CALIFORNIA ENERGY COMMISSION
1516 NINTH STREET
SACRAMENTO, CA 95814-5512
www.energy.ca.gov

April 2, 2008

DOCKET
07-AFC-3

DATE APR 0 2 2008

RECD. APR 0 3 2008

Mr. Arden Wallum, General Manager
Mission Springs Water District
66575 Second Street
Desert Hot Springs, CA 92240

Dear Mr. Wallum:

The CPV Sentinel Energy Project (CPV Sentinel) proposes to use up to 1,100 acre-feet of groundwater per year for a power plant proposed in the Mission Creek sub-basin. This groundwater would be extracted from wells installed in the Mission Creek sub-basin. During a public workshop held by the California Energy Commission staff on January 24, 2008, it was mentioned by the Mission Springs Water District (MSWD) that a groundwater model was developed by Psomas for the Mission Creek sub-basin, and that the results of this model differed from the results yielded by a model developed by URS Corporation for the CPV Sentinel power project. It is our understanding that the Psomas model was developed over the last two years and has been calibrated using historical groundwater well data.

Based on this information, we need to develop an understanding of the differences between the groundwater models and modeling results. The attached data requests are designed to provide us with this understanding. Please provide your responses by April 14, 2008, if possible. We will conduct a Data Response Workshop in Desert Hot Springs on April 17, 2008, at which time it would be appropriate to discuss your response to staff's Data Requests. Thank you for your assistance. If you need more time, please contact me at (916) 654-4206.

Sincerely,

Bill Pfanner

Bill Pfanner, Project Manager
Energy Facilities Siting Division

Enclosures

PROOF OF SERVICE (REVISED 10/15/07) FILED WITH
ORIGINAL MAILED FROM SACRAMENTO ON 4/3/08
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BACKGROUND

The Mission Springs Water District (MSWD) contracted with a consulting firm, Psomas, to develop a groundwater model of the Mission Creek Groundwater Sub-basin. It is our understanding that this model took nearly two years to develop and has been calibrated using groundwater well data. The CPV Sentinel project applicant also contracted with a consulting firm, URS Corporation (URS), to develop a screening level groundwater model of the Mission Creek Groundwater Sub-basin. URS evaluated the project assuming there is no other recharge or extraction occurring in the model domain and it does not appear it was calibrated using groundwater level data.

We understand MSWD has evaluated the project using the Psomas model and finds there is a significant difference in the results from the URS model. In a letter to Bill Pfanner, California Energy Commission Project Manager, dated March 10, 2008, URS discusses analysis of the Psomas model and finds it can not be used for their analysis of the project (a copy of the letter is included with this Data Request). URS bases their analysis of the model on review of the documentation and identifies nine significant technical deficiencies.

We need to better understand the technical basis of the Psomas model and what additional information may be provided to address the technical deficiencies identified by URS. An analysis of differences between URS and Psomas model results and why there are differences is also needed.

The URS model evaluates three different project pumping scenarios using two different transmissivity values for each scenario. The first transmissivity value used was the United States Geological Survey 1974 Tyley[1] value of 50,000 gallons per day per foot (gpd/ft). The second transmissivity value used was 25,000 gpd/ft, one-half the Tyley value as a method to conservatively represent subsurface variations in geologic materials and structures. The scenario assumptions used in the URS model are presented below.

- Scenario 1
  - Pump 1,100 acre feet per year (AFY) of groundwater.
  - Recharge 1,100 AFY is applied immediately under the replenishment program with a one year lag between spreading the water for percolation and water reaching the water table.
  - Pumping occurs for 30 years.
- Scenario 2
  - Pump 1,100 AFY of groundwater.
  - Recharge 5,500 AFY is applied every 5 years (year 6, 11, 16, 21, 26, and 31) under the replenishment program with a one year lag between spreading the water for percolation and water reaching the water table.

[1] Tyley, S.J. 1974. Analog Model Study of the Ground-Water Basin of the Upper Coachella Valley, California. U.S. Geological Survey Water Supply Paper 2027.

- No recharge occurs between the 5 year periods.
- Pumping occurs for 31 years.

- Scenario 3
  - Pump 2,059 gallons per minute for 4 months of pumping. This is equal to 1,100 AFY of pumping over four months.
  - There is no recharge.
  - Pumping occurs for 1 year.

Each scenario assumes the following:

- There is 1,000 feet of saturated thickness as assumed in the Tyley 1974 model.
- The subsurface is homogenous as assumed by Tyley in 1974.
- Specific yield is 0.08 in the western region of the basin and 0.18 in the central region of the basin also as assumed by Tyley in 1974.
- Pumping occurs with either 3 or 5 wells and groundwater is extracted from each well equally.
- There are no other wells pumping groundwater or injecting water into the subsurface.
- The Mission Creek and Banning Faults represent northern and southern boundary conditions with no-flow across the faults. The eastern and western boundaries are general head boundaries that allow flow into and out of the sub-basin.

DATA REQUEST

1. Please briefly explain the purpose of the Psomas model and how it can be used to characterize the CPV Sentinel project groundwater pumping.
2. Please describe how the groundwater sub-basin is characterized in the Psomas model.
3. Please identify whether there are any parameters in the Psomas model that describe local or unique basin conditions.
4. Please explain if and how the Psomas model accounts for heterogeneity in the subsurface. Heterogeneity in the subsurface can include differing geologic units, differing water bearing zones, variations in soils, variations in aquifer thickness, and faulting or other boundary conditions.
5. Please identify the value or values used for transmissivity and basis for the values used in the Psomas model.
6. Please explain what parameters the Psomas model is most sensitive to and magnitude or ranges of effects.
7. Please provide comparisons of the Psomas model with the URS model results using the same scenarios.
8. Please provide a detailed comparison of the modeling techniques, assumptions, and input parameters between the URS and Psomas models and explain why the model outputs differ.

9. Please provide additional information that can be used to evaluate the URS analysis of the Psomas model and address the nine significant technical deficiencies identified.
10. Please provide the Psomas model results that MSWD believes are or may be characteristic of extractions due to project operation.
11. Please provide copies of technical reports or documentation outlining the development and purpose of the Psomas model, how it is used by MSWD, and how the model reflects the groundwater basin characteristics.

URS

Memorandum

DOCKET
07-AFC-3
DATE MAR 10 2008
RECD. MAR 11 2008

Date: March 10, 2008

To: Bill Pfanner - CEC

From: Dale Shileikis – URS San Francisco

CC: Anne Connell – URS San Francisco
George Muehleck, PG – URS Oakland
Jim Zhang, PhD, PE – URS Oakland

Subject: ***CPV Sentinel – Groundwater Flow Models – URS Project Specific Model Compared to Mission Spring Water District Model prepared by PSOMAS***

This memo discusses the relevance of groundwater flow models that were developed as part of two different projects; the CPV Sentinel Energy Project (CPVS) groundwater flow model prepared by URS Corporation (URS) and the Mission Springs Water District (MSWD) model prepared by PSOMAS.

The URS model was described in the *Technical Memorandum, Model Documentation*, submitted to the CEC as Appendix R-1 of the CPVS Application for Certification in June 2007. Additional groundwater flow model scenarios were submitted to the CEC as Appendix B of the Reponses to Data Requests (35, 38, 43, 50, 60 and 62 through 65) on January 22, 2008. The PSOMAS Groundwater Flow Model of the Mission Springs Sub-basin is described in a report prepared by PSOMAS dated April 2007.

The need to understand one model compared to the other is unnecessary to evaluate the project-specific effects on water levels in the Mission Creek Sub-basin because, for the most part, the two models are not relevant to each other. That is, they were developed and conducted for different purposes. The objective of the URS modeling efforts has been to evaluate the <u>net</u> effect of project-specific pumping and recharge volume and timing variations of the relative groundwater levels in the subbasin. The purpose of the PSOMAS model as stated in PSOMAS 2007 was "to estimate what changes to groundwater elevations, if any, could be expected to occur within the Subbasin from increased groundwater pumping coupled with proposed groundwater recharge efforts". The overriding point is that the CPVS project-specific pumping and recharge effects would be the <u>relative net change</u> in the basin regardless of whatever other entities such as MSWD were doing in the basin in terms of groundwater pumping or recharge. Specifically, these <u>net effects</u> (the relative drawdown effects from project-specific pumping and mounding effects from project-specific recharge at the Desert Water Agency [DWA] recharge basins) are independent of those effects induced by others.

URS hydrogeologic evaluations for the CPVS project began with a thorough review of available geologic and hydrogeologic reports in the area, including any groundwater modeling efforts that were completed or underway. When groundwater modeling was recommended to evaluate project-specific pumping and recharge effects, URS sought the use of the existing PSOMAS model, as it would do in any basin type modeling effort where others had expended considerable effort in doing the background work in setting up a groundwater model. Hopefully, this would save considerable time, effort, expense, and would avoid duplication of effort. Typically what is done in these cases is to adopt an existing model (meaning all the model files), evaluate those files and cooperatively interface with that model's staff in order to understand model set-up, parameters, and simulations, so that it can be effectively used for the specific project in question. An initial part of that interaction includes evaluating if the existing model is adequate for our purposes and, if not, what adjustments can be made to refine the model to achieve project-specific objectives. During the course of this project CPV approached MSWD about obtaining the PSOMAS groundwater model as well as data on wells, pumping schedules, water quality, etc., for use in its hydrogeologic evaluations. In response to these requests MSWD did not provide the PSOMAS groundwater model; however, they did eventually provide the PSOMAS model report (PSOMAS 2007).

Upon review of the PSOMAS Groundwater Model report, URS' opinion is that it would not have been usable for the CPVS project due to numerous apparent technical deficiencies. URS notes that it does not have the model or any model input/output files so the comments/conclusions from the review are based solely on the PSOMAS modeling report. As stated above, the PSOMAS model was developed to estimate the future groundwater elevation changes from the increased groundwater pumping and the proposed groundwater recharge efforts for Mission Creek Groundwater Subbasin. It was constructed using MODFLOW, a groundwater-modeling program developed by the U.S. Geological Survey (USGS). It is a transient flow model with one-single layer, using two hydraulic property zones to represent the heterogeneity of the aquifer. The model was calibrated with historical groundwater elevation data and predictive simulations were run for 30 years from 2006 to 2035. URS believes that the model was improperly setup and calibrated resulting in model predictions that are not reliable. The apparent deficiencies are summarized in Table 1. URS identified nine significant deficiencies, ranking them on a scale of 1 to 5, the most severe being 5 (with 5 of 9 deficiency items being 5 on that scale). Deficiency areas include: 1) Model Domain, 2) Grid Size, 3) Boundary Conditions, 4) Hydraulic Properties Setup, 5) Recharge, 6) Model Calibration,7) Calibration Results: General, 8) Calibration Results: Specific, and 9) Simulations and Results.

Table 1 – Summary of Apparent Deficiencies - PSOMAS April 2007 Groundwater Flow Model Report

cc: File

Table 1

Summary of Apparent Deficiencies
PSOMAS April 2007 Groundwater Flow Model Report

No	Items	Description	Section, page, or Figure	Severity (scale 1-5)
1	**Model Domain**	It would be better if the western edge of the model extended to the San Bernardino Mountains (different geology). The current model edge is too close to DWA Recharge Basin so the boundary effect is not minimized.	Sec. 2.2, p. 2-6	3
2	**Grid Size**	For this modeling purpose, the uniform grid size of 500 x 500 ft used is too coarse, especially in locations where the hydraulic gradients are subject to sharp changes (i.e., associated with drawdown from pumping wells and mounding from recharge basins). Variable grid sizes should be used, allowing much smaller grid sizes at well and recharge basin areas to better simulate and depict water level changes and water level contours.	Sec. 2.2, p. 2-6	3
3	**Boundary Conditions**	The eastern edge of the model (and a small portion of western model edge) was not specified with boundary conditions. As such, these become no-flow boundaries, which are not real. General head boundary conditions with low conductance values would have been more appropriate in this case.	Sec. 2.2, p. 2-6	3
4	**Hydraulic Properties Setup**	The model specified one or two zones of hydraulic properties, which is far from reality. The Mission Creek Subbasin Aquifer System is highly heterogeneous, and the transmissivity (i.e., hydraulic conductivity x aquifer thickness) changes by orders of magnitudes from space to space (Tyley, 1974). Much more detailed hydraulic properties zones are needed and should have been applied to the model.	Sec. 2.4, p. 2-12 to 2-13	5
5	**Recharge**	Recharge at the Horton Waste Water Treatment Ponds (WWTP) was not included in the flow simulations. This would affect the model calibration. Also note that historical recharge volumes at the Mission Ck Recharge Basin (p. 4-8) are incorrect. Reported as 91 af (2003); 5,564 af (2005) and 18,778 (2006). But should be 5,564 (2004), 24,723 (2005) and 19,900 (2006).	Figure 2-7, P.5-6 and p. 4-8	2.5 to 5
6	**Model Calibration**	1. GW elevations at 7 pumping wells and 20 observation wells used as calibration targets. Per Item 2 (above), resolution is compounded or compromised by the 500 x 500 foot grid size, specifically for the 7 pumping wells. As such, the 7 pumping wells should not have been used as calibration targets. 2. The solution to the governing finite-difference flow equation is not unique. You cannot calibrate a model by varying the hydraulic input parameters (to the point they are unrealistic with respect to the hydrogeologic system) solely in order to match the observation point water levels (i.e., calibration points). The conceptual model and model set-up has to be correct and remain realistic throughout the various calibrations.	Sec. 3, p. 3-1	5
7	**Calibration Results: General**	All four calibrations appear to be incorrect in terms of both transmissivity and storativity values to the point that they are unrealistic with respect to natural hydraulic conditions within the subbasin. In addition, all four calibrations are quite different from each other in terms of the hydraulic values used. If the model is correct the hydraulic input values should be fairly close to each other for the different calibration cases.	Sec. 3, p. 3-4	5
8	**Calibration Results - Specific**	Even with the "two zone-anisotropic" alternative cited ("the so-called best calibration"), the calibration problem is more severe: a) Ky is ~20 times higher than Kx in west zone, b) Storativity in the east and west zones are quite different (2 orders of magnitude difference); and c) Storativity in West zone becomes so too small (0.0029 corresponding to specific storage of 0.00002), it acts as in confined system which is not the case as far as the historic literature indicates.	Sec. 3, p. 3-4	5
9	**Simulations and Results**	1) The simulated boundary inflow should not decrease sharply in 2005-2006, even with recharge at the DWA basins. This is because the main inflow is from west boundary, and recharge at DWA basins causes higher GW elevations, but not enough to affect the inflow from the western boundary. 2) Modeled drawdown near the interface of the two zones are low, to near zero in places (Fig 5-2), which does not make sense. 3) All simulation results show very high gradients at the south-west corner (Figure 5-3 through 5-10), which does not make any sense at all; 4) GW elevations in north of Mission Spring Fault are not correct (is it outside the model domain?); and 5) Simulation results in the western zone are not shown but the report does not indicate why.	Figure 5-2 through 5-10	5

Note: Scale of severity is from 1 to 5, and 5 is the most severe

Ref: PSOMAS, 2007. Groundwater Flow Model of the Mission Creek Subbasin, Desert Hot Springs, California. April.

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA

APPLICATION FOR CERTIFICATION FOR THE *CPV SENTINEL ENERGY PROJECT*
Power Plant Licensing Case

Docket No. 07-AFC-3
PROOF OF SERVICE
(Revised 10/15/07)

INSTRUCTIONS: All parties shall 1) send an original signed document plus 12 copies OR 2) mail one original signed copy AND e-mail the document to the web address below, AND 3) all parties shall also send a printed OR electronic copy of the documents that shall include a proof of service declaration to each of the individuals on the proof of service:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 07-AFC-3
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DECLARATION OF SERVICE

I, Christina Flores, declare that on April 3, 2008, I deposited copies of the attached CPV Sentinel Energy Project (07-AFC-3) CEC Letter to Mission Springs Water District in the United States mail at Sacramento, CA with first-class postage thereon fully prepaid and addressed to those identified on the Proof of Service list above.

OR

Transmission via electronic mail was consistent with the requirements of California Code of Regulations, title 20, sections 1209, 1209.5, and 1210. All electronic copies were sent to all those identified on the Proof of Service list above.

I declare under penalty of perjury that the foregoing is true and correct.

Christina Flores

Christina Flores