3: HMMP

3.1 Introduction

The reader is advised that the following hydrologic impact monitoring program is based on and contains many references to the hydrology impact analyses contained in the Hay Ranch Water Extraction Project Draft Environmental Impact Report (EIR). The reader is urged to read section 3.2 Hydrology and Water Quality in the EIR prior to reading this hydrologic monitoring and mitigation plan (HMMP).

This monitoring plan has been prepared in order to define monitoring of project activities to prevent potential off-site impacts of the proposed project on groundwater and surface water users in the Rose Valley. This plan also describes the methods to prevent a significant effect to ground and surface water users.

The first section of this plan includes the summary of hydrologic impacts and mitigation, as described in detail in the EIR. The second section of this plan describes the HMMP implementation methods.

This HMMP is designed to:

- Define methods for monitoring changes in groundwater levels throughout the Rose Valley;
- Compare observed changes to predicted changes and adjust model predictions as needed during the early operation of the project before any impact is predicted at Little Lake under the current model assumptions;
- Collect groundwater and surface water level data at Little Lake during the same early stages to develop time-trend water level data on Little Lake and to correlate the groundwater levels to Lake levels;
- Monitor later-stage groundwater and lake level changes as groundwater pumping continues;
- Recalibrate the numerical model developed for the project using data collected during the early stages to check and improve the model's ability to simulate stressed (pumping) conditions and to make predictions of future changes in groundwater levels and lake levels in response to pumping; and
- Facilitate the implementation of the mitigation measures defined in the EIR to avoid or reduce impacts to groundwater levels and lake levels before the impacts become significant.

Groundwater elevations and lake water levels are also influenced by natural factors beyond the effect of this project. These factors include rainfall in Rose Valley, snowfall in the Sierra Nevada Mountains, and seismic events that change the geomorphology of surface hydrological features or subsurface permeability. This monitoring and mitigation plan is not designed to mitigate naturally occurring changes in the hydrological system.

3.2 Summary of Hydrologic Issues

3.2.1 OVERVIEW

The Coso Operating Company, LLC (COC) is seeking a 30-year Conditional Use Permit (CUP No. 2007-003) from the Inyo County Planning Commission for the Coso Hay Ranch Water Extraction and Delivery System project.

The proposed project includes extracting groundwater from two existing wells on the Coso Hay Ranch, LLC property (Hay Ranch) in Rose Valley and delivering the water to the injection well distribution system at the Coso Geothermal Field in the northwest area of the China Lake Naval Air Weapons Station (CLNAWS). The proposed project is needed to provide supplemental injection water to the Coso Geothermal Field to minimize the annual decline in reservoir productivity due to evaporation of geothermal fluids from plant cooling towers. The project location is shown in Figure 3-1.

The Inyo County Planning Department (County) has prepared a Draft EIR pursuant to the California Environmental Quality Act (CEQA) to aid in the decision whether or not to issue the CUP. The Draft EIR assesses the potential impacts of the project on the environment.

Evaluation of the hydrological system within Rose Valley suggests that the project as proposed, which includes groundwater pumping at a rate of 4,839 acre-ft/yr for 30 years, may lower the water table elevation and groundwater flow rates in the valley (see Section 3.2 Hydrology and Water Quality of the EIR). If groundwater levels fall significantly in the southern end of the valley, the groundwater flow and surface water levels in the perennial but manipulated Little Lake may be affected, as well as several local wells. The magnitude of change in groundwater level and flow will vary depending on:

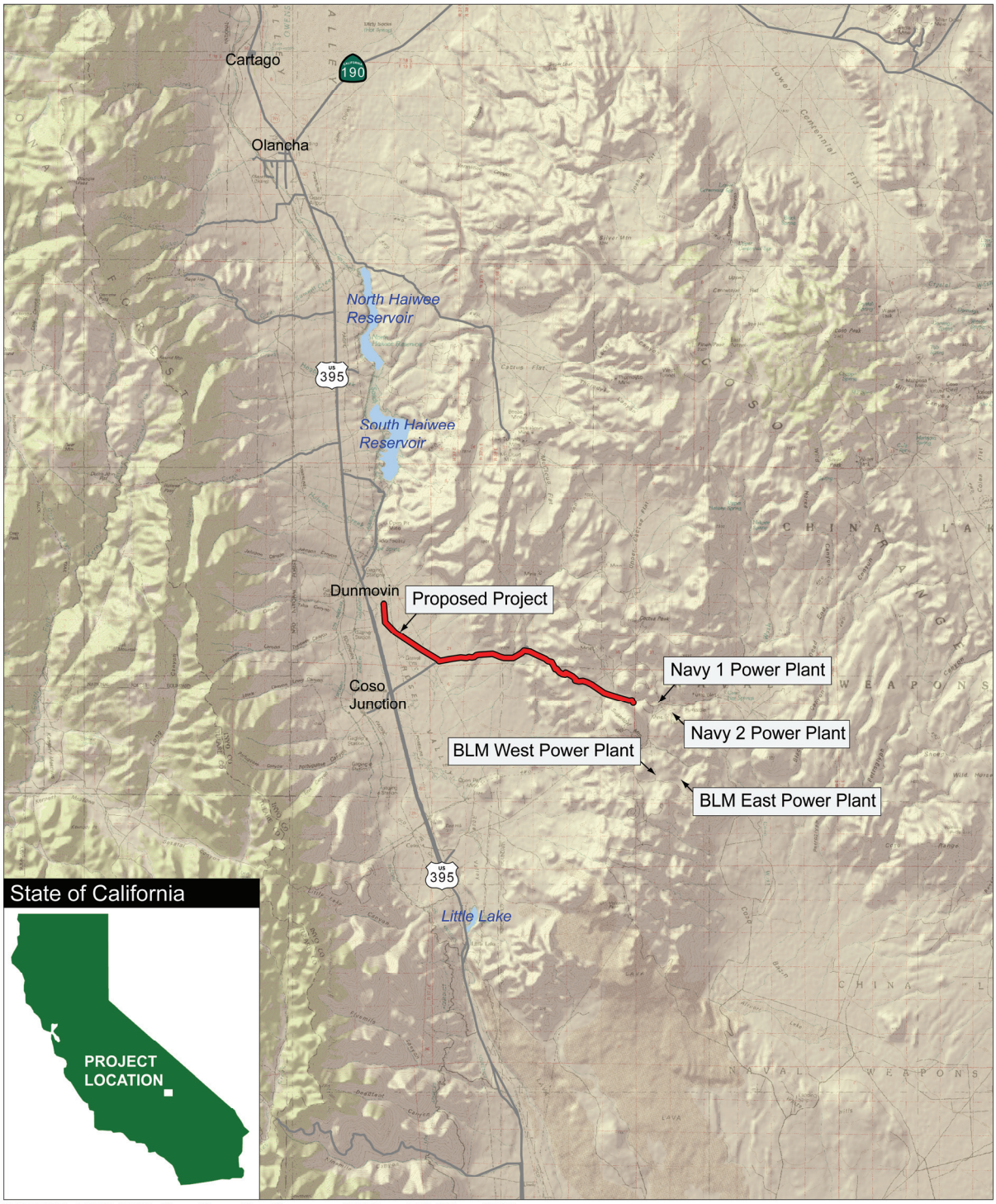
- Distance from the pumped well at Hay Ranch
- Magnitude and duration of pumping
- Manipulations at the Little Lake weir

Predictions of the effects of groundwater extraction associated with the project also depend on various assumptions of aquifer properties, boundary conditions, and aquifer recharge.

3.2.2 PUMPING TEST AND COMPUTER MODELING RESULTS

Many sources of information on local and regional hydrology and geohydrology were used to evaluate aquifer properties and identify groundwater conditions during preparation of the EIR. Consultants for the Coso Operating Company (COC) previously performed short term (24 hour) groundwater pumping tests and conducted computerized hydrologic modeling for the proposed project. These studies have been reviewed and used as appropriate to describe the environmental setting and to analyze the project impacts. During preparation of the project EIR, COC conducted a long-term (14 day) pumping test. Consultants to Inyo County subsequently used the data from the long-term pumping test to evaluate aquifer properties and to recalibrate and refine the computerized hydrologic model developed for COC. The 14-day groundwater pumping test was conducted in the Hay Ranch south well.

Figure 3-1: Project Location



Groundwater levels were monitored throughout Rose Valley for a 20-day period before, during, and after the pumping test. In addition, groundwater discharge from the Davis spring at Portuguese Bench was measured during the pumping test. The well pumping lowered groundwater levels up to 0.4 ft in wells at Coso Junction, approximately two miles south of the pumped well, but, not surprisingly given the limited duration of the pumping, it had no discernable effect on groundwater levels in wells on Navy property 5 to 7 miles south of the pumped well, or in a well located at the north end of the Little Lake Ranch property, 8 miles south of the pumped well. Minor changes observed in the groundwater discharge rate from the Davis spring at Portuguese Bench during the test did not appear to be correlated with the pumping test. The pumping test is described in Appendix C1 of the Draft EIR.

The groundwater drawdown data obtained during the pumping test from the Hay Ranch north well and other wells close to Hay Ranch, as well as hydrogeologic information from several sources, were used to recalibrate a computerized groundwater flow model previously developed to evaluate groundwater conditions in Rose Valley (Brown and Caldwell, 2006). The recalibrated groundwater flow model consists of four layers, including one unconfined (water table) layer, and three confined layers. The model was used to analyze potential long-term effects of the proposed groundwater pumping at Hay Ranch.

The results of the groundwater flow modeling indicated that the principal impact in Rose Valley from operation and maintenance of the Hay Ranch groundwater extraction project will be the propagation of groundwater table drawdown off the property as a result of removing groundwater on the Hay Ranch property and transporting it outside the Rose Valley groundwater basin (to the Coso geothermal field). Numerical groundwater flow modeling analysis was conducted to evaluate potential impacts of project operation on groundwater levels in the Rose Valley. The model setup, calibration, and prediction simulations are described in Appendix C2 of the EIR.

The groundwater flow modeling predicts that groundwater table drawdown will increase with time after pumping begins at Hay Ranch. The modeling predicted that less drawdown will be observed farther away from the pumped wells, as expected based on groundwater flow theory. After pumping is stopped, groundwater levels near Hay Ranch will soon begin to rise back to pre-project levels; however, depending on the magnitude and duration of pumping at Hay Ranch, groundwater levels at the south end of the valley may continue to decline in elevation even after pumping at Hay Ranch has stopped before they also begin to rise back to pre-project levels.

Proposed pumping at a rate of 4,839 acre-ft/yr for 30 years is predicted to cause a maximum groundwater table drawdown of:

- 25 to 55 ft in wells in the Dunmovin community and LADWP wells located 1.5 miles north of Hay Ranch
- 20 to 50 ft in wells at Coso Junction 2 miles south of Hay Ranch
- 7 to 20 ft near the Cinder Road Red Hill well 6.5 miles south of Hay Ranch
- 4 to 11 ft at the north end of Little Lake at the south end of the valley, 9 miles south of Hay Ranch

The range in predicted drawdown impacts listed above reflects uncertainty in assumed values for aquifer specific yield. Low specific yield values result in greater and earlier the drawdown, while higher specific yield values result in less drawdown with time and less drawdown farther from the pumped wells. Published values of specific yield (Johnson 1967, Morris and Johnson 1967) range from 2 % for clay to 35 % for well-graded gravels, in unconfined (water table) conditions. Groundwater-yielding sediments encountered in Rose Valley consist primarily of sand and gravel interbedded with clays; most of the groundwater would come from the more readily drainable sand and gravel horizons. Because specific yield could not be determined from the pumping test data, a

range of values corresponding to high, medium, and low values of 30, 20 and 10% were used in the project development impact analyses. The model results were particularly sensitive to the value used for specific yield, because that value is a measure of the change in water level in the aquifer per unit of groundwater that is pumped.

Groundwater modeling also indicates that the amount of drawdown is directly related to the amount of withdrawal. For example, assuming 20% specific yield and pumping for 30 years, predicted drawdown at the north end of the Little Lake ranges from approximately 1.2 ft at an extraction rate of 1,500 acre-ft/yr to approximately 3.2 ft at an extraction rate of 4,000 acre-ft/yr. The predicted change in drawdown is roughly linearly proportional to the project pumping rate; that is, pumping at 3,000 acre-ft/yr has roughly twice the impact of pumping at 1,500 acre-ft/yr.

Several springs located in upland portions of Rose Valley including the Davis Spring at Portuguese Bench, and the Tunawee Canyon Spring in Tunawee Canyon, and the Rose Spring near Haiwee Reservoir. They are sustained by mountain-front recharge in the Sierra Nevada Mountains or seepage from Haiwee Reservoir or Owens Valley. These springs are located at significantly higher elevations and are unlikely to be impacted by the project; therefore, they will not be monitored during project operation.

3.2.3 DEFINITION OF SIGNIFICANT IMPACTS TO LITTLE LAKE AND SURFACE WATERS

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.

Defining thresholds of significant effects to the environment by attempting to measure or predict those effects on vegetation around Little Lake Ranch was considered and rejected. The Little Lake area is highly manipulated. Little Lake is a reservoir, whose level is manually controlled. The vegetation surrounding the area south of Little Lake is manipulated by removal of undesirable species, planting of others, and by moving water to various areas where managers intend to promote vegetation. As a result, there is no natural background condition against which to measure effects. Additionally, by moving water around the property, vegetation may be encouraged in areas not currently highly vegetated and discouraged in areas now heavily vegetated if management objectives for the restoration project shift. Therefore, by necessity, it is most appropriate to emphasize measuring impacts to the amount of water that is available to the restoration project, rather than biological indicators.

3.2.4 MITIGATION MEASURES DEFINED IN THE EIR

Summary of Impacts and Mitigation

The existing groundwater model predicts that, with a specific yield value of 10%, the project as proposed (pumping at a rate of 4,839 ac-ft per year for 30 years) would have a significant impact on Little Lake (refer to Section 3.2 Hydrology and Water Quality in the EIR).

In order to prevent a significant impact to Little Lake and surrounding surface waters, water inflow to the lake must not decrease by more than 10% of the baseline flow. Data from Bauer (2002) indicates 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 represent a 10% decrease in gradient, and is estimated to correlate to a 10% reduction in discharge of groundwater to Little Lake.

A maximum of 10% reduction in groundwater inflow to Little Lake (this is currently benchmarked to a drawdown of 0.3 feet in the Little Lake North Dock well) would occur following pumping at Hay Ranch at proposed pumping rates for a period of approximately 1.2 years (see Figure 3-2). The model predicts that this maximum drawdown would occur as much as 30 years after the cessation of pumping at 1.2 years, due to the large distance (9 miles) from the pumping.

Mitigation, therefore, allows initiation of pumping for the project at the proposed project pumping rate, until drawdown trigger levels are reached at one or more monitoring locations throughout the valley (Table 3-1). Model predictions indicate that the trigger levels could be reached with pumping occurring in as little as 1.2 years; however, some conservative assumptions that are built into the model may extend this pumping period considerably longer, if actual decreases in the groundwater level occur more slowly than predicted. The trigger points have been established using the model to prevent a greater than 10% decrease in flows to Little Lake from ever occurring. Monitoring should occur monthly for at least two years, with results reported to the County within 2 weeks of data collection. After two years, if water levels are decreasing more slowly than predicted, the applicant can petition the County to reduce the measurement frequency to quarterly.

Data collection in the first few months to years would lead to a better understanding of the relationship between pumping at Hay Ranch and groundwater table drawdown throughout Rose Valley and at Little Lake. Data to be collected includes: water level data over time to establish background levels; response of water levels to pumping that will be used to evaluate specific yield and hydraulic conductivity; lake level data; groundwater level data adjacent to Little Lake; and other data needed to re-calibrate the groundwater flow model. These and other data that will be collected are specified in Subsection 3.3.3 and Table 3-1. Pumping may continue as long as the project does not result in a significant decrease in groundwater available at Little Lake at any point in time.

Within approximately 1 year of initiation of pumping, or less if trigger levels are reached sooner, the groundwater flow model should be recalibrated to the observed drawdown in groundwater levels, to allow for more accurate estimation of how long the pumping can continue without exceeding drawdown trigger levels and causing a significant reduction in water available to Little Lake, the springs, and wetlands. A qualified person approved by Inyo County Water Department, and provided by the applicant, would evaluate the results of the first year of data collection, would recalibrate the model, and working with the Inyo County Water Department and the applicant would estimate the duration of pumping that would keep impacts below the defined trigger levels. Recalibration of the model would also be necessary later, if pumping continues significantly longer than 1.2 years, as needed and appropriate to help understand the timing and magnitude of future drawdown of groundwater levels throughout the valley. A maximum limit of 10% groundwater inflow reduction to Little Lake has been selected, to avoid a significant effect on Little Lake. The computer groundwater flow model was used to define equivalent maximum acceptable drawdown levels, (maximum water level drawdown values) at various points up the valley that cannot be exceeded at any point in time. Water level drawdowns that were maintained below those maximum acceptable drawdown levels would, based on model results, avoid a depletion of groundwater inflow to Little Lake of more than 10%. The model was used to identify corresponding “trigger levels, water level drawdowns at earlier points in time, that would eventually lead (under continued pumping) to reaching the maximum acceptable drawdown levels, at each monitoring point. Requiring that observed drawdown values over time be kept below these defined trigger levels would provide an early warning system, allowing for the system operations to change, to reduce or stop pumping before maximum acceptable drawdown levels propagated down the valley to Little Lake.

Figure 3-2: Early Pumping Termination (1.2 years) Scenario Results

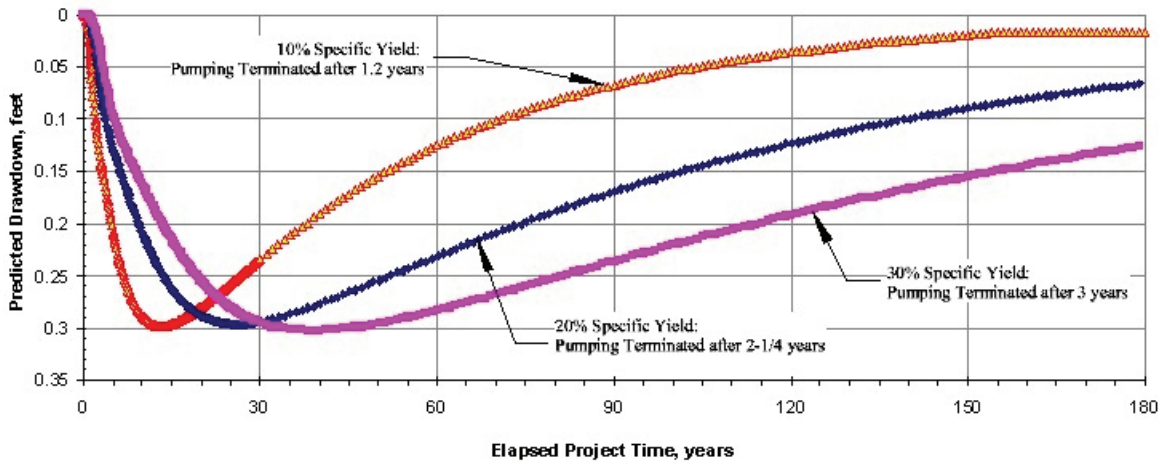


Table 3-1: Drawdown Trigger Levels (in feet)

Project Elapsed Time, years	Dunmovin Area well	Pumice Mine well	Hay Ranch Observation well	Coso Ranch North well	Coso Junction #1 well	Navy G-36 well	Navy Lego well	Cinder Road, Red Hill well	Navy 18-28 well	Little Lake Ranch North well
	Distance from Hay Ranch South Well (feet)									
	9,000	*6,100*	*1,300*	*9,700*	*10,900*	*26,000*	*27,300*	*32,000*	*38,000*	*42,600*
0.25	<0.2	0.5	3.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
0.5	0.3	1.3	4.7	0.4	0.3	<0.2	<0.2	<0.2	<0.2	<0.2
0.75	0.7	3.3	8.1	0.9	0.7	<0.2	<0.2	0.2	<0.2	<0.2
1	1.1	5.3	11.5	1.4	1.2	<0.2	<0.2	0.2	<0.2	<0.2
1.2	1.5	6.9	13.2	1.8	1.5	0.2	0.2	0.3	<0.2	<0.2
1.25	1.6	7.1	11.8	1.9	1.6	0.2	0.2	0.3	<0.2	<0.2
1.5	1.9	7	7.9	2.1	1.8	0.2	0.2	0.3	<0.2	<0.2
1.75	2.1	6.5	6.9	2.3	2	0.3	0.3	0.3	<0.2	<0.2
2	32.	6	6.2	2.4	2.1	0.3	0.3	0.4	<0.2	<0.2
3	2.7	4.8	4.8	2.5	2.2	0.5	0.4	0.4	<0.2	0.2
4	2.8	4.1	4	2.5	2.2	0.6	0.6	0.5	0.2	0.3
5	2.7	3.6	3.5	2.4	2.2	0.7	0.7	0.6	0.3	0.3
Maximum Acceptable Drawdown (in feet)	2.8	7.2	13	2.5	2.3	1.1	1.1	0.7	1	0.4
Time to Max drawdown (years since pumping began)	4	1.3	1.2	3	3.5	14.5	15	12	22	13

NOTES

1) For any wells where predicted drawdown is less than or equal to 0.25 feet, actions related to these trigger points shall not be enforced, unless the drawdown seen in these wells is greater than 0.25 feet. Drawdown values of <0.25 feet are difficult to accurately detect.

2) Based on current groundwater flow model results, these maximum drawdown values listed above result from pumping the Hay Ranch production wells at design rates for 1.2 years, with specific yield values of 10%. These maximum acceptable drawdowns can occur several years after pumping at Hay Ranch ceases.

3) With the exception of Hay Ranch, every monitoring point is subject to access approval from the appropriate owner. If approval is not forthcoming, alternative appropriate monitoring points will be established by the County, if necessary.

Exceedance of predicted groundwater drawdowns (**trigger levels**) at two or more locations in Rose Valley, or exceedance of a **maximum acceptable drawdown level** at any location, would be a cause for action as determined by the County, including re-calibration of the model and potential reductions or cessation of pumping. See Table 3-1 for trigger levels and maximum acceptable drawdown levels.

Mitigation Measures from EIR

The following mitigation measures have been defined in the EIR to reduce potentially significant impacts to water users in the Rose Valley. Note that references to Appendix 2 are included in the measures since these measures are taken directly from the EIR. This HMMP is Appendix 2 of the EIR and references are included in the sections of this document.

> **Hydrology-1:** The project applicant shall finalize and implement the Draft Hydrological Monitoring and Mitigation Program (HMMP) included in Appendix 2 [this appendix] of this EIR.
>
> **Hydrology-2:** Mitigation for effects to groundwater wells in Rose Valley shall depend upon the specific characteristics of each well, and the use of the well. The applicant shall use monitoring data and the numerical groundwater flow model described in Appendix C2 to track groundwater levels throughout the valley. The applicant shall work with the County Water Department to identify wells that may be affected by groundwater drawdown as the project progresses. The evaluation of wells depths and uses in the Rose Valley as compared with groundwater drawdown shall be made semi-annually and reported to the Inyo County Water Department. The owner of any wells that may potentially be impacted within the six months after an evaluation shall be contacted by the applicant to assess the need for additional pumping equipment on the well or deepening of the well. The applicant shall be responsible for the cost of equipping or deepening wells that are impacted by groundwater drawdown as a result of the proposed project. The applicant would also bear the costs of any additional energy costs required to pump the wells. The applicant shall also evaluate any wells that are brought to the attention of the applicant by the user to evaluate if groundwater drawdown from the proposed project is impacting the well. If it is determined by the County or by the applicant (using well monitoring data and modeling) that the well in question is being impacted by the proposed project, the applicant shall fund the necessary adjustments to the well to secure the previous uses of the well. Disputes as to the cause of well water drawdown or appropriate corrective measures shall be resolved by the County.
>
> **Hydrology-3:** Monitoring shall occur at a frequency that is sufficient to detect important changes and trends in water levels. Monitoring shall occur monthly, at a minimum, at all monitoring points, following project start-up. The data shall be collected and analyzed by a qualified person approved by Inyo County Water Department and provided by the applicant. Monitoring reports shall be prepared by the applicant and submitted to Inyo County Water Department within 20 days of data collection. After two years, monitoring shall occur quarterly. Reports shall also be provided to a designated recipient at Little Lake Ranch, Inc. A complete list of monitoring locations, parameters, and schedules is presented in Appendix 2 [this appendix], Tables 2-1 and 2-2. Hydrologic monitoring locations are shown on Figure 2-2, in Appendix 2 [this appendix]. Two new monitoring well clusters, each with three wells with screened intervals at three different depths, located approximately 700 feet south of the Hay Ranch North Wells, and 700 feet south of the South Well, respectively, shall be installed by the project applicant, and as approved by the Inyo County Water Department. An additional new water table monitoring well shall be installed by the applicant and as approved by Inyo County Water Department, approximately midway between Coso Junction and the Cinder Road Red Hill well, to provide additional monitoring capability in this area.
>
> 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 Water Department, and provided by the applicant. After a period of one year of pumping, observed groundwater level changes shall be compared with predicted groundwater-level

changes in order to assess the accuracy of the model-predicted drawdown. If the observed water level changes at two or more of the selected monitoring points differ from predicted values (trigger levels) at those locations by at least 0.25 feet at any point in time, or a maximum acceptable drawdown is reached at a designated monitoring point, or as judged appropriate by Inyo County Water Department, the model shall be recalibrated and the predicted impacts to groundwater levels re-forecast with the recalibrated model. If the model results change with recalibration, the mitigation strategy shall be updated in response to new forecasts of potential impacts to groundwater, potentially including reducing the duration or rate of pumping, or other mitigation measures as described in the HMMP. Additional recalibration is expected to be needed after one year, as monitoring continues and water level changes are detected farther down Rose Valley. Additional recalibration of the model shall be conducted as appropriate following the criteria outlined above (i.e. if the predicted water level in two or more wells differs from observed water level drawdown by at least 0.25 feet or more, or one or more maximum acceptable drawdown levels in wells all across the valley are exceeded).

Because surface water bodies at the Little Lake Ranch property are likely sensitive to changes in groundwater elevation and groundwater flow rate, the monitoring plan also identifies trigger levels that indicate when a significant impact (defined as a substantial reduction in water to Little Lake) will likely occur unless mitigation measures are implemented to reduce the pumping rate and/or duration of pumping. The plan includes the implementation of mitigation measures (namely, Hydrology-2 and Hydrology-4) to reduce any potentially significant impacts to less than significant levels.

Hydrology-4: 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.

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. At no time shall projected results of pumping result in a greater than 10% decrease in groundwater inflow to Little Lake (estimated to be equivalent to a 0.3-foot drawdown in groundwater head at the northern end of Little Lake) unless new data collected in the vicinity of Little Lake indicates that a larger decrease of head would not result in a greater than 10% decrease in groundwater inflow to Little Lake or substantially deplete the water availability to the springs and wetlands.

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. A revised plan for pumping rate and/or duration of pumping shall be submitted with full documentation to the Inyo County Water Department by the end of the first year of pumping. Pumping can continue as long as trigger levels in designated monitoring points that prevent a significant impact are not exceeded, and other signs of substantial impact on surface water bodies (Little Lake, springs, and wetlands) are not observed, as determined by a qualified person approved by Inyo County Water Department provided by the applicant.

An alternative option to minimize impacts to Little Lake could include pumping for one or more years at full scale and model recalibration as prescribed above; however, then reducing pumping to a lesser degree and/or allowing pumping for a longer period of time

along with implementing a groundwater diversion plan at Little Lake. The diversion system would include additional pumping from an existing well at the Little Lake Ranch property, if feasible, or construction of a new well. Water would be piped from the well location along existing unpaved roads to the lake where it would be discharged. Water would be withdrawn at the minimum rate necessary to sustain water availability to Little Lake and the lower pond areas. The pumping amount and duration for a water diversion at Little Lake would be determined by a qualified person approved by the Inyo Count Water Department, and provided by the applicant, based on the recalibrated model. The diversion plan is further described in Appendix 2 [this appendix]. Diversion would only be effective and implementable to minimize effects to less than significant levels if it were:

- Feasible given the availability of water at Little Lake and would not result in impacts to existing springs (e.g. Coso Spring)
- Agreed upon with Little Lake Ranch and the applicant
- Funded by the applicant
- Required for a reasonable timeframe (i.e., 20 years) that ensured accountability and funding by the applicant to mitigate all effects

If any of the above criteria are not met, then pumping would be scaled back or terminated based on model recalibration as previously described. If determined feasible, the applicant shall use biological and archaeological monitors during all ground disturbance activities associated with the construction of the augmentation plan components. The applicant shall also be responsible for obtaining any required permits for the diversion plan at the time that it is designed and implemented.

3.2.5 GOALS AND OBJECTIVES OF THIS HMMP

A number of goals and objectives provide the framework for the HMMP, and form the basis for any future decisions regarding the HMMP needed to reflect an evolving understanding of the hydrologic and biologic systems in the Rose Valley and at Little Lake. The HMMP is designed to:

- Establish an understanding of baseline conditions in the hydrologic systems at Little Lake.
- Identify a system for predicting and mitigating for groundwater drawdown in existing wells in the Rose Valley.
- Identify potentially significant impacts to the hydrology at Little Lake as early as possible, by establishing “early-warning” trigger points, based on observed drawdowns in selected monitoring points and other hydrologic parameters. Early-warning trigger points would indicate potential impacts to wetlands and surface waters well in advance of actual, significant impacts.
- Redefine pumping rates and duration of pumping for the long-term project during the period of no effects to Little Lake through recalibration of the groundwater model based on data collected during the early phases of project development.

3.3 HMMP Implementation

3.3.1 HMMP IMPLEMENTATION RESPONSIBILITIES AND SCHEDULE

The monitoring and mitigation described in this HMMP will be performed by COC. COC will report results to the Inyo County Water Department on a monthly basis, and within 20 days of data collection. In addition, COC will submit quarterly and annual reports to the Inyo County Water Department summarizing the changes observed during the year and cumulative changes of the entire monitoring period, including conclusions and recommendations evaluating those changes relative to natural conditions such as rainfall and snowfall, assessing the significance of any

changes compared to threshold levels if any, documenting any additional hydrologic modeling or adjustments to model-predicted impacts, and documenting any mitigation measures taken with respect to private wells or changes in Hay Ranch extraction rates. The applicant may request that Inyo County Water Department allow changes in monitoring frequency by presenting hydrologic data to support a reduction in monitoring frequency that would not compromise the ability to monitor the response of the aquifer to pumping. Data will also be provided to a designated contact at Little Lake Ranch, LLC.

3.3.2 INYO COUNTY CODE CHAPTER 18.77 PROTECTIONS

It should also be noted that COC is subject to all regulations as stated in the Inyo County Code, Chapter 18.77.045 and 18.77.055, which allows for the CUP to be challenged at any time if conditions of the permit are not being implemented or pumping is proven to be "causing unreasonable effect on the overall economy or environment of Inyo County." The permit could be modified or revoked as a result. Conditions of the code also help to minimize the potential for potentially significant impacts associate with the project. The final decision on any modifications to the CUP shall be in compliance with the Inyo County Code.

The Planning Commission may *revoke* the CUP if it finds that the water transfer can not be conducted without having an unreasonable effect on the economy or environment of Inyo County, regardless of the implementation of this HMMP.

3.3.3 MONITORING PHASES

Four distinct monitoring phases will be implemented:

Phase 1: Monitoring System Setup and Supplemental Data Collection

Phase 2: Startup Monitoring and Reporting

Phase 3: Model Recalibration and Redefinition of Pumping Rates and Durations; and,

Phase 4: Ongoing Monitoring, Mitigation, and Reporting

Monitoring system setup consists of several tasks that will be completed concurrent with construction of the project, including the following:

- Installation of two new monitoring well clusters on the Hay Ranch property;
- Installation of one new monitoring well between Coso Ranch and the Cinder Road Red Hill well; and
- Surveying proposed monitoring locations and elevations to establish the baseline conditions.

Startup monitoring comprises monitoring undertaken during the first 1.25 years of operation of the project. Model recalibration would occur within the first year and would be used to determine future pumping rates and duration to minimize impacts to Little Lake. Ongoing monitoring comprises monitoring conducted throughout the life of the project.

Phase 1: Monitoring System Setup and Supplemental Data Collection

Monitoring system setup comprises various tasks designed to:

- Establish monitoring facilities and benchmarks to establish prevailing conditions prior to generating impacts and to establish the monthly baseline levels from which to compare the trigger level drawdown values in Table 2-1;
- Prepare supplemental engineering plans to specify a point of contact and mitigation measures to mitigate impacts to private wells (which may include deepening wells, changing pumping equipment, or compensating well owners for increased electricity costs for pumping);

- Collect supplemental data to address data gaps identified during preparation of the EIR, necessary for recalibration of the groundwater model; and
- Conduct supplemental engineering studies to evaluate the feasibility of extracting groundwater on the Little Lake Ranch property to augment water levels in the lake, and preparation of engineering plans to implement water diversion, if pursued at a later date.

Task 1.1: Monitoring System Setup

Monitoring system setup will include the tasks listed below. Existing wells that will be used for monitoring are shown on Figure 3-3. Proposed wells are described in the text, below.

a. Completing two new monitoring well clusters on the Hay Ranch property. The northernmost new well cluster location will be completed approximately 600 to 800 feet south of Hay Ranch North well, between the two existing wells. The second well cluster will be located approximately 600 to 800 feet south of Hay Ranch South well. Each well cluster will consist of: one shallow well screened across the water table, with the screen extending from approximately 10 feet above the current water table to approximately 100 feet below the current water table (i.e., approximately 190 feet to 290 feet bgs); an intermediate depth well screened from approximately 350 to 400 feet below ground surface (bgs); and a deep well screened from approximately 500 to 550 feet bgs.

b. The purpose of the well clusters will be to provide access points for measuring groundwater drawdown on the Hay Ranch property outside of the pumped wells, so that groundwater drawdown at various depths can be assessed and aquifer parameters such as specific yield, storativity, and hydraulic conductivity can be evaluated. Because of well losses, drawdown measurements in the pumped wells themselves do not provide reliable information regarding water table drawdown in the aquifer.

c. Installing one new monitoring well approximately midway between Coso Junction and the Cinder Road Red Hill well. The well should be installed to intersect the water table, with a screen located approximately 10 feet above and 50 feet below the current water table.

d. Establishing access agreements, if possible, to monitor the Red Hill well on Cinder Road, one or more wells in the Dunmovin community, and two or more wells on the west side of Haiwee Reservoir approximately 7 miles south of Olancha (tentatively identified as the McNalley, Toone, Dews, or Buckland wells).

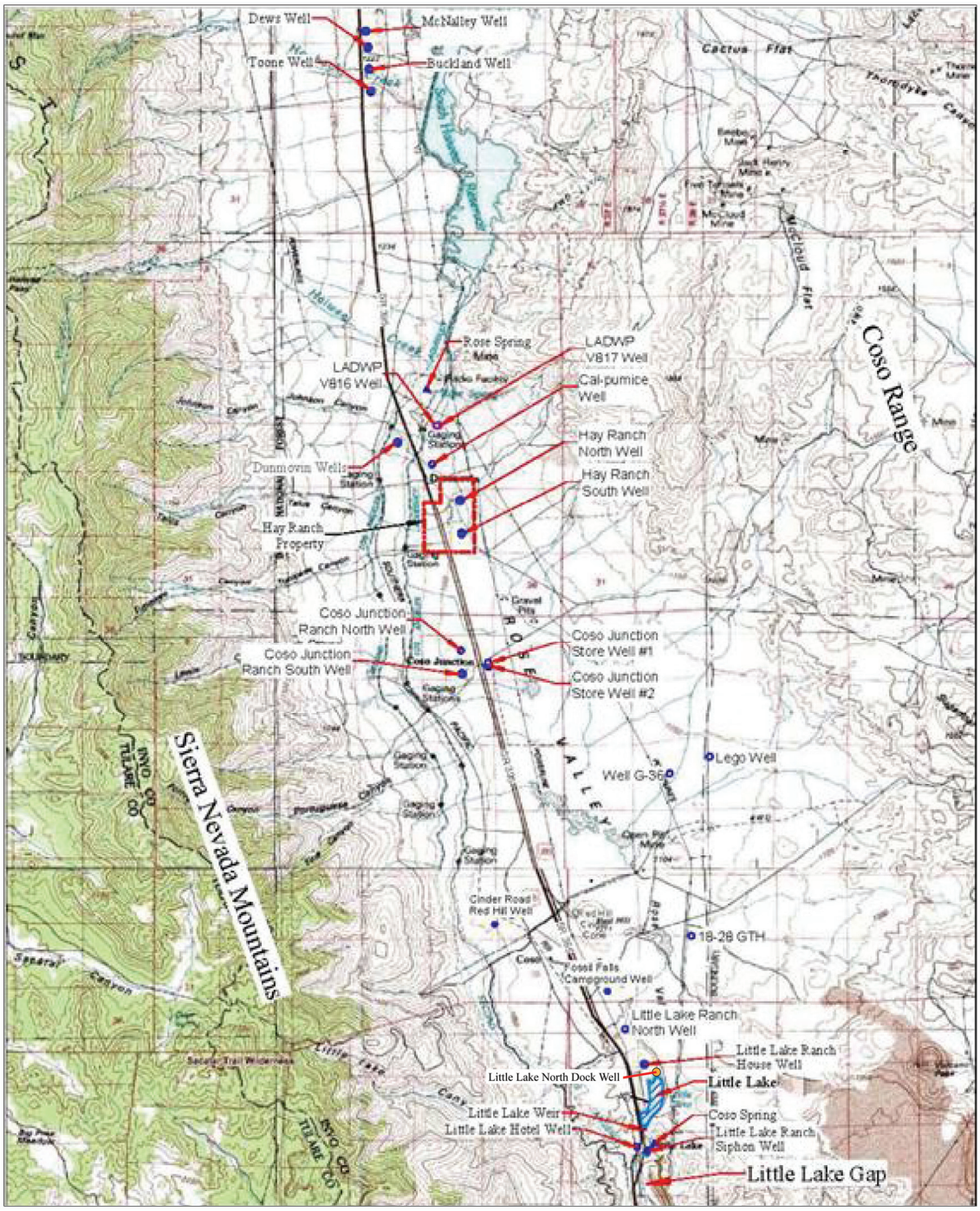
e. Installing pressure transducers and electronic data loggers in the six newly constructed Hay Ranch monitoring wells and the Little Lake North Dock well, to measure groundwater level, and in Little Lake to measure lake level. If the currently unused Little Lake Hotel well is found to be pressurized (artesian) then a pressure gauge should be installed on the well head; otherwise a reference point for manual water level measurements should be established.

f. Installing and calibrating flow measurement weirs at the discharge from Little Lake and at the North Culvert location previously used by Bauer (2002) to measure combined discharge from Little Lake, Coso Spring, the Little Lake siphon well, and the two perennial ponds (P-1 and P-2) on the Little Lake Ranch property.

g. Surveying the locations and casing elevations of wells added to the monitoring network at Hay Ranch, Dunmovin, Enchanted Lake Village, Red Hill, Fossil Falls, Little Lake Hotel, and Little Lake North Dock wells and any other designated monitoring points in Rose Valley where elevations are uncertain. Also, to be surveyed are the locations and elevations of surface water features on the Little Lake Ranch property including a reference point for Little Lake water level; base and adjustment points for Little Lake weir; Coso Spring; the siphon well head and discharge point; ponds P-1 and P-2; and, the North Culvert weir.

h. Evaluating existing well pump depths at Dunmovin, Coso Junction and Red Hill wells. The owners will be contacted to assess current pump depth and performance.

Figure 3-3: Existing Wells that will be used in Hydrologic Monitoring



SOURCE: Geologica 2008

LEGEND

- Spring or Siphon Well
- Pumping Well
- Out-of-Use Well
- Observation Well

Approximate Scale in miles

0 1 2

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i. Preparation of required and optional supplemental engineering plans primarily consists of two tasks:

- (Required) Establishment of a private well mitigation plan that would include a single point of contact for each well for resolving issues with respect to possible project impacts on existing private wells in the valley; identifying suitable qualified contractors to address issues such as pump deepening or replacement, or well deepening; putting a process in place to pay for such work.
- (Optional) Preparation of a groundwater diversion plan for Little Lake capable of providing water to augment water levels in the lake. As discussed in Section 2.1.4, this plan would only be prepared and implemented if Little Lake Ranch agreed to this diversion, adequate groundwater was documented to be available on the Little Lake property, the diversion could be conducted for a reasonable time frame (i.e. no more than 20 years), and the applicant agreed to fund the diversion. This would include an evaluation of existing wells at the Little Lake Ranch property to assess their potential yield, location relative to the lake, pump, piping and electrical needs, and lift requirements. The plan would then include tentative specifications for well construction, if needed, pump, piping, electrical work, controls, and flow meters as well as an assessment of permitting requirements and likely lead times for construction and permitting.

j. Establish background groundwater levels. Establishing a pre-pumping statistical background water level for each designated monitoring point is essential, in order to distinguish between natural seasonal variability versus drawdown caused by pumping associated with the project. Establishing a background for each monitoring point will require pre-pumping measurements to be conducted for a sufficient period of time to encompass normal seasonal variations in water level.

   A minimum of 12 months of water level data will be required to establish the background water level at each monitoring point. For monitoring points with more extensive long-term monitoring data, e.g., the Hay Ranch wells, all groundwater measurements collected to date will be used to evaluate background conditions.

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.

l. A minimum of 6 months of water level data will be required to establish the background water level at each monitoring point, and it is recommended but not required that 12 months of data be collected. For monitoring points with more extensive long-term monitoring data, e.g., the Hay Ranch wells, all groundwater measurements collected to date will be used to evaluate background conditions.

   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.

Task 1.2: Supplemental Data Collection and Evaluation

Supplemental data evaluations comprise the following tasks:

a. Evaluate groundwater levels beneath Little Lake, by installing temporary mini-piezometers to a depth of approximately 3 feet or more beneath Little Lake, at a minimum of four locations (for mini-piezometer and potentiomanometer details, see Wantry, R. and T.C. Winter, 2000). A Simple Device for Measuring Differences in Hydraulic Head Between Surface Water and Shallow Ground Water. U.S. Geological Survey Fact Sheet FS-077-00. June 2000). Measure the water levels relative to lake level, to evaluate the magnitude of the hydraulic gradient into or out of the lake, at four or more locations situated around the lake to obtain a representative evaluation of the hydraulic gradient between Little Lake and the underlying groundwater, prior to startup of the wells at Hay Ranch. Conduct measurements at the same locations for a period of six months prior to startup of the pumping system, to establish the background condition beneath the lake.

b. Depth to bottom and location measured using a hand held GPS unit at approximately 20 locations across Little Lake will be used to develop a preliminary bathymetric survey map.

c. Groundwater samples will be collected at each of the selected monitoring locations in Rose Valley to establish background (pre-pumping) conditions prior to the onset of pumping. The relationship between specific conductivity measured with a hand-held field instrument and total dissolved solids measured in the laboratory (preferably using EPA method 160.1) will also be assessed, for on-going electrical conductivity field measurements to be taken on a quarterly basis (four times/year) at a minimum.

d. Compilation of data on rainfall in Rose Valley (see Coso Hot Spring Monitoring Program 2005-2006, Geologica, 2007) and snow fall in the Sierra Nevada Range for the last 20 years to establish mean values for each and historical trends prior to project startup. These data will be used to assess future changes or trends in the relative level of potential recharge for each monitoring year.

Phase 2: Startup Monitoring and Reporting

Monitoring

The objective of start-up monitoring is to document the response of the aquifer to pumping. Data collected during the start-up monitoring phase will be used to improve estimates of aquifer specific yield, storage coefficients, hydraulic conductivity, and groundwater recharge rates as well as to better understand hydrologic conditions at Little Lake. These monitoring data will be used to validate and/or revise the computerized hydrologic model-predicted impacts long before thresholds of significance are reached. Start-up monitoring will continue for up to two years and includes the locations and parameters identified in Table 3-1 and as defined in Table 3-2, below.

Remedial Actions

The following actions are to be taken based on conditions observed during the first year of project operation:

- If drawdown trigger levels predicted **for any point in time** are exceeded in any of the selected monitoring wells, COC shall verbally report the exceedence to the Inyo County Water Department within 48 hrs, followed by a written report within 7 days.
- If drawdown trigger levels predicted **for any point in time** are exceeded in two or more of the selected monitoring points by at least at least 0.25 feet, COC shall verbally report to the

Water Department within 48 hrs, followed by a written report within 7 days, followed by a re-calibration of the model and recommendation of cessation of pumping or predictions of the duration of pumping that can be sustained without causing a significant reduction in water available to Little Lake, (defined as no greater than 10% reduction in groundwater inflow); if appropriate, the Applicant may petition the County for permission to continue pumping for a

Table 3-2: Hydrologic Monitoring Parameter Summary Rose Valley Hydrologic Monitoring and Mitigation Program

Monitored Location (1)	Parameters Monitored	Monitoring Frequency	Threshold Requiring Action	Action if Threshold Exceeded
Groundwater Level, Extraction				
Hay Ranch North and Hay Ranch South wells	Total Groundwater Extracted	Daily	Pumpage not to exceed 4,839 acre-ft per year (13.25 acre-ft per day)	Reduce or discontinue pumping.
Six New Hay Ranch Observation wells (2 nests of 3 wells)	Groundwater Elevation	Measured hourly at a minimum using dedicated pressure transducer with data downloaded and plotted weekly for the first 3 months, then monthly. Supplement with manual measurements weekly for the first three months, then monthly. Hourly collection of data may be reduced to once every 4 hours, if appropriate and approved by Inyo County, as demonstrated by the analysis.	Deviation of observed drawdown in two or more wells is at least 0.25 feet more than predicted trigger level value at any time beyond 4 months.	Alert County. County evaluates whether reduced pumping is appropriate prior to model recalibration. If appropriate, recalibrate model within one month and reassess impact to Little Lake.
			Groundwater level decline in two or more wells exceeding updated model predicted drawdown trigger levels by more than 0.25 feet in any quarterly data collection and monitoring period Maximum acceptable drawdown level from Table C4-1 exceeded	Alert County. County to determine if decreased pumping is necessary immediately. Increase monitoring frequency to weekly for one month to confirm observation. Include results as part of quarterly data submittal. Recalibrate model within one month. Pumping ceases until the model is recalibrated and will re-start only if it can be shown that pumping can continue at a rate that will maintain water levels at Little Lake Ranch.

Table 3-2 (*Continued)*: Hydrologic Monitoring Parameter Summary Rose Valley Hydrologic Monitoring and Mitigation Program

Monitored Location (1)	Parameters Monitored	Monitoring Frequency	Threshold Requiring Action	Action if Threshold Exceeded
Pumice Mine well	Groundwater Elevation	Monthly for first two years, then quarterly	Deviation of observed drawdown at least 0.25 feet from predicted trigger level value at any time beyond the first quarter in two or more wells	Alert County. Recalibrate model within one month. Reassess potential impact to Little Lake. County to evaluate whether reduction in pumping is warranted.
LADWP V816			Groundwater level decline exceeding updated model predicted drawdown trigger levels by more than 0.25 feet in any well in any quarterly data collection and monitoring period	Alert County. Increase monitoring frequency to weekly for one month to confirm observations. Include results as part of quarterly data submittal. Recalibrate model within one month. County to evaluate whether and when a reduction in pumping is warranted.
Dunmovin well				
Coso Junction #1, Coso Ranch North Well				
Lego well				
Well G-36				
Well 18-28				
Fossil Falls Campground well. New well to be located between Coso Jnc and Cinder Road Red Hill well				
Cinder Road, Red Hill well				
			Maximum acceptable drawdown level from Table C4-1 exceeded	Pumping ceases until the model is recalibrated and will re-start only if it can be shown that pumping can continue at a rate that will maintain water levels at Little Lake Ranch.
Little Lake Ranch North well	Groundwater Elevation	Monthly for first two years, then quarterly	Deviation of observed drawdown at least 0.25 feet more than predicted value at any time beyond the first quarter	Revise trigger level based on Little Lake hydrology study Reduce or cease pumping at Hay Ranch at the direction of the County. Augment flow to Little Lake in accordance with EIR Section 3.2.3 (Hydrology-3) and implement the Augmentation Plan to maintain

Table 3-2 (*Continued*): Hydrologic Monitoring Parameter Summary Rose Valley Hydrologic Monitoring and Mitigation Program

Monitored Location (1)	Parameters Monitored	Monitoring Frequency	Threshold Requiring Action	Action if Threshold Exceeded
				groundwater level above trigger level
			Groundwater level decline exceeding updated model predicted drawdown by more than 50% in the well in any quarterly data collection and monitoring period	Alert County. Increase monitoring frequency to weekly for one month to confirm observations. Include results as part of quarterly data submittal. Recalibrate model within one month. County to evaluate whether and when a reduction in pumping is warranted. .
			Maximum acceptable drawdown level from Table C4-1 exceeded	Pumping ceases until the model is recalibrated and will re-start only if it can be shown that pumping can continue at a rate that will maintain water levels at Little Lake Ranch.
At least two of McNalley, Toone, Dews, or Buckland wells located west of Haiwee Reservoir	Groundwater Elevation	Monthly for first two years, then quarterly	N/A. Information used to update model	N/A
Haiwee Reservoir	Stage level	Request average weekly values from LADWP	N/A. Information used to update model	N/A
LADWP Aqueduct	Flow rate			
Little Lake Hydrology				
Little Lake Hotel Well and Little Lake North Dock well	Groundwater Elevation (or closed well pressure)	Measured hourly using dedicated pressure transducer with data downloaded and plotted weekly for the first 2 months, then monthly. Hourly collection of data may be reduced to once every 4 hours, if appropriate and approved by Inyo County, as demonstrated by the analysis.	No threshold applied, Information used to update model and trigger levels.	N/A
Little Lake	Lake Water Level Elevation			
Little Lake Weir	Little Lake Weir Discharge and Weir Height(1)			
Little Lake North Culvert Weir	Little Lake System Discharge Rate			

Table 3-2 (*Continued)*: Hydrologic Monitoring Parameter Summary Rose Valley Hydrologic Monitoring and Mitigation Program

Monitored Location (1)	Parameters Monitored	Monitoring Frequency	Threshold Requiring Action	Action if Threshold Exceeded
Groundwater beneath Little Lake (minimum of four locations)	Groundwater elevation relative to lake	Monthly for 6 months after startup; then Quarterly		
Little Lake Ranch Pond P1	Occurrence of Siphon Well Discharge	Weekly by visual inspection; discontinue at end of baseline monitoring period		
Little Lake	Major operational changes	Request quarterly reporting of any major operational changes to lake level or groundwater pumping on property.	1 ft or more change in lake level or groundwater pumping on property in excess of 100 gpm daily average	None applicable. Data to be used for model updates, if needed, and for evaluating basin wide groundwater level responses in quarterly data submittal
Groundwater Quality				
Hay Ranch North and Hay Ranch South wells	Specific Conductivity/TDS	Quarterly	TDS increase to 2,000 mg/L or greater	Increase monitoring frequency to monthly for 3 months and monitor 18-28, G-36; evaluate basin wide response and determine whether reduction in pumping or supply of alternative water source is warranted
Coso Junction #2, Little Lake Ranch North well	Specific Conductivity/TDS	Quarterly	TDS increase to 1,500 mg/L or greater	Increase monitoring frequency to monthly for 3 months and monitor 18-28, G-36; evaluate basin wide response and determine whether reduction in pumping or supply of alternative water source is warranted
Well Yield				
Dunmovin wells, Coso Junction wells, Red Hill well, Fossil Falls Campground well	Well Yield	Quarterly	Decrease in yield of 25% or more from pre-startup levels	Mitigate well impacts per EIR Section 3.2.3 (Hydrology-2) and the Private Well Mitigation Plan
Precipitation Recharge				

Table 3-2 (*Continued*): Hydrologic Monitoring Parameter Summary Rose Valley Hydrologic Monitoring and Mitigation Program

Monitored Location (1)	Parameters Monitored	Monitoring Frequency	Threshold Requiring Action	Action if Threshold Exceeded
Little Lake Canyon Precipitation Gauge	Precipitation totals	Daily using continuous recorder	No threshold applicable. Use data to identify basin groundwater level response (west side vs. east side) and mountain vs. valley precipitation for future numerical model updates	Recalibrate model and reassess impact to Little Lake
Haiwee Reservoir Precipitation Gauge				

(1) With the exception of Hay Ranch, every monitoring point is subject to access approval from the appropriate owner. If approval is not forthcoming, alternative appropriate monitoring points will be established by Inyo County if necessary.

specified duration. The County will evaluate the report and data, and will make a determination as to whether continued operation is appropriate.

- If predicted **maximum acceptable drawdown trigger levels** are exceeded in any of the selected monitoring points located at least 9,000 feet from both Hay Ranch production wells, COC shall: verbally report to the Water Department within 48 hrs; followed by a written report within 4 days; followed by a suspension of pumping within 7 days pending re-calibration of the model; and recommend either cessation of pumping or make predictions of the duration of pumping that can be sustained without causing a significant reduction in water available to Little Lake, (defined as no greater than 10% reduction in groundwater inflow), to be conducted within 4 weeks of the observation of the exceedance. The County will evaluate the report and data, and will make a determination as to whether continued operation is appropriate.
- If measured drawdown values in all monitoring locations at all times within first year of project pumping, match predicted drawdown plots to within 25% or less but are generally below the predicted values, then COC must stop pumping at 1.2 years. However, they may recalibrate the model before cessation of pumping and use available data collected to date, to petition for a presumably small extension to pumping. The County will evaluate the report and data, and will make a determination as to whether continued operation is appropriate.
- If monitoring data collected during the first year show that a majority of monitoring points record drawdowns consistently lower than predicted, then Coso can recalibrate the Hydrology Model and make new predictions of the acceptable duration of pumping which will be summarized in a report provided to the County. Evaluation and correction of background levels for each well shall be conducted to account for natural variation and to separate effects of pumping from natural effects. The County will evaluate the report and data, and will make a determination as to whether continued operation is appropriate.

The proponent will prepare monthly reports within 20 days of data collection. The monthly reports will include the calculated drawdown amounts for each well monitored. Any well that exceeds its predicted drawdown from the baseline level for the specific month monitored, will be highlighted in the report.

Quarterly reports for submittal to the Inyo County Water Department during the startup monitoring period will also be required. The reports will include tabular summaries and electronic data packages for all monitoring data, and graphical presentations including at a minimum, the following:

- Quarterly groundwater elevation contour maps;
- Quarterly total dissolved solids (TDS) or electrical conductivity contour maps;
- Time versus water level measured in monitoring wells and Little Lake; and
- Time versus Hay Ranch pumping rate, Little Lake discharge, and flow measured at the North Culvert on the Little Lake Ranch property.

The quarterly reports will also discuss any issues such as unexpected drawdown, reduced yield or flow identified with private wells or springs in the valley, or Little Lake. Any measures taken or proposed to mitigate these issues shall be discussed. At the end of the first and succeeding years of operation, if any, the proponent will prepare an annual monitoring report summarizing the findings of the quarterly monitoring reports and evaluating the following:

a. Annual groundwater extraction from Hay Ranch wells;
b. Calculated groundwater table drawdown as measured in designated wells that are monitored in the valley;
c. Evidence for impact to spring discharge and/or surface water flows at Little Lake;
d. Evidence for adverse impacts to water quality based on measured specific conductivity or TDS in springs and well waters;
e. Trends in precipitation data to establish relative “wetness” of the first year of the project based on annual Rose Valley rainfall and Sierra snow fall that might impact recharge, groundwater levels, or spring flow in the valley;
f. Seismic events, major storms, or other unusual events as applicable;
g. Comparison of groundwater levels in wells monitored near Haiwee Reservoir to water levels in wells at the north end of Rose Valley to reevaluate the fixed northern groundwater flow boundary in the numerical model;
h. Reevaluation of the specific yield, storage coefficients, hydraulic conductivity, and groundwater recharge rates of the aquifer and comparison to values used in the numerical model.
i. Evaluation of the observed relationship between Little Lake water elevation and groundwater elevation (or pressure) in Little Lake North and/or Little Lake Hotel wells; and
j. The results of the re-calibration of the model during the first year, and any subsequent re-calibrations, shall be discussed in the annual report.

Phase 3: Model Recalibration and Redefinition of Pumping Rates and Duration

Model Recalibration

Based on the data collected in Phase 2, the numerical groundwater flow model will be recalibrated by a qualified person approved by Inyo County Water Department and provided by the applicant after six to 12 months of data have been collected. The model recalibration effort will include consideration of the following:

- Estimation of aquifer specific yield, storage coefficients, recharge through model boundaries, and any needed changes to the hydraulic conductivity distribution within the model grid to more accurately simulate the actual aquifer response to prolonged pumping at Hay Ranch.

- Evaluation of hydrologic data obtained from baseline studies and monitoring at Little Lake Ranch to reassess the trigger levels for groundwater impacts on Little Lake. Evaluation of the magnitude of the hydraulic gradient from the underlying groundwater into Little Lake.
- Evaluation of correlation between seasonal groundwater level changes at the south end of Owens Valley and groundwater elevation changes in Rose Valley and any other factors deemed significant to reassess the magnitude of groundwater underflow from Owens Valley and/or seepage from Haiwee Reservoir.
- Assessment of precipitation monitoring data to identify basin groundwater level response (west side vs. east side) and mountain vs. valley precipitation.
- Reassessment of geothermal water upwelling rate, which is currently neglected in the model, based on the observed response of wells (G-36 and 18-28) completed on Navy property.

The timeframe for recalibrating the numerical model should be accelerated if observed levels of well drawdown exceed model-predicted drawdown in two or more monitoring points by greater than 0.25 feet over predicted drawdown values, within the first six to eight months of pumping; otherwise recalibration should be conducted between eight and 12 months of project operation. The recalibrated model shall be used to reassess projected impacts to groundwater inflow to Little Lake based on the maximum acceptable drawdown trigger level at Little Lake.

The maximum acceptable drawdown trigger level at Little Lake, set at 10% reduction in groundwater inflow to the lake, is estimated to be equivalent to a drawdown of 0.3 feet in the groundwater at the northern end of Little Lake; this may be revised based on new measurements of pre-pumping groundwater levels near the lake, and on new lake level data. ***Any revisions to trigger levels must be set such that Little Lake surface waters will never experience a greater than 10% reduction in inflow as a result of the proposed project.***

The recalibrated model will be used to evaluate whether, based on a more accurate simulation of hydraulic conditions in the Rose Valley, project pumping can continue to 1.2 years or longer. 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.

Redefinition of Pumping Rates and Duration

Pumping rates and duration will be redefined by a qualified person approved by Inyo County Water Department provided by the applicant prior to the 1 year project benchmark. Pumping will not be allowed to proceed beyond the initial year operation period until revised pumping rates and duration are approved by the Water Department.

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 levels has passed at Little Lake.

Modeling conducted for the EIR indicated the groundwater table at Little Lake could continue to decline as a result of pumping the Hay Ranch wells for up to 30 years after termination of pumping before beginning to rise back to pre-project levels. Consequently, the analysis of revised pumping rates and duration should consider when the maximum groundwater table drawdown will occur, and how much drawdown will occur, to ensure that Little Lake never experiences a greater than 10% decrease in groundwater flow as a result of the proposed project.

Phase 4: Ongoing Monitoring, Reporting, and Mitigation Implementation

Groundwater and surface water monitoring will continue to be conducted during the subsequent years of groundwater production from Hay Ranch, according to Tables 2-1 and 2-2, above.

Groundwater Monitoring and Mitigation Implementation

Groundwater monitoring includes the monitoring of groundwater pumping rates at Hay Ranch, water elevations in designated non-pumped wells through out the valley, specific conductivity and/or TDS, and water levels and pumping rates in pumped wells within the valley as listed in Table 2-1. Groundwater elevations will be compared to the model-predicted levels annually. The need for recalibrating the numerical groundwater flow model should be reviewed for every year of Hay Ranch well pumping (or more frequently if trigger levels are exceeded, as noted previously) to ensure the accuracy of predictions of future water level drawdown.

Groundwater levels in private pumped wells will be monitored using depth to groundwater measurements from designated monitoring points located throughout the valley. When the static groundwater elevation appears to be within 20 feet of the bottom of the well or the well yield is observed to be reduced and further investigation indicates that the water level has dropped too low for an effective pump depth, the well will be remediated by COC by setting the pump deeper, and potentially deepening the well. Some wells may require more powerful pumps to compensate for lower water levels. Mitigation of impacts to private wells will be implemented as described in the Private Well Mitigation Plan, established during the 2 year setup phase (previously described).

Groundwater elevations in Little Lake Ranch well, Little Lake Hotel well, and the North Dock well, and Little Lake water levels and Little Lake discharge rates will be monitored to ensure that trigger levels are not reached for the duration of the project, as determined in Phase 3 Model Recalibration and Redefinition of Pumping Rates and Duration. Mitigation in terms of reduced pumping rates or duration of pumping and/or implementation of a groundwater diversion plan would be implemented as described in Phase 3.

Surface Water Monitoring and Mitigation

Although surface water monitoring will include the Coso Spring and Little Lake, threshold levels triggering mitigation will be focused on Little Lake. The lake water elevation, lake discharge and specific conductivity, spring discharge and specific conductivity, and occurrence of siphon well discharge will be monitored.

If agreed upon by the County, COC, and Little Lake Ranch and determined to be feasible as defined in mitigation measure Hydrology-3, a Little Lake water diversion plan will be developed during project start-up and implemented based on trigger levels throughout the valley. The water diversion plan will include additional pumping from one or more of the existing wells at the Little Lake Ranch property, if feasible, or construction of a new well. Water will be piped from the well location to the lake where it shall be discharged. Water will be withdrawn at the minimum rate necessary to maintain lake water levels and surface water flows for maintenance of existing plant communities on the property or at the level indicated with updated modeling results.

The applicant will use biological and archaeological monitors during all ground disturbance activities associated with the construction of the augmentation plan components. The applicant will also be responsible for obtaining any required permits for the augmentation plan at the time that it is designed and implemented. The applicant will also be responsible for financing the augmentation plan for the duration that it is determined needed.

Ongoing Reporting

During the Ongoing Monitoring Phase, COC will continue to prepare monthly and quarterly reports.

An annual report will also be prepared for submittal to the Inyo County Water Department. If the Inyo County Water Department approves groundwater extraction at Hay Ranch beyond the initial year, the proponent may petition Inyo County to reduce the reporting frequency for interim reports (i.e. monthly reports). The annual reports will include tabular and graphical summaries of all monitoring data as discussed under Phase 1: Startup Monitoring. The monitoring reports will also discuss any issues identified with respect to potential impacts to private wells in the valley, such as reduced yield or other problems, and will discuss any measures taken to mitigate these issues. On an annual basis, the proponent will prepare an annual monitoring report summarizing the findings of the quarterly monitoring reports and evaluating the following:

- Annual groundwater extraction from Hay Ranch wells;
- Calculated groundwater table drawdown in wells in the valley and comparison to groundwater drawdown trigger levels;
- Evidence for impact to spring discharge and/or surface water flows at Little Lake;
- Evidence for adverse impacts to water quality based on measured specific conductivity or TDS in springs and well waters;
- Trends in precipitation data that might impact recharge, groundwater levels, or spring flow in the valley; and
- Seismic events, major storms, or other unusual events as applicable.

Based on these analyses, the annual reports will discuss the need for mitigating impacts to Little Lake, if any, and discuss any recommended changes to the monitoring plan including monitoring frequency, parameters, or locations.