TECHNICAL AREA: WATER RESOURCES

Data Adequacy Request 53: Please provide an estimation of aquifer drawdown based on a computer modeling study conducted by a professional geologist and include the estimated drawdown on neighboring wells within 0.5 mile of the proposed well(s), any effects on the migration of groundwater contaminants, and the likelihood of any changes in existing physical or chemical conditions of groundwater resources.

Response: URS professional geologists performed an analysis for an initial assessment of the area of pumping influence for a proposed well located within the project site. Since there are no known wells operating within 0.5 mile of the site and limited hydrogeological information for the basin, a Calculated Fixed Radius (CFR) method of analysis was performed in accordance with the California Drinking Water Source Assessment and Protection (DWSAP) and the USEPA handbook of Groundwater and Wellhead Protection (USEPA 1994). A Zone of Contribution (ZOC) was estimated for a well pumping at the annual average pumping rate needed to meet site operations (approximately 30 gpm) at various travel times (2-, 5-, 10- and 30-year timeframes), assuming a default value for effective porosity (n=0.2) and a production zone screen length based on a California default calculation. The equation for the CFR is as follows:

$$R_t = \sqrt{Qt / \pi \eta H}$$

Where:

R_t	=	radius of zone (feet) for time period *t*
Q	=	pumping capacity of the well (ft^3/yr)
t	=	travel time (years)
π	=	3.1416
η	=	effective porosity (unitless)
H	=	screened interval of the well (feet)

For purposes of this assessment, the R_t is used to define four ZOCs as follows:

Zone A = two year time of travel considered to be the microbial/direct chemical contamination zone.

Zone B5 = five-year time-of-travel considered to be the zone that provides more response time for chemical spills

Zone B10 = ten-year time-time-of travel that considers the long-term aspects of the groundwater source.
Zone B30 = thirty-year time-time-of travel that considers the potential total life expectancy of the project.

Input parameters for the ZOC calculations are as follows:

Variable	Units	Quantity	Description
Q	ft3/yr	2,108,021	The annual volume of water produced from one well assuming an average production rate of 30 gpm.
t	years	2, 5, 10, and 30	Corresponding time-of-travel for Zone A, Zone B5, Zone B10 and Zone B30
π	--	3.1416	Pi
η	--	0.2	A California default value used for effective porosity when site specific production well data is unavailable (DHS, 1999).
H	ft	10	The production zone screen length is based on a California default calculation that assumes 10% of the pumping capacity of the well in gpm, with a minimum of 10 feet (DHS, 1999). In this case a 30 gpm well capacity has an assumed production interval of 10 feet.

On the basis of these input parameters, the CFR for each ZOC is as follows:

ZOC	Radial Distance in Feet
Zone A	819
Zone B5	1,295
Zone B10	1,832
Zone B 30	3,173

Based on the results of this calculation, the zone of contribution ranges from a radial distance of approximately 800 feet after 2 years, to 3,200 feet (approximately 0.6 miles) after 30 years, which is the lifetime of the project. These results suggest that pumping groundwater to meet the project's water demand will not significantly effect water levels at distances greater than 0.5 mile of the proposed pumping well.

There are no known groundwater contaminants present within the basin based on results of a Phase I Environmental Site Assessment (ESA) conducted by URS. Therefore, it is not anticipated that pumping groundwater from onsite well(s) will result in migration of groundwater contaminants. Additionally no changes to existing physical or chemical conditions of groundwater resources is expected as a result of pumping groundwater to meet project water needs. Limited groundwater elevation data from west to east that shows considerable changes in elevation across faults suggests that the Lavic Groundwater Basin is hydrologically isolated from the neighboring basins. Therefore there is little potential to significantly impact water levels or water quality as a result of pumping groundwater to meet the project water supply needs.

References:

California Department of Health Services, 1999, Drinking Water Source Assessment and Protection (DWSAP) Program, January 1999 revised January 2000.

USEPA, 1994. "Handbook---Ground Water and Wellhead Protection". U.S. Environmental Protection Agency, Office of Research and Development, EPA/625/R-94/001.