Standard Review Form
Draft Environmental Impact Report Eagle Crest Energy Pumped Storage

Reviewer's Name: __Joshua Tree National Park__________ **Reviewer's Organization**: _National Park Service___

Reviewer's email address: ____________________________ **Reviewer's Telephone numbers**: ________________

Primary Disciplinary Area (e.g., ecology, land use planning, regulatory oversight): ____________________________

Section or Chapter Number and Date of Reviewed Document: __October 4, 2010_______________________________

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		Evaluation of conformance with applicable groundwater LORS is lacking. Section 3.3.1 of the draft EIR presents discussion about the Federal, State, and local laws, ordinances, regulations, and standards (LORS) applicable to the proposed Project. Little or no discussion is presented elsewhere in Section 3.3 on whether or not the Project, as proposed, will conform to these LORS. Only a blanket statement in the first sentence of Section 3.3.1 is provided that the Project will conform to the LORS outlined in the section. Presumably, where impacts are predicted and mitigation measures are proposed to correct or offset these impacts, it is likely the result of not conforming to one or more of the LORS. Further discussion is needed to make this link so that the reader can see that in cases where the Project will not conform to a particular LORS, an acceptable mitigation measure will be implemented that brings this impact into conformance. With respect to State Water Resources Control Board Policy Resolution No. 88-63, which designates all groundwater and surface waters of the State as potential sources of drinking water worthy of protection for current or future beneficial uses, none of the policy exceptions (a, b, c or d) presented in Section 3.3.1.2 appears to apply to the groundwater that will be used by the	

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		applicant for this project. Yet, there will be an estimated annual consumptive evaporative loss of approximately 1,763 afy (or 82,900 acre-feet over the Project life) of drinking-quality water from the two project reservoirs. Given the SWRCB's existing policy (refer to Resolution No. 75-58) of limiting the use of scarce supplies of inland water resources for evaporative cooling of power plants in order to assure proper future allocations of inland waters considering all other beneficial uses, how does the SWRCB rectify the apparent policy inconsistency of allowing significant evaporative losses to occur for the pumped storage energy project under Resolution No. 88-63, while discouraging comparable evaporative losses from occurring for other energy projects in the valley such as wet-cooled solar energy projects under Resolution No. 75-58? There is little or no recognition or discussion presented in the draft EIR on this very important issue, let alone any discussion on possible mitigation measures that might significantly reduce these evaporative losses. Unless this policy inconsistency is corrected by the SWRCB and/or addressed through mitigation measures, this potentially opens a loophole that could be exploited by this Project and other proposed groundwater pumped storage energy projects in the state. This policy inconsistency should be addressed before any permit is granted for this Project.	
		Groundwater storage depletion estimates are under-estimated due to an unreasonably high water balance. The NPS appreciates the applicant's effort to re-evaluate their water balance estimates and subsequent analysis of individual and cumulative impacts to groundwater storage in the basin resulting from their Project and other reasonably foreseeable projects. After reviewing the revised water balance analysis, the NPS is still concerned that the analysis grossly over-estimates the amount of natural recharge coming into the Chuckwalla Valley, Pinto Valley and Orocopia Valley and therefore, under-estimates the amount of groundwater storage depletion that will occur. Our concern is based on the following primary lines of evidence:	

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		• The follow-up literature review has neglected considering the results from a recent USGS Scientific Investigations Report 2004-5267 prepared for the nearby Joshua Tree area that may be more applicable to the study area than the Fenner Basin studies cited by the applicant. The Joshua Tree area study utilized multiple analysis methods, which indicated that present-day groundwater recharge in this region of the Mojave Desert is very limited, and that nearly all of the water being removed from the basins in this region is likely coming from depletion of existing groundwater storage. The NPS believes the results of this study should be extrapolated to the study area instead of the Fenner Basin studies. • In their recoverable water estimate study (Section 12.4, Attachment F), the applicant summarily dismisses the validity of the modified Maxey-Eakin Method recharge estimates (600 to 3,100 afy) for the study area basins because the estimates are not in-line with higher recharge estimates from other methods utilized in the presumably analogous Fenner Basin. When the NPS applied a range of recharge coefficients derived from the results of the distributed parameter watershed modeling effort in the USGS Scientific Investigations Report 2004-5267 to the Project study area basins, a total recharge estimate ranging from 3,300 to 6,000 afy resulted, providing support to the upper range of the modified Maxey-Eakin Method estimates. • The applicant's water balance analysis suggesting an excess of inflow over outflow is NOT supported by the water level records in the study area. The available water level evidence largely points to a steady decline of water levels over the period of record, indicating that outflow has exceeded inflow to the study area and that depletion of groundwater storage likely has been occurring for many years. The applicant has even contradicted their own analysis with the recognition that water level trends in the study area suggest a steady annual decline of about 0.1 feet, while conversely predicting with their	

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		water balance analysis that groundwater storage (and water levels) will increase over the life of the Project. • The lower recharge estimates of 3,300 to 6,000 afy proposed by the NPS appear to be supported by the declining water level trends in the study area. Evaluation of the declining water level trend in the Pinto Valley by the NPS indicates that this decline can be partially explained by the lower estimates of recharge for this valley and the depletion of groundwater storage in the valley by Kaiser pumping from 1950-1985. These lines of evidence will be discussed in more detail in specific comments provided for Sections 3.3 and 5.3, and selected supporting technical memoranda contained in Section 12.4.	
		Insufficient synthesis of information from supporting technical memoranda. While it is fine to refer the reader to more detailed information contained in the supporting technical memoranda, the challenge is to synthesize and distill the important concepts, results and study conclusions into the main body of EIR document so that the public can begin to understand the complexities involved in the analyses and the conclusions drawn from these technical information sources. By referring the reader to the technical memoranda and glossing over the discussion of this information in the main body of the draft EIR, the reader is often faced with a search for the supporting information. This hampers the reader's comprehension of the discussion. As a result, several sections lack an adequate summary of the supporting information needed to understand the evaluation. This is particularly evident in the Section 5.3, the cumulative effects discussion for the groundwater resources in the Project area. This section makes no use of supporting figures and is unusually short and redundant given the importance of the topic.	

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3.3.2		The section on the environmental setting for the study area is missing a discussion on the climate setting. Please provide a discussion on the climate records of the study area basins, including tabulations of temperature extremes (daily and monthly), precipitation extremes (monthly and annual), and estimated evaporation rates (monthly) for climatic stations in the vicinity of the project study area. This information is important in understanding the potential amount of recharge to these basins, as well as evaporative losses from the Project reservoirs.	
3.3.2		The section on the environmental setting for the study area is missing a tabulation and discussion on the existing water balance for the study area. While Sections 3.2.8 through 3.2.10 provide a discussion of the elements leading to a water balance, the EIR needs a baseline water balance table to illustrate the amount of recharge and discharge to and from the groundwater flow system.	
3.3.2.3 & Figure 3.3-4	3.3-6 & 3.3-7	In the paragraph extending from page 3.3-6 to 3.3-7, the applicant contends that the Colorado River cannot recharge the Chuckwalla Valley Groundwater Basin due to changing subsurface geologic conditions that exist in the region where the Chuckwalla Valley transitions into the Palo Verde Mesa Valley. The basis for this conclusion cannot be ascertained from the subsurface interpretation provided in geologic cross-section A-A' (Figure 3.3-4). The decision to lump the Pleistocene non-marine sediments (Bouse Formation?) and Quaternary alluvium into one unit (Qc) on the cross-section masks the subsurface conditions that are said to prevail. Additionally, there is no well on the cross-section in the Palo Verde Mesa Valley that supports the interpretation that has been presented. Please provide a more detailed cross-section in this transitional area of both basins that substantiates the interpretation of the subsurface conditions presented in the discussion. If it exists, please provide a water level for the well located in the	

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		Hayfield/Orocopia Valley presented in cross-section A-A'. Lack of a groundwater level at this well location suggests a groundwater divide is present in this area of Orocopia Valley. Is this the case?	
3.3.2.5	3.3-9	Reference is made to the various wells with water level records that were evaluated in the draft EIR and discussion is presented on selected wells. Please provide a table that summarizes the water level information for all of the wells in the study area that have water level measurements. This will provide more transparency to the discussion as it is difficult to determine the water level measurements due to the scale utilized in the hydrographs that have been presented. Additionally, reference is made to Figure 3.3-2, which shows the location of the wells that are discussed. No wells are labeled on this figure, making it impossible for the reader to know where any well is located in the study area. Please label all wells in this figure that have a water level record.	
3.3.2.5	3.3-9	Throughout the discussion on water level trends, it is hard to discern whether or not the wells of interest were being pumped during the different periods of record noted in the discussion. Please clarify whether the various wells were pumping during the period of record or whether they were inactive and acted as monitoring wells. This information could be accommodated in the table that has been suggested in the previous comment. The water level discussion is more strongly supported if these wells were effectively acting as monitoring wells instead of pumping wells.	
3.3.2.5	3.3-9	The discussion on water levels focuses on selected wells in the basin while excluding other wells that may have sufficient water level data capable of allowing additional interpretations of long-term water level trends in the study area. Recent draft EIS's for the Palen Solar Power Project and the Genesis Solar Energy Project in Chuckwalla Valley presented additional hydrographs of wells that appear to indicate a long-term decline in water levels is	

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		occurring in parts of the study area that are more distant from the historic pumping centers that occurred in the Desert Center area. This includes well 4/17-6C1, located north of the Palen Dry Lake area, and wells 5/17-19Q1 and 5/17-33N1, located south of the Palen Dry Lake area. It is recommended that the water level data for these wells (and others with sufficient records) be evaluated and included in the discussion. If hydrographs are presented, please use scales that allow the reader to see the magnitude of the water level change that has occurred. Declining water levels in the valley are an indication that natural recharge may be much lower than is proposed and that depletion of groundwater storage may be occurring. This is why it is important to be transparent in presenting all of the water level data.	
3.3.2.5	3.3-9	The discussion in the third paragraph on this page focuses on a water level recovery of about 100 feet in the Desert Center area from 1986 to 2002, and 2007 data that indicate water levels are still about 17 feet lower than the static water level in 1980 before heavy pumping began. The 2007 residual drawdown levels are partially explained by drawdown created by current reduced pumping in the area. The discussion should be revised to recognize that some of this residual decline is likely the result of groundwater storage depletion occurring from historic agricultural pumping and earlier pumping by Kaiser. Given that current agricultural pumping is approximately 3 times lower than it was in 1986, some of the water level decline could be explained by depletion of groundwater storage in the aquifer. Additionally, please provide the 2007 water level data (in Figure 3.3-7 and in the table requested earlier) confirming that water levels in this area remain 17 feet below the 1980 static water level. Evidence for groundwater storage depletion in Chuckwalla Valley exists in the information presented in Figure 3.3-7, and Table 3.3-7 of the draft EIR and Table 8 in Section 12.4 (Revised Groundwater Supply Pumping Effects) of the draft EIR. Figure 3.3-7 shows that the water level in well 5S/16E-7P1	

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		(and 5S/16E-7P2) between the early 1950s and 2000 (about 47 years) has dropped about 30 feet due to pumping in the valley. When heavy agricultural pumping had started in 1981, the water level in this well had already dropped about 12 feet from the 1950s static water level as a result of Kaiser pumping in the upper Chuckwalla Valley (and Pinto Valley). From 1965-1980, about 57,534 acre-feet of groundwater had been pumped from the upper Chuckwalla Valley (see Table 8, Section 12.4). Table 3.3-7 indicates that from 1981-1986, an additional 109,998 acre-feet of groundwater was pumped from the valley. Together, about 167,532 acre-feet of groundwater was removed from storage between 1965 and 1986. If the applicant's storage estimate of approximately 15,000 acre-feet of water for each foot of saturated thickness for the basin-fill aquifer is reliable, as much as 11 feet of the observed 30-foot drop (167,532 ac-ft / 15,000 ac-ft/ft = 11.2 ft.) could be explained by the amount of groundwater removed from storage in the upper Chuckwalla Valley / Desert Center area, assuming a low recharge rate for Chuckwalla Valley. The remainder of the 30-foot decline is likely a reflection of additional storage depletion and the drawdown related to the pumping in the valley after 1986.	
3.3.2.5	3.3-9 & 3.3-10	In the paragraph extending from page 3.3-9 to 3.3-10, the applicant contends that pumping by Kaiser in the Pinto Valley and upper Chuckwalla Valley lowered water levels in the Pinto Valley by 15 feet and that the water level has recovered to about 7 feet below its static level in 1960. It is further maintained that the water level recovery is being slowed in part by pumping effects related to current pumping occurring in the Desert Center area. The discussion should be revised to recognize that much of this residual decline could be explained as a result of groundwater storage depletion occurring from the earlier pumping by Kaiser in the Pinto Valley and upper Chuckwalla Valley. Evidence for storage depletion in Pinto Valley exists in the Kaiser pumping	

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		information presented in Figures 4 and 8, and Table 8 of Section 12.4 (Revised Groundwater Supply Pumping Effects) of the draft EIR. Figure 8 shows that the amount of drawdown due to the combined Kaiser pumping in both valleys was more than 20 feet, when starting from the initial water level measurement of about 930 feet msl measured in 1954. Table 8 shows that from 1948 to 1984 (37 years), an estimated total of 137,196 acre-feet of groundwater was pumped from wells in the Pinto Valley, while 63,434 acre-feet of groundwater was pumped from the upper Chuckwalla Valley. If the applicant's storage estimate of approximately 15,000 acre-feet of water for each foot of saturated thickness for the basin-fill aquifer is reliable, as much as 9 feet of the 20 foot drop (137,196 ac-ft / 15,000 ac-ft/ft = 9.1 ft.) could be explained by the amount of groundwater removed from storage in the Pinto Valley, assuming a low recharge rate for Pinto Valley. As shown in Figure 8, with the advent of Kaiser pumping in the upper Chuckwalla Valley from 1965-1981, additional drawdown of water levels in Pinto Valley occurred, most likely as a result of well interference effects between the two Kaiser pumping centers. This additional pumping and drawdown most likely increased the storage depletion occurring in the Pinto Valley during this period. Furthermore, inspection of Figure 4 reveals that between 1984 and 2007, once Kaiser pumping had ceased (1984-85) and agricultural pumping near Desert Center was significantly reduced after 1986, the water level in the Pinto Valley well 3S/15E-4J1 only rose about 3 feet in 23 years. By 2007, the water level in this well is about 13 feet below the 1954 static water level, providing a strong indication that a significant amount of groundwater has been removed from storage and that recharge rates in Pinto Valley and the study area are likely much lower than the rates proposed by the applicant. The NPS agrees it is also likely that the water level recovery is being partially offset by current pumping that is occurring in the Desert Center area.	

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3.3.2.7	3.3-10	Please provide more details on the parameter estimates that were used to derive the groundwater storage volume for the Chuckwalla Valley Groundwater Basin. The storage volume presumably required an estimate of the saturated volume (i.e., saturated area x saturated thickness x drainable porosity) of the sediments in the basin. In addition, please provide an estimate of the groundwater storage volume for the Pinto Valley and Orocopia Valley, as existing, Project and reasonably foreseeable project pumping have the potential to affect groundwater levels and storage volumes in these basins as well. Finally, the statement that the applicant's storage volume estimate of 10,000,000 acre-feet is similar to DWR's 1979 estimate (15,000,000 acre-feet) is incorrect. The estimate is closer to DWR's 1975 estimate (9,100,000). Please correct this statement.	
3.3.2.8	3.3-11 & 3.3-12	In the paragraph that extends from page 3.3-11 to 3.3-12, the statement is made that annual pumping at the two prisons is expected to be reduced from 2,100 afy to 1,500 afy by 2011. If this is true, then the wastewater recharge estimate of 800 afy should be reduced proportionately (approximately 29%) to reflect the lower amount of wastewater that will be produced, and therefore, recharged back to the aquifer. The wastewater recharge estimate after 2011 remains unchanged in the water balance estimates presented in Section 12.4 and should be changed to reflect a proportional decrease in the production of wastewater after 2011.	
3.3.2.9		The title of this section leads the reader to believe that the discussion will focus on the recharge sources to the basin and the perennial yield estimate of the basin. However, there is no definition or discussion provided on the perennial yield of the basin. Please update the current discussion to address this deficiency. The concept of perennial yield is very important with respect to the amount of groundwater development these basins can support. A widely accepted	

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		definition of perennial yield in California is "*the maximum quantity of usable water from a groundwater aquifer that can be economically withdrawn and consumed each year for an indefinite period of time without developing an overdraft condition*." This definition is consistent with the "safe yield" concept which implies that in order to avoid an overdraft condition, the perennial yield cannot exceed the natural recharge occurring within that basin and ultimately is limited to the maximum amount of natural discharge occurring within that basin that can be utilized for beneficial use. In order to avoid overdraft conditions from occurring in regional groundwater systems that are comprised of several hydrologically connected basins, it is important to maintain the amount of through-flow (i.e., subsurface inflow and outflow) occurring between these basins, otherwise, water levels and groundwater storage will decrease over time and affect senior water users in these interconnected basins.	
3.3.2.9	3.3-12	In the last paragraph on page 3.3-12, the applicant states a literature search was conducted to find a representative method to estimate the amount of recharge occurring in the basins contained in the study area. The literature search only seems to focus on one basin, the Fenner Basin. In comments submitted in early 2010 by the NPS in response to FERC's request for additional study requests, we identified a 2004 study conducted by the USGS in the Joshua Tree (town) area that may have as much, if not more relevance to estimating recharge to the proposed project area basins. The 2004 USGS study included several basins that are located immediately west-northwest of Pinto Valley, where multiple analysis methods were used, including instrumented boreholes, geochemical sampling, distributed-parameter watershed modeling and numerical groundwater flow modeling, to estimate the recharge in these basins. The results of this study (USGS Scientific Investigations Report 2004-5267) provide compelling evidence indicating that present-day groundwater recharge for basins in this region of the Mojave Desert is very limited, and that nearly all of the water being removed from the	

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		basins in this region is likely coming from depletion of existing groundwater storage. However, no mention is made that this study was even considered in the literature search. Why was this study not taken under consideration with respect to identifying a representative method for estimating recharge rates in the project area basins? The results from the 2004 USGS study noted the following key observations and conclusions: • Sources of groundwater inflow (recharge) to the study basins were limited to infiltration of channelized stormflow runoff, groundwater underflow from neighboring basins and septage infiltration. • Physical and geochemical data collected away from stream channels show that direct areal infiltration of precipitation to depths below the root zone and subsequent groundwater recharge did not occur in the Joshua Tree area. • Oxygen-18 and deuterium data indicated that winter precipitation is the predominant source of groundwater recharge. • Tritium data indicated that little or no recharge has reached the water table since 1952. • Carbon-14 data indicated that the uncorrected groundwater ages ranged from 32,300 to 2,700 years before present, suggesting that groundwater stored in Mojave Desert basins are of ancient origin. • Results of the distributed-parameter watershed model indicated most of the recharge in the region likely occurs during anomalously wet periods, or even isolated occurrences of extreme storms, that are separated by relatively long (multi-year to multi-decade) periods of negligible recharge. • Numerical modeling results indicated that 99 percent of the cumulative volume of groundwater pumped from the study area basins (41,930 acre-feet out of a total of 42,210 acre-feet) between 1958 and 2001 was removed from groundwater storage, explaining the 35-foot	

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		decline in measured groundwater levels in the basins. Based on these observations and conclusions, the results of the 2004 USGS study should be extrapolated to the study area instead of extrapolating the results of the Fenner Basin study methodologies.	
3.3.2.9	3.3-13	In the first paragraph on page 3.3-13, the applicant identified two of the analytical methods used in the Fenner Basin that could be used to estimate the recharge in the Chuckwalla Groundwater Basin using available data. Please explain the basis for choosing the Maxey-Eakin method and the Metropolitan Water District Review Panel method from all of the Fenner Basin methods to estimate the recharge for the Chuckwalla Groundwater Basin.	
3.3.2.9	3.3-13	In the discussion about applying the Maxey-Eakin method and the MWD Review Panel method to the Chuckwalla Groundwater Basin, the applicant states that because the Maxey-Eakin method produced a significantly lower recharge estimate (600 to 3,100 afy) when compared to the MWD Review Panel method or other Fenner Basin study methods, the Maxey-Eakin method results were discounted as substantially under-estimating the recharge for the Chuckwalla Groundwater Basin. However, the Maxey-Eakin method results for both basins (Fenner and Chuckwalla) were in relative agreement with each other (see Figure 2, Attachment F, Section 12.4). Discounting these results because they don't agree with the higher estimates predicted by the other methods (including the MWD Review Panel method) is biasing the recharge analysis toward a higher recharge estimate. This ultimately has the effect of over-estimating the recharge and, therefore, dampening the effects of the Project pumping in the water balance analysis that is presented later by the applicant. If the results of the 2004 USGS Joshua Tree area study (USGS Scientific Investigations Report 2004-5267) had been taken into consideration and	

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		extrapolated to estimating the recharge rates for the Chuckwalla Groundwater Basin, one finds that the lower recharge estimates predicted by the Maxey-Eakin method are supported by other analysis methods that have been applied nearby. When the NPS applied a range of recharge coefficients, derived from the results of the distributed parameter watershed modeling conducted under the 2004 USGS study, to the Project study area basins, a total recharge estimate ranging from 3,300 to 6,000 afy resulted, providing support to the upper range of the applicant's modified Maxey-Eakin Method estimates. The NPS's recharge coefficients were derived by taking the total annual recharge estimates for the whole Joshua Tree study area (1,090 acre-feet) and the basins located west of the Pinto Valley (sub-basin CM18, 244 acre-feet) presented in Table 12 of the 2004 study, and dividing them by their respective basin areas (159,801 acres and 64,994 acres) presented in Table 7 of the 2004 study. This produced recharge coefficients of 0.0068 ac-ft/acre and 0.0038 ac-ft/acre, respectively. When these recharge coefficients are applied to the basin areas for the Chuckwalla Valley (604,000 acres), Pinto Valley (183,000 acres), and Orocopia Valley (96,500 acres), basin recharge estimates ranged from 4,100 to 2,270 acre-feet for the Chuckwalla Valley, 1,250 to 690 acre-feet for Pinto Valley, and 660 to 360 acre-feet for Orocopia Valley. The total recharge estimate for all three basins ranged from 6,000 to 3,300 acre-feet using this extrapolation method. The lower end of this range represents a recharge volume that might be expected if a recharge rate (coefficient) similar to that estimated for the basins located west of Pinto Valley was applied to the proposed Project basins. These basins are very similar to Pinto Valley in elevation and proximity, and therefore provide a reasonable analogous model for extrapolating recharge estimates to the proposed project basins. It should be noted that the NPS's recharge estimates above may be over-estimated based on conclusions presented by the USGS in their 2004 study. The USGS cautioned that the simulated total annual streamflow recharge is 2	

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		to 10 times greater than the measured total annual streamflow recharge, indicating that the recharge values estimated using the distributed-parameter watershed model may be high by a factor of 2 to 10. If true, the estimated total annual recharge to the Chuckwalla Valley, Pinto Valley, and Orocopia Valley may range from 3,000 to 300 acre-feet, which is nearly identical to the range the applicant predicted for the Project basins using the Maxey-Eakin method (600 to 3,100 acre-feet).	
3.3.2.9	3.3-13	In the discussion on the results of the MWD Review Panel method, it was stated that the estimation of recharge was accomplished using the local precipitation-elevation curve for the Fenner Basin and recharge infiltration percentages of 3%, 5% and 7%. This method produced total annual recharge estimates for the three proposed project basins ranging from 7,600 to 17,700 acre-feet, with a mean of 12,700 acre-feet. Examination of Figure 3 in Attachment F (Recoverable Water Estimates) of Section 12.4 shows three precipitation-elevation curves that can be used in this method: a local curve (Fenner Valley), a regional curve (region undefined), and a Western Mojave Desert curve. Given the Chuckwalla Groundwater Basin is generally situated in the western Mojave Desert, why was the Western Mojave Desert curve not used in the calculations? It is apparent from Figure 3 that use of the local Fenner Basin curve in the calculations may be biasing the recharge estimates upward. No meteorological information has been presented in the draft EIR for the Chuckwalla Groundwater Basin that supports using the Fenner Basin local precipitation-elevation curve. Given the lack of such supporting information, it is more appropriate (conservative) to use the Western Mojave Desert curve in the calculations. Use of this curve would result in lower total annual recharge estimates for the three proposed Project basins ranging from 5,500 to 12,800 acre-feet, with a mean of 9,100 acre-feet. The lower end of this revised range is in congruence with the upper range of the NPS's proposed	

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		recharge estimates (6,000 to 3,300 acre-feet).	
Missing Section	3.3-15	The Environmental Setting discussion is missing a summarization and discussion on the existing water balance in the Project area. While individual discussions have been provided on the inflow and outflow elements that go into a water balance, an additional section should be created that illustrates in tabular form the different inflow and outflow estimates that comprise the water balance. This would provide more transparency to the reader in understanding the static water balance conditions and how these conditions change when Project pumping and foreseeable project pumping is imposed. The NPS recommends creating this new section as Section 3.3.2.11 and renumber the Water Quality section as 3.2.2.12.	
3.3.3.2	3.3-19	In the discussion on Thresholds of Significance, the NPS recommends that the SWRCB better define the thresholds and significance criteria used to evaluate individual and cumulative impacts to groundwater resources in the Chuckwalla Valley groundwater basin. For example, in threshold (b) on page 3.3-19, does this criterion apply to individual and cumulative impacts, and how is "*substantial depletion*" and "*substantial interference*" to be interpreted from one project to another? Similar threshold descriptions have been used recently in draft EIS documents for some of the solar energy projects in the Chuckwalla Valley. Is substantial depletion or substantial interference defined differently for the pumped storage project as compared to these solar energy projects? Terms like substantial, significant, and considerable, unless defined quantitatively (i.e., with numerical limits or bounds), are open to broad and inconsistent interpretation, which leads to confusion.	
3.3.3.3.1	3.3-20	The discussion on seepage neglects to address potential water quality (i.e., acid mine drainage) concerns that might arise with the infilling and subsequent seepage of water from the two project reservoirs. Based on a preliminary review of the final license application and applicant-prepared	

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		EIS, a previous NPS request for additional study, and review of the current draft EIR, additional geochemical sampling studies are needed to confirm the potential impacts to regional water quality resulting from possible generation of acid mine drainage associated with seepage from the storage reservoirs. The applicant should conduct additional leachate analyses on the native bedrock beneath the two reservoirs and on the tailings material that is proposed to be used as liner material for the reservoirs. Reliance on analytical results from leachate testing on just five rock/tailings samples collected and conducted over fifteen years ago provides a minimal level of comfort, especially when the applicant admits that they cannot confirm some of the earlier analytical results. The NPS requests that additional geochemical sampling be conducted to confirm the validity of earlier leachate testing results so that the NPS and residents in the valley can be assured that the potential threat of acid mine drainage associated with the pumped storage project is low as the applicant claims. At a minimum, the applicant should conduct a review of comparable analytical methods in use today to assess whether a newer, more precise analytical method(s) has superseded the 1954 analytical methodology that was utilized originally. Whether or not a newer methodology exists, we believe the leachate analyses should be repeated on a statistically significant number of rock/tailings samples using the most appropriate and precise method for analyzing acid mine drainage potential of rock and soil samples. The NPS was confused by FERC's response to our original study request. FERC stated that acid mine drainage (AMD) leachate testing does not fully address the long-term potential production of acidic runoff and other natural environmental factors, and is therefore inadequate for assessing the potential for AMD. Yet, this is exactly what the applicant is relying on in the supporting documents accompanying their application. The NPS requested that the Commission further clarify their response so that we could better understand the Commission's reasoning for not adopting this portion of our	

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		study request, but we are unaware that further clarification has been provided. In a December 1994 technical document on acid mine drainage prediction (EPA530-R-94-036), the Environmental Protection Agency (EPA) describes several industry-recognized static and kinetic tests that can be used for determining the AMD leachate potential at a mine site. Based on the descriptions of the different tests provided in EPA's technical document, the Commission's response to our study request seemed to suggest that kinetic tests may be needed to fully address the AMD potential. Additionally, the applicant indicated in their response letter to the NPS's study request that they plan on conducting additional rock testing and laboratory analysis (type unspecified) during the two year design phase <u>following</u> licensing to address this issue. EPA's technical document notes that researchers agree that sampling and testing should be <u>concurrent</u> with resource evaluation and site planning. It is the NPS's contention that additional static and/or kinetic testing of AMD generating potential be explicitly defined and conducted on the tailings and mine rock located at the Project site in preparation of the EIR/EIS and final licensing and NOT after the EIR/EIS and licensing are completed, as proposed by the applicant. The expectation that the Project will be leak-proof is never certain, even with the application of the best available mitigation technology. Iron sulfide is one of the most common AMD-generating minerals found in metal mining sites. The necessity for utilizing fine, possibly iron sulfide-bearing tailings material to create an impervious layer has been proposed to minimize seepage loss in the reservoirs. However, as noted in EPA's technical document (EPA530-R-94-036), the finest particles expose more surface area to oxidation (and AMD generation potential), for example from leaking oxygenated reservoir water. The necessity for additional testing for potential AMD release should be of paramount concern during the EIR/EIS process.	

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3.3.3.3.2	3.3-20	As noted in an earlier comment, the title of this section leads the reader to believe that the discussion will focus on the perennial yield of the basin. However, no definition or discussion about the perennial yield of the basin has been provided. How are you defining perennial yield? Please update the current discussion to address this deficiency. The primary topic of discussion in this section seems to be focusing on effects to the prevailing water balance of the basin and associated depletion of groundwater storage. Consideration should be given to renaming the section to align with the primary topic of discussion.	
3.3.3.3.2	3.3-20	The discussion in the last paragraph on this page indicates that historic pumping in the basin between 1981 and 1986 exceeded the perennial yield of 12,700 acre-feet, which resulted in a cumulative reduction in groundwater storage of 36,200 acre-feet. The NPS contends the impact to groundwater storage during this period (and throughout the period of record) has been significantly under-estimated due to the over-estimation of the perennial yield (i.e., recharge) by the applicant. As stated in several earlier comments, the method used by the applicant to estimate the amount of recharge occurring in the three project area basins biased the estimate upward and that other analysis methods used in the region by the USGS indicate a significantly lower recharge rate for these basins. When the NPS substituted a conservative, annual average inflow estimate (i.e., perennial yield) of 3,000 acre-feet for all three basins into Table 3.3-7, this resulted in an estimated cumulative groundwater storage depletion of about 94,400 acre-feet during this 6-year period. The substitute average inflow was estimated by taking one-half of the upper range of the annual recharge (6,000 – 3,300 acre-feet) the NPS estimated using the recharge coefficients derived from the distributed-parameter watershed modeling results presented in the 2004 USGS study near Joshua Tree. This inflow estimate is consistent with the USGS's cautioning that recharge values	

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		derived from the distributed-parameter watershed model may be over-estimated by a factor of 2 to 10. Figure 3.3-7 shows that the water level in well 5S/16E-7P1 (and 5S/16E-7P2) between 1981 and 2000 (about 20 years) dropped about 17 feet, primarily due to the heavy pumping in the valley between 1981 and 1986. If the applicant's storage estimate of approximately 15,000 acre-feet of water for each foot of saturated thickness for the basin-fill aquifer is reliable, as much as 6 feet of the observed 17-foot drop (94,400 ac-ft / 15,000 ac-ft/ft = 6.3 ft.) could be explained by the amount of groundwater removed from storage between 1981 and 1986, using the NPS's lower average inflow rate of 3,000 acre-feet for Chuckwalla Valley. The remainder of the 17-foot decline is likely a reflection of additional storage depletion and the drawdown related to the reduced pumping in the valley following 1986.	
3.3.3.3.2 & 3.3.3.3.3	3.3-21 to 3.3-23	The NPS disagrees with several aspects of the water balance analysis and discussion presented by the applicant on pages 3.3-21 and 3.3-22. First, a start date of 2008 (already two years in the past) only has the purpose of inflating the cumulative storage estimate in the water balance prior to the beginning of Project pumping for construction purposes in 2012 (see water balance presented in Table 14, Section 12.4 – Revised Groundwater Supply Pumping Effects). From 2008-2011, the applicant's water balance produces a cumulative water storage increase of 12,000 acre-feet before project pumping even begins. This cushion of 12,000 acre-feet helps to dampen the Project's pumping effects once pumping starts up. The applicant has provided no legitimate basis for starting the water balance in 2008. Since the Project may not be given approval any sooner than 2011, the water balance should be revised to begin in 2011 or 2012. Second, as noted in previous comments, the applicant's method of estimating the total natural recharge and inflow for the Chuckwalla Valley, Pinto Valley	

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		and Orocopia Valley has biased the estimate upward and that other analysis methods used in the region by the USGS indicate a significantly lower recharge rate for these basins. As a result, the applicant has under-estimated the potential impact to groundwater storage in the Chuckwalla Valley that may result from the pumped storage project. The NPS is providing Tables 1 - 5 as additional evidence that the applicant has over-estimated the annual recharge to the basin and under-estimated the effects of Project pumping on groundwater storage in the basin. Table 1 is a preliminary water balance prepared by the NPS for the period 1948 – 2007. The water balance tries to account for all pumping that was occurring in the Chuckwalla Valley during this period, and incorporates the applicant's estimate of total annual recharge (12,700 acre-feet) for the three Project basins. Estimates for the various pumping sources were gleaned from the various tables presented by the applicant in the draft EIR and associated technical memoranda. In the case of agricultural pumping from 1987-1995, the NPS used an equal weighting approach to approximate the large yearly decline in pumping that was suggested during these years. For the years 1996-2007, this weighting approach was not used as agricultural pumping was in a steadier range The purpose of this table is to evaluate whether the applicant's proposed recharge rates are consistent with the historic water level record for well 5S/16E-7P1 & 7P2 (see Figure 4, Section 12.4). It should be noted that the applicant did not present and discuss such an analysis in the draft EIR, but are strongly encouraged to do so. The preliminary results indicate that by 2007, a cumulative increase in storage of about 267,000 acre-feet would have occurred if the applicant's recharge estimate is correct. Using the applicant's storage estimate of approximately 15,000 acre-feet of water for each foot of saturated thickness for the basin-fill aquifer, this would equate to a potential water level rise of about 18 feet (267,000 acre-feet / 15,000 acre-feet/foot) or about 0.3 feet per year throughout the basin. This upward trend is counter to the declining historic water level trend shown in	

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		Figure 4 (Section 12.4), in which groundwater levels in the Desert Center area have fallen nearly 40 feet between 1952 and 2007 (approximately -0.68 feet/year) at this well. This contradiction in trends suggests the applicant's recharge estimate is too high. Table 2 is the same preliminary water balance for the period 1948 – 2007, with the NPS's lower total annual recharge estimate of 3,000 acre-feet substituted for the applicant's proposed recharge rate. The purpose of this table is to evaluate whether the NPS's lower recharge rates are consistent with the historic water level record for wells 5S/16E-7P1 & 7P2 (see Figure 4, Section 12.4). The preliminary results indicate that by 2007 a cumulative depletion in storage of about **314,000** acre-feet would have occurred if the NPS's recharge estimate is correct. Using the applicant's storage estimate of approximately 15,000 acre-feet of water for each foot of saturated thickness for the basin-fill aquifer, this would equate to a potential water level decline of about **21** feet (314,000 acre-feet / 15,000 acre-feet/foot) or about -0.35 feet per year throughout the basin. This downward trend is consistent with the declining historic water level trends shown in Figure 4 (Section 12.4), in which groundwater levels in the Desert Center area have fallen nearly 40 feet between 1952 and 2007 (approximately -0.68 feet/year). The difference in the water level declines suggested in Table 2 and Figure 4 (21 feet vs. 40 feet, respectively) over this period further suggests that the total average annual recharge to these basins may be less than the NPS's conservative estimate of 3,000 acre-feet. Table 3 is a reconstruction of the applicant's current water balance including existing pumping, excluding Project pumping and foreseeable project pumping, and using the applicant's estimate of total annual recharge (12,700 acre-feet) for the three basins. The purpose of this table is to evaluate the baseline cumulative effects to groundwater storage if the Project and other foreseeable projects <u>are not</u> allowed to proceed and all other existing pumping	

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		in the valley continues as described by the applicant under the applicant's higher recharge conditions. It should be noted that the applicant did not present and discuss such an analysis in the draft EIR but are strongly encouraged to do so. To be consistent with the applicant's water balance analysis, the NPS maintained a start date of 2008 for Tables 3 - 6. The results indicate that by 2060 (the end of the permit period for the Project), groundwater storage might be expected to increase by approximately 183,000 acre-feet under existing pumping conditions. Using the applicant's storage estimate of approximately 15,000 acre-feet of water for each foot of saturated thickness for the basin-fill aquifer, this would equate to a potential water level rise of about 12 feet (183,000 acre-feet / 15,000 acre-feet/foot) or about 0.23 feet per year throughout the basin. This trend reversal is counter to the declining water level trends shown in Figure 4 (Section 12.4 of the draft EIR), which indicates groundwater levels in the Desert Center area have fallen nearly 40 feet between 1952 and 2007 (approximately 0.-68 feet/year). During this earlier period, historic annual groundwater pumping volumes [2,344 to 4,177 afy for Kaiser pumping (1965-1981), and 3,078 to 7,140 afy for agricultural/domestic pumping (1987-2007)] were usually less than the applicant's current pumping volume estimate (10,200 acre-feet) in their water balance analysis, with the exception of a few years (e.g., 1981-1986 which ranged from 12,553 to 21,996 afy). This projected trend reversal is also counter to the applicant's statement in the draft EIR (page 3.3-25) that projections indicate water levels in the basin appear to be falling about 0.1 feet per year due to local pumping. It is the NPS's contention that groundwater storage should continue to decrease and not increase in the future, as would have been the prediction using the applicant's estimate of average annual recharge (12,700 acre-feet) for the three basins in a baseline water balance analysis. If the applicant had conducted this water balance using their recharge estimate, they also would have seen that the predicted 12-foot rise of water levels throughout this 50-year period would be counter to	

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		the 4-foot drop in water levels they predicted for the same scenario using their analytical model. Table 4 is a reconstruction of the applicant's current water balance including existing pumping, excluding Project pumping or foreseeable project pumping, and using the NPS's lower estimate of total annual recharge (3,000 acre-feet) for the three basins. The purpose of this table is to evaluate the baseline cumulative effects to groundwater storage if the Project and other foreseeable projects are not allowed to proceed and all other existing pumping in the valley continues as described by the applicant under lower recharge conditions. The results indicate that by 2060 (53 years later), groundwater storage may decrease by approximately **330,000** acre-feet. Using the applicant's storage estimate of approximately 15,000 acre-feet of water for each foot of saturated thickness for the basin-fill aquifer, this would equate to a potential water level decline of about **22** feet (330,000 acre-feet / 15,000 acre-feet/foot) or about -0.4 feet per year throughout the basin. The decline in groundwater storage and water levels suggested by the results in Table 4 are consistent with an expected continuation of the declining water level trends observed between 1952 and 2007 (see Figure 4, Section 12.4), in which groundwater levels in the Desert Center area have fallen nearly 40 feet (approximately -0.68 feet/year) over this period. The difference in the water level declines indicated in Table 4 and Figure 4 (22 feet vs. 40 feet, respectively) over a similar period again suggests that the total average annual recharge to these basins may be less than the NPS's conservative estimate of 3,000 acre-feet. Table 5 is a reconstruction of the applicant's water balance including existing pumping and Project pumping, excluding foreseeable project pumping, and using the NPS's lower estimate of average annual recharge (3,000 acre-feet) for the three basins. The purpose of this table is to evaluate the cumulative effects to groundwater storage if the Project is allowed to proceed and all	

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		other existing pumping in the valley continues as described by the applicant under lower recharge conditions. The results indicate that by 2060, groundwater storage may decrease by approximately **440,000** acre-feet. Using the applicant's storage estimate of approximately 15,000 acre-feet of water for each foot of saturated thickness for the basin-fill aquifer, this would equate to a potential water level decline of about **29** feet (440,000 acre-feet / 15,000 acre-feet/foot) or about -0.55 feet per year throughout the basin. This is significantly different from the applicant's estimated increase in groundwater storage (74,000 acre-feet) and water level rise (5 feet) over this same period of time (see Section 3.3.3.3.3, Table 3.3-8). Additionally, comparing the difference in cumulative groundwater storage results in Tables 4 and 5 indicates that Project pumping could directly result in a 7-foot decline in water levels around the basin during the Project life. In summary, use of the applicant's total average annual recharge estimate of 12,700 afy results in a significant under-estimation of the potential effects of project pumping on groundwater storage in the basin. The applicant's recharge estimate and water balance analysis is not supported by the historic water level trends provided in the draft EIR. Conversely, the NPS's contention that the total average annual recharge to these basins (3,000 acre-feet or less) is much lower than the applicant's estimate appears to be supported by the NPS's revised water balance analyses, and the historic pumping volumes and resulting water level trends provided in the draft EIR.	
3.3.3.3.5		The discussion on the modeling results is lacking a summary discussion of the type of model that was used and why it was chosen, the input parameters that are required (hydraulic conductivity, transmissivity, storage coefficient, recharge, discharge rates, etc.), the parameter values used in the model, the modeling runs performed, and the limitations of the model results. This would help the reader to better understand the modeling effort and the results without having to dig deeper into Section 12.4 or the associated technical	

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		memoranda. At times, some of this information is presented but is incomplete. Please provide a better summarization of this information in the discussion in Section 3.3.3.3.5.	
3.3.3.3.5	3.3-25	The discussion in the first full paragraph on page 3.3-25 makes reference to “maximum historic drawdown” in several of the valleys, but no numerical values are provided. Please extract these values from Section 12.4 and summarize them in Section 3.3.3.3.5 for each of the valleys and areas of interest, so that the reader can better understand what the modeling results mean. With respect to the maximum historic drawdown of 15 feet for the Pinto Valley, the NPS requests changing this value to 8 feet. Based on the historic drawdown information presented in Figure 8 of Section 12.4 for the Pinto Valley well 3S/15E-4J1, the applicant postulated that 8 feet of the total historical drawdown of 15 feet in this well was attributable to additional Kaiser pumping that occurred after 1965 in the upper Chuckwalla Valley. This pumping occurred in conjunction with Kaiser pumping in the Pinto Valley that began in the late 1940’s and continued through the early 1980’s. Since heavy pumping has ceased in the Pinto Valley, it is more appropriate to use 8 feet as the maximum historic drawdown value for Pinto Valley, which is directly attributable to pumping effects emanating from the Chuckwalla Valley. Project pumping will occur only in the Chuckwalla Valley so drawdown in Pinto Valley that can be directly related to historic pumping in the Chuckwalla Valley should be the measure. The NPS further contends that the revised value of 8 feet may be on the high side, as some of the additional drawdown that occurred after 1965 in this well probably represents well interference effects that resulted from the coalescence and deepening of the cones of depression created by the Kaiser pumping centers in both valleys.	
3.3.3.3.9	3.3-28	The NPS recommends the discussion under the heading labeled	

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		Environmental Impact Assessment Summary be designated as a new section (Section 3.3.3.3.10). This seems like a logical topical break from the initial discussion under Section 3.3.3.3.9 (*Potential Impacts to Water Quality*) presented on pages 3.3-27 and 3.3-28.	
3.3.3.3.9	3.3-28 & 3.3-29	The NPS strongly disagrees with the conclusions presented for threshold item (b) as to whether or not the Project would *substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level*. In several previous comments, the NPS has provided compelling evidence that: • The applicant has over-estimated the amount of recharge to the Chuckwalla Valley. Reputable scientific information exists indicating the amount of recharge is most likely significantly lower than the applicant's estimate and that groundwater from basins in the region is being withdrawn almost exclusively from groundwater storage. • Groundwater storage depletion has been occurring in the Chuckwalla Valley for years as a result of past/existing pumping exceeding the significantly lower annual recharge occurring in the area. This contention is supported by the historic water level trends provided by the applicant in the draft EIR. • Pumping effects from the applicant's proposed Project will likely add to the deficit in the aquifer volume already occurring by further depleting the aquifer volume an estimated <u>440,000</u> acre-feet and lowering the local groundwater table by an estimated <u>7</u> feet during the life of the Project. • The applicant's claim of a net increase in aquifer volume and a projected rise in the local groundwater table of 5 feet is not supported by the declining water level records in the valley. Over the last 50+ years, past/existing pumping in the upper valley has resulted in a 40-foot lowering of the water table in this area, presumably under the	

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		same recharge conditions argued by the applicant. However, in the next 50 years during the life of the project, the depletion of aquifer volume will inexplicably reverse itself and increase by 74,000 acre-feet and water levels will rise by 5 feet. How is this possible when the existing and project pumping volume will be similar to if not higher than most of the historical pumping volumes? Based on this evidence, the potential impact to the basin overdraft from the proposed Project pumping should be considered ***significant*** as it will continue to contribute to groundwater storage depletion and declining water levels already occurring in the basin. The NPS does agree with the applicant's conclusion that in combination with pumping for all reasonably foreseeable projects, basin overdraft is likely to occur over the life of the project, and that the project would contribute to a *significant adverse cumulative effect*. However, the applicant's cumulative overdraft estimate contributing to a 9-foot decline in water levels is under-estimated for the same reasons noted above, and may be closer to a 40-foot decline.	
3.3.3.3.9	3.3-29	The NPS disagrees with the conclusions presented for threshold item (c) as to whether or not the Project would *cause local groundwater level reductions that affect local residents and businesses dependent upon overlying wells*. Based on the lines of evidence presented in preceding comments, water level declines will likely occur and may be significant enough to adversely affect some local residents and businesses that rely on groundwater wells as a water source. Therefore the impact from the proposed Project should be considered *significant*. Instead of basin water levels rising 5 feet during the Project's life as the applicant claims, basin water levels may decline about 7 feet in response to a continuation of existing pumping and Project pumping. The NPS does agree with the applicant's conclusion that in combination with pumping for all reasonably foreseeable projects, basin overdraft and a decline in basin water levels are likely to occur over the life of the Project, and that	

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		the Project would contribute to a *significant adverse cumulative effect*. However, the applicant's cumulative overdraft estimate contributing to a 9-foot decline in water levels is under-estimated for the same reasons noted in the preceding comment, and may be closer to a 40-foot decline.	
3.3.3.3.9	3.3-29 to 3.3-31	What is the purpose of providing the impact assessment discussions on Impacts 3.3-1 through 3.3-7 immediately following the discussion on the four currently defined thresholds of significance? Some of this discussion (e.g., Impacts 3.3-1 and 3.3-2) is redundant with some of the discussions related to the thresholds (e.g., b and c). If these are significant impacts to assess, then shouldn't they be considered for inclusion as additional thresholds of significance and discussed under that umbrella? The NPS would recommend including Impacts 3.3-3 through 3.3-7 with the existing thresholds of significance and eliminating Impacts 3.3-1 and 3.3-2, since this discussion has already been addressed. Keep discussions on applicable monitoring and mitigation measures that may be applied to each threshold of significance, as this allows the reader to see how some of the expected impacts will be offset.	
3.3.4.1		The NPS requests including all mitigation measure(s) that can be implemented to significantly reduce the evaporative losses that will occur from the surfaces of the two storage reservoirs. Such measures might help to reduce the amount of replacement water that would be needed annually which might help to mitigate groundwater storage depletion and water level declines in the valley related to the proposed Project. The applicant estimates there will be an annual consumptive evaporative loss of approximately 1,763 afy (or 82,900 acre-feet over the Project life) of drinking-quality water from the two project reservoirs. Yet, there is little or no recognition or discussion presented in the draft EIR on this very important issue, let alone any discussion on possible mitigation measures that might significantly reduce these evaporative losses.	

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		Given the SWRCB's existing policy (refer to Resolution No. 75-58) of limiting the use of scarce supplies of inland water resources for evaporative cooling of power plants in order to assure proper future allocations of inland waters, the same consideration should be given to the pumped storage project to reducing evaporative losses as is given to evaluating wet-cooled solar energy projects that have been recently proposed in the Mojave Desert region of southern California. A good example is the Genesis Solar Project located in eastern Chuckwalla Valley, which was originally proposed as a wet-cooled plant estimated to require about 1,650 afy of groundwater for evaporative cooling needs. As part of approving its operating permit, this solar project has been receiving much pressure by the State of California to institute mitigation measures (e.g., dry-cooling technology) to reduce the amount of drinking-quality groundwater needed for the project. If the applicant cannot propose a workable mitigation measure to address this same concern, then the evaporative loss from the reservoirs should be considered an *unavoidable, adverse impact* to the groundwater resources in the basin and the SWRCB and FERC should consider denying the operating permit for the proposed pumped storage project.	
3.3.4.3		As noted in an earlier comment, the NPS requests that additional geochemical sampling be conducted <u>concurrent</u> with resource evaluation and site planning to confirm the validity of earlier leachate testing results so that the NPS and residents in the valley can be assured that the potential threat of acid mine drainage associated with the pumped storage project is low as the applicant claims. The applicant has indicated in their response letter to the NPS's earlier study request that they plan on conducting additional rock testing and laboratory analysis (type unspecified) during the two year design phase <u>following</u> licensing to address this issue. Assuming the applicant will be allowed to proceed as planned and this additional rock testing and analysis indicates a high potential for generating acid mine drainage, what mitigation measures are proposed to address this possible water quality concern?	

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5.5.3	5-20	In the second paragraph on page 5-20, how does the applicant arrive at the conclusion that "pumping by the cumulative solar project and the proposed landfill will add about 5 feet of additional drawdown to the areas of the basin where water is being pumped"? This conclusion is stated without any supporting information provided. Please expand the discussion to provide more details that support this conclusion. If more detailed information is available elsewhere in the draft EIR, please note where it can be found, but also extract a summary of this information and provide it in Section 5.5.3. In general, the discussion in Section 5.5.3 is short on details given the importance of the subject matter (cumulative effects).	
5.5.3	5-20	In the fifth paragraph on page 5-20, reference is made to Table 5-5, which "*demonstrates the results of the groundwater balance and potential effects of groundwater pumping on groundwater storage over the life of the Project with the landfill and solar projects*." Please correct the results in Table 5-5 as the results are identical to the results previously presented in Table 3.3-8 (see pages 3.3-22 and 3.3-23).	
5.5.3	5-20 & 5-21	The NPS disagrees with several of the applicant's statements concerning the magnitude of the cumulative pumping effects that will result over the life of the Project. As noted in previous comments, the applicant's method of estimating the total natural recharge and inflow for the Chuckwalla Valley, Pinto Valley and Orocopia Valley has biased the estimate upward and that other analysis methods used in the region by the USGS indicate a significantly lower recharge rate for these basins. As a result, the applicant has under-estimated the potential cumulative effects to groundwater storage and water level declines in the Chuckwalla Valley that may result from the pumped storage project and other foreseeable projects in the basin. The NPS is providing Table 6 as additional evidence that the applicant has under-estimated the effects of cumulative pumping on groundwater storage and the	

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		associated water level decline in the basin. Table 6 is a reconstruction of the applicant's cumulative effects water balance including existing pumping, Project pumping and foreseeable project pumping, using the NPS's lower estimate of average annual recharge (3,000 acre-feet) for the three basins. The purpose of this table is to evaluate the cumulative effects to groundwater storage if the proposed Project and the other foreseeable projects are allowed to proceed, and all other existing pumping in the valley continues as described by the applicant under the NPS's proposed <u>lower</u> recharge conditions. The results indicate that cumulative pumping may exceed recharge by 16,000 to 20,000 afy during the reservoir filling period (2014-2017) and by about 9,200 to 14,400 afy during the remainder of the Project life (2018-2060). By the end of the Project (2060), groundwater storage may decrease by approximately **602,000** acre-feet. Using the applicant's storage estimate of approximately 15,000 acre-feet of water for each foot of saturated thickness for the basin-fill aquifer, this would equate to a potential water level decline of about **40** feet (602,000 acre-feet / 15,000 acre-feet/foot) or about -0.76 feet per year throughout the basin. This future annual rate of decline is greater than the NPS's estimated annual rate of decline of -0.68 feet per year for historical pumping from 1952-2007. The NPS's storage depletion estimate represents approximately a <u>6.6% decline</u> of the estimated 9,100,000 acre-feet in storage. This is significantly different from the applicant's estimated maximum decrease in groundwater storage (95,300 acre-feet in 2046) and corresponding water level decline (9 feet) over this same period of time. It should also be noted that the applicant's estimate of a 9-foot decline appears to be incorrect, as it is not consistent with the decline predicted by their maximum storage depletion estimate (i.e., 95,300 acre-feet / 15,000 acre-feet/foot = 6.3 feet). Furthermore, the NPS's results indicate that depletion of groundwater storage is likely to continue long after the life of the Project. Table 6 indicates that by	

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		the year 2100, the cumulative storage depletion may be on the order of **862,000** acre-feet, due to the assumed continuation of existing pumping in the valley and resulting depletion of groundwater storage. This represents a 9.5% depletion in groundwater storage and an estimated water level decline of over **57** feet (862,000 acre-feet / 15,000 acre-feet/foot = 57.5 feet) around the basin. The applicant's claim that the basin will recover to pre-Project levels by 2094 cannot be substantiated by the historically declining water level trends observed in the valley, which strongly suggest much lower recharge conditions exist than those proposed by the applicant. Additional pumping from the proposed Project and other foreseeable projects will only exacerbate the depletion of groundwater storage and decline in water levels in the valley. Based on the results of the NPS's revised water balance analysis, the cumulative effect of reasonably foreseeable projects on groundwater levels in the valley may result in an additional decline of 11 feet during the life of the Project. This is more than double the decline estimated by the applicant. Finally, in the second to last sentence in the last paragraph on page 5-20, reference is incorrectly made to Table 3-11. Please check this citation as it is believed the applicant meant to reference Table 3.3-7.	
5.5.3	5-21	The second paragraph on page 5-21 should be removed as it is redundant to the discussion already presented on page 5-20.	
12.4	5 & 6	In the discussion on the analytical model setup, please provide more information on the model itself including the commercial name of the model if it has one, and the input parameters that are required to run the model (e.g., hydraulic conductivity, transmissivity, storage coefficient, aquifer thickness, hydraulic gradient, recharge, maximum contribution from adjacent well, etc.). Are recharge and the hydraulic gradient of the aquifer input parameters to the model and if not, what effects does this have on the model results? Do the	

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		input parameters for image wells mimic the pumping centroid wells? Providing additional discussion on the relevancy of each input parameter to estimating the drawdown effects in the model will allow the lay-reader to better understand how the model operates. Additionally, please provide a discussion on the limitations of the model results given the nature of the model. Why was this analytical model chosen over other publically- or commercially-available analytical models or the development of a simplified numerical groundwater model that could test the validity of the applicant's recharge estimates?	
12.4	7	In the discussion on modeling the Historic Pumping in Upper Chuckwalla Valley on page 7, the NPS requests some discussion clarification on the following concerns it has with the modeling effort: • Did the pumping simulation only account for Kaiser pumping that occurred in the vicinity of the Kaiser centroid well in the upper Chuckwalla Valley or was Kaiser pumping in Pinto Valley also simulated at this centroid well? From the discussion, it is unclear whether or not the applicant was simulating all of the 1965-1981 Kaiser pumping occurring in both valleys, or just the Kaiser pumping occurring in the upper Chuckwalla Valley. Reference is made to Table 8 which describes all Kaiser pumping occurring in both valleys, which leads the reader to believe all of the pumping is being simulated. Please clarify this in the discussion so that the reader is not confused on which pumping is being simulated. • What did this modeling exercise accomplish other than being able to simulate (i.e. calibrate to?) the 8-foot drawdown that occurred in the Pinto Valley well 3S/15E-4J1 from 1965-1981 and to estimate the amount of drawdown beneath the CRA at OW10? The simulation model is different from the Historic Pumping in Desert Center Area simulation model (i.e., the final model) used to simulate Project water supply pumping impacts, as the input parameter estimates (K, b, S and	

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		T) for the Desert Center Area model are different from the Upper Chuckwalla Valley model. If the Desert Center simulation model is going to be used to predict Project-related drawdown near the mouth of Pinto Valley, then what was the purpose of conducting the upper Chuckwalla Valley pumping simulation?	
12.4	7 & 8	In the discussion on modeling the Historic Pumping in the Desert Center Area on pages 7 and 8, the NPS requests some discussion clarification on the following concerns it has with the modeling effort: • For the Desert Center model to be reliable in simulating Project-related drawdown in the upper Chuckwalla Valley and Pinto Valley, shouldn't it also be calibrated to the historic drawdown occurring in the Pinto Valley well 3S/15E-4J1 from the 1965-1981 Kaiser pumping in the upper Chuckwalla Valley? It seems that a simulation period from 1965-2007 might have provided better calibration results for the Pinto Valley well 3S/15E-4J1. The Kaiser pumping that was occurring from 1965-1984 is dismissed from the simulation, but this pumping obviously had an influence on water levels in the upper Chuckwalla Valley and Pinto Valley before and after heavy agricultural pumping began. Please provide more discussion on why the Kaiser pumping in the valley was not factored into the simulation. • Did the 27-year pumping simulation described in the last paragraph on page 7 include only agricultural and domestic pumping or did it also include Kaiser pumping occurring in the valley? The discussion seems to suggest that only agricultural and domestic pumping was accounted for based on the references to Tables 10 and 11 in the preceding paragraph. However, examination of Table 9 indicates that from 1981-1986, Kaiser pumping in the Chuckwalla Valley was similar in magnitude to the non-agricultural pumping (i.e., other pumping) that was included in the simulation. Exclusion of this pumping from the simulation may affect the calibration results.	

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		Please clarify this issue in the discussion so that the reader is clear as to what pumping was used in the simulation. • How did the applicant interpolate the different pumping rates for the time periods 1986-1992, 1992-1996, 1996-2005, and 2005-2007 in the 27-year simulation? There is no mention in the discussion describing how agricultural and the other types of pumping were apportioned during these time periods. Table 11 only gives specific pumping rates for 1986, 1992, 1996, 2005 and 2007. Please clarify this issue in the discussion and revise Table 11 to clearly denote what annual pumping rates were used in the simulation for all the types of pumping that were known to be occurring from 1981-2007. • What are the other input parameter values that were used in the 27-year simulation? The discussion only notes what hydraulic conductivity (K) values were used in the simulation, but no mention is made of the values used for saturated thickness (b), transmissivity (T), storage coefficient (S), or other parameters that are necessary. Based on the discussion presented on page 4 about the aquifer hydraulic characteristics for the Desert Center area and the subsequent discussion on pages 8 and 9 about the project water supply pumping simulations, one assumes a saturated thickness of 300 feet, a transmissivity of approximately 224,000 to 280,000 gpd/ft, and a storage coefficient of 0.05 might have been used. Please clarify this issue in the discussion so that the reader is clear as to what input parameter values were used in the simulation. • What is the basis and/or relevance of using the 1960 static water level for the Pinto Valley well to affect a better fit between the modeled drawdown and the actual drawdown for this well? In actuality, this 1960 water level was solely influenced by Kaiser pumping occurring in the Pinto Valley and not by any pumping in the Chuckwalla Valley that can be substantiated. This arbitrary substitution of a 1960 static water level (925 feet MSL) for a 1981 static water level (910 feet	

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		MSL) appears to be a contrivance by the applicant to make the reader believe the model calibration is better than it actually is in predicting the drawdown effects in the vicinity of the Pinto Valley well. Instead, could the poor match between modeled and actual drawdown at this well be related to the omission of 1965-1984 Kaiser pumping from the simulation and/or the inherent weakness of the analytical model to accurately replicate water level recovery?	
12.4	8	In the discussion on page 8 concerning the sensitivity analysis that was performed by the applicant, the discussion only addresses the sensitivity of the modeling results to variable hydraulic conductivity (K) conditions. The sensitivity analysis is incomplete, as it fails to address the sensitivity of the model results to the other important input parameters saturated thickness (b) and storage coefficient (S). Given that the analytical model solves for the Theis non-equilibrium well function, the transmissivity (T) and storage coefficient (S) are the two most important factors that can affect the drawdown predicted by the analytical model. Transmissivity, which equals the hydraulic conductivity (K) times the saturated thickness of the aquifer (b), affects the shape of the resulting drawdown cone. The storage coefficient affects the amplitude of the drawdown – the lower the storage coefficient, the greater the drawdown. Therefore, the sensitivity of the model calibration results to a reasonable range of hydraulic conductivity, saturated thickness and storage coefficient values should be evaluated and discussed in more detail to better inform the reader as to their relative impact on the modeling results due to the uncertainty in estimating the average value of each parameter. Conducting the sensitivity analysis in this manner will help to constrain the average input parameter values and model results. In turn, this allows for the most reasonable model calibration results, as well as the most reasonable drawdown estimates when simulating the impacts from Project water supply	

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		pumping and foreseeable project pumping.	
12.4	8 & 9	In the discussion on the Project Water Supply Pumping Simulation results on pages 8 and 9, the NPS requests some discussion clarification on the following concerns it has with the modeling effort: • Was other existing pumping in the valley that was accounted for in the applicant's water balance analysis incorporated into the analytical model simulation? The only reference in the discussion to the pumping that was modeled is the projected pumping for the proposed pumped storage project. If other existing pumping is included in the simulation, please revise the discussion to indicate this is the case and provide supporting information describing the centroid well locations from which the pumping occurred and the annual pumping volumes involved with these other existing pumping sources. • How much does the applicant estimate that their centroid well modeling approach is either over-estimating or under-estimating the amount of drawdown occurring in the model area? In the discussion in the last paragraph of this sub-section, it is noted that while the use of a centroid well is an accepted modeling approach, it may locally over-predict the drawdown at the pumping well and under-estimate the affected area. Please provide additional discussion and information that potentially quantifies this uncertainty at the various monitoring points of concern (e.g., OW-18, OW-15, etc.). It seems that if the applicant ran additional simulations trying to reproduce the historic pumping results in the upper Chuckwalla Valley and in the Desert Center area and compare the results with your original model calibration simulation results in these same areas, you might be able to quantify the over- or under-estimation of drawdown at these points.	
12.4	10	The applicant's statement in the last sentence preceding the sub-section titled Existing Pumping should either be removed or revised to indicate that the	

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		current trend in water levels clearly indicates that water levels in the valley have been declining over the last 50 years, most likely due to pumping exceeding the perennial yield of the basin during this period. In several previous comments, the NPS has provided compelling evidence that this condition has prevailed in the valley and that groundwater storage is likely being depleted.	
12.4	10 & 11	Please correct Figure 23 showing the simulation results for the Pinto Valley simulation well (OW-18) to reflect a maximum historic drawdown of 8 feet instead of 15 feet. An 8-foot historic drawdown is more reflective of the historic impact that pumping in the Chuckwalla Valley has had on water levels in the Pinto Valley, as previously noted by the applicant (see also Figures 7 and 8 and related discussion in Section 12.4). The maximum historic Chuckwalla Valley pumping impact is more pertinent to the potential Project pumping impacts on Pinto Valley water levels, as existing, Project and all reasonably foreseeable pumping will occur solely in the Chuckwalla Valley. The 15-foot historic drawdown currently cited is the result of combined Kaiser pumping that occurred in Pinto Valley (1948-1981) and the upper Chuckwalla Valley (1965-1981) prior to the start-up of agricultural pumping in 1981. As a result of this correction, the discussion related to Figures 21-24 under the sub-section titled Existing Pumping should be revised to indicate that continuation of existing pumping in the Chuckwalla Valley over the next 50 years could result in drawdown that may likely exceed the 8-foot historic drawdown level in the Pinto Valley (OW-18). Additionally, in Figures 23 and 24, please change the type and color of the symbol used for the actual water level measurements for Well 3S/15E-4J1 and Well 5S/16E-7P1, 7P2, respectively. The actual water levels in these wells are represented by a symbol similar in shape and color that is used to represent the simulated water level for the Existing + Project Pumping scenario. As a result, it makes it difficult to distinguish between simulated vs.	

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		actual water levels where these two are in close proximity to each other.	
12.4	11	In the discussion under the sub-section titled Existing Pumping with Project Pumping, please correct the discussion to reflect that after 50 years of combined existing pumping and Project pumping, the model results predict that drawdown will exceed the maximum historic drawdown level of 8 feet for the Pinto Valley (OW-18) by about 5 feet. The applicant is incorrectly portraying the maximum historic drawdown of Pinto Valley water levels that are related to historic pumping in the Chuckwalla Valley (see previous comment). Additionally, an incorrect reference to Figure 13 is made in the second paragraph of this sub-section and should be corrected to Figure 19.	
12.4	11 & 12	In the discussion under the sub-section titled Existing Pumping, Project and Proposed Pumping, please correct the discussion to reflect that after 50 years of combined existing pumping and Project pumping, the model results predict that drawdown will exceed the maximum historic drawdown level of 8 feet for the Pinto Valley (OW-18) by about 8 feet. The applicant is incorrectly portraying the maximum historic drawdown of Pinto Valley water levels that are related to historic pumping in the Chuckwalla Valley.	
12.4	12	In the discussion presented in the sub-section titled Post Project Groundwater Levels, reference is made in the second paragraph of this sub-section to a proposed estimate of the annual recharge to the basin by the National Park Service of 9,800 afy. The NPS requests that the discussion for the final EIR be modified to recognize that this was a preliminary estimate and the NPS has since proposed a reduced estimate for recharge of 3,000 afy or possibly lower, based on the extrapolation of results from a recent USGS study (USGS Scientific Investigations Report 2004-5267) conducted in the near vicinity of the Chuckwalla Groundwater Basin.	

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12.4	12	In the discussion presented in the sub-section titled Post Project Groundwater Levels, the NPS disagrees with the discussion presented in the third and fourth paragraphs of this sub-section and recommends the water balance analysis and associated discussion be revised to reflect the strong likelihood that the water balance for the basin is much less than the applicant is currently proposing. In previous NPS comments concerning the discussions presented in Sections 3.3.3.3.2, 3.3.3.3.3 and 5.5.3 of the draft EIR, the NPS presented and discussed several alternative water balance calculations (see Tables 1 - 6 attached to the NPS's comments to the draft EIR) that suggest the water balance analyses conducted by the applicant are over-estimating the amount of recharge to the basin and, therefore, are under-estimating the Project-related impacts and the cumulative impacts to the groundwater storage and water levels in the basin. In all six cases, the NPS contends the water balance for the basin has been and will continue to be in deficit, as a result of existing and future groundwater pumping exceeding the recharge for the basin. In particular, Table 6 presents the NPS's alternative cumulative effects water balance to the applicant's currently proposed cumulative effects water balance presented in Tables 14 and 15. The NPS's water balance indicates that cumulative pumping in the valley will exceed recharge by 16,000 to 20,000 afy during the reservoir filling period (2014-2017) and by about 9,200 to 14,400 afy during the remainder of the Project life (2018-2060). By the end of the Project (2060), groundwater storage may decrease by approximately 602,000 acre-feet. This storage depletion estimate represents approximately a 6.6% decline of the estimated 9,100,000 acre-feet in storage. This is significantly different from the applicant's estimated maximum decrease in groundwater storage (95,300 acre-feet in 2046). Furthermore, the NPS's results indicate that depletion of groundwater storage is likely to continue long after the life of the Project. Table 6 indicates that by	

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		2100, the cumulative storage depletion may be on the order of 862,000 acre-feet, primarily due to the assumed continuation of existing pumping in the valley after the Project shuts down. This represents a 9.5% depletion in groundwater storage in the basin since the start-up of the Project. The applicant's claim that the basin will recover to pre-project levels by 2094 cannot be substantiated by the historically declining water level trends in the valley resulting from past and existing pumping, which strongly suggest much lower recharge conditions exist than those proposed by the applicant. Additional pumping from the proposed Project and other foreseeable projects will only exacerbate the depletion of groundwater storage and decline in water levels in the valley that has been going on for years.	
12.4	13 - 16	In the discussion under the section titled Conclusions on pages 13-16, the NPS requests some discussion clarification on the following concerns it has with the conclusions drawn from the modeling effort: • The discussion in the first and second paragraphs talks about the favorable calibration results obtained after simulating the 27-year historic agricultural pumping simulation near Desert Center and after simulating the 17-year historic Kaiser pumping in the upper Chuckwalla Valley. The two simulations used different sets of model inputs (i.e. are two different models), each representing the different hydraulic conditions/ characteristics occurring in the two areas. How different would the calibration results for the 17-year Kaiser pumping simulation be if the 27-year agricultural pumping model had been used? Since the 27-year agricultural pumping model was adopted by the applicant for subsequent use in estimating Project-related pumping impacts, it is possible that the Project-related impacts to water levels in the upper Chuckwalla Valley and Pinto Valley are mischaracterized. While this model calibrated favorably to the water level response observed in wells 5S/16E-7P1 & 7P2 that resulted from the 27-year historic agricultural pumping, the applicant never used this	

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		model to also calibrate to the water level response observed in well 3S/15E-4J1 that resulted from the 17-year historic Kaiser pumping. If the applicant had done this, they might have a better sense of whether the predicted drawdown at OW-18 (Pinto Valley) resulting from Project-related pumping is over-estimated or under-estimated. Similarly, why wasn't one model with one set of input parameters representing the average hydraulic conditions/ characteristics (i.e., average K, b, and S) between the two areas ever considered for calibration to the actual water level responses observed in wells 5S/16E-7P1 & 7P2, and well 3S/15E-4J1? Since the analytical model approach cannot simulate variable hydrologic conditions within the modeled area, such an approach might have been another acceptable way of estimating the average drawdown impacts that could be expected. • In the summary table on page 14, please revise the maximum actual drawdown for OW-18 to 8 feet instead of 15 feet, and modify the discussion accordingly to reflect this change. As noted in an earlier comment, evaluation of the effects of Project-related pumping and cumulative pumping in the Chuckwalla Valley on Pinto Valley water levels should be measured by the historical maximum drawdown in Pinto Valley that was created solely by historic pumping in the Chuckwalla Valley, which is estimated to be 8 feet. Additionally, it is unclear from the discussion as to what the values in the right-most column represent. Are these the drawdown values obtained during the calibration simulations or during the Project-related simulations? • In the first full paragraph on page 15, please revise the discussion to reflect that water level declines due to a continuation of existing pumping into the future will also exceed the historic maximum drawdown of 8 feet in the Pinto Valley. • Please revise the summary table on page 15 as it is very confusing to the reader. The column heading in the current table leads the reader to	

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		believe the values listed in fourth column are derived from the difference of the values listed in the second and third columns, Closer examination reveals this not to be the case. If this is a summary of the information presented in Figures 21-24, which it appears to be, please change the values in the third column to reflect the total drawdown values shown in these figures that result since the start of the simulation (1981). In this case the revised values for the third column for simulation wells OW03, OW15, OW18 and CWdc (two values) would be approximately 22, 16, 16, and 90 (0 to 7 years) and 50 (7 to 50 years), respectively. The reader can then see that the values reported for each well in the fourth column are the result of taking the difference between the values reported in the second and third columns for each well. In addition to this suggested change, please change the value for OW03 in the second column from 12 to 15 to be consistent with the maximum historic drawdown previously reported for this well. Finally, please change the values for OW18 in the second column from 15 to 8 and in the fourth column from 1 to 8 to be consistent with the NPS's previous comment about changing the historic maximum drawdown for the Pinto Valley. • The NPS disagrees with the conclusions drawn by the applicant in the last paragraph of the Conclusions section. As noted in several earlier comments, the NPS believes the applicant's water balance analyses need to be revised to reflect the strong likelihood that the water balance for the basin is much less than the applicant is currently proposing. The NPS presents several revised versions of the applicant's water balance (Tables 1- 6) for consideration, which indicate that depletion of groundwater storage has been occurring, is likely to occur throughout the life of the Project and continue long after the life of the Project, thus refuting the applicant's claim that the basin will recover to pre-project levels by 2094. The NPS's concerns about the likelihood of a significantly lower recharge rate to the basin	

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		need to be taken seriously and factored into the evaluation of potential impacts to groundwater storage and water levels that might occur in the basin as a result of the Project, and the ability of the basin to recover from these effects after cessation of the Project.	
12.4	Tables 12 & 14	The annual water use value for aquaculture in the Desert Center Area presented in Table 12 (215 afy) is different from the water use value for aquaculture presented in Table 14 (599 afy). Please rectify this inconsistency and adjust the water balance or analytical modeling results and associated discussion accordingly. Additionally, why wasn't the pumping from the two prisons, accounted for in Table 12 and the analytical modeling? All pumping that was used in the water balance analysis should be accounted for in the analytical modeling if the water balance results are to be used in support of the analytical modeling results.	

To add addition boxes, press tab.