Appendix H Attachment 1 – Responses to Threshold Comments

Condition 7 of the State Water Resources Control Board Order WR 2010-0029-DWR states:

> *Release of transfer water is conditioned upon implementation of the Seepage Monitoring and Management Plan in Appendix D of the Final WY 2010 EA/IS.*
>
> *The groundwater monitoring network shall account for subsidence in the area when determining differences in groundwater elevations. Groundwater elevation thresholds shall be established to determine when impacts to agricultural lands or levee stability are imminent. Interim flows shall only be released in a manner consistent with the Plan.*
>
> *As part of implementing the Seepage Monitoring Plan, Reclamation shall publish the then-current well locations, monitoring / buffer groundwater thresholds, and proposed process for development of and updates to action thresholds on the SJRRP website by January 10, 2011 for public review and comment and shall also provide this information to the Division. In the event that written comments are submitted within 20 calendar days, Reclamation shall consider these comments and provide written responses, which may include revisions to the thresholds, by March 1, 2011. Comments, responses, and then-current thresholds shall be published on the SJRRP website by March 1, 2011, and also provided to the Deputy Director for Water Rights for review, modification and approval.*

1 Comments Received

The comments received on the Monitoring Well Thresholds Technical Memorandum (Thresholds TM), which was posted on the San Joaquin River Restoration Program's (SJRRP) website on January 10, 2011 for public review and comment, and the responses to these comments received are provided below.

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Harrison, Katrina E

From: Larry R. Harris [mailto:LHarris@murdoc.com]
Sent: Monday, January 31, 2011 8:17 AM
To: Craig Moyle
Cc: 'Gidding, Margaret A'; cwhite@ccidwater.org
Subject: RE: SJRRP Seepage and Conveyance TFG Meeting No. 1

Craig,

I had an opportunity to review Dan Royer's notes from the Jan 14th seepage technical feedback group meeting. I noticed that there was discussion about setting the seepage threshold at 7 to 7.5 feet in reach 4A. Setting the threshold at that level is unacceptable. This threshold does not protect the land owner who currently has a base water level of 12 to 15 feet. At this 7 foot level the landowner will suffer the consequences of losing their ability to grow permanent crops. For example a landowner may currently be growing tomatoes on his property that has a 12 to 15 foot water level pre restoration flows. If, restoration flows take the water level to 7 feet, as discussed in your meeting, it might be fine for tomatoes, but it takes from the land owner the opportunity to grow permanent crops such as almonds and pistachios in the future. As I am sure you are aware there is a substantial difference between the value of row crop ground and tree ground.

1 - Wolfsen

I think this same scenario is true in certain portions of reach 4B as well.

I would appreciated it if you pass my comments on to the appropriate person at USBR drafting the seepage technical memorandum.

Thanks,
Larry Harris
Wolfsen

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RMC
San Joaquin River
Resource Management Coalition

P.O. Box 2115
Los Banos, CA 93635
Phone: (209) 827-8616
Fax: (209) 827-9703
Email: contactus@sjrecwa.net
Website: http://www.sjrmc.info

January 31, 2011

Via Email: interimflows@restoresjr.net
San Joaquin River Restoration Program
MP170
2800 Cottage Way
Sacramento, CA 95825

RE: ***Comments on "Draft Technical Memorandum," "Monitoring Well Thresholds"***

Ladies and Gentlemen:

The RMC represents the landowners along the San Joaquin River potentially impacted by the activities associated with the restoration activities of the agencies implementing the River settlement and the law. We continue to seek reasonable and practical solutions to the challenges of implementation of the restoration program and offer the following in the spirit of that commitment.

The RMC is submitting comments on the subject draft technical memorandum. The comments are included in the cover letter and a supplementary report included as an attachment. The letter outlines our general concerns regarding the effort and the technical memorandum provides an analysis of the additional considerations needed to make the well thresholds more reflective of the actual field conditions that give our landowners the protections required by law and improve the seepage impacts protection process.

At the January 14, 2011 Seepage Management meeting, the United States Bureau of Reclamation indicated that requests and corrections were forthcoming to the proposal. For instance, the background data and process behind the development of Table 2 – 5, "capillary fringe thickness" is needed before we can finalize comments on this section. We anticipate having the opportunity to do so even though the overall comments are being submitted as of the date requested. 2 - RMC

With regard to the comment made in the report about the thickness of the capillary fringe in the Cal Poly Nickel study, your record needs to be corrected.

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There may be a compaction element under a farm field road but the depth of that compaction would be at most 18 inches. However, we confirmed with the property owner that the investigation was truly in a farm field, in fact, the owner authorized cutting through field drip irrigation tape to optimize the understanding of the irrigation water and seepage relationship. Therefore, the capillary fringe discovered there is more related to the naturally compacted layers at depth (see attached technical memorandum on soil layers). 3 - RMC 4 - RMC

We have repeatedly stated that many of the monitoring wells in the well atlas are perforated well below the surface of the water table and therefore are too deep for use as seepage threshold sites. The wells need to be more carefully sorted and the resulting Table shortened to reflect the sites that truly qualify. 5 - RMC

The following additional comments are specific to sections of the report.

In section 1.0 Introduction, line 24 the sentence should read; "zones necessary to protect"…. In section 1.1 Background, line 31 and 32 should read; "Confluence of the San Joaquin River while avoiding material adverse impacts such as groundwater seepage impacts to crops in adjacent fields". In line 37 we agree with the need for "operational criteria and response actions" and wonder when they will be ready for inclusion in the program documents. 6 - RMC 7 - RMC 8 - RMC

On page 1-2, we offer further suggestions for clarity and continuity.

In line one, while 100 wells have been constructed to assess hydrologic conditions near the River, we have pointed out above that many of these wells are not qualified to serve as seepage threshold stations. The report should reflect which are qualified. 9 - RMC

Starting with line 7, we believe the report would be better served if it reflected the following three points:

10 - RMC 1. Reclamation will endeavor to limit interim flows so as to not exceed seepage thresholds.

11 - RMC 2. If groundwater levels exceed or are approaching a threshold, Reclamation will conduct a site visit to determine if the water levels are correct at the site.

12 - RMC 3. Based on the site visit, Reclamation shall reduce interim flows in the Reach to last known safe flow and re-evaluate field control seepage thresholds.

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With regard to the paragraph beginning with line 17, we mentioned previously the need for operational criteria and response actions. We also believe that the criteria and responses should be by River Reach and that notion reflected in this paragraph. **13 - RMC**

Regarding the Table on page 2-15 we understand there is a problem with the contractor who developed the information and request additional effort be made to resolve the contract issue so as to allow us the opportunity to review the field information this chart is based on. **14 - RMC**

Our summary request is that the current process be finished as soon as possible so as to completely link together the flows, the monitoring wells, the adjacent field seepage thresholds process and the response and remediation activities into one complete program element. Until that is done, the RMC will devote all its energy to make sure any interim flows are held to the absolute minimum necessary to prevent any injury at all to potentially impacted landowners. **15 - RMC**

Thank you for the opportunity to provide these comments. We look forward to your response.

Sincerely,

Mari Martin,
RMC President

Enclosure: RMC Technical Memorandum on Soil and Groundwater Relationships

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RMC Technical Comments

On

The "Monitoring Well Thresholds"

Draft Technical Manual

Introduction:

The following comments include discussion on three of the major issues the draft "technical manual" is proposing to address. The issues are hydrology, soil hydraulic conductivity and agronomic impacts of River Restoration flow seepage management and the attendant monitoring wells. The comments include general comments and then additional analysis of three core issues. The concluding remarks propose to offer a field confirmation strategy to properly link the seepage monitoring wells to field conditions.

General Comments

A significant premise of the "Monitoring Well Thresholds" draft technical manual (SJRRP January 10, 2011) proposed as a core strategy to protect the nearby lands from adverse impacts to crop production is that the monitoring well condition, an elevation of depth to a saturated water table or zone, will be sufficiently conservative to protect all of the neighboring lands and soils from any adverse impacts of a shallow water table that can impact crop growth. The premise is based primarily on a preliminary understanding of local hydrology (vertical and horizontal movement of the zone of saturation). Unfortunately, there has not been enough time and effort to verify the correlations to the variable conditions one finds in certain stretches of the River and that is a fatal flaw. The chief disconnect is the lack of information on the differences between the hydrology and the hydraulic conductivity (both saturated and unsaturated flow, horizontally and vertically) of the varying soil types within the spheres of the proposed monitoring wells. The current assumption is the "factors" used for the crop protection thresholds are sufficiently conservative to protect the crops even without knowing the properties of the various soil types and the resulting agronomic conditions. The representatives of the RMC are not in agreement with that notion and propose that additional field work be conducted to confirm the viability of the strategy. Of particular concern is the implementation of the thresholds during the spring pulse flows in years when the flows may extend through the month of May (March, April and May). Many of the crops in place and contemplated in the vicinity of the project are in critical growth stages during the early to late spring and those growth stages are susceptible to various water-related impacts including, but not limited to; anoxia, fungi and bacteria associated with wet conditions, temperature, salinity and nutrient availability. These items will be explained further in a technical discussion below with associated reference materials.

16 - RMC

17 - RMC

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Technical Issues Review

The three core technical issues that need to be integrated more carefully are hydrology, conductivity and agronomy.

Hydrology

18 - RMC

The current proposal uses "key" monitoring wells to determine a depth to saturation that will ostensibly protect the crops nearby. The discussion above provides the "general" case that there may be a disconnection between the wells proposed and the real-time condition of the immediate and contiguous soils in the vicinity of the monitoring well. Additional analysis is warranted about the need to correlate the monitoring wells with field investigations to assure the wells provide the intended protection. The technical issue has two primary facets. The first is the well construction of each of the wells has to be carefully analyzed to make sure the information is about the true "first" water (zone of saturation) in the soil profile and can be correlated to seepage from the flow in the San Joaquin River. In the primary threshold table (Table 4-1) each monitoring well is currently correlated to the threshold under the assumption that the first water zone is the source of the seepage. If the wells are perforated in deeper zones and the hydrostatic head is insufficient to cause a rise in the water column, the well may not be representative of the true water surface elevation, especially down gradient. Coincidentally, if the perforated zone is under hydrostatic pressure and the zone is a semi-confined zone of say a sand lens that travels for some distance away from the origin, that hydrostatic pressure may not reveal itself in a meaningful, visible way but be in contact with a finer textured material above which has a propensity to have larger capillary fringe. The result of these instances is an erroneous threshold depth may occur. Each existing monitoring well needs to be carefully re-evaluated to make sure it is

19 - RMC

constructed in a manner that allows the free water surface to be accurately measured. Future monitoring wells need to be designed with the same goal. The second hydrologic discontinuity is the variability of the soils with respect to their complex horizons, especially in the west of river stretches 3W, and all of 4. The variability is spatially complex with both vertical and horizontal components. What happens at a monitoring well near the source of the seepage may not adequately reflect the conditions

20 - RMC

in an adjacent area within a short distance of the well. Further discussion of the localized impacts of this likely phenomena will be presented in the hydraulic conductivity section of this report, but suffice it to say that additional investigation and monitoring techniques will be needed to make the necessary correlations and corrections to the thresholds in order to compensate for the dynamic variability in or near several stretches of the River.

Conductivity

The category of conductivity, or "flux", includes all phases: liquids, gases, heat and ion exchange. The conductivities in the soil matrix are a key element missing in the consideration of the thresholds established in the document. The proposed process in the technical memorandum uses primarily a hydrologic process in what is offered as a "conservative" approach to protect crops and crop root zones from the seepage anticipated with a fully operational River. The following is a discussion of the

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additional elements of conductivity that need to be considered and integrated into the hydrologic approach.

1. Hydraulic conductivity – hydraulic conductivity covers all of the movement of fluids in soil, primarily water; saturated and unsaturated movement, vadose zone and capillary fringe.
2. Gas flux; anoxia, oxygen, CO_2, de-nitrification.
3. Heat and temperature.
4. Ion exchange (including salts and specific ions).

21 - RMC

23 - RMC

22 - RMC

The core issue of water movement substantially influences the other above issues with the notable exception of ion exchange. Ion exchange is a soil- texture dominated phenomena. Sandy soils have low ion exchange. However, a number of the soils in the vicinity of the San Joaquin River have a fine texture (clay content). Therefore the exchange activity can be affected by the hydraulic conditions. Exchange materials such as nutrients (NH_4) and major elements such as calcium and magnesium are affected by the salt and physical conditions induced by irrigation or flux of the groundwater table.

24 - RMC

The hydraulic conductivity issue is also texture-related and the main concern about using a key well to predict the water table conditions in the adjacent soil areas is the issue of concern. The differences can be demonstrated in the soil map extract from the California soil survey in the vicinity of River stretch 4a. A soil nearer the River is the Palazzo sandy loam and the adjacent down gradient soil is Escano clay loam. The soils vary horizontally and vertically with the sandier materials (Palazzo) nearer the river channel and finer textured materials further away (Escano). That changeover is one of the more important conditions that need to be considered when establishing the threshold because when the water table runs into the finer textured Escano, the impact will be different in terms of the impacts to the capillary fringe, temperature and gas flux than the coarser Palazzo. A suggested mitigation method is to instrument the Escano with tensiometers at numerous depths so as to develop a correlation database that reflects the difference in impact from where a well is located and the different soil types.

25 - RMC

More information on the relationship of the other soil differences related to the hydraulic conductivity; gas flux, temperature and de-nitrification are as follows and their impacts discussed further in the agronomy section.

Saturated soil conditions have an impact on gas transfer and a significant issue for some crops is the lack of oxygen, therefore, any differences in soil types that are not accounted for or if the threshold is not conservative enough could cause oxygen deprivation. Saturated conditions and the associated capillary fringe and vadose zone also demand more heat calories for altering (increasing, an important plant growth need) the soil temperature. Therefore, if the well thresholds are not reflective of the soil conditions, excess moisture will cause the temperature of soil to decrease with wetter conditions. The soil physics of the impact are included in the attachments.

22 cont. - RMC

23 cont. - RMC

Agronomy

Agronomy issues are the result of all the above discussion but they are somewhat crop specific. The literature in the attachments offers information on these differences. The following general case is

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presented to inform the existing discussion of rooting depths and crop needs to establish the thresholds needed for optimum production of the principal cultivars used in the area.

1. Temperature – the agronomic impact of temperature is primarily the need for soil warming in the critical root hair growth stage in early to middle spring. Whether the crops are annual or permanent, the same processes are occurring and the physiological impact of cool soil is that the stage is set for ultimate production by the plant in the critical spring stage; cooler soil inhibits the proper root growth that then decreases the ultimate production of the desired plant materials. Cool soil from the endothermic impact of high moisture content is more of an issue in finer textured soils. While such soils have a more rapid heat transfer capability, the soil moisture content and hence evaporation is the foremost caloric demand before the soil temperature actually rises to meet the more favorable crop root growth conditions. 26 - RMC
2. Anoxia – lack of oxygen is also a critical issue in the early spring growth stage of plants. Many crops can withstand low oxygen in the soil during the dormant stage but as soon as the air and soil temperature is adequate for the root development or upper growth stages, the oxygen content becomes critical, especially for certain root-types. Plant respiration also includes the release of CO_2 into the soil matrix; high water content impedes that flux. The soil water oxygen and carbon dioxide balance are all impacted by wet conditions. Further discussion of these requirements is in the reference material. 27 - RMC
3. Nutrients, fungi and bacteria – soil water content and temperature also impact the biosphere of the soil, and the biosphere impacts the plants in numerous ways. Soils that are too wet can foster fungi and bacterial conditions that are detrimental to the crops. Wet conditions also can induce de-nitrifying conditions that cause loss of critical nitrogen that has been applied for optimum crop production. Soil temperature that fosters the right mix of fungi and bacteria that induce nutrient and minor element flux in symbiotic relationships with plant root structure are can also be impeded by adverse wet conditions. These issues are also presented in the attachments. 28 - RMC
4. Salinity – while many of the soils under investigation in the 3W and 4 River Reaches have a propensity to harbor significant salts and some crops generally grown in the area (cotton, small grains) have salt tolerance, none have a tolerance for salt in the early growth stages. The plants build their capacity to tolerate salt over time with a more diverse root system. Young plants are susceptible to salt accumulation at the upper boundary of the capillary fringe. The soil thresholds need to consider that salt accumulation near the fringe. 29 - RMC
5. Crop rooting depth protection proposals - specific crop rooting depths for protection from water tables have been proposed for the area under investigation and the literature generally supports most of the depths proposed with the exception of almonds. Since almond varieties, rooting stock and the likelihood of the introduction of more permanent crops is likely in the area; additional review of the proposal is needed. To make sure the almond trees do not have production reduction or fatalities, the sensible approach is to use the most conservative threshold to protect the investment. The thresholds can be adjusted somewhat to the age of the planting but any mature orchard will need a twelve foot root- 30 - RMC

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protective zone in the sensitive portion of the year. The references include information on almond root physiology.

Summary and Recommendations

The current proposed method of using key wells for establishing thresholds for certain crops has depended on the understanding of the hydrologic conditions determined by a network of monitoring wells. That information has to be augmented with the understanding of the soil physics to make the necessary correlations to the actual field conditions of the complex soil and crop areas adjacent to the San Joaquin River. Before the network is used for the flow releases in the River the RMC recommends the correlation work be done among the different soil and crop types to make sure the wells and soil characteristics are sufficiently normalized such that the well information provides the crop protection anticipated. Additional tools are available to evaluate and provide data to develop such correlations. One tool that perhaps could determine differing soil and field conditions is tensiometers. In order to be truly complete, the total process needs full incorporation of: flow, river stage elevation, monitoring wells constructed to intercept the first zone of saturation, monitoring of the different soil types with correlation to the well information so the best crop protection thresholds can be ascertained and a response and remediation process if the River flow results in potential crop impacts.

Attachments:

1. Alfalfa reference document
2. Almond reference document
3. Root system physiology pgs. 107 -113 – two pdfs.
4. Baldocchi's "Why Ecologists need Soil Physics"
5. Jury, W.A. and R. Horton, 2004, "Soil Physics", 6th Edition
6. Effects of Irrigation on Soil Temperature
7. Soil Science 107, UC Davis, soil temperature, heat and water flux
8. Cotton Production Reference
9. Cotton Seedling Diseases
10. IPM for Cotton
11. Crop Water Use and Growth Stages – Colorado State Extension
12. FAO Irrigation and Drainage Paper 56
13. Soil Aeration and Temperature – Morton Arboretum
14. Plant Growth and Yield as Affected by Wet Soil – University of Nebraska, Lincoln
15. UC Cotton Planting Forecasting
16. Baker et. al. "Tutorials on Soil Physics"
17. Soil Physics with Hydrus
18. Palazzo-Escano soils map and descriptions`

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NICKEL FAMILY LLC

Memo

To: Seepage Technical Feedback Group
interimflows@restoreSJR.net

File: 1.35

From: James L. Nickel

Date: February 3, 2011

Re: COMMENTS ON THRESHOLDS

My comments on the 1/10/11 Draft are as follows:

1.1 Background

31 - Nickel

It states that "if groundwater levels increase above a threshold, Reclamation will conduct a site visit to evaluate the potential seepage conditions at the site". We need to clarify/expand upon what a site visit consists of. Just driving by and looking doesn't accomplish much. I would hope that there would be some extensive investigation and testing, such as digging a pit and calculating the capillary rise of the salts.

2.3.1 Approach

A buffer for drip irrigation crops is needed for more than a month prior to planting to allow for leaching. First off, planting times are never when we plan them due to numerous factors. Secondly, leaching can occur in the Fall or Winter. It depends upon many factors, such as availability of water, timing of ground preparation, weather, availability of equipment and sprinklers, etc.

32 - Nickel

I don't think you can vary the depth of the thresholds based upon the season.

2.3.3 Limitations

I don't agree with the statement that monitoring wells located underneath irrigation header lines will show increases in groundwater levels. This

33 - Nickel

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statement assumes huge leaks in the header (main) lines which is not always the case.

An additional limitation would be if the drainage lines are installed and the disposal of the tile drain water.

2.4.1 Approach

34 - Nickel

Rather than utilizing data from old text books, I suggest that actual in-field studies on different soil types be conducted to determine capillary rise.

2.4.2 Results

It is an incorrect statement that the analysis conducted by ITRC was sited on a compacted road. It was in the field, not under a road. 35 - Nickel

3.2 Approach

36 - Nickel

It states the values were averaged. It is dangerous to use averages when setting standards.

JLN/rjr

● Page 2

2 Responses to Comments

Reclamation provided an initial draft of thresholds in the Thresholds TM posted on the SJRRP website on January 10, 2011. This section includes Reclamation's responses to comments received on Thresholds TM. Comments received on the Thresholds TM were also incorporated these into this Seepage Management Plan. Landowners may continue to submit comments during the continuing development of the Seepage Management Plan.

2.1 Comment 1 – Wolfsen

Comment: I had an opportunity to review Dan Royer's notes from the Jan 14th seepage technical feedback group meeting. I noticed that there was discussion about setting the seepage threshold at 7 to 7.5 feet in reach 4A. Setting the threshold at that level is unacceptable. This threshold does not protect the land owner who currently has a base water level of 12 to 15 feet. At this 7 foot level the landowner will suffer the consequences of losing their ability to grow permanent crops. For example a landowner may currently be growing tomatoes on his property that has a 12 to 15 foot water level pre restoration flows. If, restoration flows take the water level to 7 feet, as discussed in your meeting, it might be fine for tomatoes, but it takes from the land owner the opportunity to grow permanent crops such as almonds and pistachios in the future. As I am sure you are aware there is a substantial difference between the value of row crop ground and tree ground. I think this same scenario is true in certain portions of reach 4B as well.

Response: Reclamation's understanding of historical practices is that landowners may leach salts after flood events. Reclamation will adjust thresholds when notified about conversion to permanent crops. Landowners should call the Seepage Hotline at 916-978-4398 to notify about conversion to permanent crops or submit comments to interimflows@restoresjr.net.

2.2 Comment 2 – RMC

Comment: The background data and process behind the development of Table 2-5, "capillary fringe thickness" is needed before we can finalize comments on this section. We anticipate having the opportunity to do so even though the overall comments are being submitted as of the date requested.

Response: See response to Comment 14.

2.3 Comment 3 – RMC

Comment: Compaction element under a farm field road would be at most 18 inches

Response: This comment has been incorporated into the Seepage Management Plan.

2.4 Comment 4 – RMC

Comment: ITRC report pits were dug in a farm field, in fact, the owner authorized cutting through field drip irrigation tape to optimize the understanding of the irrigation water and seepage relationship. Therefore, the capillary fringe discovered there is more related to the naturally compacted layers at depth (see attached TM on soil layers).

Response: This comment has been incorporated into the Seepage Management Plan.

2.5 Comment 5 – RMC

Comment: Only use shallow monitoring wells for setting thresholds. Update table to only use these.

Response: Reclamation developed a groundwater monitoring network to collect data on surface and subsurface physical processes. The network includes both shallow wells suitable for thresholds during Interim Flows and deeper wells for a long term understanding of deep percolation. Wells are installed to understand relevant physical processes as well as detect seepage. Some wells will help understand hydrologic conditions, but may not provide operational information. Thresholds as described in Appendix H of this Seepage Management Plan include only wells perforated in shallow zones. Perforation intervals for all monitoring wells are included in the Monitoring Well Atlas, available on the SJRRP website at: http://www.restoresjr.net/flows/Groundwater/Groundwater.html.

2.6 Comment 6 – RMC

Comment: In Section 1.0 Introduction, line 24 the sentence should read; “zones necessary to protect”

Response: This language has been modified.

2.7 Comment 7 – RMC

Comment: In section 1.1 Background, line 31 and 32 should read; “Confluence of the San Joaquin River while avoiding material adverse impacts such as groundwater seepage impacts to crops in adjacent fields.”

Response: This language has been modified.

2.8 Comment 8 – RMC

Comment: Request operational criteria and response actions included in program documents.

Response: See response to Comment 15.

2.9 Comment 9 – RMC

Comment: In line one on page 1-2, while 100 wells have been constructed to assess hydrologic conditions near the River, we have pointed out above that many of these wells are not qualified to serve as seepage threshold stations. The report should reflect which are qualified.

Response: See response to Comment 5.

2.10 Comment 10 – RMC

Comment: Suggested adding at line 7 page 1-2 “Reclamation will endeavor to limit interim flows so as to not exceed seepage thresholds.”

Response: This has been clarified in the Operations section of the Seepage Management Plan main body.

2.11 Comment 11 – RMC

Comment: Suggested adding at line 7 page 1-2 “If groundwater levels exceed or are approaching a threshold, Reclamation will conduct a site visit to determine if the water levels are correct at the site.”

Response: This has been addressed in the main body of the Seepage Management Plan, through the Triggers section.

2.12 Comment 12 – RMC

Comment: Suggested adding at line 7 page 1-2 "Based on the site visit, Reclamation shall reduce interim flows in the Reach to last known safe flow and re-evaluate field control seepage thresholds."

Response: This has been addressed in Operations section of the main body of the Seepage Management Plan.

2.13 Comment 13 - RMC

Comment: With regard to the paragraph beginning with line 17 (page 1-2), we mentioned previously the need for operational criteria and response actions. We also believe that the criteria and responses should be by River Reach and that notion reflected in this paragraph.

Response: See response to Comment 15.

2.14 Comment 14 – RMC

Comment: Regarding the Table on page 2-15 we understand there is a problem with the contractor who developed the information and request additional effort be made to resolve the contract issue so as to allow us the opportunity to review the field information this chart is based on.

Response: A full write-up of soil salinity data including the measurements of the capillary fringe is expected by the end of March. Reports must be given to individual landowners 10 days prior to public release. This information will be made available to the public as soon as possible.

2.15 Comment 15 – RMC

Comment: Our summary request is that the current process be finished as soon as possible so as to completely link together the flows, the monitoring wells, the adjacent field seepage thresholds process and the response and remediation activities into one complete program element.

Response: Operational criteria will be continually updated and so will not be part of the updated Seepage Management Plan. The updated Seepage Management Plan will identify monitoring wells, thresholds, potential remediation activities, potential projects. A process to select and implement potential seepage projects will be developed in more detail in the upcoming Seepage Project Handbook. Operational criteria will be updated during the Interim Flows program and can be found in the flow bench evaluations posted on the SJRRP website at: http://www.restoresjr.net/flows/FlowScheduling/flow_scheduling.html#Evals.

2.16 Comment 16 – RMC

Comment: Lack of information on the differences between the hydrology and the hydraulic conductivity (both saturated and unsaturated flow, horizontally and vertically) of the varying soil types within the spheres of the proposed monitoring wells.

Response: Reclamation's thresholds do not depend upon hydraulic conductivity. The significance of this variability under the proposed approach is unclear. Reclamation will discuss

additional information needed from landowners or stakeholders regarding this topic at a future Seepage and Conveyance Technical Feedback Group meeting. This information can be incorporated on a site-specific basis.

2.17 Comment 17 – RMC

Comment: May is the critical month for thresholds, crops are the most sensitive during this time to "various water-related impacts including… anoxia, fungi and bacteria associated with wet conditions, temperature, salinity, and nutrient availability."

Response: Comment noted. Thresholds will be consistent for large portions of the year for ease of operations and to avoid the potential need for frequent leaching.

2.18 Comment 18 – RMC

Comment: Only use monitoring wells with shallow perforations to set thresholds.

Response: See response to Comment 5.

2.19 Comment 19 – RMC

Comment: Design new wells to be perforated in the first zone of saturation correlated with shallow seepage.

Response: Perforation intervals for shallow monitoring wells are generally 10-25 feet, with the exact perforation determined by the geologist in the field based on site conditions. Reclamation will continue to use deep wells where warranted to understand hydrology, and use shallow wells to manage for seepage. Also see response to Comment 5.

2.20 Comment 20 – RMC

Comment: Account for variability in soil types in thresholds due to vertical and horizontal changes in soil types.

Response: See response to Comment 16.

2.21 Comment 21 – RMC

Comment: Hydraulic conductivity including saturated and unsaturated movement, vadose zone and capillary fringe "need to be considered and integrated into the hydrologic approach".

Response: The flow stability section of the Flow Bench Evaluations addresses hydraulic conductivity and the vadose zone. Capillary fringe is included in the agricultural practices threshold.

2.22 Comment 22 – RMC

Comment: Gas flux; anoxia, oxygen, CO2, de-nitrification should be considered and integrated into the hydrologic approach.

Response: Appendix A was modified to add the effects of high water on these concerns. The agricultural practices threshold - root zone addresses this concern.

2.23 Comment 23 – RMC

Comment: Heat and temperature should be considered and integrated into the hydrologic approach.

Response: Appendix A was modified to add the ability of groundwater to influence these concerns. The agricultural practices threshold addresses this concern.

2.24 Comment 24 – RMC

Comment: Ion exchange (including salts and specific ions) should be considered and integrated into the hydrologic approach.

Response: Appendix A was modified to add the ability of groundwater to influence these concerns. The agricultural practices threshold addresses this concern.

2.25 Comment 25 – RMC

Comment: Change capillary fringe buffer based on soil types in broader area around well. Well may be in coarse material close to clays.

Response: Changes in thresholds based on soil types may be incorporated as an approach for future analysis is determined.

2.26 Comment 26 – RMC

Comment: Soil warming is critical during the root hair growth stage in early to middle spring. Cool soil from the endothermic impact of high moisture content is more of an issue in finer textured soils. While such soils have a more rapid heat transfer capability, the soil moisture content and hence evaporation is the foremost caloric demand before the soil temperature actually rises to meet the more favorable crop root growth conditions.

Response: Appendix A was modified to add the ability of groundwater to influence these concerns. The agricultural practices threshold addresses this concern.

2.27 Comment 27 – RMC

Comment: Anoxia is critical in the early spring growth stage of plants.

Response: Appendix A was modified to add the ability of groundwater to influence these concerns. The agricultural practices threshold addresses this concern.

2.28 Comment 28 – RMC

Comment: Soils that are too wet can foster fungi and bacterial conditions that are detrimental to the crops. Wet conditions also can induce de-nitrifying conditions that cause loss of critical nitrogen that has been applied for optimum crop production.

Response: Appendix A was modified to add the ability of groundwater to influence these concerns. The agricultural practices threshold addresses this concern.

2.29 Comment 29 – RMC

Comment: While many of the soils under investigation in the 3W and 4 Reaches have a propensity to harbor significant salts and some crops generally grown in the area (cotton, small grains) have salt tolerance, none have a tolerance for salt in the early growth stages. The plants build their capacity to tolerate salt over time with a more diverse root system. Young plants are susceptible to salt accumulation at the upper boundary of the capillary fringe. The soil thresholds need to consider that salt accumulation near the fringe.

Response: Thresholds will use the root zone depths of mature plants and include a capillary fringe.

2.30 Comment 30 – RMC

Comment: The literature generally supports most of the depths proposed with the exception of almonds. Since almond varieties, rooting stock and the likelihood of the introduction of more permanent crops is likely in the area; additional review of the proposal is needed. To make sure the almond trees do not have production reduction or fatalities, the sensible approach is to use the most conservative threshold to protect the investment. The thresholds can be adjusted somewhat to the age of the planting but any mature orchard will need a twelve foot root-protective zone in the sensitive portion of the year.

Response: The references provided show a 9 foot root zone for almonds. Thresholds have been adjusted accordingly. These thresholds will be implemented year-round.

2.31 Comment 31 – Nickel Family LLC

Comment: Section 1.1 "It states that 'if groundwater levels increase above a threshold, Reclamation will conduct a site visit to evaluate the potential seepage conditions at the site'. We need to clarify/expand upon what a site visit consists of. Just driving by and looking doesn't accomplish much. I would hope there would be some extensive investigation and testing, such as digging a pit and calculating the capillary rise of the salts."

Response: Site visits often include stage measurements, hand auger holes, and collection of soil texture information, soil moisture content, and water levels. This is clarified in the Operations Appendix to the Seepage Management Plan.

2.32 Comment 32 – Nickel Family LLC

Comment: Section 2.3.1 "A buffer for drip irrigation crops is needed for more than a month prior to planting to allow for leaching. First off, planting times are never when we plan them due to numerous factors. Secondly, leaching can occur in the Fall or Winter. It depends upon many factors, such as availability of water, timing of ground preparation, weather, availability of equipment and sprinklers, etc. I don't think you can vary the depth of the thresholds based upon the season."

Response: When a landowner notifies the SJRRP of poor drainage, the irrigation buffer will be added year-round.

2.33 Comment 33 – Nickel Family LLC

Comment: Section 2.3.3 "I don't agree with the statement that monitoring wells located underneath irrigation header lines will show increases in groundwater levels. This statement assumes huge leaks in the header (main) lines which is not always the case. An additional limitation would be if the drainage lines are installed and the disposal of the tile drain water."

Response: Reclamation does not assume huge leaks in the header lines at all times. Monitoring wells located underneath irrigation header lines may show increases in groundwater levels during flushing of lines, testing, or if there are large leaks. Knowing the timing of these events helps understand and analyze groundwater levels in a well. The future Seepage Project Handbook will discuss advantages and disadvantages of different potential projects, including tile drain water disposal.

2.34 Comment 34 – Nickel Family LLC

Comment: Section 2.4.1 "Rather than utilizing data from old text books, I suggest that actual in-field studies on different soil types be conducted to determine capillary rise."

Response: Over 80 soil borings were augered throughout the SJRRP area. These actual in-field studies collected samples for soil salinity testing, and noted soil moisture content and the capillary rise in each boring. These borings were then used to determine capillary rise by soil type. Soil types in locations without a soil sampling location were taken from Reclamation drill logs. Based on the capillary rise classifications by soil type identified from the 80 hand auger soil borings, capillary rise was extrapolated to areas where soil borings were not conducted. This information is used to set the capillary rise buffer as described in Appendix H. This information will be publicly available soon, see the response to Comment 14.

2.35 Comment 35 – Nickel Family LLC

Comment: Section 2.4.2 "It is an incorrect statement that the analysis conducted by ITRC was sited on a compacted road. It was in the field, not under a road."

Response: This text has been corrected.

2.36 Comment 36 – Nickel Family LLC

Comment: Section 3.2 "It states the values were averaged. It is dangerous to use averages when setting standards."

Response: Historical groundwater levels are not available in every location and require some method of averaging or statistical analysis. The historical groundwater section has been revised to use a statistical analysis.

3 Reach 4A Thresholds

The following section addresses Condition 28 of the Order Granting in Part and Denying in Part the Petition for Reconsideration of WR 2010-0029-DWR.

This condition states:

> *By March 1, 2011, Reclamation shall submit to the Deputy Director for Water Rights, to the extent this information is not already provided to the Division under Condition 7, a report describing: (a) current and proposed groundwater elevation thresholds (acceptable, potential buffer, and threat) in Reach 4A; (b) a summary of its evaluation of seepage monitoring data from the WY 2010 Interim Flows Project regarding Reach 4A; (c) any changes to its assessment of channel capacities in Reach 4A; and (d) any measures taken to ensure that flows under the SJRRP do not cause exceedance of a groundwater elevation action threshold in Reach 4A.*

3.1 Current Thresholds in Reach 4A

Thresholds in Reach 4A are provided in Appendix H of the revised Seepage Management Plan.

3.2 Monitoring Data

A summary of seepage monitoring data from the WY 2010 Interim Flows Project related to Reach 4A is provided in the Monitoring Well Atlas, which is available and updated approximately monthly on the SJRRP website at: http://www.restoresjr.net/flows/Groundwater/Groundwater.html#Atlas. This information is also included in the Annual Technical Report, available on the SJRRP website at: http://www.restoresjr.net/flows/atr.html.

3.3 Channel Capacities

Reclamation has not formally changed its assessment of channel capacity in Reach 4A.

3.4 Measures Taken

As of March 4, 2011, Reclamation is currently holding Interim Flows to no more than 50 cfs in Reach 4A and downstream due to thresholds on properties adjacent to the Eastside Bypass. This operational criteria (formerly known as action threshold) will remain until a site evaluation determines another flow is more acceptable or a project is implemented.