Table 1.
Comment Letters Received

Number	Comment Letter ID	Name	Date
1	JN	Jim Nickel, Nickel Family LLC	08/24/2015
2	BW	Bill Ward, BB Limited	09/03/2015
3	DD	David Doll, UCCE Merced County	09/13/2015
4	KB	Kimberly Brown, Wonderful Orchards	09/14/2015
5	BS	Blake Sanden, UCCE Kern County	08/21/2015
6	RP	Ralph Pistoresi	08/18/2015
7	JN2	Jim Nickel, Nickel Family LLC	09/28/2015
8	EC	San Joaquin River Exchange Contractors Water Authority	10/02/2015

Table 2.
Comment/Response Matrix

Comment ID	Comment	Response
JN-01	When devising seepage management plans, you need to remember that you are basing your management plans on averages. Every site is different, so what works for one site might not work for another. You also have to keep in mind that historical cropping patterns are somewhat irrelevant. A landowner has the right to grow whatever he elects to grow, so assuming that he will continue with a shallow rooted crop is not realistic. If he subsequently elects to grow almonds, he has every right to do so, and the seepage management plan should provide for that possibility.	Agreed. The Seepage Management Plan (SMP) has attempted to incorporate some site-specificity into the capillary fringe buffer, which is added to the crop root zone to create a groundwater level threshold. The capillary fringe buffer is based on the soil type of a specific field as logged during installation of the monitoring well. The Seepage Project Handbook (SPH) also incorporates significant site specificity into the design of seepage projects. Reclamation conducts a variety of site-specific monitoring (hydraulic conductivity tests, monitoring wells, soil salinity sampling, water stage measurements, surveying, etc.) to evaluate each property and determine the most appropriate seepage projects in the Site Evaluation (Section 2.0 of SMP Appendix L). Reclamation also bases the depth, diameter, and location of interceptor lines, for example, on the site specific infrastructure, soil textures, and thresholds. Regarding crop types, Reclamation will change a threshold when a landowner changes their crop type (SMP, Table H-5).
JN-02	Historical groundwater levels are also irrelevant in some cases. As landowners convert from furrow irrigation to drip irrigation, groundwater levels will drop, as has occurred on our properties. You can observe from the monitoring wells on our properties, the groundwater levels have reduced substantially since most of the acreage is irrigated with drip systems, which is the new normal.	As discussed in the SMP (Appendix H), one of the methods used to set groundwater level thresholds is based on historical groundwater levels (where historical is pre-SJRRP, not pre-agriculture). Reclamation utilizes this method in areas where historical groundwater levels are historically shallow. The SJRRP is not responsible for improving groundwater conditions over historical conditions by lowering the groundwater table below historical levels. Reclamation may need to re-evaluate the historical (or without Restoration Flows) levels in the future based on changes in irrigation as noted by the commenter.
JN-03	In your presentation, you did not include the potential need to mitigate the seepage impacts on our properties on which we have installed tile irrigation lines. We have neither assurance nor knowledge that those existing tile drainage lines	Reclamation evaluates the property, including any existing infrastructure, during the Site Evaluation. Reclamation has already completed a seepage project (purchase of a seepage easement) on a property that had an existing interceptor

Comment ID	Comment	Response
	and systems can fully mitigate river flows up to 4500 cfs.	line. Reclamation observed surface ponding during 2011 flood flows on the property, and so knew that the existing interceptor line was not adequate. Reclamation intends to evaluate all properties that our modeling indicates may be impacted by Restoration Flows, or landowners tell us may be impacted, whether or not they have existing interceptor lines.
JN-04	The language for the permanent easement needs to be clarified. Since the proposed easement language will include not only water released for the existing SJRRP statue, but also for any future court order or law, it is impossible to know the full potential seepage impacts. Hence, it is impossible for an appraiser to know what the highest and best use post acquisition will be. The only safe and fair manner to appraise the post-acquisition value is to assume that it will be unfarmable.	Reclamation is not responsible for appraisals, and cannot direct the appraiser. All federal agencies are required to follow the "Yellow Book", the *Uniform Appraisal Standards for Federal Land Acquisitions*. A separate government agency, the Office of Valuation Services (OVS) reviews appraisals and deems them approved for government use. The appraiser has flexibility in how seepage easements are appraised, with the provision that the appraisal would need to be accepted by OVS. The language in the existing template seepage easement allows for groundwater levels to rise up to or above the ground surface. This excludes surface water flowing over the surface of the property, but allows any vertical extent of groundwater seepage. Reclamation provides OVS information on our Restoration Flows and groundwater monitoring and modeling, which they may choose to pass on to the appraiser to consider. The appraisers use the rights that Reclamation is getting in the seepage easement and whatever relevant information OVS passes on to them to determine the highest and best use of the property post-acquisition of the seepage easement.
JN-05	Your almond root zone study is full of generalizations and vague conclusions. In discussion of the root zones, you use terms such as "where most of the nutrient and water uptake occur" or "where most of the roots are". But what about all the uptake and location of all the roots? Using "most" might result in an 80% yield for a grower, which is "most" of the potential, but not "all". Your experts don't give an absolute assurance they are correct. Because of the uncertainty and the fact that the program does not have a procedure to compensate a grower for damages, we feel that you should error on the side of caution. A mistake with almonds could result in significant damages. As you know, the capillary fringe will vary for soil type to soil type. I suggest that you stay with the 9 foot depth. I doubt your experts would risk their own money on a depth less than that.	The Almond Root Zone Study Plan, Phase 1 report (Study Plan) sought to determine the root zone depth that would be protective of almond trees based on the range of scientific information available regarding root function and depth. There is natural variability in soil and agricultural systems and as a result thresholds in scientific literature and observations are commonly presented as ranges. The root zone where most of the nutrient and water uptake occurs was defined as the active root zone in the Study Plan (Page 2-1). The active root zone ranged from two to three feet deep according to experts and literature (Appendix A). The effective root zone includes the active root zone as well as some deeper structural roots. Experts agreed that the effective root zone extends to three to five feet. The effective root zone includes approximately 80 to 90 percent of the tree's roots. Experts indicated that deeper roots can occur but have a low level of activity due to lack of nutrients at depth and difficulty in transporting water or nutrients from depth (Appendix A). There was no disagreement among experts on this subject, and there was no greater specificity found either in literature or in the expert comments. There are no studies to our knowledge that indicate a correlation of yield to

Comment ID	Comment	Response
		exposure of a proportion of the total root system. However, studies indicate, and experts agree, that tree roots beyond the five foot depth are minimally functional in water and nutrient uptake. Therefore, experts indicated that intermittent seepage conditions affecting roots outside of the active root zone would have less impact than intermittent seepage conditions on roots within the effective root zone. The Study Plan was focused on defining appropriate root zone depth and did not focus on capillary fringe. It is acknowledged, however, that capillary fringe is an important consideration in addition to root zone to determine a groundwater threshold. Capillary fringe is addressed in Appendix H of the SMP in Section H.2, and does vary with soil type in the thresholds that Reclamation sets. Further evaluation of broader variation in capillary fringe is also being considered as part of Phase 2 study efforts. There were no studies, expert experience, or objective scientific knowledge or opinions encountered during the development of the Study Plan that indicated that a nine foot root zone should be protected. However, the study may not have been clear regarding various terminology related to different components of a drained soil zone. It is important to clarify the difference between the aerated root zone, effective root zone, capillary fringe, and the water table. The recommended aerated root zone includes the effective root zone (5 feet) plus one foot as a factor of safety, totaling 6 feet. The Seepage threshold as proposed is comprised of the aerated root zone (6 feet) plus the tension saturated capillary fringe. Currently, capillary fringe buffers are specified in Appendix H of the SMP (0.5 or 1 ft); however, observations of larger capillary fringe values have been made and are a concern relative to protection of the root zone. Further evaluation of variation in capillary fringe within the project area is being considered as part of Phase 2 study efforts in order to potentially expand and refine capillary fringe values in the SMP. These components of the overall Seepage Threshold will be addressed by adding further explanation and illustration to distinguish between the terminologies. Please refer to Figure 1 for a graphical definition of these terms. Reclamation will operate 2016 Restoration Flows based on the existing almond root zone of 9 feet. Also, as discussed in our December 17, 2015, the UCCE experts appear to be in agreement about the 6 foot almond root zone. Our ongoing area of controversy is in regards to the appropriate capillary fringe buffer. Based on your and other's comments, Reclamation proposes to change the Seepage Management Plan in

Comment ID	Comment	Response
		two ways: (1) to change the almond root zone to 6 feet and (2) to change the capillary fringe buffer to whatever is the greatest capillary fringe anticipated in the fields around a given well, based on the drill log of that well and any other information available. This would change the capillary fringe buffer to up to 4 feet depending on soil type. Thus, the 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).
JN-06	As you know, the Bureau's history regarding the prediction of the amount of seepage that will occur is not good. The worse thing that can happen to the program is to cause additional damages by taking a risky approach, rather than a cautionary one.	Reclamation has adopted what is believed to be an appropriate seepage management approach since settling a tort claim in 2011 that arose from seepage concerns. Reclamation agrees that a cautionary approach is the best one. Following this conservative approach, Reclamation conducts evaluations of our groundwater levels in wells prior to making any increases in flows. Reclamation also plans to increase river stage in approximately six inch stage increments when full reconnection to the Merced River confluence occurs. Reclamation would plan to hold each flow increment for 10 days, allowing groundwater levels to respond, rather than increasing flows all at once.
BW-01	Nice model. However SJR needs to recognize that it really does not matter. Models are models. Seepage is seepage. In fact, it may be the best model ever. It does not matter whether the model says 6', 9', 10' or 12 feet. SJR cannot wiggle its way out of seepage liability simply because their model says "this is the limit of the rootzone". Biology does not work like that.	Reclamation strives to use the best available science to inform our decision making. Reclamation, as part of the federal government, always has liability through the tort claim process, regardless of our best intentions and plans.
BW-02	Seepage is just what it says, it is what happens outside the proscribed limits/levees. And SJR knows and should acknowledge that it has liability whenever and wherever SJR flows cause seepage related damage! End of discussion.	Reclamation developed the SMP to provide a defined process to evaluate the potential impacts of seepage caused by Restoration Flows. The SMP also provides a process to provide seepage projects to mitigate these impacts.
BW-03	If SJR cannot take on open ended liability, then SJR needs to step up and buy the acres. And if you buy too few acres, SJR will still have liability whenever and wherever SJR flows cause seepage related damage!	Reclamation agrees that if Restoration Flows cause seepage outside of the area of a seepage easement we have purchased, we still have liability and will need to acquire additional rights or compensate the landowner accordingly.
BW-04	"No third party damages." From the start, that phrase was a huge, and not time bound, condition on this entire project. The program needs to honor it. Seepage is a poster child for the sorts of unseen, and sometimes unforseeable damages that this phrase was meant to address.	Reclamation has researched the legislative record developed during the Legislation process to find the source of this term. The term was used during discussions prior to the Legislation passing, but does not appear anywhere in the Legislation itself. Reclamation however, is required in Public Law 111-11 to identify impacts that will occur to water districts or landowners, and mitigate those impacts. Reclamation identified these impacts in our Programmatic Environmental Impact Statement/Report (PEIS/R). As a result, our Record of Decision (ROD), which completed our National Environmental Policy Act (NEPA) process and is a binding document we have to follow in implementation of the San Joaquin River Restoration Program (SJRRP), requires us to follow the SMP. Reclamation has been following the SMP and continues to adjust it as new information is available.

Comment ID	Comment	Response
		We appreciate your efforts to review this study and we hope that Reclamation and landowners can work together to continue to improve the SMP based on the best available science to be protective of crops while not being overly conservative.
DD-01	I am deeply concerned in the consideration of decreasing the water table depth from 10' to 6' as proposed. Within these soils along the San Joaquin River (SJR) in Western Fresno, Madera, and Merced County, a water table at 6' will kill perennial crops. This depth would provide conditions that are unsuitable for perennial crop growth as follows:	Experts interviewed in development of the Phase 1 almond root zone study and literature reviewed agreed, with broad consensus, that the effective almond root zone was three to five feet in depth, with most roots (estimated at approximately 80 percent) in the top two feet. Reclamation has proposed an additional foot of aerated root zone, to include a factor of safety, and thus proposes a six foot almond root zone. The current proposal resulting from the scientific evidence gathered in the Study Plan defines the almond root zone as six feet. As at our December 17, 2015 meeting, this depth is not the depth to the top of the water table. This six feet of rooting depth would be added to the capillary fringe buffer to determine the groundwater level threshold (and minimum depth to the water table). The six foot almond root zone depth is supported by literature and recommendations of University of California, Cooperative Extension (UCCE) experts, which also advise a six foot root zone that includes a one foot additional factor of safety over the effective root zone. Reclamation's understanding is that after recent discussions you are now more comfortable with this approach and think a 6 foot almond root zone is appropriate, if we adjust the capillary fringe buffer to account for the full range of capillary fringe in the full variety of soil types. The peer review in 2012 suggested a 3.3 to 6.6 foot almond effective root zone. It is acknowledged that capillary fringe is an important consideration for protection of a defined aerated root zone. Appendix H of the SMP provides a definition of the water table threshold that can be calculated via the Agricultural Method (SMP, Appendix H, Section H.1.3.1 and H.2). This threshold comprises both a root zone depth (proposed at 6 feet as supported above) and a capillary fringe buffer. The capillary fringe buffer is added to that root zone depth per the specifications of Appendix H; however, observed field variation in capillary fringe has exceeded values provided in Appendix H in some areas and is a concern relative to protection of the root zone. Further evaluation of variation in capillary fringe within the project area is being considered as part of Phase 2 study efforts in order to potentially expand and refine capillary fringe values in the SMP. Reclamation recognizes various terminology may be unclear related to different components of the drained soil zone. It is important to clarify the difference between the root zone (and its component parts of maximum, effective, and active), capillary fringe, and water table. These components of an overall seepage threshold and their importance and interaction will be addressed by adding further explanation and illustration to distinguish between the

Comment ID	Comment	Response
		terminologies. Please refer to Figure 1 for a graphical definition of these terms.
DD-02	The depth does not take into account capillary fringe, which can range from 2-3' in loam soils common to this area along the SJR. The width of capillary fringe has been confirmed through studies performed by Cal Poly, San Luis Obispo, and my own personal observations with backhoe pits dug in farmer's fields within the area;	It is correct that the study did not focus on capillary fringe. The Study Plan was intended to focus on root depth, which is the depth of aerated root zone that should be protected above the groundwater and associated capillary fringe. Reclamation understands that the observed field variation in capillary fringe has exceeded thresholds provided in Appendix H in some areas. Further evaluation of variation in capillary fringe within the project area is being considered as part of Phase 2 study efforts in order to potentially expand and refine capillary fringe values in the SMP.
DD-03	In my work with previous farmers in the area, the backhoe pits often revealed a water table at 10' or deeper - in which the water contained high amounts of salts which can inhibit growth or kill trees. Movement of this salt front higher into the rooting zone would damage the trees;	Salinity concerns were also raised in the Study Plan (see log of Franz Neiderholzer's comments). Since there have been no known studies that impose treatments of raising the water table, this effect is also uncertain. However, seepage thresholds are intended to protect the defined aerated root zone from both waterlogging and root zone salinity effects. The seepage thresholds account for the capillary fringe, which, Reclamation agrees, can bring salts into the root zone. As the commenter notes, high water tables can lead to excess salts in the upper root zone. However, the specific conductance (and, therefore, salinity) of San Joaquin River water is low enough that salinity problems may not develop in areas directly affected by river seepage. Soil salinity levels may actually improve in some areas. Regardless, groundwater level thresholds are set to keep potentially salty groundwater out of the crop root zones. The SJRRP operates Restoration Flows so groundwater levels do not rise above thresholds. Seepage projects such as interceptor drains are set at groundwater threshold levels in order to maintain this aerated root zone permanently. For more information on baseline soil salinity, see Appendix G of the SMP, which includes soil salinity sampling in over 140 locations at depths of 0 to 12, 12 to 30, and 30 to 60 inches.
DD-04	Although most root systems are most active in the top four feet, deeper roots - which do occur down to 7-9 feet- would be within saturated soils, making them susceptible to various Phytophthora species. These roots would serve as a point of establishment for infection, which could, and most likely, lead to tree loss;	Phytopthora concerns were acknowledged in the Study Plan but not investigated in detail. The Phytopthora section will be expanded with information from local experts in the revised version of the Study Plan.
DD-05	I have observed trees die from saturated soils due to a high water table near Hilmar, CA. These collapses often happen rapidly, and leave farmers with a greater than 90% loss in most cases;	Reclamation agrees that the SJRRP should avoid saturation of the aerated root zone, and the intent of the Seepage Management Plan is to avoid tree losses and yield impacts such as those you mention.
DD-06	There is no research-based information or studies that have demonstrated that trees will survive with a water table at six feet. In contrast, successful orchards	Experts interviewed in development of the Phase 1 almond root zone study and literature reviewed agreed, with broad consensus, that the effective almond root

Comment ID	Comment	Response
	have been observed with water table depths greater than 10.'	zone was three to five feet in depth, with most roots (estimated at approximately 80 percent) in the top two feet. Reclamation has proposed an additional foot of aerated root zone, to include a factor of safety, and thus proposes a six foot almond root zone. The current proposal resulting from the scientific evidence gathered in the Study Plan defines the almond root zone as six feet. As at our December 17, 2015 meeting, this depth is not the depth to the top of the water table. This six feet of rooting depth would be added to the capillary fringe buffer to determine the groundwater level threshold (and minimum depth to the water table). The six foot almond root zone depth is supported by literature and recommendations of University of California, Cooperative Extension (UCCE) experts, which also advise a six foot root zone that includes a one foot additional factor of safety over the effective root zone. Reclamation's understanding is that after recent discussions you are now more comfortable with this approach and think a 6 foot almond root zone is appropriate, if we adjust the capillary fringe buffer to account for the full range of capillary fringe in the full variety of soil types. The peer review in 2012 suggested a 3.3 to 6.6 foot almond effective root zone. It is acknowledged that capillary fringe is an important consideration for protection of a defined aerated root zone. Appendix H of the SMP provides a definition of the water table threshold that can be calculated via the Agricultural Method (SMP, Appendix H, Section H.1.3.1 and H.2). This threshold comprises both a root zone depth (proposed at 6 feet as supported above) and a capillary fringe buffer. The capillary fringe buffer is added to that root zone depth per the specifications of Appendix H; however, observed field variation in capillary fringe has exceeded values provided in Appendix H in some areas and is a concern relative to protection of the root zone. Further evaluation of variation in capillary fringe within the project area is being considered as part of Phase 2 study efforts in order to potentially expand and refine capillary fringe values in the SMP. Reclamation recognizes various terminology may be unclear related to different components of the drained soil zone. It is important to clarify the difference between the root zone (and its component parts of maximum, effective, and active), capillary fringe, and water table. These components of an overall seepage threshold and their importance and interaction will be addressed by adding further explanation and illustration to distinguish between the terminologies. Please refer to Figure 1 for a graphical definition of these terms.
DD-07	Considering that it takes an estimated $7000/acre to establish an orchard, in no way would I feel comfortable recommending or suggesting to a farmer that they could successfully farm an orchard in an area with a water table at six feet. There is a high risk that the trees will be negatively affected, with tree death as a	Reclamation acknowledges the expense of orchard installation. The intent of the SMP is to protect orchard health. Appendix H of the SMP provides a definition of the water table threshold that can be calculated via the Agricultural Method (Section H.2). The agricultural threshold is comprised of both a root zone depth and a capillary fringe buffer. The six foot depth discussed in the Study Plan is the

Comment ID	Comment	Response
	possibility. Furthermore, this proposal does not take into account the variability of water tables. In areas in which water tables are present, levels often rise and fall based on weather conditions. Any movement of the water table above 6' would kill the orchard.	root zone depth for almonds. The capillary fringe buffer is added to that root zone depth to establish the seepage/groundwater threshold. It is acknowledged that capillary fringe is an important consideration for protection of a defined aerated root zone, and Reclamation is considering proposing revising the Seepage Management Plan to adjust the capillary fringe buffer to 0.5 to 4 feet based on your and other's comments. The Study Plan focused on effective root zone depths that should be protected. Further evaluation of variation in capillary fringe within the project area is being considered as part of Phase 2 study efforts in order to potentially expand and refine capillary fringe values in the SMP.
KB-01	As one of the largest almond growers in the state, Wonderful has serious concerns on adjusting seepage thresholds for almonds from the current root zone level of 9'. Many site specific conditions contribute to the impact that water levels can have on almond tree health and must be analyzed on a case-by-case basis. Lowering the threshold across the board, or even after a phase 2 "field investigation of almond root zone characteristics," cannot properly account for unique soil, salt and other site specific characteristics which could cause varying water levels to have detrimental impact on almond trees resulting in potentially significant economic losses. For example, some of the soil types on the New Columbia Ranch can hold water above the measured groundwater level, creating saturation conditions than can kill critical roots and push salts into the root zones.	Experts interviewed in development of the Phase 1 almond root zone study and literature reviewed agreed, with broad consensus, that the effective almond root zone was three to five feet in depth, with most roots (estimated at approximately 80 percent) in the top two feet. Reclamation has proposed an additional foot of aerated root zone, to include a factor of safety, and thus proposes a six foot almond root zone. The current proposal resulting from the scientific evidence gathered in the Study Plan defines the almond root zone as six feet. As at our December 17, 2015 meeting, this depth is not the depth to the top of the water table. This six feet of rooting depth would be added to the capillary fringe buffer to determine the groundwater level threshold (and minimum depth to the water table). The six foot almond root zone depth is supported by literature and recommendations of University of California, Cooperative Extension (UCCE) experts, which also advise a six foot root zone that includes a one foot additional factor of safety over the effective root zone. Reclamation's understanding is that after recent discussions you are now more comfortable with this approach and think a 6 foot almond root zone is appropriate, if we adjust the capillary fringe buffer to account for the full range of capillary fringe in the full variety of soil types. The peer review in 2012 suggested a 3.3 to 6.6 foot almond effective root zone. It is acknowledged that capillary fringe is an important consideration for protection of a defined aerated root zone. Appendix H of the SMP provides a definition of the water table threshold that can be calculated via the Agricultural Method (SMP, Appendix H, Section H.1.3.1 and H.2). This threshold comprises both a root zone depth (proposed at 6 feet as supported above) and a capillary fringe buffer. The capillary fringe buffer is added to that root zone depth per the specifications of Appendix H; however, observed field variation in capillary fringe has exceeded values provided in Appendix H in some areas and is a concern relative to protection of the root zone. Further evaluation of variation in capillary fringe within the project area is being considered as part of Phase 2 study efforts in order to potentially expand and refine capillary fringe values in the SMP. Reclamation recognizes various terminology may be unclear related to different

Comment ID	Comment	Response
		components of the drained soil zone. It is important to clarify the difference between the root zone (and its component parts of maximum, effective, and active), capillary fringe, and water table. These components of an overall seepage threshold and their importance and interaction will be addressed by adding further explanation and illustration to distinguish between the terminologies. Please refer to Figure 1 for a graphical definition of these terms. Reclamation will operate 2016 Restoration Flows based on the existing almond root zone of 9 feet. Also, as discussed at our December 17, 2015 meeting, the UCCE experts appear to be in agreement about the 6 foot almond root zone. Our ongoing area of controversy is in regards to the appropriate capillary fringe buffer. Based on your and other's comments, Reclamation proposes to change the Seepage Management Plan in two ways: 1) to change the almond root zone to 6 feet and 2) to change the capillary fringe buffer to whatever is the greatest capillary fringe anticipated in the fields around a given well, based on the drill log of that well and any other information available. This would change the capillary fringe buffer to up to 4 feet depending on soil type. Thus, the 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).
KB-02	Practically the thresholds established by the Program must manage to the most conservation root zone levels within the Program area to ensure protection of all relevant crops, therefore Reclamation needs to clearly establish how variations in crop types up stream, that allow for shallower root zone depths will be managed to ensure crops downstream are protected.	The SMP describes site-specific groundwater level thresholds that are dependent on the crop and soil types on a specific property. If a groundwater well is near multiple crop types, the crop type with the deepest root zone is selected to set the groundwater level in that well. Flows in the San Joaquin River are held to the lowest level that can pass without causing groundwater levels to rise above any of the site-specific groundwater level thresholds (SMP, Appendix H).
KB-03	In the Phase 1 Almond Root Zone Study, Reclamation appears to have taken general comments made by University of California Cooperative Extension (UCCE) experts interviewed and applied them as criteria that could be used generally and apply to all almond crops. Almonds are extremely sensitive crops whose health can be impacted by many factors. Indeed, these site-specific factors were noted by the UCCE experts and in the literature reviewed by Reclamation. Phase 1 Almond Root Zone Study, 2-9; 3-1. We ask Reclamation to more fully develop the questions asked of the experts to better understand the impacts of unique site specific conditions on water level thresholds that are protective of almond crops.	The comments by UCCE were intended to inform and guide a review of existing information on almond root zones. The purpose of this effort was to refine and expand on the information on almond root zone depth in the SMP, which included general guidelines, but little information specific to California. UCCE experts provided much information; however, there are few, if any, formal studies conducted on agricultural tree roots that indicate depth with certainty. The goal of these efforts is to provide a scientific foundation for guidelines that are established in the SMP. Reclamation is currently scoping a potential field program to assess and refine almond root depth and capillary fringe in the SJRRP area. Reclamation anticipates that field investigations will yield useful information about root zone depth and/or capillary fringe as it varies across sites. Reclamation is also open to meeting with landowner representatives and UCCE or other experts concurrently after more formally developing questions to ask the experts with

Comment ID	Comment	Response
		landowner input.
KB-04	We encourage Reclamation to retain the existing root zone depth for almonds at 9' to protect our crops and avoid the significant economic loss that could result from changes. We also encourage Reclamation to conduct site-specific analyses before adopting any general rules that could adversely impact individual growers in the Program area.	Reclamation is currently looking into a Phase 2 of the Study Plan that would conduct site-specific analyses of almond root zones and/or capillary fringe. This study, which we hope to discuss with growers in early-2016, would be considered prior to any changes to the almond root zone. Reclamation will not change the existing nine foot almond root zone for 2016 Restoration Flows (if they exist). Also, note that changes to the almond root zone will not affect the Restoration Flows released until approximately 2018, at which point more impacted properties with annual crops are anticipated to have seepage projects completed. Also, as discussed in our December 17, 2015 meeting, the UCCE experts appear to be in agreement about the 6 foot almond root zone. Our ongoing area of controversy is in regards to the appropriate capillary fringe buffer. Based on your and other's comments, Reclamation proposes to change the Seepage Management Plan in two ways: 1) to change the almond root zone to 6 feet and 2) to change the capillary fringe buffer to whatever is the greatest capillary fringe anticipated in the fields around a given well, based on the drill log of that well and any other information available. This would change the capillary fringe buffer to up to 4 feet depending on soil type. Thus, the 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).
BS-01	I would like to begin my comments with a clarification to our earlier interview on January 27, 2015 as recorded in the draft publication you have prepared titled: "Almond Root Zone Study Administrative Draft Phase 1A-3-June2015" On page A-3 you quote me as follows: Blake Sanden, January 27, 2015 Though growers are pushing the limits on almond rooting zone up to only 4-ish ft (because of high almond prices, chasing good water quality, etc.) no farm advisor would recommend it. Farm advisors recommend 6 ft of oxygenated root zone. ***Would demand an average water table at 6 ft, accounting for capillary fringe, which can be up to 4 ft on some clay soils. Periodic saturation up to 4 ft would probably be OK, but not ok on average*** [emphasis in the original]***.*** Timing of saturation is also important. If increased flows, and therefore, increased seepage occurs in spring (for fish flows) that is prime temperature/conditions for phytophthora disease. Also, from mid-April to mid-June, "June-drop" occurs in almond trees. This is where they drop some of their developing fruits as a way to balance carbohydrates. During this time, B, P, Mn and Cu nutrition is critical for fruit set, canopy growth, and cell division. Under saturated conditions, nutrient availability and uptake are inhibited. Therefore, timing of saturation (and duration)	The Study Plan almond root zone depth recommendation of six feet is consistent with this input and the recommendation of UCCE. As noted previously, the focus of the Study Plan was on almond root zone and not on capillary fringe which we agree is an important factor. Also, as discussed in our December 17, 2015 meeting, the UCCE experts appear to be in agreement about the 6 foot almond root zone. Our ongoing area of controversy is in regards to the appropriate capillary fringe buffer. Based on your and other's comments, Reclamation proposes to change the Seepage Management Plan in two ways: 1) to change the almond root zone to 6 feet and 2) to change the capillary fringe buffer to whatever is the greatest capillary fringe anticipated in the fields around a given well, based on the drill log of that well and any other information available. This would change the capillary fringe buffer to up to 4 feet depending on soil type. Thus, the 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 would choose the most conservative capillary fringe buffer from the fields adjacent to the monitoring well.

Comment ID	Comment	Response
	potentially affects disease occurrence and production. As for the specific effects of duration and frequency of saturation on roots, talk to Patrick Brown. These effects would likely be less pronounced on roots deeper than the primary root zone in the top two ft, but doesn't know for sure because could depend on soil, moisture conditions, etc. Should also consider existing "shelf' of salinity. If seepage is coming from below, could potentially push shelf of salt that was previously ok (lower than roots) up into root zone. The above comment of recommending a full 6 feet of oxygenated rootzone is absolutely the standard for UCCE general recommendations to growers exploring new developments.	
BS-02	However, there is some confusion in the third line of the above comment. It should read, "This would demand a saturated water depth of 6 feet below the orchard floor - meaning you must account for the saturated 'capillary fringe ' (which can be as much as 4 feet in a typical fine-textured Westside clay loam soil) that subs up above the actual gravimetric depth of groundwater. Thus, to provide assurance of an oxygenated 6 foot rootzone, the actual water table depth should be at least 10 feet below the orchard floor." My apologies if this was not clear in our original interview. The additional comments are correct.	The clarification noted in this comment will be made. Reclamation acknowledges that capillary fringe varies with soil conditions and also that capillary fringes of four feet are possible, although not common. Appendix H of the SMP addresses capillary fringe and how it is used in SMP groundwater level thresholds. Further evaluation of variation in capillary fringe within the project area is being considered as part of Phase 2 study efforts in order to potentially expand and refine capillary fringe values in the SMP. Experts interviewed in development of the Phase 1 almond root zone study and literature reviewed agreed, with broad consensus, that the effective almond root zone was three to five feet in depth, with most roots (estimated at approximately 80 percent) in the top two feet. Reclamation has proposed an additional foot of aerated root zone, to include a factor of safety, and thus proposes a six foot almond root zone. The current proposal resulting from the scientific evidence gathered in the Study Plan defines the almond root zone as six feet. As at our December 17, 2015 meeting, this depth is not the depth to the top of the water table. This six feet of rooting depth would be added to the capillary fringe buffer to determine the groundwater level threshold (and minimum depth to the water table). The six foot almond root zone depth is supported by literature and recommendations of University of California, Cooperative Extension (UCCE) experts, which also advise a six foot root zone that includes a one foot additional factor of safety over the effective root zone. Reclamation's understanding is that after recent discussions you are now more comfortable with this approach and think a 6 foot almond root zone is appropriate, if we adjust the capillary fringe buffer to account for the full range of capillary fringe in the full variety of soil types. Reclamation is considering changing the capillary fringe buffer to whatever is the greatest capillary fringe anticipated in the fields around a given well, based on the drill log of that well and any other information available. This would change the

Comment ID	Comment	Response
		capillary fringe buffer to up to 4 feet depending on soil type. Thus, the almond 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 would choose the most conservative capillary fringe buffer from the fields adjacent to the monitoring well.
BS-03	The very uncertain issue here is the final rise height of the capillary fringe about the actual water table elevation AND the potential salt load that may come subbing back up into the rootzone if the water table rises above the 10 foot depth. Many Westside almond growers have had to make due with minimal water over the last 5 years especially, even supplementing with well water of marginal quality -resulting in minimal leaching and the very high likelihood of significant salt accumulation in the 4 to 6 foot depths. Water table and capillary fringe rise within this zone will cause these salts to move up into the active crop rootzone certainly limiting tree ET due to the increased osmotic potential from the added salts and quite possibly resulting in total salinity and/or specific ion toxicity from excessive sodium, chloride and/or boron. Unlike anoxia, which goes away as soon as the water drains, this salt intrusion remains with in this "subbing/fringe" zone until added surface fresh water leaches it downward. The below two pictures illustrate this concept clearly: showing shallow groundwater at pit in a pistachio orchard in NW Kern county planted to a sandy silt loam near a large un-lined canal and an adjacent nearly dead pistachio rootstock planted that spring.	Reclamation agrees with the ideas described in this comment. Reclamation's proposal was to set the root zone depth for the agricultural threshold method (SMP, Appendix H) at six feet. The capillary fringe buffer would be added to this depth (see response to BS-02). As noted previously, to avoid confusion in terminology, an explanation and schematic will be developed to illustrate and distinguish between the aerated root zone, capillary fringe, and drainage design allowances. Please refer to Figure 1 for a graphical definition of these terms. Reclamation is considering changing the capillary fringe buffer to whatever is the greatest capillary fringe anticipated in the fields around a given well, based on the drill log of that well and any other information available. This would change the capillary fringe buffer to up to 4 feet depending on soil type. Thus, the almond 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 would choose the most conservative capillary fringe buffer from the fields adjacent to the monitoring well. These changes to the capillary fringe buffer would increase the depth to water for all properties with fine soil types, regardless of crop type.
BS-04	To my knowledge there are no perched water table studies in almonds. We try never to plant there! That said, Keith Backman (soils/agronomy with Dellavalle Labs, Fresno) told my years ago he had some walnuts that got a big chunk of their water requirement via lateral subbing of shallow groundwater off the Kings River. I do not know what specific depths to the water table he was working with. Keith supplied the following comment via email: "I would use the 10' (water table depth) concept with flood irrigation. Now, with the vast changes of crops in low flow and soil moisture monitoring I could use 7', but if the (water) table suddenly rises or an irrigator thinks more water is better, 7 ft is not safe. "	The intent of seepage thresholds is to consistently maintain the water table at a level protective of the defined aerated root zone.
BS-05	There are studies looking at the contribution to plant ET in flood irrigated cotton grown over shallow groundwater, but these are not germane to this issue given the above considerations. I trust you find this information useful.	This Study Plan focused on almond-specific information. We acknowledge that different crop roots have different tolerances to saturation and salinity.
RP-01	Thank you for all the research you put into gathering the best information available regarding the danger of water logging the almond tree's root zone. I found it very educational and especially useful in that we are converting many of	Reclamation has attempted to develop and use scientifically-based information for decision making. We understand that this information can be valuable to both Reclamation and to other third-parties.

Comment ID	Comment	Response
	our vineyards to almond orchards.	
RP-02	The point of the presentation seemed to be if the belief of a 9 foot safe waterlogged free zone could be changed to a 6 foot waterlogged free zone by your findings. The reason that you were commissioned to even do such a study to reestablish the "safe threshold" is to reestablish the "responsible threshold" the River Restoration people would be held to. In whatever case it is my opinion that whenever you build a project for irrigation or drainage it is <u>always</u> [emphasis in the original] wiser to oversize it. Let me explain why.	Experts interviewed in development of the Phase 1 almond root zone study and literature reviewed agreed, with broad consensus, that the effective almond root zone was three to five feet in depth, with most roots (estimated at approximately 80 percent) in the top two feet. Reclamation has proposed an additional foot of aerated root zone, to include a factor of safety, and thus proposes a six foot almond root zone. The current proposal resulting from the scientific evidence gathered in the Study Plan defines the <u>almond root zone</u> as six feet. As at our December 17, 2015 meeting, this depth is not the depth to the top of the water table. This six feet of rooting depth would be added to the capillary fringe buffer to determine the groundwater level threshold (and minimum depth to the water table). The six foot almond root zone depth is supported by literature and recommendations of University of California, Cooperative Extension (UCCE) experts, which also advise a six foot root zone that includes a one foot additional factor of safety over the effective root zone. Reclamation's understanding is that after recent discussions you are now more comfortable with this approach and think a 6 foot almond root zone is appropriate, if we adjust the capillary fringe buffer to account for the full range of capillary fringe in the full variety of soil types. The peer review in 2012 suggested a 3.3 to 6.6 foot almond effective root zone. It is acknowledged that capillary fringe is an important consideration for protection of a defined aerated root zone. Appendix H of the SMP provides a definition of the water table threshold that can be calculated via the Agricultural Method (SMP, Appendix H, Section H.1.3.1 and H.2). This threshold comprises both a root zone depth (proposed at 6 feet as supported above) and a capillary fringe buffer. The capillary fringe buffer is added to that root zone depth per the specifications of Appendix H; however, observed field variation in capillary fringe has exceeded values provided in Appendix H in some areas and is a concern relative to protection of the root zone. Further evaluation of variation in capillary fringe within the project area is being considered as part of Phase 2 study efforts in order to potentially expand and refine capillary fringe values in the SMP. Reclamation recognizes various terminology may be unclear related to different components of the drained soil zone. It is important to clarify the difference between the root zone (and its component parts of maximum, effective, and active), capillary fringe, and water table. These components of an overall seepage threshold and their importance and interaction will be addressed by adding further explanation and illustration to distinguish between the terminologies. Please refer to Figure 1 for a graphical definition of these terms.
RP-03	When you establish a pipeline system for a farm development the cost of going	Reclamation understands the importance of including a factor of safety when

Comment ID	Comment	Response
	from a 14 inch to a 16 or 18 inch pipe (concrete) could be only 2 dollars and 4 dollars per foot more. All the other costs are the same, but [emphasis in the original] if you want to convey a greater head of water to the other parts of the farm you can do it. Also in the future what good is a new well that pumps much water if you can't get it through your system. The tiny savings in the smaller line is the most expensive mistake you could have made.	designing a seepage mitigation project. Given the uncertainty inherent in quantifying subsurface information, allowances and safety factors in many design parameters are included in the design process.
RP-04	The same is true when designing roads and setbacks and easements are not first purchased before improvements have been placed on them. The costs to fix the short sightedness is expensive and troublesome. The initial layout has to factor in "high use moments." As roads when people are going and returning from work, rush hour events." A "rush hour event" regarding high capacity river flows will not result in a half hour delay in getting home but in the full destruction and productive earning capacity of a high grossing investment.	Reclamation agrees that the SJRRP needs to account for the maximum groundwater seepage conditions when designing interceptor lines, similar to the road analogy that you use. We design interceptor lines to account for a full 4,500 cfs in the San Joaquin River year-round, even though 4,500 cfs will only occur for a couple of weeks. 4,500 cfs is the maximum Restoration Flow. Reclamation sizes drain diameters and pumps accordingly. Reclamation understands the importance of including a factor of safety when designing a seepage mitigation project. Given the uncertainty inherent in quantifying subsurface information, allowances and safety factors in many design parameters are included in the design process.
RP-05	Any recapturing seepage mechanism put in place needs to be built to handle these higher than expected or calculated flows. It can make the difference between total success or total failure. So it is my opinion based on experience and common sense that the seepage piping should be placed as deep as possible with plenty of rock cover and the pumps more than adequate to handle the flows.	Reclamation agrees, and includes additional safety factors in our designs both in terms of depth, drain diameter, and pumps. Rock cover, or the gravel envelope, is set primarily by levee stability requirements, but Reclamation extends the gravel envelope several feet above the interceptor line in cases with unknown or layered soil textures, to make sure that we are picking up all of the groundwater seepage. Reclamation understands the importance of including a factor of safety when designing a seepage mitigation project. Given the uncertainty inherent in quantifying subsurface information, allowances and safety factors in many design parameters are included in the design process.
RP-06	I would close this letter in restating that I believe this salmon restoration project is not viable, makes no sense at all and is a misallocation of water that borders on criminality.	Reclamation is obligated to implement Public Law 111-11.
JN2-01	I am writing to you regarding the proposed revision to the Seepage Management Plan that would reduce the depth to groundwater for almond tree roots from 9 feet to 6 feet. As a farmer who farms 825 acres of almond trees in the San Joaquin Valley, I have had over 40 years of experience growing almonds. My experience growing almonds includes experience with multiple soil types, varying depths to groundwater and variable water quality. I also have experienced flood conditions where the water table temporarily rose to saturate the root zone. I have consulted with various experts regarding the challenges of growing almonds and employ an agronomist to assist with crop growth and	Reclamation appreciates your time and effort to review this report given your extensive experience farming almonds in the San Joaquin Valley. Reclamation strives to arrive at an almond root zone that is protective of crops, avoids overly conservative values, and is based on science. The assistance of growers with local knowledge is much appreciated.

Comment ID	Comment	Response
	development. Through these experiences I have developed substantial knowledge regarding the conditions under which almond orchards should be developed.	
JN2-02	I would not risk my money or property attempting to grow almond trees in the Exchange Contractors service area with only six feet of depth to groundwater. I would be running the substantial risk of financial ruin and loss of thousands of valuable trees.	Reclamation appreciates the perspective of local growers. Reclamation has noted almond orchards being planted within Exchange Contractors service area, in areas with shallow groundwater depths. The SJRRP is not required to decrease groundwater levels beyond what existed prior to the SJRRP. Improving groundwater conditions would put an undue burden on the federal taxpayer. However, clearly, the SJRRP is responsible for implementing the SMP and avoiding material adverse groundwater seepage impacts from our flows. The Study Plan focused on the appropriate aerated almond root zone (defined as six feet. This depth is not the same as the depth to the top of the water table. An additional buffer for capillary fringe is added to the root zone to establish the seepage/groundwater threshold. Experts interviewed in development of the Phase 1 almond root zone study and literature reviewed agreed, with broad consensus, that the effective almond root zone was three to five feet in depth, with most roots (estimated at approximately 80 percent) in the top two feet. Reclamation has proposed an additional foot of aerated root zone, to include a factor of safety, and thus proposes a six foot almond root zone. The current proposal resulting from the scientific evidence gathered in the Study Plan defines the almond root zone as six feet. As at our December 17, 2015 meeting, this depth is not the depth to the top of the water table. This six feet of rooting depth would be added to the capillary fringe buffer to determine the groundwater level threshold (and minimum depth to the water table). The six foot almond root zone depth is supported by literature and recommendations of University of California, Cooperative Extension (UCCE) experts, which also advise a six foot root zone that includes a one foot additional factor of safety over the effective root zone. Reclamation's understanding is that after recent discussions you are now more comfortable with this approach and think a 6 foot almond root zone is appropriate, if we adjust the capillary fringe buffer to account for the full range of capillary fringe in the full variety of soil types.
JN2-03	I have reviewed the letters submitted to you by Wonderful Orchards. I agree with the statements by Wonderful Orchards, David Doll and Blake Sanden. Six feet of depth to groundwater is insufficient for almond trees. I urge Reclamation to keep the depth to groundwater at 9 feet and to not consider this issue any further.	Reclamation will not change the existing nine foot almond root zone depth for 2016 Restoration Flows (if they occur). Also, as discussed in our December 17, 2015 meeting, the UCCE experts appear to be in agreement about the 6 foot almond root zone. Our ongoing area of controversy is in regards to the appropriate capillary fringe buffer. Based on your and other's comments, Reclamation proposes to change the Seepage

Comment ID	Comment	Response
		Management Plan in two ways: 1) to change the almond root zone to 6 feet and 2) to change the capillary fringe buffer to whatever is the greatest capillary fringe anticipated in the fields around a given well, based on the drill log of that well and any other information available. This would change the capillary fringe buffer to up to 4 feet depending on soil type. Thus, the 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 would choose the most conservative capillary fringe buffer from the fields adjacent to the monitoring well.
EC-01	The following comments to the proposed revision to the Seepage Management Plan (SMP) are submitted on behalf of the San Joaquin River Exchange Contractors Water Authority and the San Joaquin River Resource Management Coalition (referred to hereafter for convenience as either "Exchange Contractors" or where appropriate "Landowners"). Thank you very much for granting an extension of tIme to submit these comments. The Exchange Contractor s and Landowners have worked closely with Reclamation and other interested parties over the past several years to address problems associated with seepage resulting from the San Joaquin River Restoration Program ("SJRRP"). Much of this collaborative work resulted in the SMP. Included in that collaborative process were experts from California State Polytechnic University at San Luis Obispo who addressed such issues as capillary fringe, salt update and root zone saturation.	Reclamation has appreciated all the time the Exchange Contractors and landowners have provided to create the SMP over the past five years. It has been a pleasure working with those with vested interests in the decisions made by the SJRRP to develop the SMP and learn from local expertise.
EC-02	Since the start of the comment period for proposed revisions to the SMP, we have been informed that Reclamation has decided to hold off on revising the SMP to address almond root zone depth. We understand this is not necessarily a final determination by Reclamation and that the depth lo groundwater for the almond root zone may still be revisited. The Exchange Contractors urge Reclamation to finalize the depth to groundwater for the almond root zone at nine feet. The nine foot depth is the most defensible depth and was arrived at through an open and transparent process and reflect s the expert opinions of the local agricultural experts from the University of California Cooperative Extension. Further support for retaining the nine foot depth to groundwater is set forth below.	The SMP may always be revised if more up to date or scientifically valid information is discovered. The nine foot almond root zone depth is in the current SMP; however, it has much less scientific support than the other crop root zones identified in the SMP (refer to SMP Section H.2.1). There were no studies, expert experience, or objective scientific knowledge or opinions encountered during the development of the Study Plan that indicated that a nine foot root zone should be protected. The intent of this study was to characterize the body of expert knowledge and scientific literature on almond root zones. There was significant agreement and consensus among experts on this topic.
EC-03	The SMP was reviewed by a Peer Review Panel ("PRP"), which largely endorsed the approach taken in the SMP. The SMP reviewed by the PRP concluded that a nine foot depth to groundwater was appropriate for almond trees.	The Peer Review Panel actually found that the effective root zone depth for almond trees was between 3.3 and 6.6 feet (SMP Peer Review, Table 1). The Panel recognized that the maximum root depth in unrestricted soils may be up to 12 feet.

Comment ID	Comment	Response
		There were no studies, expert experience, or objective scientific knowledge or opinions encountered during the development of the Study Plan that indicated that a nine foot root zone should be protected. The intent of this study was to characterize the body of expert knowledge and scientific literature on almond root zones. There was significant agreement and consensus among experts on this topic.
EC-04	The SMP that was issued as recently as January 2015 again reflected the work that had been done over the past several years by the Exchange Contractors, Landowners, independent experts, and Reclamation. The SMP called for a nine foot depth to groundwater for almond trees. In June 2015, Reclamation issued an administrative draft of the "Almond Root Zone Study Plan Phase I" ("Root Zone Study"). Based on the results of Phase 1 of the Root Zone Study, Reclamation proposed to amend the SMP. As we understand it, the Root Zone Study proposed to reduce the acceptable threshold for groundwater in areas where permanent crops are planted or may be planted from 9 feet to 6 feet below ground surface ("bgs"). As is explained below, the Exchange Contractors have examined this proposal, consulted with some of the same experts answered questions about root zone proposed by Reclamation and have concluded that it would jeopardize thousands of acres of almond trees and therefore is an ill- founded proposal.	Reclamation is attempting to find the appropriate almond root zone depth that is protective of crops while not being overly conservative, and based in science. Reclamation welcomes local expertise and thanks those that have spent time in reviewing the Study Plan and SMP. Reclamation plans to work cooperatively with local stakeholders to ensure the appropriate root zone depth is selected.
EC-05	Seepage and seepage management have been a challenge for the San Joaquin River Restoration Program since prior to enactment of the San Joaquin River Restoration Settlement Act ("Act"). In the Act, the Secretary of the Interior has been mandated to avoid seepage impacts (Act, Secs. 10004(d), (h)(3), and 10009(a)(3)). Seepage management is also a requirement of the long-term amendment to Reclamation's water rights on the San Joaquin River allowing for the release and protection of restoration flows down the San Joaquin River, which also requires review, modification and approval by the Deputy Director for Water Rights of any change (See Order Approving Change and Ins/ream Flow Dedication, Conditions 6-12, <ltd October 21, 2013). The SMP has been the backbone of Reclamation's approach to seepage management.	Reclamation agrees with the statements made in this comment. The SMP is Reclamation's approach to seepage management. Seepage has indeed been a challenge for the SJRRP, as evidenced by the fact that it is not mentioned at all in the Stipulation of Settlement of NRDC vs. Rodgers, yet is now a significant ($189 million) portion of the SJRRP's budget in the Revised Framework for Implementation.
EC-06	The Programmatic Environmental Impact Study/Environmental Impact Report ("PEIS/R") discussed the problem of seepage impacts. Chapter 12 of the Draft PEIS/R reports significant seepage problems in several reaches of the San Joaquin River within the restoration area. (Draft PEIS/R, pgs 12-34-12-36) In Appendix D of the Draft PEIS/R, Reclamation and DWR set forth the criteria for root zone protection. Almond trees are identified as having a zone of protection of 6-9 feet, based on information received from the Westlands Irrigation District (WWD). The Exchange Contractors note that soil types within the Exchange Contractors' service area differ from that within WWD and that with capillary fringe uptake of water by as much as 2-3 feet in the Exchange Contractors' service	Reclamation understands that the capillary fringe is a highly variable and key component of setting a groundwater level threshold. The almond root zone is not synonymous with the groundwater level. An additional buffer for capillary fringe is added to the root zone to establish the seepage/groundwater threshold. Reclamation has assessed capillary fringe at 143 sites over four years (80 sites sampled in 2010, 51 sites in 2011, 109 sites in 2012, and 128 sites in 2013). Further evaluation of variation in capillary fringe within the project area is being considered as part of Phase 2 study efforts in order to potentially expand and refine capillary fringe values in the SMP.

Comment ID	Comment	Response
	area, a 6 foot depth would only provide 2-3 feet of unwetted, non-saline soil.	Also, as discussed in our December 17, 2015 meeting, the UCCE experts appear to be in agreement about the 6 foot almond root zone. Our ongoing area of controversy is in regards to the appropriate capillary fringe buffer. Based on your and other's comments, Reclamation proposes to change the Seepage Management Plan in two ways: 1) to change the almond root zone to 6 feet and 2) to change the capillary fringe buffer to whatever is the greatest capillary fringe anticipated in the fields around a given well, based on the drill log of that well and any other information available. This would change the capillary fringe buffer to up to 4 feet depending on soil type. Thus, the 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 would choose the most conservative capillary fringe buffer from the fields adjacent to the monitoring well.
EC-07	In September 2014, Reclamation issued a draft Seepage Management Plan ("SMP 2014"). Seepage management is an issue in both losing reaches of the San Joaquin River where water flows from the river into the adjacent groundwater system, and in gaining reaches where an increase in river stage reduces the amount of water than can flow back into the river from the adjacent groundwater system. In response to either of these mechanisms, the water table will rise until equilibrium with surface water is established. (SMP 2014. Pg. 1-2). Among the key elements for minimizing the effect of restoration flows on the adjacent land is the establishment of groundwater levels that identify the potential for seepage damage and events that result in the likelihood of rising groundwater which in turn may restrict the magnitude, timing or duration of restoration flows. (SMP 2014, pg. 1-4). In creating various iterations of the SMP, Reclamation has identified various modifications to reduce seepage effects and allow for higher restoration flows. These modifications will require supplemental environmental documentation and regulatory review. (Id.) As Reclamation states "The SMP is part of the project description for the SJRRP and the expected environmental impacts of implementing the SMP must comply with [NEPA and CEQA] criteria". (SMP 2014, pg. 1-5).	The SMP is an attachment to Reclamation's PEIS/R, which provides project-level environmental compliance on the release of flows from Friant Dam for the San Joaquin River Restoration Program. Reclamation does acknowledge that seepage projects will require compliance with NEPA, and fully intends to comply with NEPA for implementation of seepage projects. Reclamation agrees that changing the almond root zone depth from nine to six feet requires NEPA compliance. In addition, this is a change to the SMP and as such Reclamation will send it to the Deputy Director of Water Rights for the State Water Resources Control Board for review and approval as required in our Water Rights Order.
EC-08	Appendix H of the SMP 2014 was revised as of January 2015. Hence, as of nine months ago Reclamation prescribed a root zone depth for almonds of nine feet. (App. H, pg. H-7) This is the same depth that has been prescribed for several years, including following the Peer Review Panel analysis in 2012.	The Peer Review Panel did not propose a nine foot root zone depth for almonds. The Peer Review Panel actually found that the effective root zone depth for almond trees was between 3.3 and 6.6 feet (SMP Peer Review, Table 1). However, Reclamation did include a nine foot root zone depth for almonds in the SMP after the 2012 peer review and has not changed this value since.
EC-09	In the August 6, 2015 Seepage and Conveyance Technical Feedback Group meeting, Reclamation proposed a revision to the depth-to-groundwater for almond trees. Reclamation conferred with a number of experts and believes,	An aerated root zone of six feet is the recommendation from UCCE staff as stated in comment BS-01. As mentioned in previous responses, all experts agreed that the threshold at which a water table should be maintained does not need to equal

Comment ID	Comment	Response
	erroneously, that the experts concurred that a 6-foot root growth was sufficient to protect almond trees against root zone saturation and salinization. What in fact is evident is that a root zone depth of somewhere between 5-13 feet is appropriate. Appropriate root depths will vary by types of soil and other growing conditions, root stock and other plant characterizations, as well as salinity in the soil.	the depth of the deepest roots because of the very low function of those roots. There is no scientific support to date indicating that a protected root zone of 10-13 feet is necessary. It is also acknowledged that capillary fringe must be also be accounted for and root zone is not synonymous with groundwater level. The Study Plan also acknowledged that there is variability in sites that results from several factors that influence almond rooting zones. The site-specific aspects of root zone and capillary fringe estimation are intended to be addressed in a potential Phase 2field study.
EC-10	Reclamation completed Phase 1 of the Root Zone Study. Based on Reclamation's own characterization, the Root Zone Study was not a comprehensive study, but rather a literature review and generalized survey of some of the issues that affect root zone depth. A review of the study indicates there was no clear consensus.	The intent of the study was to characterize the body of expert knowledge and scientific literature on almond root zones. There was significant agreement and consensus among experts on this topic. All experts agreed that the effective root zone in almonds extends three to five feet in depth. Experts also agreed that root presence and activity is greatly diminished beyond this depth, regardless of soils, because 1) irrigation water is, for the most part, restricted to shallow depths; 2) there are few nutrients beyond this depth; 3) it takes much more energy for the tree to transport nutrients and water from greater depths. There was also agreement that the depth of the aerated root zone does not need to equal the depth of the deepest roots because of the very low functionality and efficiency of those deep roots.
EC-11	As part of the study Reclamation informally posed questions via telephone or email to a group of professors and consultants with the University of California Cooperative Extension (UCCE). The questions and summary of the responses were set forth in the Root Zone Study. Reclamation summarized the results in a PowerPoint presentation made on August 6, 2015 to the Seepage and Conveyance Technical Feedback Group meeting. (http://www.rcstoresjr.net/wp-content/uploads/20150806 SCTFG Final.pdf) For example, question number 2 that was posed to the experts asks "What is the effect of saturation on the primary root zone and the total root zone?" Responses indicated that the effects were site specific and could be influenced by seasonal timing, frequency and duration of saturation. Most telling is that the experts conceded that research is inadequate to estimate how these factors might interact. (PowerPoint presentation slide I 06). Also uncertain was the minimum age of almond trees at which peak root development occurs. Apparently there have been no long-term studies conducted on almond root development in California. (Slide 107).	Agreed.
EC-12	Also uncertain is what the effect of orchard density might be on almond root depth. Again, there are no studies to rely on regarding root structure and orchard density. There is some belief that roots do not compensate for higher density plantings by growing deeper. (Slide 108). Also there was substantial uncertainty	Agreed.

Comment ID	Comment	Response
	regarding the effect of rootstock on almond root depth. (Slide I 09). Apparently rootstocks vary in their depth and tolerance to salinity. But, importantly, salinity tolerance is a major objective in rootstock breeding and while rootstock influences rooting depth, salinity is likely the driving factor. (Slide 110). In an area such as that adjacent to the San Joaquin River where natural salinity occurs and where water with moderately high salinity is applied, salinity is a major concern.	
EC-13	As mentioned above, in January 2015 the SMP set a root zone for almond trees at 9 feet. (See Appendix H, SMP) (slide 112). Prior versions of the SMP went through a Peer Review Panel (PRP) in 2012. The PRP concluded that requiring a depth of 12-13 feet was deeper than necessary and that 2.5 feet was too small. They felt the range was most likely in the 3.3 to 6.6 foot area. However, they indicated more refinement was needed for effective and maximum root zones. In other words, again there was no clear consensus. (Slide 112). But, what the PRP did conclude was that information was uncertain and that more work needed to be done.	Agreed. The intent of the study was to characterize the body of expert knowledge and scientific literature on almond root zones. There was significant agreement and consensus among experts on this topic. All experts agreed that the effective root zone of three to 5 feet should be protected and a 1 foot buffer (totaling 6 feet) is recommended by experts. Additional information may also be sought in a Phase 2Field Study.
EC-14	Reclamation concedes that general scientific literature and local experts agreed that it is the effective root zone, not the maximum root depth that needs to be used in addition to capillary rise to estimate root zone. One must recall that substantial work has already been done by experts from California Polytechnic University at San Luis Obispo who determined that capillary rise and salinity were significant and that a depth to groundwater of 9-10 feet was appropriate.	It is agreed that capillary fringe is an important factor that must be considered along with root zone. We acknowledge the Cal Poly Study and that capillary fringe is known to vary by soil type. The Study Plan focused on the effective root zone. Capillary fringe is addressed in the Seepage Management Plan under Appendix H, Section H.2. Further evaluation of variation in capillary fringe within the project area is being considered as part of Phase 2 study efforts in order to potentially expand and refine capillary fringe values in the SMP. As discussed in our December 17, 2015 meeting with you, David Doll, and Blake Sanden, the experts appear to be in agreement about the 6 foot almond root zone. Our ongoing area of controversy is in regards to the appropriate capillary fringe buffer. Based on your and other's comments, Reclamation proposes to change the Seepage Management Plan in two ways: 1) to change the almond root zone to 6 feet and 2) to change the capillary fringe buffer to whatever is the greatest capillary fringe anticipated in the fields around a given well, based on the drill log of that well and any other information available. This would change the capillary fringe buffer to up to 4 feet depending on soil type. Thus, the 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 would choose the most conservative capillary fringe buffer from the fields adjacent to the monitoring well.
EC-15	The PRP also made it clear that local conditions were extremely important. Within the areas adjacent to the San Joaquin River, local conditions vary substantially. (Slides 116-117). From least limiting to most limiting, soil types range from non-saline, coarse-textured soils with potential high water tables to	Agreed.

Comment ID	Comment	Response
	restrictive hard pans or clay layers, or stratified soils. (Id.)	
EC-16	The PowerPoint presentation incorrectly concludes as shown below - with a statement that "expert, UCCE, and literature sources converge on recommended effective root zone and capillary fringe totaling 6 feet." (Slide 120) Yet, at the same time, it concludes that "certain root zone seepage effects and dynamics are unknown." (Slide 120). Despite this uncertainty, Reclamation proposes to revise the SMP to decrease root zone depth for almonds from 9 feet to 6 feet.	Reclamation acknowledges that there may be some confusion presented between the Study Plan and presentation with respect to the proposed root zone of six feet and the inclusion or exclusion of capillary fringe. These terms will be clarified in the revised study plan and documentation. Please refer to Figure 1 for a graphical definition of these terms. Experts interviewed in development of the Phase 1 almond root zone study and scientific literature reviewed agreed, with broad consensus. All UCCE expert comments were incorporated in the Draft Study Plan after a given review period. The six foot recommendation, based on expert opinion on effective root zone plus a 1 foot factor of safety, also aligns with the previous Peer Review Panel root zone recommendation. A capillary fringe value is added to this root zone to determine the seepage threshold.
EC-17	The Phase I Almond Root Zone Study administrative draft dated June 29, 2015 sets forth a summary of comments by the experts that were consulted. It is evident reviewing the comments from the various experts that there is a lack of certainty regarding root depth. For instance, Gurreet Brar stated that the effective root zone is in the top 2 feet. Yet, this is directly contradicted by the Root Zone Study which indicates that the effective zone is at least as far down as 3-5 feet. Further, Mr. Brar defers to Roger Duncan.	The effective root zone Mr. Brar referred to is referred to as the active root zone by others, or the depth to which roots actively take up nutrients and water. There was general agreement among experts on active and effective root zone function and depth. The effective root zone of three to five feet is where uptake occurs and also where structural roots are important.
EC-18	Roger Duncan indicates that while 80% of the root zone is in the top 2 feet, he "would not be comfortable planting where [the] water table was at 5 feet. Would be okay if water table was at IO feet. Water table should be somewhere between 5 and IO feet, but not sure where."	The results of this Study Plan indicate the water table should be controlled at a depth protective of an aerated effective root zone (so that the water table falls below the root zone and capillary fringe zone).
EC-19	Bruce Lampinen observed that rooting depth is highly variable and dependent on how the irrigation system is operated during the summer. (Appendix A, pg. 3). Ken Shackel observed that a precautionary principle needs to be applied because "trees are known for taking a long time to die; i.e. harm may be occurring but you may not see it right away." He also agreed that you can't drain the soils to just the lowest of active roots (4-5 feet) because there needs to be some room for leeching. There was no comment about capillary action. (Id.) Brent Holtz observed that root depth depends on water quality and stated that while it might be possible to have more shallow water tables, water quality is the determinative factor. (Id.)	Reclamation acknowledges in previous comments and in the Study Plan that water table depth is not the same as the protected root zone and that capillary fringe also plays an important role. Site specific effective root zone depths vary based on a number of factors and, based on expert input and literature, are expected to be less than the proposed six feet. Experts interviewed in development of the Phase 1 almond root zone study and literature reviewed agreed, with broad consensus, that the effective almond root zone was three to five feet in depth, with most roots (estimated at approximately 80 percent) in the top two feet. Reclamation has proposed an additional foot of aerated root zone, to include a factor of safety, and thus proposes a six foot almond root zone. The current proposal resulting from the scientific evidence gathered in the Study Plan defines the <u>almond root zone</u> as six feet. As at our December 17, 2015 meeting, this depth is not the depth to the top of the water table. This six feet of rooting depth would be added to the capillary fringe buffer to determine the groundwater level threshold (and minimum depth to the water

Comment ID	Comment	Response
		table). The six foot almond root zone depth is supported by literature and recommendations of University of California, Cooperative Extension (UCCE) experts, which also advise a six foot root zone that includes a one foot additional factor of safety over the effective root zone. Reclamation's understanding is that after recent discussions you are now more comfortable with this approach and think a 6 foot almond root zone is appropriate, if we adjust the capillary fringe buffer to account for the full range of capillary fringe in the full variety of soil types.
EC-20	Reclamation talked to Blake Sanden who is also a consultant to Wonderful Orchards (formerly Paramount Farms) and one of the only people Reclamation spoke to who has considerable local experience. Attached to this comment letter is a letter dated September 14, 2015, from Ms. Kimberly Brown, Senior Director, Water Resources, Wonderful Orchards (formerly Paramount Farms), to Ms. Katrina Harrison providing copies of letters from two experts that were consulted by Reclamation, Blake Sanden and David Doll, and also Ms. Brown's own comments based on the extensive experience of Wonderful Orchards. Mr. Sanden reports that the summary of his comments reported on page 3 of Appendix A were misstated. He clarified that his comment should be as follows: This would demand a saturated water depth of 6 feet below the orchard floor - meaning you must account for the saturated "capillary fringe" (which can be as much as 4 feet in a typical fine-textured Westside Clay Loam soil" that subs up above the actual gravimetric depth of groundwater. Thus, to provide assurance of an oxygenated 6 foot root zone, the actual water table depth should be at least I 0 feet below the orchard floor." (underscore in original) In his letter, Mr. Sanden also cited soils and agronomy expert Keith Backman, who recommends a I 0 foot water table depth to use with flood irrigation and notes that while 7 feet might be acceptable with low flow and soil moisture monitoring, if the water table were to suddenly rise or an irrigator felt he/she needed to add more water, 7 feet would not be a safe level.	Many, if not all, of the UCCE experts interviewed have local experience relevant to the questions posed. The responses to Mr. Sanden's comments are provided as responses BS-01 and BS-02.
EC-21	Also attached to the Wonderful Orchards letter was a letter dated September 13, 2015 from Mr. David Doll, who is the tree nut pomology farm advisor from University of California, Cooperative Extension for Merced County. Mr. Doll cites deep concern regarding the proposal to decrease water table depth from 10 feet to 6 feet. He states unequivocally that "within the soils along the San Joaquin in western Fresno, Madera, and Merced County, a water table at 6 feet will kill perennial crops." Among his reasons for stating that a 6 foot depth is unsuitable is the failure of that depth to take into account capillary fringe, which can be as	Mr. Doll's comments are addressed elsewhere in this table. Experts interviewed in development of the Phase 1 almond root zone study and literature reviewed agreed, with broad consensus, that the effective almond root zone was three to five feet in depth, with most roots (estimated at approximately 80 percent) in the top two feet. Reclamation has proposed an additional foot of aerated root zone, to include a factor of safety, and thus proposes a six foot almond root zone. The current proposal resulting from the scientific evidence

Comment ID	Comment	Response
	much as 2-3 feet (Mr. Sanden notes possibility of 4 feet); high amounts of salts which can inhibit growth or kill trees; susceptibility of the deeper roots down to 7-9 feet to Phytophthora species of disease: observations of rapid tree death due to high water tables near Hilmar; and the lack of research/based information that has demonstrated that studies will survive with a water table at 6 feet, whereas successful orchards have been observed with water table depth greater than I 0 feet. Mr. Doll argues that given the cost to establish an orchard, he would not recommend to a farmer that they could successfully establish an orchard in an area with a water table at 6 feet. He states the risk is too high.	gathered in the Study Plan defines the almond root zone as six feet. As at our December 17, 2015 meeting, this depth is not the depth to the top of the water table. This six feet of rooting depth would be added to the capillary fringe buffer to determine the groundwater level threshold (and minimum depth to the water table). The six foot almond root zone depth is supported by literature and recommendations of University of California, Cooperative Extension (UCCE) experts, which also advise a six foot root zone that includes a one foot additional factor of safety over the effective root zone. Reclamation's understanding is that after recent discussions you are now more comfortable with this approach and think a 6 foot almond root zone is appropriate, if we adjust the capillary fringe buffer to account for the full range of capillary fringe in the full variety of soil types. As discussed in our December 17, 2015 meeting, the UCCE experts appear to be in agreement about the 6 foot almond root zone. Our ongoing area of controversy is in regards to the appropriate capillary fringe buffer. Based on your and other's comments, Reclamation proposes to change the Seepage Management Plan in two ways: 1) to change the almond root zone to 6 feet and 2) to change the capillary fringe buffer to whatever is the greatest capillary fringe anticipated in the fields around a given well, based on the drill log of that well and any other information available. This would change the capillary fringe buffer to up to 4 feet depending on soil type. Thus, the 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 would choose the most conservative capillary fringe buffer from the fields adjacent to the monitoring well.
EC-22	Reclamation also spoke with Astrid Voider. However, she indicates that she has only studied pecan roots and one walnut orchard. Apparently she is unqualified to discuss almond roots. (Appendix A, pg. 3).	The Study Plan states "University of California Cooperative Extension (UCCE) experts were interviewed to gain information on both almond root depth and on appropriate methods and factors to consider in a potential almond root depth field study." Drs. Volder and Berry were consulted for their expertise in various root study and excavation methods, to help inform the field study. These experts did not provide expertise on almond root depth specifically.
EC-23	Franz Niederholzer from UCCE was also interviewed. Mr. Niederholzer noted that when water is seeping up from the bottom, salts in the root zone are problematic. Wicking could concentrate salts. Where roots have been established to lower water tables, he indicates they may have trouble adapting to a water table that rises. (Appendix A, pg. 4). Mr. Patrick Brown was also consulted and he stated he agreed with Mr. Sanden regarding the March to May period being critical, but noted that if the root zone is saturated during that time trees will be harmed. But he notes that if there is a salt shelf below the 3 foot limit, it might be pushed up during seepage events which must also be taken into	Agreed. The intent of the SJRRP is to protect the defined aerated root zone.

Comment ID	Comment	Response
	account. (Id.)	
EC-24	Reclamation also spoke with Ms. Alison Berry. Her comments seemed mostly to be aimed at how to study impacts on tree roots, rather than an opinion regarding the appropriate depth to the water table (Id.)	Agreed. Please see response to EC-22.
EC-25	Mr. Doll and Mr. Duncan had a follow-up communication regarding Reclamation's proposal to decrease the depth to water from 6 feet to 9 feet. Paraphrasing an email exchange between them, Mr. Duncan opined that based on his review of the comments from the experts, he wasn't sure that any of the comments "were in support" of changing a recommendation of a minimum water table depth from ten feet to six feet; that he would not be comfortable planting an orchard if the water table was at five feet and that "six feet isn't much different", that there is a need to leach salts below the root zone, that "water tables are rarely stable, and a fluctuating water table can kill trees that have survived for many years", and finally, with regard to a six foot depth to water, "I hope they have good insurance."	Experts interviewed in development of the Phase 1 almond root zone study and literature reviewed agreed, with broad consensus, that the effective almond root zone was three to five feet in depth, with most roots (estimated at approximately 80 percent) in the top two feet. Reclamation has proposed an additional foot of aerated root zone, to include a factor of safety, and thus proposes a six foot almond root zone. The current proposal resulting from the scientific evidence gathered in the Study Plan defines the almond root zone as six feet. As at our December 17, 2015 meeting, this depth is not the depth to the top of the water table. This six feet of rooting depth would be added to the capillary fringe buffer to determine the groundwater level threshold (and minimum depth to the water table). The six foot almond root zone depth is supported by literature and recommendations of University of California, Cooperative Extension (UCCE) experts, which also advise a six foot root zone that includes a one foot additional factor of safety over the effective root zone. Reclamation's understanding is that after recent discussions you are now more comfortable with this approach and think a 6 foot almond root zone is appropriate, if we adjust the capillary fringe buffer to account for the full range of capillary fringe in the full variety of soil types.
EC-26	Based on the above, it cannot be stated that there is a consensus among those experts that it is acceptable to decrease the depth to water table. Clearly the responsible approach is to leave the depth to water table at 9 feet. It represents a consensus among landowners and was the result of the extended public process. The experts consulted by Reclamation were never asked the key question (which seems very strange) of whether they would recommend a six foot depth to groundwater in the affected area. While their answers to the questions asked varied, we have very definitive opinions by the two experts who are actively engaged with almond growers in the affected area and a similar opinion from Mr. Duncan when asked the direct key question. These experts should be given deference as compared to those who have only more general knowledge. Further, Wonderful Orchards has submitted their comments and given the substantial experience they have regarding almond orchards in this area, local experience, knowledge of soil types, and interaction with groundwater tables, their expertise is deserving of deference.	The Study Plan did not set out to validate a predetermined root zone. Experts were not asked about any specific root zone or water table depth as this would have introduced suggested bias. The six foot root zone depth recommendation was a result of the compilation of expert opinions and scientific literature, plus a one foot factor of safety, rather than a starting point. This depth also agrees with the former recommendation that resulted from the Peer Review Panel analysis in 2012. There was no scientific information found supporting an effective almond root zone of nine feet. It is acknowledged that the difference between water table and root zone should be clarified to avoid confusion between these terms. This clarification will be added to the revised Study Plan. Also, as discussed in our December 17, 2015 meeting, the UCCE experts appear to be in agreement about the 6 foot almond root zone. Our ongoing area of controversy is in regards to the appropriate capillary fringe buffer. Based on your and other's comments, Reclamation proposes to change the Seepage Management Plan in two ways: 1) to change the almond root zone to 6 feet and 2) to change the capillary fringe buffer to whatever is the greatest capillary fringe anticipated in the fields around a given well, based on the drill log of that well and any other information available. This would change the capillary fringe buffer to up

Comment ID	Comment	Response
		to 4 feet depending on soil type. Thus, the 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 would choose the most conservative capillary fringe buffer from the fields adjacent to the monitoring well.
EC-27	It is also important to consider that Reclamation has not performed any environmental analysis of this proposed change. If Reclamation were to reconsider its current position regarding maintenance of the nine foot depth to groundwater, this highly substantive controversial change must go through full NEPA review.	The SMP is an attachment to Reclamation's PEIS/R, which provides project-level environmental compliance on the release of flows from Friant Dam for the San Joaquin River Restoration Program. Reclamation does acknowledge that seepage projects will require compliance with NEPA, and fully intends to comply with NEPA for implementation of seepage projects. Reclamation agrees that changing the almond root zone depth from nine to six feet requires NEPA compliance. In addition, this is a change to the SMP and as such Reclamation will send it to the Deputy Director of Water Rights for the State Water Resources Control Board for review and approval as required in our Water Rights Order.
EC-28	The Exchange Contractors understand that Reclamation has indicated that if it reconsiders the nine foot depth to groundwater it will conduct Phase II of the Almond Root Zone Study if requested by landowners. It is the position of the Landowners that Phase II is unnecessary at this point as the depth to groundwater should remain at 9 feet. If Reclamation changes what we understand is its current view that the root zone will not be reduced to 6 feet, then the Landowners do request that Phase II of the study be undertaken. However, prior to undertaking such study, it is requested that Reclamation meet with the Landowners and local experts to discuss, among other matters, impacts, compensation, and how the program would operate given varying soil types and different requirements for depth to groundwater. It seems infeasible to operate in a manner where river flow and seepage impacts can be adjusted from location to location. The Landowners also request that Reclamation include the Landowners and their experts in the study development and implementation.	Reclamation agrees. Reclamation plans to conduct Phase 2 of the study if landowners request it. Reclamation is planning to meet with the Exchange Contractors and landowners to discuss these comments and responses and the objectives of a Phase 2 study. Another Seepage and Conveyance Technical Feedback Group Meeting will be held following that meeting to discuss these comments and responses. Reclamation recognizes that the landowners and Exchange Contractors could have been included more directly in Phase 1 of the Study Plan. Therefore, Reclamation plans to more fully include these groups in Phase 2.
EC-29	Finally, we are concerned that the proposed change of depth to groundwater may be part of an agenda to affect how seepage mitigation is being undertaken. This raises another serious set of questions that need to be addressed if Reclamation is tying these issues together. We will rely on Reclamation's obligation to be forthright as a governmental entity regarding any effort it is making to reduce its seepage obligations by changing the depth to groundwater. If such is the case, Reclamation must make this issue transparent and analyze the effects on landowners of this change as well as the effects on what physical projects or real estate actions might be taken as a result. Reclamation's consideration of a unilateral change to the depth to groundwater is a very significant issue to landowners. Reclamation should undertake further	Reclamation's purpose in undertaking this study was to analyze the best available science regarding almond root zone depths, and identify a depth that was protective of crops while not being overly conservative. The nine foot root zone depth has very minimal scientific support. The peer review performed in 2012 found that the effective root zone depth (i.e., the roots that the SMP aims to protect) is between 3.3 and 6.6 feet for almonds. Thus, Reclamation felt that a nine foot almond root zone depth may not be based on the best available science and undertook this study to attempt to find consensus among the experts and literature on what the appropriate depth should be. Reclamation appreciates your time and effort in providing these comments, and hopes to continue to work with you to determine whatever the appropriate almond root zone depth is.

Comment ID	Comment	Response
	outreach if it intends to pursue this issue further. To reiterate, it is our strong recommendation that Reclamation back off of this proposal and retain depth to groundwater at 9 or 10 feet.	
EC-30	We are ready and willing to continue to engage with Reclamation on this issue to ensure that the outcome of these discussions fairly represents existing conditions along the San Joaquin River and does not deprive any landowners of their right to make the highest and best use of their property. Any compromise in this regard would result in a taking that must be compensated 1 • We are anxious to avoid a situation where this becomes a confrontational issue. To that end, we recommend that any further considerations by Reclamation be developed using an open and transparent process that permits full participation by the Landowners and their experts and is based on sound scientific principles.	Reclamation agrees. Reclamation understands that the development of the Study Plan was not done in a fully transparent manner. Reclamation recognizes that the landowners and Exchange Contractors could have been included more directly in Phase 1 of the Study Plan. Therefore, Reclamation plans to more fully include these groups in Phase 2. Reclamation is hopeful that Phase 2 can be developed collaboratively to identify an almond root zone depth that is both protective of crops and not overly conservative, while being rooted firmly in science. Reclamation is attempting to provide an open and transparent process moving forwards, by discussing the comments received on Phase 1 as well as the potential Phase 2 at the next public Seepage and Conveyance Technical Feedback Group meeting prior to moving forwards on any further steps. Reclamation will not change the existing nine foot almond root zone depth for 2016 Restoration Flows. Reclamation will strive to work closely with growers, the Exchange Contractors, and the RMC to scope Phase 2 of the study, and conduct potential fieldwork together so that both Reclamation and the landowners are have a similar understanding as the expectations and process involved. Reclamation appreciates the time and effort in writing these comments and hopes that our future efforts will be more collaborative. Also, as discussed in our December 17, 2015 meeting, the UCCE experts appear to be in agreement about the 6 foot almond root zone. Our ongoing area of controversy is in regards to the appropriate capillary fringe buffer. Based on your and other's comments, Reclamation is considering proposing to change the Seepage Management Plan in two ways: 1) to change the almond root zone to 6 feet and 2) to change the capillary fringe buffer to whatever is the greatest capillary fringe anticipated in the fields around a given well, based on the drill log of that well and any other information available. This would change the capillary fringe buffer to up to 4 feet depending on soil type. Thus, the 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 would choose the most conservative capillary fringe buffer from the fields adjacent to the monitoring well.

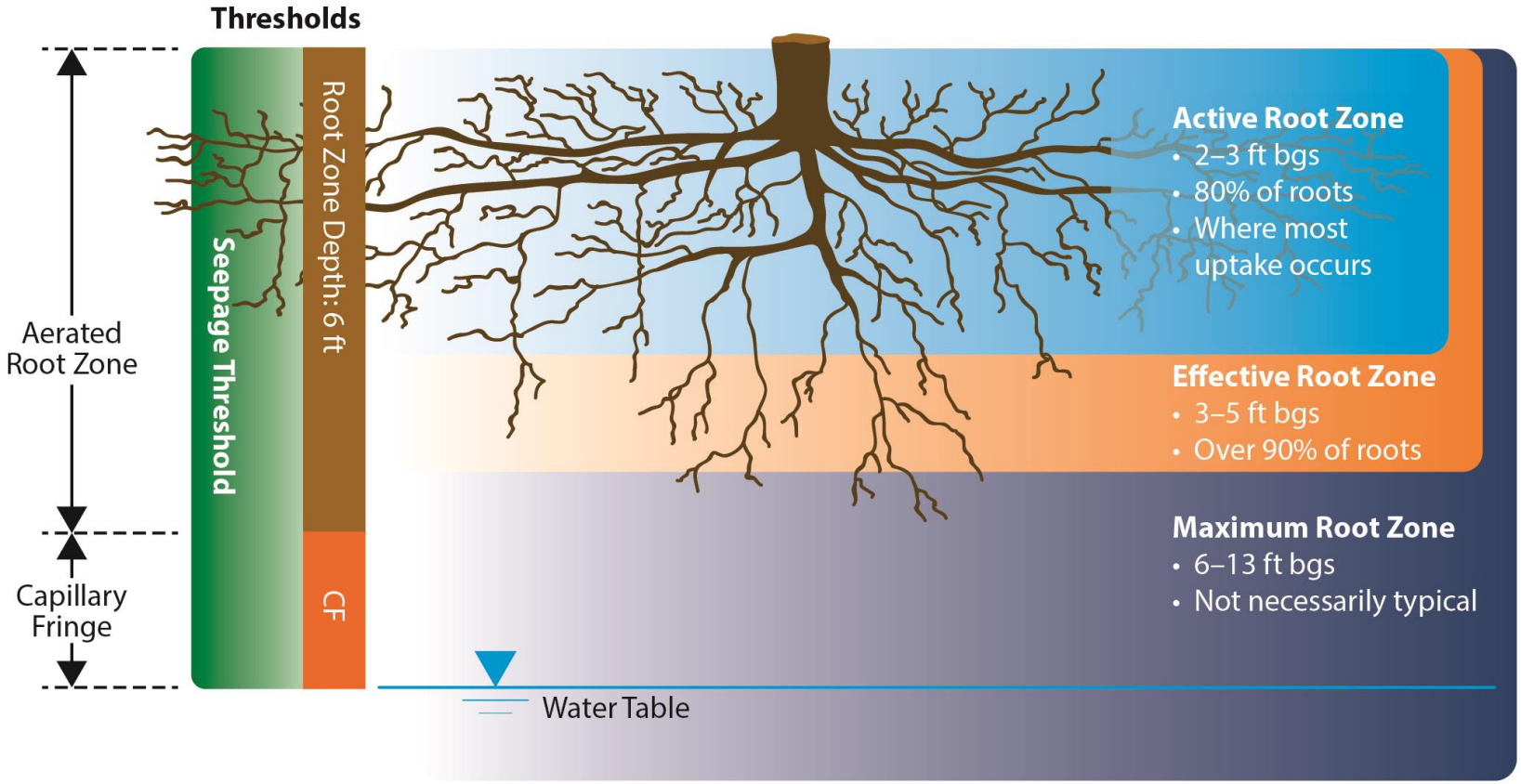

Figure 1.
Definition of Root Zone, Capillary Fringe, and Threshold Terminology

List of Acronyms

NEPA	National Environmental Policy Act
PEIS/R	Programmatic Environmental Impact Statement/Report
ROD	Record of Decision
SJRRP	San Joaquin River Restoration Program
SPH	Seepage Project Handbook
SMP	Seepage Management Plan
Study Plan	Almond Root Zone Study Plan, Phase 1, Administrative Draft, June 2015
UCCE	University of California, Cooperative Extension