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Arnold Schwarzenegger
Governor

December 10, 2010

James R. Hunt, Ph.D.
Professor of Civil and Environmental Engineering
University of California, Berkeley
625 Davis Hall, MC 1710
Berkeley, CA 94720-1710

Dear Dr Hunt:

SUBJECT: RESPONSES TO SCIENTIFIC PEER REVIEW COMMENTS FOR A STAFF REPORT IN SUPPORT OF A BASIN PLAN AMENDMENT TO CONDITIONALLY PROHIBIT WASTEWATER DISCHARGES FROM SEPTIC TANK SUB-SURFACE DISPOSAL SYSTEMS IN THE TOWN OF YUCCA VALLEY, SAN BERNARDINO COUNTY, CALIFORNIA

Thank you for reviewing and commenting on the subject staff report. This letter provides responses to your comments provided by letter dated October 31, 2010. Your comments are summarized below in the order presented in your letter. Our response to each comment is provided in **bold type**.

COMMENT: "1. USGS report of 2003. This study is a detailed analysis of exiting [*sic*] groundwater elevation data as well as nitrate levels in well waters within the Warren Subbasin. It is clear from this study that nitrate is coming from septic tank discharges."

RESPONSE: **Agreed. The USGS study clearly indicates nitrate levels in groundwater samples from the Warren Subbasin result from septic tank discharges.**

COMMENT: "2. USGS modeling....Flow and transport models require a representation of the subsurface geometry that is only poorly known from well logs and local geologic information, including the presence of faults that can act as barriers to groundwater migration. These uncertainties in the subsurface lead to extensive model calibration to identify appropriate parameter values related to subsurface transport properties and nitrate release rates. Once the model is calibrated then sensitivity studies are undertaken to identify what parameters are critical, and in this case the USGS report provided a detailed analysis of model uncertainty."

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RESPONSE: Agreed. The subject USGS report adequately addresses the uncertainty of their model.

COMMENT: "3. USGS data adequacy. There is generally never enough data, but professional judgment is required to utilize the available historical data and recently collected data to move forward with more informed decisions. The historical data was adequate and new data collected from existing wells in the basin was a reasonable approach to undertake groundwater flow and solute transport modeling."

RESPONSE: Agreed. Combining historical data with recent data is reasonable for modeling groundwater flow and transport.

COMMENT: "4. Septic tank discharges and groundwater recharge. The multiple models evaluated in the USGS report ranging from mixing models to numerical groundwater and solute transport models support the conceptual model that the increase in nitrate in well water came from a rise in the water table caused by the importation of water into the basin. There is an alternative explanation that was not discussed in the USGS report. Prior to artificial recharge into the basin, the overdrafting of the groundwater basin provided a very thick vadose zone where septic tank nitrogen compounds probably encountered partially oxidizing conditions. Under those conditions ammonia and organic nitrogen can be oxidized to nitrate. If that nitrate is then mixed with high organic content septic tank water, nitrate reduction to nitrogen gas is possible via denitrification. When the artificial recharge was initiated, this possible soil-aquifer treatment system could have been arrested by water flooding. Since denitrification can cause a shift in the isotopic composition of the remaining nitrate, and perhaps there is a detectable shift in the nitrate isotopic composition to support or dismiss this alternative explanation. Nitrogen isotope geochemistry under denitrification conditions is not something I had time to investigate within the time constraints of this review."

RESPONSE: As you indicate, the soil-aquifer treatment system may have been arrested by flooding of the vadose zone during artificial aquifer recharge. However this does not alter your conclusion later in your letter where you state:

"The installation of a sewer during Phase I implementation is justified by the annual rate of failure of septic systems within Yucca Valley. Septic systems for residential development at that density along with commercial establishments exceed waste accommodation rates and the soil's infiltration capacity." (Emphasis added)

Given the above, the situation you describe does not significantly affect the need for the subject Basin Plan Amendment in the Town of Yucca Valley. We will, however, provide your comment(s) to the authors of this USGS report for their consideration and possible investigation.

COMMENT: "5. Groundwater data from 2002 – 2010. Appendix D of the staff report with recent nitrate and groundwater elevation data demonstrate continued high levels of nitrate in the groundwater even though they do not exceed drinking water standards. Levels reported are in the range of 10 to 30 mg/L and that level might represent some steady state value of septic tank discharges and groundwater recharge, but such an analysis does not appear in the staff report and the USGS report does not consider that situation. In the USGS 2003 report, Figure 15 (page 42) shows nitrate concentrations increasing over time in the deepest groundwater sampling interval (YV2-570) over the period of artificial recharge with SWP water. Additionally, groundwater from this deepest sample with the highest nitrate concentrations has a mixing curve of Delta Oxygen-18 water and nitrate in Figure 18 (USGS page 55) that indicates there has been no dilution of that water with imported SWP water. These results suggest that septic tank discharges are possibly denser than ambient groundwater and artificially recharged SWP water causing the waste to sink to the lower levels of the aquifer. Appendix D in the staff report does not include nitrate concentrations in that well in the 2003 to 2010 period to evaluate if deeper groundwater could be a reservoir of nitrate contamination for the whole aquifer."

RESPONSE: Staff agrees that wastewater discharges may be denser than ambient groundwater or SWP water, and sink to the lower levels of the aquifer. This possibility, while interesting, does not affect the need for the subject Basin Plan Amendment for the Town of Yucca Valley. We will forward your comments to the USGS report authors for their consideration.

Bigger Picture:

COMMENT: "The USGS report and the staff report on the Yucca Valley water supply did not start off with an analysis of the aquifer storage, the town's water pumping, and septic tank discharges to quantify the waste load being added to the subsurface. While there is considerable consumptive use of Yucca Valley water reported for a golf course, there is no consideration of landscape irrigation by households and the corresponding nutrient loads associated with those practices. There should be an analysis of actual consumptive use with an overall water balance for the basin. Prior to the importation of SWP water the groundwater aquifer was being used as the sole source of drinking water and the sole recipient of wastewater. That circumstance resulted in the long term buildup of wastewater components in the groundwater basin and would not be viewed as sustainable either from a water supply or a waste management perspective."

RESPONSE: In addition to being the local water purveyor, the Hi-Desert Water District (HDWD) was designated the Water Master of this "adjudicated basin" in 1977 by court order due to severe overdraft of areal aquifers. In 1991, HDWD adopted the "Warren Valley Basin Management Plan" and began encouraging water conservation through programs such as "Cash for Grass", which advocates replacing lawns with desert landscape. The only golf course in the Town was closed in 2004; this combined with the prevalence of desert landscape has reduced nutrient loading from landscape irrigation to insignificant levels.

COMMENT: "The installation of a sewer during Phase I implementation is justified by the annual rate of failure of septic systems within Yucca Valley. Septic systems for residential development at that density along with commercial establishments exceed waste accommodation rates and the soil's infiltration capacity."

RESPONSE: Agreed.

COMMENT: "Separate from the documents presented for this review was a description of the Water Reclamation Facility being planned for Yucca Valley present on the Hi-Desert Water District website. The proposed plant will utilize secondary treatment with filtration to achieve 10 mg/L

BOD (organic matter), 10 mg/L suspended solids, and 8 mg/L total nitrogen. With extended aeration it is likely the wastewater effluent will be nitrified and all the nitrogen will be present as nitrate. Since this effluent will be infiltrated on site, the groundwater basin will again be subject to increased nutrient loading along with the accumulation of salts within the aquifer. While the sewer collection system and treatment plant will be an advance over a poorly functioning diffuse septic system, will the solution being proposed ultimately improve the nitrate loading to the groundwater basin?"

RESPONSE: Nitrate loading to the groundwater basin from proposed facilities will be assessed by our agency during issuance of Waste Discharge Requirements (WDRs). WDRs protect the quality and beneficial uses of state waters by ensuring sufficient treatment of wastewater before discharge.

Thank you for reviewing the scientific elements of the proposed Basin Plan Amendment to Prohibit Wastewater Discharges from Septic Tank Sub-Surface Disposal Systems in the Town of Yucca Valley, California. Your contribution to this process is greatly appreciated.

If you have further comments or questions, please contact Jon Rokke at (760) 776-8959.

Sincerely,



Joan Stormo
Senior Engineering Geologist, PG, CHG
Colorado River Basin
Regional Water Quality Control Board

JR/tab

File: Yucca Valley Septic Prohibition