that accounts for any future field studies and states, "The greater capillary fringe value (more protective) between Table H-7 and site specific results will be used in assigning the threshold." Reclamation will perform field studies in specific areas where requested by landowners to further inform the capillary fringe values on their fields.

**Response 4-10:** See Response 4-9.

**Response 4-11:** Analysis of existing site specific soil data from the SJRRP Reach 2B levee investigations indicates that soil textures in the 7-9 foot depth range from sand to very fine sandy loam. The corresponding capillary fringe values for these soil textures range in thickness from 0.5 to 1.7 feet based on Table H-7 in the SMP. These data are from 12 soil boring sites located on the north bank levee alignment between river mile 204 to 208.5. Stratified soils do lead to capillary fringes that are atypical of any one soil. This was confirmed by Dr. Grismer in the expert conversations. However, in some cases, the capillary fringe may by greater than the surface soil would indicate, but in others it may be smaller. Where stratified soils are known to exist and groundwater levels are relatively high (within the total threshold or near it) site-specific information would be useful in refining the capillary fringe for that site. Reclamation concurs.

**Response 4-12:** Reclamation agrees that site specific data is important and that soils are highly variable. Given the very large area of the SJRRP, it is not feasible to sample for capillary fringe in every field or portion of every field. Thus, some simplifications must be made. Reclamation

used published values based on the best available information to estimate capillary fringe values in various soil types. The data used to determine these values came from over 1,000 soils representing over 5,000 soil horizons. Experts agreed that this is the best information short of observed capillary fringe. However, because it may not be representative of every specific field near the San Joaquin River, site-specific information can be used to refine the capillary fringe values for a specific site.

The 85 soil samples from 2010-2013 do not serve as the primary basis for the revised root zone depths. These soil samples are of observed capillary fringe. Even though they are site-specific information, as they are not the correct depth, Reclamation used the capillary fringe table (SMP Table H-7) to select the capillary fringe in each well.

**Response 4-13:** Reclamation did not have access to Wonderful's property until recently, for Reach 2B geotechnical investigations. If allowed access, Reclamation will conduct soil sampling investigations on Wonderful's property to verify the capillary fringe table in the SMP, and will use the deepest of the observed capillary fringe or capillary fringe from Table H-7 of the SMP.

**Response 4-14:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 4-15:** As discussed above, Reclamation has performed capillary fringe observations in 85 soils along the SJR, and logged soils in 210 monitoring wells.

**Response 4-16:** This comment is a comment on the Seepage Management Actions Environmental Assessment (EA). A response to this comment will be provided in the final EA.

**Response 4-17:** See Response 4-12.

**Response 4-18:** See Responses 4-10 and 4-12.