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MEMORANDUM

To: **Gary Arnold, Arnold, Bleuel, LaRochelle, Mathews & Zirbel, LLP**
Walt Pachucki, TEAM Engineering & Management, Inc.

From: **Andrew Zdon, P.G., C.E.G., C.Hg., Golden State Environmental, Inc.**

Date: **January 14, 2009**

Re: Comments Concerning Coso Operating Company Hay Ranch Water Extraction and Delivery System, Meeting Comments

In response to the discussions at the Inyo County Water Commission meeting on January 12, 2009, Golden State Environmental, Inc. (GSE) wanted to provide some clarifications regarding our views of the Rose Valley model. As discussed there is great uncertainty associated with the predictive capabilities of the Rose Valley model. Some of the uncertainty is inherent in groundwater models due to uncertainty, and perhaps reasonable disagreements, in setting parameter estimates, such as recharge, hydraulic conductivity, transmissivity, specific yield, aquifer depth and storativity.

These uncertainties are then compounded by the additional uncertainties due to the flawed nature of the model which have been described in my previous letters. The critical flaws in the model include:

- Non-use of long-term groundwater level data for calibration;
- Lack of consideration of changing precipitation conditions over time for transient calibration and predictive simulations.
- Sensitivity analyses for recharge were only run for the non-pumping scenarios therefore the effect of full project pumping during dry year recharge conditions is not evaluated.
- Post-calibration alteration of specific yield prior to conducting predictive simulations.
- Unrealistic recharge distribution (recharge to Layer 1 from runoff is absent; all recharge is in deeper layers from mountain-block).
- The predictive model simulations were run with vastly different conditions than the calibration simulations which according to Cal-EPA guidance may make the simulations invalid.

Other uncertainty is tied with the amount of groundwater recharge from the north. Should the Los Angeles Department of Water & Power recover seepage losses (estimated at 900 afy) from Haiwee Reservoir, a 15 to 20% reduction to the inflow portion of the groundwater budget would be realized. Full project pumping by Coso (4,840 afy) as proposed would then exceed the remaining basin inflow (appx. 3,940 afy) creating an overdraft condition.

With respect to the proposed Hay Ranch project, the importance of the uncertainty is directly tied to the scale of the project. Since the proposed pumping would be nearly equal to estimated recharge from precipitation, major impacts would be expected and the uncertainty

of the model becomes a particularly severe issue. As the proposed pumping rate is lowered towards zero, the importance of the uncertainty also is lowered. If the no project alternative (zero pumping) is approved, the uncertainty in the model becomes is academic. All of these issues point to the need to limit pumping to a small fraction of the estimated recharge for a much shorter pre-determined period of time, if the project is approved at all.

With respect to the limited pumping rate, it is important to remember that all of the model runs assume normal precipitation. This is a valid assumption for a model/basin in steady state. However, once project pumping initiates, the basin conditions will change and become transient (changing with time). In that case, transient conditions such as seasonal changes in precipitation/recharge will be very important. The model was not tested for how it responds to dry and wet years when there is project pumping (recharge sensitivity was only tested for non-pumping conditions). Recharge would certainly not be expected to be sensitive for the steady state runs but that would be very unlikely when project pumping is taking place. Witness the need for a drought recovery policy in the Owens Valley.

Any limited pumping should be based on an assumed dry-year condition (for example an estimated 65% year). Taking 65% of the assumed 3,940 afy that would be left if Haiwee seepage is recovered would leave approximately 2,360 afy. Any initial project pumping should be limited to less than half that amount to account for uncertainty in the recharge estimate. 750 afy for two years would allow 465 gallons per minute to be pumped 24 hours per day, 365 days per year for the period and would provide ample stress to the aquifer system to evaluate model predictive capability and potential impacts.