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RE: Comments on the U.S. Bureau of Reclamation and San Luis & Delta-Mendota Water Authority March 2015 Final Long-Term Water Transfer EIS/EIR response to my comments on the DRAFT EIS/EIR, dated September 2014

The following are my comments on the BoR/SLDMWA's responses to my comments on the September 2014 Draft EIS/EIR (10-Year Transfer Project), response to comments numbered NG01-1 to -85. Many of the responses to my comments refer to the common responses. The responses to my comments that I have included below are those that represent the most significant issues where the Final EIS/EIR lacks sufficient information to allow adequate evaluation of the hydrologic connections between the 10-Year Transfer Project's groundwater substitution transfer wells and the surrounding wells and surface water resources. In addition to reviewing the responses to my comments, I'm providing, (1) new comments on the additional figures and tables included in the Final EIS/EIR, (2) responses to several of the common responses that are relevant to my comments NG01-1 to -85, (3) comments of the revised Mitigation Measures WS-1 and GW-1, and (4) the comments on the applicability of the November 2014 Lower Tuscan/Tehama Aquifer Study by Dr. Todd J. Greene and Dr. Karin Hoover at Chico State University to the evaluation of aquifer conditions in the Sacramento Valley.

There are a number of substantive changes in the Final EIS/EIR, in the project information provided, the SACFEM2013 model documentation, and mitigation measure GW-1. These changes give substantive information that provides new information on the potential environmental impacts and introduce new elements to the groundwater mitigation and monitoring procedures that are relied on to reduce the project's impacts to less than significant. Even with this additional information, data and analysis are still lacking information on many of the issues raised in my comments on the Draft EIS/EIR. Because of this new information, the public should have an opportunity to review and comment on these changes. Therefore, I recommend that the document be re-circulated for additional public comment and review.

<u>Comments on Additional Figures and Tables in Final EIS/EIR</u>

- The final figures on historic groundwater level changes previously published by the California Department of Water Resources (DWR) are now included in the Final EIS/EIR (Figures 3.3-9a-c to 3.3-11) along with new figures that show changes in groundwater levels from spring 2010 to spring 2011 within different aquifer zones (Figures 3.3-13a-c). These figures help in documenting the current groundwater conditions. I'll discuss the significance of the spring 2010-2011 figures below in my comments on the Common Response 4.

- Table 3-3 lists the number of dry wells reported in 2014. The Final EIS/EIR doesn't provide information on where these wells are relative to the historic changes in groundwater levels or the areas of anticipated change in groundwater levels due to the 10-Year Transfer Project. No information is provided on wells that went dry since 2004, the period of the DWR groundwater elevation change maps (Figures 3.3-9a-c to 3.3-11). Without information of the where wells are known to be going dry, evaluation of the existing basin conditions and the adequacy of the baseline assumptions made for the SACFEM2013 modeling effort can't be evaluated. Additional information on the numbers and locations of wells that have gone dry is needed. In addition, tracking the loss of wells during the 10-Year Transfer Project is important and should be made a part of the monitoring and reporting requirements in Mitigation Measure GW-1.

- Figure 3.3-16 provides a map of the active groundwater clean up sites in the Sacramento Valley project area along with the groundwater substitution transfer wells. There is still an issue with the scale of the map not allowing for technical review of potential impacts to non-participants lands. It would be very useful to overlay the areas of estimated future groundwater level impacts (Figures 3.3-28a-c to 3.3-33a-c) on top of this cleanup location map. This is needed because the changes in groundwater elevation from the 10-Year Transfer Project will cause increases in groundwater gradient, which may accelerate ground water flow, change the direction of contaminant movement and/or expand the volume of contaminated groundwater. Information is still lacking on whether the 10-Year Transfer Project's groundwater substitution pumping will result in new or increases in contaminant levels to non-participant lands and groundwater. Additional analysis of the potential environmental impacts from the 10-Year Transfer Project's groundwater pumping on existing groundwater contamination is needed to conclude that the project will have no impacts on water quality.

- Table 3.3-6 lists statistics on the number of domestic, municipal and irrigation wells in the Sacramento Valley Groundwater Basin. This information is important. In addition to these statistics, the table should give the number of well in each category. As I noted in my Draft EIR/EIS comment no. 7, DWR has already tallied the number of wells in each township/range so compilation of this information would require minimal effort for much of the project area. In addition, the number of wells that may be potentially impacted by the 10-Year Transfer Project's groundwater substitution pumping should be provided to give an measure of the potential number of impacts and to guide the extent and type of groundwater mitigation monitoring. This information should be combined with the number of wells going dry to allow for analysis of the potential economic impacts from the 10-Year Transfer Project. Additional analysis is needed on the number of wells that have or may potentially go during the 10 years of the project to demonstrate that groundwater substitution transfer pumping will have a less than significant impact.

- Table 3.3-7 on page 3.3-156 lists changes in groundwater level since 2008 in 8 selected monitoring wells along with a comparison to groundwater level changes since 2008 and the SACFEM2013 modeled changes to document potential impacts from subsidence. The discussion on page 3.3-155 links Figures 3.3-8 and 3.3-9 to this table. Figures 3.3-8a-d provides well identification numbers and locations along with hydrographs for 21 other wells in the Sacramento Valley that were used in the discussion of groundwater production, levels and storage. Figures 3.3-9a-c provide changes in groundwater level from the spring of 2013 to spring of 2014, but there is no well identification information on the figures. The footnote in Table 3.3-7 crosses out the reference to Figures 3.3-8 and 3.3-9 and substitutes DWR's water data library as the source for Table 3.3-7 yet the text still states the table's information was derived from Figures 3.3-8 and 3.3-9. The locations of the 8 wells in Table 3.3-7 don't appear to be on Figures 3.3-8a-d. While the 21 hydrographs in Figure 3.3-8a-d aren't evaluated in the Table 3.3-7. There is no explanation as to why the information on groundwater level changes given in Figures 3.3-8a-d and 3.3-9a-c isn't considered in Table 3.3-7. Additional information is needed to demonstrate why only these 8 wells rather than the additional 21 wells shown in Figures 3.3-8a-d are the most appropriate to analyze and demonstrate the lack of significant subsidence impacts from the changes in groundwater levels as a result of the groundwater substitution transfer pumping.

<u>Comments on revised Mitigation Monitoring Measures WS-1 and GW-1</u>

The Final EIS/EIR relies on two mitigation measures, WS-1 and GW-1, to reduce the impacts from groundwater substitution transfer pumping to less than significant, see Table ES-4. Mitigation Measure WS-1 given in Section 3.1.4.1, page 3.1-22, only provides a general concept of how the streamflow depletion factor (SDF) will mitigate potential water supply impacts from the groundwater substitution transfer pumping. The procedure for WS-1 is essentially to either accept a default SDF of 13 percent or develop an exact percentage with Bureau of Reclamation (BoR) and DWR approval. Essentially, WS-1 is a future mitigation measure with requirements yet to be determined. The procedures by which the public can participate in the determination of an exact percentage SDF aren't provided. The mitigation measure provides no guidance on what methods should be used or what types of information would be required for the exact percentage SDF calculation; presumable that too would be developed in the future. The discussion of WS-1 mitigation measure doesn't indicate how the minimum SDF of 13 percent was determined. Based on the responses to my comments on the stream depletion factor it appears that the 13 percent SDF was determined by the SACFEM2013 modeling effort. However, my review of the model results and documentation doesn't find the model results clearly document how this default SDF was calculated. Figures B-6 and B-7 in Appendix B give graphs of the model result on changes in stream-aquifer interaction in units of 1,000s of acre-feet per month. The document doesn't discuss how the acre-feet per month values are converted to the SDF default value of 13 percent. Additional information is needed to document how the default 13 percent SDF is was derived and why its protective and reduces the impacts of stream depletion to a level of less than significant.

Mitigation Measure GW-1 was extensively rewritten in the Final EIS/EIR along with the supporting technical document *DRAFT Technical Information for Preparing Water Transfer Proposals,* revision dated November 2014. I have the following comments on the revised GW-1 mitigation measure.

- GW-1 now requires sellers to confirm that their pumping will comply with Groundwater Sustainability Plan (GSPs), which is important, even though the GSPs are CEQA exempt and the process for public input is currently unclear.

- GW-1 requires that well data detailed in the 2014 *DRAFT Technical Information for Preparing Water Transfer Proposals* document be provided to BoR and DWR to apparently determine if the well can be used in the groundwater substitution transfer project. This future data submittal and agency review should probably have already been done because the wells that will participate in the 10-Year Transfer Project's groundwater substitution transfers are already known. If some of the 329 wells listed in Table 3.3-5 as participating in the groundwater substitution program are not eligible, then that may change the results of the SACFEM2013 modeling of impacts, may change the conclusion regarding impacts to fisheries, vegetation and wildlife, and may reduce the amount of water that can be transferred. In the response to my comment NG01-4, BoR states that the well acceptance criteria are not used in determine acceptable groundwater substitution transfer wells. I'll discuss this issue in more detail below under NG01-4.

- GW-1 is similar to WS-1 in that it contains a number of elements that are essentially future mitigation measures to be undertaken apparently without public participation. All of the wells that will participate in the groundwater substitution transfer program are known, the hydrogeologic characteristics of the wells are said to be known well enough to accurately predict the changes in groundwater elevation using the SACFEM2013 model simulations, the locations of important resources needing protection are said to be known and included in the model, area of contaminated groundwater are said to be known, some information on non-participating domestic, municipal and irrigation wells is known, and the requirements contained in existing Groundwater Management Plans and Basin Management Objective are known (Section 3.3.1.2). Even though all of the basic information needed to evaluate the impacts from the 10-Year Transfer Project's groundwater substitution transfers is said to be available such that potential future impacts from pumping can be known to sufficient accuracy to determine that most potential impacts to fisheries, vegetation, and wildlife are less than significant, the design and requirements in GW-1 for the plans to monitor impacts is left for a future discretionary action by BoR and DWR. Coordination with parties other than BoR and DWR isn't specifically required other than the GW-1 plan has to describe how 3rd party input will be incorporated into the plan and how communication will occur. There is no stated requirement to provide timely information to 3rd parties or communicate at any regular time interval. Without public participation in the development of the GW-1 mitigation and monitoring plans, the plans can't ensure that all potential impacts are being monitored and mitigated to less than significant.

- GW-1 establishes that the primary criteria for groundwater level monitoring will be the existing Basin Management Objectives (BMOs) set in existing Groundwater Management Plans (GMPs). GW-1 appears to assume that the existing quantitative BMOs are protective for the 10-Year Transfer Project's groundwater pumping impacts even though the Final EIS/EIR doesn't provide any substantive analysis of these BMOs. Apparently, the only way that public participation in the monitoring and mitigation plans will occur is when there are no quantitative BMOs (page 3.3-163). In that case a 3rd party, which presumably includes the public, needs to contact BoR to express their concerns about a potential impacts and BoR will determine if they have a valid concern. BoR will then decide if a 3rd party's concerns for impact will be made part of the GW-1 mitigation measures. The process outlined in GW-1 for 3rd party participation doesn't provide for any public participation when quantitative BMOs exist. Without public participation in the development of the GW-1 mitigation and monitoring plans, the plans can't ensure that all potential impacts are being monitored and mitigated to less than significant.

- GW-1 provides a discussion of mitigation measures to avoid significant impacts to vegetation. These mitigation measures apparently don't apply to vegetation that requires a depth to groundwater of less than 10 feet. The vegetation mitigation doesn't require installing any new monitoring wells, instead relies on visual monitoring of vegetation health. The vegetation mitigation doesn't appear to require any baseline evaluation of vegetation health. I'll leave the question of whether this mitigation measures to protect shallow rooted vegetation is needed to the biologists. The vegetation mitigation does indicate that when losses exceeds a percentage that is determined by BoR in the future, the seller will prepare a report that document restoration activities. The vegetation restoration is apparently a requirement of the vegetation mitigation in GW-1, but is based on unspecified criteria, and the duration of restoration activities are limited to 5 years. The Final EIS/EIR should provided specific standards for the restoration of lost vegetation, and justify the determination that 5 years of mitigation monitoring is all that is needed. The standard requirement that revegetation is successful base on field measurements and statistical analysis should be included in any restoration specifications and made part of any restoration plan.

- GW-1 provides expanded discussion of subsidence issues and mitigation and monitoring requirements. The trigger for subsidence mitigation is the drop in groundwater levels below historic lows during the time of the proposed water transfers. This seems to leave out the issue of the cumulative impacts from transfer and non-transfer pumping by not accounting for long-term downward trends in groundwater levels. If groundwater levels are known to be consistently dropping without the 10-Year Transfer Project groundwater substitution pumping and the GMPs, or GSPs, already recognize this condition, why doesn't mitigation GW-1 also recognize this trend. Evaluation of the potential for subsidence due to groundwater substitution pumping under the 10-Year Transfer Project should account for trends in groundwater elevations.

- The GW-1 mitigation monitoring plan requirements for subsidence are extensively expanded in the Final EIS/EIR Section 3.3.4.1.3. Subsidence monitoring now has five stages. Unfortunately each of the stages doesn't appear to require public disclosure of changes in groundwater levels or subsidence information being collected. For example, in Stage 3 if the ground surface elevation drops more than 0.2 feet the seller has to cease groundwater substitution pumping until one of three events occur. One is groundwater level recovery above historic lows. This action doesn't seem to account for the drop below historic lows when pumping resumes. The other two are investigations and reports, one on the local subsidence hydrogeology and the other on the local infrastructure. Neither of these reports requires that the public, the local infrastructure owners, or state and local government official be notified that subsidence is occurring and that investigation are being done. It isn't until Stage 4 when subsidence has impacted local infrastructure that lead agencies are notified. Apparently, the mitigation measure GW-1 assumes that the lead agency will notify the local infrastructure owners and the general public. BoR will be the agency approving any contingency plan for corrective action. Participation of local agencies, the infrastructure owner, or the public in BoR's approval process isn't specifically required.

- GW-1 states that the 2014 *DRAFT Technical Information for Preparing Water Transfer Proposals* provides guidance for the development of groundwater substitution water transfer proposals. Section 3.3.1 of the 2014 *DRAFT Technical Information for Preparing Water Transfer Proposals* provides information requirements for groundwater substitution wells and states that *[t]he amount of information submitted for each well will depend on its location relative to surface water features (criteria shown in Appendix D) and other areas that may be sensitive to groundwater pumping effects.* Appendix D provides a table of specific criteria for groundwater transfer well acceptance. Elsewhere in GW-1, the well acceptance criteria are linked to a default SDF of 12% (page 42). However, the BoR's response to my comment NG01-4 stated that the 10-Year Transfer Project doesn't rely on the well acceptance criteria. This appears to contradict the requirements of GW-1, but no information is given as to why Appendix D in GW-1 isn't valid for the 10-Year Transfer Project. Other responses to my comments state that the SDF was derived from the SACFEM2013 modeling, but that value is set at 13 % in WS-1. The Final EIS/EIR still fails to provide sufficient information of how the SDF, at either 12% or 13%, was calculated and how these values ensures that the impacts from the 10-Year Transfer Project groundwater substitution pumping are less than significant. Also see my comments on NG01-4 below for additional discussion on this issue.

<u>Common Response 4: Groundwater Existing Conditions</u>

The Final EIS/EIR has included the DWR groundwater elevation change maps for the Sacramento Valley in Figures 3.3-9a-c and 3.3-10a-c. Also included are maps of the spring 2010 to spring 2014 groundwater change for all of California, Figure 3.3-11, and a new set of spring 2010 to spring 2011 groundwater change maps, Figures 3.3-13a-c. BoR/SLDMWA's response sort of acknowledges that the groundwater elevations have generally gone down since 2004, but then concludes that groundwater levels recover *to pre-drought levels after subsequent wet periods*. They seem to infer that the spring 2010-2011 increase in groundwater elevation of up to 8 feet as shown in Figures 3.3-13a-c is sufficient evidence to prove that groundwater substitution pumping will recover in wet years to pre-drought levels across the Sacramento Valley. The Final EIS/EIR notes that the Sustainable Groundwater Management Act now requires development and implementation of basin Groundwater Sustainability Plans (GSPs) for medium to high priority groundwater basin and that these GSPs are required for most of the Sacramento Valley basins involved in the 10-Year Transfer Project. However the existing impact information used by DWR to rank the basins as medium or high priority isn't clearly presented or used in the Final EIS/EIR. The information used by DWR to rank the groundwater basin in the 10-Year Transfer Project is relevant to the discussion of existing conditions and impacts and should be included in the Final EIS/EIR.

The assertion that groundwater levels will recover with a few wet years is clearly contradicted by DWR's 2004 to 2014 groundwater level change maps that show that recent pumping has significantly impacted the Sacramento Valley. The Final EIS/EIR doesn't explain why the 2010-2011 wet year didn't result in full recovery of groundwater levels across the valley. The greatest increase in shallow groundwater level (<200 feet bgs) during 2010-2011 occurred in wells that are adjacent to the Sacramento River, Figure 3.3-13a, and apparently canals. I count 12 wells in Figure 3.3-13a that had an 8+ feet rise out of 210 wells shown on the map (estimate by hand counting). That's 6% of the wells measured. The alignment of highest rise in groundwater level with the Sacramento River isn't a surprise. That's where the recharge is occurring; beneath surface water bodies. A review of several of the 8+ well hydrographs finds that the 2010-2011 rise in groundwater level is typical of the buildup and dissipation of a groundwater mound beneath an area of infiltration. The well hydrographs shows that the 2010-2011 rise in groundwater wasn't sustained and many return to near or below 2010 levels by 2012.

Table 1-3 in the Final EIS/EIR shows the North of the Delta Water transfers from 2000 to 2014. No transfers occurred during 2011 and 2012, therefore I assume no groundwater substitution pumping occurred. Yet the 2011 rise in groundwater elevation wasn't generally sustained. The sum of the transfers from 2000 to 2014 is 280,847 acre-feet for the 10 years. How much of this transferred water was involved with groundwater substitution pumping isn't stated. But even if all of it was from groundwater substitution pumping, the proposed 10-year Transfer Project will potentially pump more than 10 times that amount in the same period of time.

The upper limit of groundwater transfer is given in Final EIS/EIR Table 2-5 as 290,495 acre-feet per year (AFY). In Section ES.4 on Potential Water Transfer Methods, Final EIS/EIR on page ES-9 gives a somewhat confusing statement on the amount of water that will be transferred. A maximum is given at 600,000 AFY for critically and dry years, and for some year after, while 360,000 AFY is given for all other years. Because the volume of groundwater substitution transfers is *only* 290,495 AFY, it appears that the full volume of groundwater transfer can be transferred each year for 10-years under this project description. Note that the 600,000 AFY maximum exceeds the 511,094 upper limit for transfers given in Table ES-2.

Basic logic says that a groundwater substitution transfer pumping of 290,495 AF in one year would likely result in a significant impact based on what has occurred in the past 10 years, see Figures 3.3-10a-c, and the medium to high priority ranking of the basins by DWR. One has to assume that the baseline level of pumping for non-groundwater substitution uses that occurred during 2004 to 2014 would continue, which when combined with an additional 290,495 AFY groundwater transfer pumping would result in deeper and wider areas of groundwater depression. If the changes in groundwater elevation from 2004 to 2014 shown in Final EIS/EIR Figures 3.3-9a-c to 3.3-10a-c are the result of baseline pumping and the transfer a total of 272,162 AF (2000 to 2014 less year 2002), how can it be concluded that pumping more than that amount each year for each of 10 years would result in less than significant impacts? BoR/SLDMWA counters that level of maximum groundwater substitution transfer pumping won't occur, and that analysis of impacts from the project's maximum pumping isn't required by NEPA/CEQA. But that's how the project is described and the fact that the project may not reach its full potential shouldn't remove the obligation to provide an analysis of the full project impacts. A simulation based on one past series of events doesn't provide a complete analysis of potential impacts. Without an analysis of the potential impacts from the maximum pumping allowed under the project's description, the scenario that was modeled can be properly evaluated because the modeled results can't be measured against the possible maximum range impacts. In other words, where do the SACFEM2013 model results lie between no project and the full project, and do the results provide reasonable evaluation of impacts? Are the estimated impacts closer to the no project or the full project alternative, or somewhere in the middle?

<u>Comments on Common Response 6: Groundwater Mitigation</u>

This response provides in Table J-3 links to existing Groundwater Management Plans some of which have Basin Management Objectives (BMOs). This information is useful, but the monitoring requirements for any actual groundwater substitution transfer pumping will be determined in the future, as part of the future GW-1 mitigation measure development. The Final EIS/EIR doesn't map or otherwise show where the groundwater transfer pumping will occur in areas where "quantitative" BMOs don't exist, leaving it to the public to figure that out for themselves. The Final EIS/EIR doesn't actually state which Basin Management Plan have BMO's acceptable for use in monitoring the 10-Year Transfer Project impacts. The Final EIS/EIR appears to assume that all existing quantitative BMOs are sufficient to maintain groundwater-pumping impact to a level of less than significant and that they have protective threshold for groundwater level change that triggers protective mitigation measures. This common response and the language in Mitigation Measure GW-1 state that they will only coordinate with 3rd parties on groundwater data collection and monitoring when there are no "quantitative" BMOs. But the burden is on the 3rd party to start the coordination. This seems to in part make the project's monitoring and mitigation measures the responsibility of non-participants. The Final EIS/EIR needs to analyze the existing GMPs and BMOs to determine if they are adequate for mitigating the impacts from the 10-Year Transfer Project's groundwater substitution pumping and provide maps at a readable scale that show the boundaries between quantified and quantified BMOs.

Comments on Common Response 7: Subsidence

Comments on this response are provided under my discussion of the revised Mitigation Measure GW-1.

Comments on Common Response 8: Streamflow Depletion Factor

The response to comments on the streamflow depletion factor (SDF) states that this factor is only relevant to Mitigation Measure WS-1 and is specific to the CVP and SWP water supplies. This is apparently based on the conclusion that there will be no significant impacts to fisheries, vegetation or wildlife from losses to surface water as the result of groundwater substitution transfer pumping. Note that the potential impacts to natural communities in small streams due to reduced stream flow from groundwater substitution are mitigated by GW-1 and not WS-1, see section 3.8 on page ES-17. The conclusion of no impacts was apparently reached based on the results of the SACFEM2013 modeling effort, which as discussed above didn't evaluate the full amount of groundwater substitution transfer pumping. Thus, the evidence doesn't support the conclusion that no impacts to fisheries, vegetation or wildlife can occur from the groundwater transfer substitution pumping. As I discussed in my comment no. 22, modeling of the Sacramento Valley groundwater system since the 1920's to 2010 by DWR and the Northern California Water Association shows that stream accretion, groundwater discharges to surface water, has decreased approximately 1.5 million acre-feet annually over the pre-pumping levels. My Exhibit 10.7 combines the time histories from modeling results for stream accretion and groundwater pumping and shows that historic average rate of loss in stream accretion is approximately equal, but opposite in sign, to the historic average rate of increase in groundwater pumping. This information indicates that there is a long-term correlation between groundwater pumping and stream flows.

The Final EIS/EIR also indicates that actual measurement of changes in stream flow during groundwater substitution transfer pumping can't be done, so apparently there are no methods for verifying the SACFEM2013 modeling results. The assertion that changes in stream flow can't be monitored contradicts the conclusions in reports by others. I've provided a discussion of this issue in my comment no. 22 and a reference to a 2008 water flux study done on the Lower Merced River. The Final EIS/EIR responses to my comments also don't address the issue that the SDF response functions can and should be calculated for each the of the 329 groundwater substitution transfer wells. The SDF response functions can be derived from the SACFEM2013 modeling as shown for the 2009 transfers, a detailed discussion and reference given in my comment no 21. Without individual well SDF response funtions, a adequate evaluation the of the Final EIS/EIR's analysis of the impacts to fisheries, vegetation and wildlife can't be done. The Final EIS/EIR reaches a conclusion of no cumulative impacts based on the SACFEM2013 regional modeling effort that only analyzed a subset of all of the surface water bodies overlying the 10-Year Transfer Project's groundwater substitution transfer pumping area. As I discussed in my comment no. 21, the distance between a well and a surface water body has a significant affect on rate and timing of stream depletion. It would be reasonable to assume that there are water bodies that weren't included in the SACFEM2013 modeling and that some of these water bodies lie closer to the 329 groundwater substitution transfer wells than those modeled by SACFEM2013. Without individual well SDF response functions, an evaluation of the significance to the impacts analysis of leaving out these smaller water bodies can't be done.

Comments on the 2014 Lower Tuscan/Tehama Aquifer Study

Drs. T.J. Greene and K. Hoover at California State University at Chico have released a report on their study that evaluated the hydrostratigraphy of the Lower Tuscan and Tehama aquifers in the area surrounding Hamilton City, California (http://www.csuchico.edu/cwe/research/lower-tuscan-aquifer.shtml). Information developed in this study was then used to re-interpret previous results of pump tests conducted in four key wells. The methodology for this study differs from the typical procedures used in groundwater modeling for interpreting subsurface conditions. Study methods include the point count analysis of thin sections made from sieved samples of material collected during the drill of the four key wells to determine the source area and assign the interval to either the Lower Tuscan, Tehama or combined geologic units, and the percentage of sand. In addition, 457 geophysical well logs obtained from the California's Division of Oil, Gas & Geothermal Resources along with other well logs from DWR and Butte County were used to pick the depths of seven stratigraphic surfaces. The hydrostratigaphic interpretation of the study area used the seven surfaces to develop maps showing the elevations contours of the top of each surface (structural maps), the thickness between two surfaces (isopach maps), and maps of sand fraction percentages. This type of analysis of subsurface stratigraphy is commonly done in the oil and gas industry, but is relatively rare in the groundwater industry. One of the results of the Chico State study shown in Figure 5 identified a central north-south oriented sandy braided river system being flanked by a volcanoclastic fan apron on the east, and intermittent creeks and flood plain system on the west.

Although the area of study was restricted to the Lower Tuscan and Tehama aquifers, the results of the study show that the hydrostragraphic interpretation used in the SACFEM2013 modeling may not adequately represent subsurface conditions. For example, Figure 9 in the SACFEM2013 model documentation report, Final EIS/EIR Appendix M, shows the elevations contours at the top of Layer 6, which the model assumes is the top surface of the Lower Tuscan aquifer (page 3-5). The equivalent unit in the Chico State report is layer LT-7 and the structural contours of the top of the layer are shown in the LT-7 structural map on page 86 in Appendix F. Basic visual comparison of these two maps shows that the Chico State report found the surface to has a much greater complexity.

Another example can be seen in a comparison of the SACFEM2013 models layers 6 and 7 horizontal hydraulic conductivity distribution contours, Figure 13 in Appendix M, with sand fraction maps in Appendix I of the Chico State report. While this comparison isn't between the same physical properties, the percentage of sand in an aquifer correlates with the hydraulic conductivity because the greatest conductivity typically occurs in the coarser grained units. The greater the percentage of sand typically results in the greater the hydraulic conductivity. Again, the difference in complexity is dramatic.

The re-interpretation of the four pump tests in the Chico State study also demonstrates the importance of adequately evaluating the subsurface hydrostratigraphy. The results of the pump test re-interpretations where evaluated in using the Chico State hydrostratigraphy and found a number of subsurface hydrologic conditions that apparently weren't previously recognized. The re-interpreted pump tests suggest that several previously unknown impermeable hydraulic barriers and buried faults are present in the subsurface in the vicinity of Hamilton City. The study also concluded that the differences between aquifer properties in one well, OAWD-2, and the other wells is likely due to a sharp boundary between the two different depositional systems.

The results of the Chico State Lower Tuscan/Tehama study while limited in area and restricted to the lowermost aquifers demonstrates that the assumptions about the hydrostratigraphy and resulting hydrogeologic conditions used in the SACFEM2013 model may be too simplistic to produce an accurate estimate of pumping impacts. The recognition of previously unknown impermeable hydraulic barriers, faults and a sharp boundary along with the north-south oriented sandy braided river system are important features that strongly influence the flow of groundwater as evidenced by the pump-tests. The recognition that faults can create hydraulic barriers to groundwater flow is important regardless of their potential for seismic activity. Reliance of the SACFEM2013 modeling effort on an assumption that the hydraulic conductivity distribution is significantly less complex than that found by the Chico State study may produce model results that don't accurate estimate the impacts from aquifer stresses caused by the 10-Year Transfer Project's groundwater substitution transfer pumping. If a goal of the groundwater modeling efforts for the Sacramento Valley is to produce a model that can accurately identify areas of potential impacts from groundwater pumping, then I recommend that the methodology used in the Chico State's study of the Lower Tuscan/Tehama aquifers should be utilize elsewhere in the Sacramento Valley. The significance of the difference on the estimates of potential impacts can only be evaluated by running the groundwater model with the Chico State hydrostratigraphy.

<u>Response NG01-2: SACFEM2013 map scale and Well confidentiality issues</u>

The Final EIS/EIR provides new Figures 3.3-28 to 3.3-33 that show historic changes in groundwater levels. Based on my printer output, the 8-1/2 by 11 inch maps provided in the Draft EIS/EIR are at a scale of approximately 1.1 inches = 20 miles (1:1,152,000), and the new maps in the Final EIS/EIR are at a scale of approximately 1.1 inches = 10 miles (1:576,000). USGS 7-1/2 minute topographic quadrangle maps that are typically used to present regional information have a scale of 1 inch = 2,000 feet (1:24,000). The revised Final EIS/EIR maps are reduced approximately 24 times the normal 7-1/2 minute quadrangle map scale and are still difficult to use to assess the impacts at a specific location. While there is a need to have maps that fit into a standard size report, the Final EIS/EIR was released digitally. Thus a digital file with the maps at the quadrangle scale could have been released. The question is can a 3rd party, ie., the public, identify where a groundwater substitution well is located relative to their property, to areas of environmental significance, and to the water bodies of interest using the Final EIS/EIR maps? In my opinion, these maps are still at a scale that doesn't allow for basic investigation work. Digital maps at the 7-1/2 minute quadrangle scale would allow the public to find their property and other areas of interest and facilitate their evaluation the project's potential impacts.

GW-1 has been significantly revised from the draft and now includes a requirement that 3rd parties can contact BoR if they are concerned about groundwater pumping impacts (pg 3.3-163), but only when and where quantitative BMOs don't exist. Why are 3rd parties limited to raising concerns only when BMO's don't exist? The Final EIS/EIR doesn't indicate where spatial information can be found on where BMOs don't exist? It appears that GW-1 requires that 3rd parties determine if their property lies within an area of no quantitative BMOs, determine what the well(s) being used for groundwater substitution transfer and if they are or aren't covered by quantitative BMOs before they contact BoR. The knowledge of location of each groundwater substitution transfer well is critical to allowing 3rd parties participation in GW-1 mitigation process. In other word, how can a 3rd party know that they need to contact BoR about their concerns without maps at a useable scale, 7-1/2 minute quadrangle or better?

In addition to individual well locations, the lack of the well information that I listed in my comment no. 1(NG01-2) prevents a 3rd party from making a reasoned determination of potential for impacts at their property and prevents them from developing credible evidence to support their concerns about potential impacts. How can a 3rd party determine which well is being pumped, how much is being pumped, the well's hydraulic characteristics, and then the distance to that well, without specific information on each well? As I discussed in my comment no 21, the level of impact from pumping is related to the distance between the pumping well and point of interest. The BoR's position that the well locations and characteristics are confidential create a condition where 3rd parties have no valid information to make an independent determination if the pumping will impact them, except after the impact(s) occurs. And even then, they can't make a valid argument that the groundwater substitution transfer pumping caused the impact. The end result is that the lack of information about an individual well means that a 3rd party can never prove a linkage between a groundwater substitution transfer well's pumping and the impacts on their land. This fact also means that the design of Mitigation Measure GW-1 is inadequate to demonstrate that non-participants in the 10-Year Transfer Project will be protected from significant impacts.

On the issue of well confidentiality, Water Code Section 13752 says that the well completion reports are not available for public inspection, but doesn't say that the information can't be summarized and provide to the public. In fact, the well completion report can be made available to anyone that has written authorization from the well owner. The 10-Year Transfer Program's groundwater substitution pumping is a voluntary project; no one is requiring the sale of this water. The burden to prove that the transfers will have no impact on the source area is with the sellers. As such, it seems to me that the seller has the burden to demonstrate the level of impact and provide sufficient information about their "project" to inform the public so that they can provide reasoned independent analysis and comments. In my opinion, this is a clear CEQA/NEPA process issue. How much information on a project's location and intensity of development is required in an EIS/EIR to allow the public to have sufficient knowledge of the potential impacts? Can specifics about a project's location and the intensity of the development be kept secret and still have a CEQA/NEPA process that demonstrates the validity of the assessment of potential impacts, mitigation measures and mitigation monitoring requirements?

As discussed above, the GW-1 mitigation measure give 3rd parties false hope that they can raise objections to their concerns about potential groundwater substitution pumping impacts because no information is being provided on where, when and how much groundwater is being pumped at any given time, combined with the lack of well specific information, ie., on the hydraulic characteristics of each well. Non-governmental 3rd parties can't evaluate the potential extent of the impacts because there is no independent information to conduct an evaluation.

Response to NG01-4: Mitigation GW-1 Doesn't Rely on the Well Acceptance Criteria

This response states that GW-1 doesn't rely on the well acceptance criteria. However, the revised GW-1 still contains language referring to the well acceptance criteria and the criteria are provided in **Appendix D** of 2014 *DRAFT Technical Information for Preparing Water Transfer Proposals* document that provide guidance for development of groundwater substitution transfer proposals (Final EIS/EIR page 3.3-161). The following is a discussion of the five area where procedures in GW-1 rely or refer to the well acceptance criteria.

First, the description of Mitigation Measure GW-1 in Section 3.3.4.1, page 3.3-161, states that the 2014 *DRAFT Technical Information for Preparing Water Transfer Proposals* provides guidance for the development of proposals for groundwater substitution water transfer proposals. In the Well Review Process in Section 3.3.4.1.1 GW-1 states that *[p]otential sellers must submit well data for Reclamation and, where appropriate, DWR review, as part of the transfer approval process. Required information will be detailed in the most current version of* the *DRAFT Technical Information for Preparing Water Transfer Proposals.*

Second, the 2014 *DRAFT Technical Information for Preparing Water Transfer Proposals* states in on page 27 in Section 3.3.1 on the information requirements for groundwater substitution wells that *[t]he amount of information submitted for each well will depend on its location relative to surface water features (**criteria shown in Appendix D**) and other areas that may be sensitive to groundwater pumping effects.* In Section 3.4 on determining the amount of transferable water, starting on page 28, it states that the amount of water that can be transferred under groundwater substitution will be determined by five criteria. Criteria no. 3 requires determination of *the reduction in streamflow during balanced Delta conditions resulting from pumping groundwater to make surface water available for transfer (streamflow depletion factor).* Criteria no. 5 requires the calculation of *[g]ross Transfer Pumping – (Estimated Streamflow Reduction) = (Surface Water Made Available for Transfer).* Both of these require the stream depletion factor (SDF) be calculated.

Third, in Appendix B of the 2014 *DRAFT Technical Information for Preparing Water Transfer Proposals* the *Water Transfer Information Checklists* for groundwater substitution transfers, starting on page 42, requires that *[i]f applicable, for Project Agencies consideration, technical analysis that supports a streamflow depletion factor (SDF) other than 12% and/or information sufficient to demonstrate that a well likely does not have a significant hydraulic connection to the surface water system tributary to the Delta according to the well acceptance criteria (**Appendix D**). For this specific information, it is recommended transfer proponents provide additional time for Project Agency review.*

Fourth, in the Final EIS/EIR Section 3.1.4.1 Mitigation Measure WS-1: *Streamflow Depletion Factor* on page 3.1-22, states that [*t]he exact percentage of the streamflow depletion factor will be assessed and determined on a regular basis by Reclamation and DWR, in consultation with buyers and sellers, based on the best technical information available at that time. The percentage will be determined based on hydrologic conditions, groundwater and surface water modeling, monitoring information, and past transfer data. … The minimum streamflow depletion factor (based on modeling completed for this EIS/EIR) will be 13 percent, but this factor may be adjusted based on additional information on local conditions.*

Finally, there is a requirement under Mitigation Measure WS-1 to use a streamflow depletion factor, the default is 13%, to address the potential streamflow depletion effects to CVP and SWP water supply. WS-1 allows for adjustment of the streamflow depletion factor, but doesn't give any specifics other than BoR and DWR will consult with buyers and sellers. Under Mitigation Measure GW-1, a streamflow depletion factor, which I assume is the same streamflow depletion factor referred to in WS-1, has to be used to determine the amount of water that can be transferred under groundwater substitution, although the default is 12% not 13%. GW-1 also says that a streamflow factor other than the default, 12%, can be use if sufficient information is provided according to the well acceptance criteria in **Appendix D**, page 42.

Nevertheless, the response to my comment NG01-4 is that Mitigation Measure GW-1 doesn't rely on the well acceptance criteria, that is **Appendix D** in the 2014 *DRAFT Technical Information for Preparing Water Transfer Proposals* document. But there is a specific requirement in GW-1 to use a streamflow depletion factor for calculation of the amount of water that can be transferred. Any modification of the streamflow depletion factor from the default value needs to provide information in accordance with the well acceptance criteria, **Appendix D**. It is assumed that the streamflow depletion factor required in WS-1 is the same as in GW-1. WS-1 allows for change from the default 13% value, but no technical requirements are stated.

Thus, we have two mitigation measures, WS-1 and GW-1, that require the use of a streamflow depletion factor but have different default values. The only stated method for revising the streamflow depletion factor is the one provided in GW-1, which clearly requires consideration of the well acceptance criteria given in **Appendix D**. Therefore, contrary to the assertion in response NG01-4 it appears that the well acceptance criteria are part of both Mitigation Measures WS-1 and GW-1 and are intended to be considered in any modification of the streamflow depletion factor.