(760) 878-0001
FAX: (760) 878-2552

EMAIL: mail@inyowater.org
WEB: http://www.inyowater.org

P.O. Box 337
135 South Jackson Street
Independence, CA 93526

**COUNTY OF INYO**
**WATER DEPARTMENT**

# Addendum to the Hydrologic Monitoring and Mitigation Plan for Conditional Use Permit #2007-003/Coso Operating Company, LLC

**Prepared by County of Inyo Water Department**

**April 1, 2011**

---

## Background

In May 2009, the Inyo County Board of Supervisors granted a Conditional Use Permit (CUP) to the Coso Operating Company (Coso) for the "Coso Hay Ranch Water Extraction and Delivery Project" (Project) which allowed groundwater to be extracted from two existing wells on the "Hay Ranch" owned by Coso in Rose Valley and transported via pipeline to Coso's geothermal plant located on the China Lakes Naval Air Weapons Station. A Hydrologic Monitoring and Mitigation Plan (HMMP) developed for the project was included in the Environmental Impact Report (EIR) on the Project and the HMMP was adopted by the Board of Supervisors as a condition of Project approval.

The EIR developed for the Project set the standard for determining significant impacts of the Project's groundwater pumping. As noted on page 3-5 of the HMMP:

> *The EIR identifies that the project would have a significant impact if it would substantially reduce the amount of water available to surface water bodies at Little Lake Ranch and to other areas in the Rose Valley. A substantial reduction in the amount of water available at Little Lake is defined as greater than 10% reduction in water flowing into the surface features at Little Lake.*

The HMMP and CUP require that after approximately one-year of groundwater pumping, the Rose Valley groundwater model developed for the Project be recalibrated and used to revise the groundwater level triggers, pumping rate, and duration of pumping in the HMMP. In this regard, page 3-9 of the HMMP provides in pertinent part under Mitigation Measure "Hydrology 4" that:

*During the first year, a qualified person, approved by Inyo County Water Department and provided by the applicant, shall conduct the studies described in Hydrology-1 and Appendix 2 of this EIR in order to recalibrate the groundwater model to the early groundwater data. The groundwater model shall be recalibrated in order to more accurately understand the relationship between groundwater pumping, reduction in groundwater elevations across the valley, and availability of water at Little Lake. Pumping rates and duration of pumping shall be determined based on the results of the model and the observed water table drawdown.*

*The revised pumping rate and duration shall be approved by the Inyo County Water Department. The recalibration shall occur within one year after project startup to ensure adequate time is available to make adjustments to the pumping schedule if necessary, to ensure significant impacts do not occur. The model shall be calibrated to the new drawdown data collected since project startup. Based on the results of the recalibrated model, a revised schedule for pumping and revised trigger levels shall be determined that will not be expected to cause a greater than 10% decrease in groundwater inflow to Little Lake.*

In addition, Page 3-22 of the HMMP under the heading “Model Recalibration and Redefinition of Pumping Rates and Duration” provides:

*The recalibrated model shall also be used to establish new trigger levels for each of the monitoring wells listed in Table 2-1. The new trigger levels will be incorporated into an addendum to this plan, and again, must meet the criteria that Little Lake surface waters will not ever experience a greater than 10% reduction in inflow as a result of the proposed project. The recalibrated model and any modifications to trigger levels must be reviewed and approved by the Inyo County Water Department.*

and:

*The revised pumping rates and duration will be set to reduce potentially significant impacts to less than significant levels for the duration of the project until the period of maximum drawdown has passed Little Lake.*

The CUP modified Mitigation Measure Hydrology-4 in the EIR by replacing the following language:

*The applicant shall be allowed to pump the project at the full proposed pumping rate until a time when and if the predicted groundwater drawdown trigger levels are exceeded at two or more of the designated Rose Valley monitoring points by at least 0.25 feet, or if a maximum acceptable drawdown level is exceeded in any monitoring point.*

with:

> *Applicant shall be allowed to pump 3,000 acre feet a year for the first year after initiation of pumping or until the groundwater model is recalibrated, whichever is later. Thereafter, the applicant shall be allowed to pump at the full proposed pumping rate. All such pumping is allowed until a time when and if the predicted groundwater drawdown trigger levels are exceeded at two or more of the designated Rose Valley monitoring points by at least 0.25 feet, or if a maximum acceptable drawdown level is exceeded at any monitoring point.*

Thus, the CUP provides that, after one year of operation, Coso Operating Company shall be allowed to pump at the full proposed rate of 4,839 acre-feet/year (afy), but that pumping may be curtailed in order to avoid significant impacts.

In approving the CUP the Board of Supervisors found that the Water Department should retain discretion over the life of the CUP to enforce and modify mitigation measures associated with the Project. The CUP states:

> *The Inyo County Water Department has extensive experience evaluating the effects of groundwater pumping and a long track record of protecting the County's natural resources from the negative effects of groundwater withdrawal and export. Inyo County has demonstrated its commitment to protecting the natural resources of the County while furthering the interests of its citizens and is the single entity capable of balancing the varying interests of the citizens of Inyo County. It is important to this Board that the Water Department retain discretion over the life of this permit to enforce mitigation measures and modify them, if necessary, to protect the County's citizens and environment, subject to oversight by the* [Planning] *Commission and ultimately the Inyo County Board of Supervisors. Doing so is an obligation inherent in the County's sovereign role as protector of the health, welfare and safety of its citizens.*

EIR Mitigation Measure Hydrology-3 states that the recalibrated groundwater model should be used to update mitigation measures for the Project. Concerning the modification of mitigation measures, Mitigation Measure Hydrology 3 and the HMMP (page 3-9) place responsibility on the Water Department for overseeing the recalibration of the model and determining the need for modifications to mitigation measures:

> *The monitoring program also includes reassessment of model-predicted impacts and recalibration of the groundwater model by a qualified person approved by the Inyo Count*[y] *Water Department … If the model results change with recalibration, the mitigation strategy shall be updated in response to new forecasts of potential to groundwater, potentially including reducing the duration or rate of pumping, or other mitigation measures as described in the HMMP.*

In fulfillment of its responsibilities under the EIR, CUP and HMMP, the Water Department has prepared this Addendum to the HMMP, modifying the pumping rate, groundwater level triggers, maximum allowable drawdowns, and pumping duration, in a manner that ensures that groundwater inflow to Little Lake surface waters will never be reduced by greater than 10% as a result of the Project. Additionally, to document various aspects of the HMMP that have been implemented over the past year, this Addendum discusses monitoring well designations, modifications made to the groundwater model, the groundwater monitoring program, and baseline water levels. Finally, the "Conclusions and Findings" sections of this document, explain why changes incorporated into this Addendum do not cause new significant environmental impacts or increase the impacts of the Project identified in the EIR, and why the changes are consistent with the EIR's adopted standard of not reducing groundwater outflow to Little Lake by greater than 10% and of avoiding other significant impacts.

**Standardization of the Designations of the Monitoring Wells**

Mitigation Measure Hydrology-3 on page 3-8 of the HMMP describes the monitoring that will take place to detect changes and trends in groundwater levels. TEAM Engineering and Management, Inc. of Bishop, California has been conducting the monitoring required by the HMMP. The results of this monitoring are available on the Water Department's web site:
http://www.inyowater.org/coso/default.htm

During the development of the EIR and HMMP, names for the various wells in the monitoring network were used inconsistently. In order to standardize monitoring well names, TEAM Engineering developed a system of station identifiers to alleviate confusion resulting from inconsistent use of well names. This HMMP addendum uses the station identifiers developed by TEAM Engineering. To facilitate comparing this addendum to the HMMP, Table 1 relates the current well identifiers with the terminology used in the HMMP.

Table 1. Well numbers and well names discussed in this addendum compared to well names used in HMMP.

| Well number | Name used in this addendum | Name used in HMMP |
|---|---|---|
| RV-30 | Cal Pumice | Pumice Mine Well |
| RV-40 | Dunmovin | Dunmovin Area well |
| RV-60 | Hay Ranch 1A | Hay Ranch Observation well, [one of] Six New Hay Ranch Observation Wells |
| RV-61 | Hay Ranch 1B | Hay Ranch Observation well, [one of] Six New Hay Ranch Observation Wells |
| RV-62 | Hay Ranch 1C | Hay Ranch Observation well, [one of] Six New Hay Ranch Observation Wells |
| RV-80 | Hay Ranch 2A | Hay Ranch Observation well, [one of] Six New Hay Ranch Observation Wells |
| RV-81 | Hay Ranch 2B | Hay Ranch Observation well, [one of] Six New Hay Ranch Observation Wells |
| RV-82 | Hay Ranch 2C | Hay Ranch Observation well, [one of] Six New Hay Ranch Observation Wells |
| RV-90 | Coso Junction Ranch | Coso Ranch North Well |
| RV-100 | Coso Junc. Store #1 | Coso Junction #1 Well |
| RV-120 | Red Hill | New monitoring well between Coso Junction and Cinder Road Red Hill Well |
| RV-130 | G-36 | Navy G-36 Well |
| RV-140 | Lego | Navy Lego Well |
| RV-150 | Cinder Road | Cinder Road Red Hill Well |
| RV-160 | 18-28 GTH | Navy 18-28 Well |
| RV-180 | LLR North | Little Lake Ranch North Well |
| RV-210 | LLR Dock | Little Lake North Dock Well |

*Conclusions and Findings - Standardization of the Designations of the Monitoring Wells.* The standardization of the designations of the monitoring wells does not cause new significant environmental impacts or increase the impacts of the Project identified in the EIR.

**Model Recalibration and Revision**

The data available during the development of the EIR and HMMP were limited to conditions of little or no groundwater pumping. Recognizing this, the HMMP requires recalibration of the model and reconsideration of the drawdown triggers after one year of pumping for the project. The recalibration of the model resulted in a model that is better able to reproduce the reality of observed aquifer responses in the past, thereby increasing the reliability of the model for predicting aquifer responses in the future.

The HMMP provides that information gained during the initial operation of the Project is to be used to improve the groundwater model, and the improved groundwater model is to be used to revise groundwater level triggers, pumping rates, and pumping duration to better reflect the aquifer's response to pumping. These changes must be consistent with the overall goal of avoiding significant impacts at Little Lake.

Daniel B. Stephens and Associates (DBS&A), the consultant chosen to conduct the model recalibration, has revised and recalibrated the groundwater model. Their work is documented in a report "Revised Groundwater Flow Model and Predicative Simulation Results, Coso Operating Company Hay Ranch Water Extraction and Delivery System Conditional Use Permit (CUP 2007-003), prepared for County of Inyo, January 28, 2011". The full report produced by DBS&A is available on the Water Department's web page: http://www.inyowater.org/coso/default.htm.

As described in DBS&A's report, the key revisions to the model were:

- Estimates of recharge to Rose Valley were conducted using the Distributed Parameter Watershed Model. The estimated recharge from precipitation totals 4,455 afy, and was calculated independently of the groundwater flow model. This estimate is similar to previous estimates, but arrived at by a more rigorous and systematic method.

- The model grid was refined in the horizontal dimension so that cells are now 660 feet on a side (one-eighth mile), as opposed to 2,640 feet (one-half mile) in the previous model, in order to better simulate local pumping effects in the vicinity of Hay Ranch. In addition, to better represent the geology of Rose Valley, the updated model has 5 model layers as opposed to 4 in the previous model.

- The thickness of the alluvial fan material (model layer 1) was adjusted across the model area based on the available geologic well logs.

- Model hydraulic properties and layering were adjusted to better match the observed water levels in Los Angeles Department of Water and Power wells between Hay Ranch and Haiwee Reservoir, and available information was examined to better understand the correlation of water levels and Haiwee Reservoir levels in this region.

- Model boundary conditions were changed to improve the simulation of physical processes in the Little Lake area. In the updated model, the MODFLOW drain package was used to simulate groundwater outflows to Little Lake, the MODFLOW evapotranspiration (ET) package is used to simulate ET from the vegetation bordering Little Lake, and the MODFLOW general head boundary package was used to simulate subsurface discharge to Indian Wells Valley through the Little Lake Gap area. In the model used for the EIR, general head boundary conditions were used to simulate discharge at Little Lake. The modifications made in the updated model more realistically simulate the processes of groundwater discharge present at Little Lake (spring discharge and evapotranspiration).

- Estimates of pumping during the 1970s and 1980s were developed using satellite imagery, providing a better assessment of pumping than was developed for the EIR and improving the data put into the model. Over the period 1972 though 1985, it is estimated that 44,850 acre-feet were pumped for irrigation in Rose Valley. Because some of pumped water percolated back into the ground, the pumping during this period resulted in 31,650 acre-feet of net groundwater extraction.

- The model was recalibrated to historical transient conditions accounting for seepage from Haiwee Reservoir, previous pumping for irrigation, and pumping for the Project. The primary calibration targets were observed historical water levels, including those collected through September 2010 as part of the HMMP. Prior to the start of pumping, seven new wells were installed, providing additional monitoring points for model calibration; thus, the recalibration data set accounted for more monitoring locations and higher pumping than the data set used to calibrate the model for the EIR. The updated model uses different hydraulic properties and parameter zones than the previous model. The updated model calibration indicates that a specific yield of 0.1 best matches the observed data; other higher values of specific yield considered in the EIR are not used in the predictive simulations.

- The location of trigger well RV-40 (Dunmovin) was corrected to its actual location. It was located incorrectly in the model used for the EIR. The incorrect location affected the amount of drawdown modeled at the well, thereby affecting trigger levels. As a result of the correction the amount of drawdown allowable at the well has been increased because the well is closer to the production wells than as located in the EIR and HMMP. Drawdown in the well to date has not affected the ability of RV-40 meet the pumping needs of well owner. If in the future, the groundwater pumping of the Project affects the pumping needs of the owner of RV-40, impacts will be mitigated under EIR mitigation measure Hydrology-2.

The recalibrated model was used to produce three scenarios, each with a different pumping rate and duration that meets the hydrologic criteria for avoiding significant impacts. The three scenarios equate to pumping 790 acre-feet per year (afy) for 29 years (Scenario A); pumping 3000 afy, for 4.5 years (Scenario B); or pumping 4,839 afy for 2.7 years (Scenario C) (DBS&A, 2011). Each of these durations starts on 1/1/2011. For each pumping rate and duration, DBS&A produced for each monitoring well a maximum acceptable drawdown and a drawdown at the cessation of pumping. Note that the total amount of groundwater pumped varies between the three scenarios. In addition to the first year's pumping, Scenario A results in 22,910 acre-feet pumped over 29 years; Scenario B results in 13,500 acre-feet pumped over 4.5 years; and Scenario C results in 13,065 acre-feet pumped over 2.7 years.

For each trigger well, two monitoring thresholds are defined: the maximum acceptable drawdown, and the drawdown at cessation of pumping. The maximum acceptable drawdown in each monitoring well is the maximum model-predicted drawdown in a well that will not diminish groundwater discharge to Little Lake by more than 10%. Since drawdown in a monitoring well may continue to increase for a period of time after pumping ceases, DBS&A also identified the drawdown at cessation of pumping as a trigger necessary to control pumping and prevent significant impacts. Because of the time-lag between when pumping stops and maximum drawdown occurs, triggers set based solely on maximum acceptable drawdown are not sufficient to ensure that significant impacts will not occur. "Drawdown at cessation of pumping" is the groundwater level that will ensure that, if pumping ceases when that level is reached, there will not be an ultimate drawdown greater than the maximum acceptable drawdown. Protective management of pumping requires that drawdown at cessation of pumping also be used as the groundwater trigger level; therefore, drawdown at cessation of pumping will be used for the "trigger levels" discussed in the CUP. Each scenario has a specific set of groundwater level triggers and a fixed pumping rate. Once a pumping rate is approved, the associated duration of pumping limits the overall pumping for the Project. Therefore, the duration of pumping that is approved below is not automatically extended indefinitely simply because no triggers are exceeded.

The maximum acceptable drawdowns and the depth of drawdowns at cessation of pumping determined by DBS&A increased over the levels of the corresponding drawdown triggers presented in HMMP

Table 3-1. The recalibrated model used observations from the first year of Project pumping to refine the model's ability to reproduce aquifer response to pumping. Use of the recalibrated model resulted in an increase the depth of maximum acceptable drawdowns and the depth of drawdowns at the cessation of pumping; however, because of the improvements in the recalibrated model, these changes are consistent with the EIR's standard not reducing groundwater outflow to Little Lake by greater than 10%.

Groundwater discharge to Little Lake was evaluated using the discharge produced by the updated model. In contrast, the EIR used the water level in a well immediately adjacent to Little Lake (RV-210, LLR Dock Well) to assess discharge to Little Lake by comparing groundwater levels in the well with water levels in the lake. Data evaluated in the EIR indicated that the historical groundwater elevation at the north end of Little Lake was consistently 3 feet higher than the lake level; because groundwater flow is proportional to the hydraulic head gradient, a 0.3 foot decrease in the groundwater in the LLR Dock well was assumed to represent a 10% decrease in gradient, which was assumed to result in a 10% reduction in discharge of groundwater to Little Lake. Given the data available at the time the EIR was developed, this was a viable strategy to use; however, as a result of additional data available after the first year of operation of the Project, DBS&A and Water Department staff questioned the validity of this method for the following reasons:

1. The method used in the EIR assumes that local (to Little Lake) groundwater hydraulic head gradients could be used to evaluate groundwater discharge to Little Lake. Work done under HMMP Task 1.2(a) showed hydraulic head gradients in the vicinity of the lake are variable, and that it is faulty to use groundwater level in a single well next to the lake as an indicator of groundwater discharge to the Little Lake are.

2. Observations made during the first year of Project operation show that water level changes in the LLR Dock Well mimic water level changes in the lake. This indicates that the well is in good hydraulic connection to the lake; however it is as yet unknown whether it is a good measure of regional aquifer response to pumping.

3. Using the difference in water level between two points may, under the circumstance where water levels decline as both points, may fail to assess changes in discharge to the lake.

For these reasons, a different method of evaluating groundwater discharge was sought. DBS&A considered two alternative methods: (1) evaluation of the change in groundwater flow through the model layer immediately north of Little Lake, and (2) use of the recalibrated model to evaluate the changes in discharge in the vicinity of Little Lake. The second alternative is the most conceptually straightforward, as it is the most direct means of estimating groundwater discharge, and it also proved to the more conservative of the two alternatives, so it was the method used to develop the revised triggers. As a result of a decision to use the second alternative, DBS&A recommended using "the simulated efflux at the drain cells" from the recalibrated model to represent groundwater outflow to Little Lake. Importantly, the standard used for assessing whether a significant impact is occurring or will occur at Little Lake, i.e., a 10% reduction in groundwater flow to the lake and other groundwater dependent habitats, is unchanged from the EIR.

*<u>Conclusions and Findings - Model Recalibration and Revision.</u>* The revision and recalibration of the groundwater model used by the EIR, including the correction of the location of RV-40 Dunmovin, does not cause new significant environmental impacts or increase the impacts of the Project identified in the EIR, because the EIR's standard for avoiding a significant impact to Little Lake, which is defined as avoiding a 10% reduction in groundwater flow to the lake and other groundwater dependent habitats, is maintained. The model was recalibrated using observations of the groundwater system's response to the initiation of Project pumping, which improved the model's ability to predict system response to future groundwater pumping. Therefore, this Addendum is based on an improved version of the groundwater model. As anticipated by the EIR and HMMP, the update of the groundwater model improved the mitigation designed to avoid a significant impact to Little Lake and other resources.

**Baseline Water Levels**

On page 3-14, HMMP Task 1.1 (k) requires that baseline water levels be established in each trigger well in order to distinguish between natural variability and drawdown due to Project pumping. HMMP Task 1.1 (k) provides in pertinent part:

> *k. The applicant shall conduct statistical evaluation of the background water level data by a qualified person approved by Inyo County Water Department and provided by the applicant. An appropriate statistical method to calculate the background water levels shall be proposed by the applicant, subject to approval by Inyo County. Upon approval, the background water level for each monitoring point shall be calculated by the applicant and presented to Inyo County Water Department for review and approval. It is anticipated that statistical methods similar to those used to calculate background concentrations of naturally occurring chemical constituents at RCRA and CERCLA sites may be applicable.*

In accordance with the HMMP, a consultant, Schlumberger Water Services (Brooks, 2010), developed baseline water levels for trigger wells so that drawdown can be evaluated in each well relative to a baseline groundwater elevation. Baseline water levels were developed by Brooks (2010) for all wells in Table 2 of this Addendum except RV-80. It should be noted that Brooks (2010) deviated from the program described in the EIR by not setting baseline water levels for RV-30 (Cal-Pumice) or any of the Hay Ranch monitoring wells (RV-60, RV-61, RV-62, RV-80, RV-81, and RV-82), and by recommending that these wells not be used as trigger wells. In this Addendum, the Water Department follows the recommendations of Brooks (2010) to not establish baseline water levels in RV-30, RV-60, RV-61, RV-61, RV-81, and RV-82; however, in Table 2, the Water Department has adopted a baseline water level in RV-80 using methods similar to those used by Brooks (2010). The reasons for these deviations from the monitoring program described in the EIR are discussed below.

- RV-30, the Cal-Pumice well, experienced an anomalous drop in water level a few weeks prior to the start of Project pumping, which dissuaded Brooks (2010) from establishing a baseline water level for RV-30. No subsequent insight has been gained regarding the cause of anomalous water level changes in RV-30, so no baseline has been established for that well, as any baseline would be suspect. RV-30 will continue to be monitored. Given that RV-30 is north (upgradient) of Hay Ranch and Little Lake is south (downgradient) of Hay Ranch, RV-30's absence from the trigger well list does not diminish the effectiveness of the HMMP with respect to protecting Little Lake and other resources.

- RV-60, RV-61, and RV-62, the northern Hay Ranch monitoring well cluster, is located between the two Hay Ranch production wells. Brooks (2010) recommended that these wells not be used as trigger wells, because the depth-specific construction of the wells was not consistent with use of the groundwater model to determine triggers. No triggers for these wells are included in this HMMP addendum, but these wells will continue to be monitored.

- RV-80, RV-81, and RV-82, the southern Hay Ranch monitoring well cluster, is located south of the Hay Ranch production wells. Brooks (2010) did not recommend using these wells as trigger wells for similar reasons to those given above for the northern cluster wells. However, based on the past year's observations and DBS&A's work, RV-80 appears feasible to use as a trigger well and is included in Table 2. Using methods similar to those used by Brooks (2010), the Water Department established a baseline water level for well RV-80, the shallow piezometer in the southern monitoring well cluster.

*Conclusions and Findings - Baseline Water Levels.* Based on these considerations, RV-30, RV-60, RV-61, RV-62, RV-81, and RV-82 are not included as trigger wells in Table 2 but RV-80 is included in Table 2. Also, baseline water levels recommended by Brooks (2010) and approved by the Water Department are included in this Addendum. These deviations from the monitoring program described in the HMMP are within the range of modifications that are expected when implementing a groundwater monitoring program, and do not cause new significant environmental impacts or increase the impacts of the Project identified in the EIR. The monitoring and mitigation trigger well network (Table 2) contains a sufficient number of wells at favorable locations to avoid significant impacts to Little Lake and other resources from occurring.

**Groundwater Monitoring and Mitigation Implementation**

As required by Phase 4 of the HMMP, groundwater elevations (including those on the Hay Ranch) will continue to be compared annually to model predicted levels. The need for groundwater model calibration will be evaluated annually to ensure the accuracy of future water level drawdown predictions. Based on new data, the groundwater model may be recalibrated and the Water Department may adjust pumping amount, duration and trigger levels based on the new data and recalibration. Public notice shall be given prior to such recalibrations and again prior to any future modification of the HMMP.

**Revisions to Pumping Rate, Maximum Acceptable Drawdowns, Groundwater Trigger Levels, and Pumping Duration**

The CUP and HMMP require that the Water Department approve revised groundwater level triggers, pumping rate, and pumping duration for the ongoing operation of the Project. The pumping rate, maximum acceptable drawdowns, groundwater level triggers, and duration of pumping given below are based on the results given in DBS&A (2011), the provisions of the CUP, and the requirements of the HMMP. Among the three scenarios analyzed by DBS&A, the Water Department approves Scenario C, a pumping rate of 4,839 afy for 2 years and 8 months (2.7 years). According to DBS&A's analysis, all three scenarios are equally protective of the environment and meet the requirement that groundwater discharge to Little Lake not be diminished by more than 10%. The approved pumping rate is most consistent with the CUP's provision that after the first year of operation, the Project should be allowed to pump at the full proposed rate. Although this scenario allows the highest annual rate of pumping, because of its short duration, it results in the least total groundwater extraction.

*Pumping rate.* The CUP provides that after the first year of Project pumping, the applicant may pump at the full proposed rate (4,839 afy); however, the HMMP also requires that that the trigger levels, pumping rate, and duration of pumping may be modified to assure that significant impacts do not occur. DBS&A's analysis shows that it is feasible to pump the full proposed rate for 2 years and 8 months and still avoid significant impacts. Based on the CUP's allowance that the applicant may pump at the full proposed rate after one year, and DBS&A's finding that such a pumping rate may continue for 2 years and 8 months, pumping may proceed at a rate of 4,839 afy for the two-year period January 1, 2011 through December 31, 2012. For the eight-month period of January 1, 2013 through September 1, 2013, a total of 3,226 acre-feet may be pumped (two-thirds of the amount that may be pumped during a full year). At any time during the period January 1, 2011 through September 1, 2013, the average pumping rate for the period from January 1, 2011 up to that time may not exceed 4,839 afy.

*Groundwater level triggers.* The CUP provides that if groundwater level triggers are exceeded by more than 0.25 feet in two trigger wells, or if a maximum acceptable drawdown is exceeded in one trigger well, pumping will stop. Revised groundwater level triggers and maximum acceptable drawdowns are given in Table 2. If at sometime before September 1, 2013 drawdown at cessation of pumping in two or more trigger wells is exceeded by greater than 0.25 feet, then pumping will stop and not resume until all wells listed in Table 2 have recovered to their baseline water levels. If a maximum allowable drawdown is exceeded at any monitoring well, pumping will cease until all wells listed in Table 2 have recovered to their baseline water levels. In the event that pumping ceases because of these conditions, the applicant may request that the Water Department review the data and circumstances related to the trigger exceedence to determine if the exceedence was not a result of Project pumping. If the Water Department determines that the exceedence was not a result of Project pumping, then pumping may continue under triggers, pumping rate, and pumping duration modified to account for the non-pumping-induced exceedence, as approved by the Water Department.

*Pumping duration.* Pumping may continue until September 1, 2013, or until groundwater level triggers require that pumping stop, whichever occurs sooner. Pumping may not resume until:

1. Water levels in all trigger wells recover to their baseline levels, or

2. Pumping is allowed to continue or resume after September 1, 2013 based on the following analysis: using water level measurements recorded prior to September 1, 2013, if drawdown in each trigger well is less than the drawdown at cessation of pumping listed in Table 2, then the Rose Valley groundwater model will be used to reevaluate trigger levels, pumping rates, and duration of pumping and determine if pumping can continue, and if so, how long, with what trigger levels, and pumping rates. This evaluation will be carried out using similar methods and reasoning employed in DBS&A (2011).

This addendum does not diminish the discretion afforded to the Water Department under the CUP to further enforce or modify mitigation measures to protect the citizens, economy, and environment of the County.

Table 2. Baseline groundwater elevations (GWE) and drawdown triggers in monitoring wells for the approved pumping rate of 4,839 afy and duration 2 years and 8 months.

| Well ID | Well Name | Baseline GWE (ft amsl) | Drawdown at cessation of pumping | | Maximum acceptable drawdown | |
|---|---|---|---|---|---|---|
| | | | Drawdown (ft) | GWE (ft amsl) | Drawdown (ft) | GWE (ft amsl) |
| RV-40 | Dunmovin | 3252.73 | 23.2 | 3229.53 | 23.3 | 3229.43 |
| RV-80 | Hay Ranch 2A | 3240.92 | 27.6 | 3216.32 | 27.6 | 3213.32 |
| RV-90 | Coso Junction Ranch | 3230.65 | 11.3 | 3219.35 | 11.7 | 3218.95 |
| RV-100 | Coso Junc. Store #1 | 3227.59 | 9.5 | 3218.09 | 10.1 | 3217.49 |
| RV-120 | Red Hill | 3200.66 | 1.8 | 3198.86 | 3.9 | 3196.76 |
| RV-130 | G-36 | 3198.35 | 1.0 | 3197.35 | 3.4 | 3194.95 |
| RV-140 | Lego | 3199.21 | 0.0 | 3199.21 | 2.3 | 3196.91 |
| RV-150 | Cinder Road | 3186.92 | 0.2 | 3186.72 | 2.3 | 3184.62 |
| RV-160 | 18-28 GTH | 3187.67 | 0.0 | 3187.67 | 2.1 | 3185.57 |
| RV-180 | LLR North Well | 3158.88 | 0.0 | 3158.88 | 1.3 | 3157.58 |

*Conclusions and Findings – Revisions to Pumping Rate, Maximum Acceptable Drawdowns, Groundwater Trigger Levels, and Pumping Duration.* The revisions of the pumping rate, maximum acceptable drawdowns, groundwater trigger levels, and pumping durations do not cause new significant environmental impacts or increase the impacts of the Project identified in the EIR. By making the revisions to the groundwater model required by the HMMP, and using the revised and improved model to determine new pumping rates, groundwater level triggers, and duration of pumping, the EIR's adopted standard of not reducing groundwater outflow to Little Lake by greater than 10% will be maintained. With the changes, the recalibrated model simulates reduction in groundwater flow to Little Lake at 9.7% at about 9 years and 2 months after pumping stops and the maximum simulated drawdown at LLR Dock Well of 0.52 feet. It is important to note that the drawdown prediction is based upon use of the recalibrated model to simulate change in groundwater levels from December 2009 conditions and the simulated 1 foot change in the groundwater level occurs north of Little Lake at the trigger well, LLR North Well, not in Little Lake itself. (See Figure 28 in the DBS&A

report). Moreover, the recalibrated model uses the MODFLOW drain package to simulate groundwater outflows to Little Lake and, in particular, the simulated efflux (outward flow) at the drain cells represents the groundwater outflow to the lake. DBS&A (2011) p. 22, found that the drain flow approach is more conservative than using groundwater flow north of Little Lake to represent groundwater outflow to Little Lake, because less pumping led to a 10% reduction in drain-cell outflow than that which led to a 10% reduction in groundwater flow north of Little Lake.

## References


Daniel B. Stephens & Associates, Revised Groundwater Flow Model and Predictive Simulation Results, Coso Operating Company Hay Ranch Water Extraction and Delivery System Conditional Use Permit (CUP 2007-003), report prepared for Inyo County, January 28, 2011.

Brooks, S., Technical Memorandum to B. Harrington – Rose Valley Baseline Water Levels, Schlumberger Water Services, SWS Ref. 2815, January 19, 2010.