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January 26, 2010

DOCKET
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Dale Rundquist
Project Compliance Coordinator
Siting, Transmission and Environmental Protection Division
California Energy Commission
1516 Ninth Street, MS-2000
Sacramento, CA 95814

Re: Panoche Energy Center (06-AFC-5C) Correspondence To and From the Central Valley Regional Water Quality Control Board Regarding Report of Waste Discharge

Dear Mr. Rundquist:

On behalf of Panoche Energy Center, LLC, please find enclosed the following correspondence related to the Panoche Energy Center.

- From Douglas Patteson, Senior Engineer, Central Valley Regional Water Quality Control Board (CVRWQCB), re *Complete Report of Waste Discharge* to Don Burkard, Panoche Energy Center, LLC, dated December 21, 2009; and,
- From Jason Moore, Project Geologist, URS Corporation, re *Additional Information for Report of Waste Discharge Unlined Wastewater Surface Impoundments* to Douglas Patteson, CVRWQCB, dated January 25, 2010.

Should you have any questions regarding these items, please do not hesitate to contact Melissa Foster at (916) 447-0700.

Very truly yours,

Kimberly J. Hellwig

Kimberly J. Hellwig
KJH:jmw
Enclosures

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COMPLETE REPORT OF WASTE DISCHARGE

DECEMBER 21, 2009

Linda S. Adams
Secretary for Environmental Protection

1685 E Street. Fresno. California 93706
(559) 445-5116 • Fax (559) 445-5910
http://www.waterboards.ca.gov/centralvalley

Arnold Schwarzenegger
Governor

21 December 2009

Don Burkard
Panoche Energy Center, LLC
43883 West Panoche Road
Firebaugh, CA 93622

COMPLETE REPORT OF WASTE DISCHARGE, PANOCHE ENERGY CENTER, FRESNO COUNTY

Panoche Energy Center submitted an Amended Report of Waste Discharge (RWD), prepared by URS Corporation and dated 18 November 2009. The RWD was in response to a Central Valley Water Board letter dated 21 October 2009, which stated Panoche's previous RWD was incomplete.

Central Valley Water Board staff has determined the 18 November 2009 RWD contains the technical information needed to draft Waste Discharge Requirements; therefore, the RWD is complete.

If you have any questions regarding this matter, please call Denise Soria at 559.444.2488 or via email at dsoria@waterboards.ca.gov.

Lonnie M. Wass
for DOUGLAS K. PATTESON
Senior Engineer
RCE No. 55985 RCE No. 38917

cc: Dale Rundquist, California Energy Commission, Sacramento
Cheryl Closson, California Energy Commission, Sacramento
Stuart St. Clair, URS Corporation, Fresno

ADDITIONAL INFORMATION FOR REPORT OF WASTE DISCHARGE

JANUARY 25, 2010

URS

January 25, 2010

Douglas K. Patteson, RCE
California Regional Water Quality Control Board
1685 "E" Street
Fresno, California 93706

Subject: Additional Information for Report of Waste Discharge Unlined Wastewater Surface Impoundments Panoche Energy Center Fresno County, California

Dear Mr. Patteson:

URS Corporation (URS) prepared this letter on behalf of Panoche Energy Center, LLC (PECL). PECL, as owner of the Panoche Energy Center (PEC), filed a Report of Waste Discharge (ROWD), dated September 21, 2009, with the Regional Water Quality Control Board, Central Valley Region (RWQCB) for the discharge of some or all of the facility's wastewater to two on-site, unlined wastewater surface impoundments (UWSI). This letter provides additional information regarding recharge of the upper, semi-confined aquifer underlying the PEC and historic groundwater quality within the aquifer.

The earliest groundwater data available for the upper aquifer are in a preliminary report by W.C. Mendenhall published in 1908.[1] The elevation of groundwater near the PEC appears to be about 180 feet above mean sea level (amsl) based on a groundwater levels map provided as Plate 1 in the report. Assuming a pre-development ground surface elevation of approximately 420 feet amsl, the depth to groundwater would have been approximately 240 feet below ground surface (bgs). Additional details are provided in a 1916 report by Mendenhall and others. The elevation of groundwater near the PEC remained about 180 feet above sea level (240 feet bgs) based on the groundwater levels map provided as Plate 1 in the report.[2] For both the 1908 and the 1916 report, the map data in the PEC area appear to be from wells screened above the Corcoran Clay to depths of no greater than 300 feet. In addition, November 1, 1910 field assay water quality data for a well owned by the Belmore Land and Water Company are provided in Table 50 of the report. This well was located in Township 15 south, Range 13 east, Section 5 (Mount Diablo Baseline and Meridian) near the present location of the PEC; data are summarized in Table 1 below. In both reports, Mendenhall

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1 Mendenhall, W.C., 1908. *Preliminary Report on the Ground Waters of San Joaquin Valley, California.* U.S. Geological Survey Water Supply Paper 222.
2 Mendenhall, W.C., Dole, R.B., and Stabler, H., 1916. *Ground Waters in San Joaquin Valley, California.* U.S. Geological Survey Water Supply Paper 398.

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indicated that San Joaquin Valley groundwater was recharged by rainfall and snowfall in the drainage basins tributary to the valley.

Table 1
Field Assay Groundwater Quality Data – November 1910
Belmore Land and Water Company Well

<table>
<tr><th>Parameter</th><th>Result</th><th>Unit</th><th>Comment</th></tr>
<tr><td>Depth of well</td><td>284</td><td>Feet</td><td>Assume depth bgs</td></tr>
<tr><td>Carbonate radicle (CO_2)</td><td>Trace</td><td rowspan="6">Parts per million (milligrams per liter)</td><td rowspan="5">Determined quantity</td></tr>
<tr><td>Bicarbonate radicle (HCO_3)</td><td>205</td></tr>
<tr><td>Sulphate radicle (SO_4)</td><td>1,810</td></tr>
<tr><td>Chlorine (Cl)</td><td>160</td></tr>
<tr><td>Total hardness as $CaCO_3$</td><td>1,130</td></tr>
<tr><td>Total solids</td><td>3,100</td><td>Computed quantity</td></tr>
<tr><td>Mineral content</td><td>Very high</td><td rowspan="4">Not applicable</td><td rowspan="4">Classification</td></tr>
<tr><td>Chemical character</td><td>$Na-SO_4$</td></tr>
<tr><td>Quality for boilers</td><td>Very bad</td></tr>
<tr><td>Quality for irrigation</td><td>Poor</td></tr>
</table>

The use of groundwater for large scale-irrigation in the Mendota-Huron area began in 1915 and expanded until the late 1920s. Development of irrigation was slow in the 1930s, but was accelerated by the high prices for crops during the second World War and continued rapidly after 1945. In the 10 year period between 1941 and 1951, the number of irrigation wells in the area tripled to over one thousand wells. By 1957, at least 75 percent and possibly more than 80 percent of the groundwater pumped in the area was withdrawn from the lower aquifer (confined aquifer located below the Corcoran Clay). While movement of groundwater in both the upper and lower aquifers initially was from the foothills of the Coast Ranges on the west toward the axial trough of the valley on the east, heavy draft on groundwater supplies far in excess of replenishment eventually produced a westward gradient. This reversal of groundwater flow directions was recognized in the lower aquifer, but water levels in the upper aquifer were not closely monitored.[3] The post-development rate of recharge between 1961 and 1977 was more than 40 times greater than the estimated pre-development rate for the Central Valley.[4]

As of 1957, G.H. Davis and J.F. Poland noted that high concentrations of sodium chloride were present in the groundwater of the upper aquifer along the eastern border of the Mendota-Huron area and indicated that the lateral distribution of these waters is extremely irregular. The areas of high concentrations of chloride and boron are mapped in G.H. Davis and others 1964 report. The present day PEC is located along the southwest margin of an area of mapped poor quality shallow groundwater shown on Plate 2 of their report.[5]

Based on a map of increases in irrigation of land by W.B. Bull and R.E. Miller (1975), the area of the present day PEC was irrigated by groundwater beginning as early as 1940 and as late as 1950. The map was based on interpretation of aerial photographs taken of the area in 1937, 1940, 1942, 1950, 1954, and 1955.[6]

Agricultural drainage problems in the San Joaquin Valley have attracted national attention since 1983, when selenium in water from subsurface drainage systems in the central part of the western valley was found to have toxic effects on waterfowl at Kesterson Reservoir. A 1989 report by Gilliom and others summarized the results of U.S. Geological Survey (USGS) studies and research by others on the sources, distribution, and mobility of selenium in soils and groundwater of the San Joaquin Valley. Basic relations between selenium, hydrology, and salinity were examined in a manner that provides a background on processes likely to affect other constituents as well. Selenium concentrations in shallow groundwater in Coast Range sediments are highly correlated with salinity and the distribution of dissolved solids in shallow groundwater is similar to that of selenium. High selenium concentrations in the soils of mudflows and other alluvial sediments east of Monocline Ridge, in the area between the alluvial fans of Cantua and Panoche Creeks (the PEC is located in the northwestern part of this area), may be attributed to high selenium concentrations in the parent geologic formations of the adjoining hills.[7]

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3 Davis, G.H., and Poland, J.F., 1957. *Ground-Water Conditions in the Mendota-Huron Area, Fresno and Kings Counties, California.* U.S. Geological Survey Water-Supply Paper 1360-G.
4 Williamson, A.K., Prudic, D.E., and Swain, L.A., 1985. *Ground-Water Flow in the Central Valley, California.* U.S. Geological Survey Open-File Report 85-345.
5 Davis, G.H., Lofgren, B.E., and Mack, S., 1964. *Use of Ground-Water Reservoirs for Storage of Surface Water in the San Joaquin Valley, California.* U.S. Geological Survey Water-Supply Paper 1618.
6 Bull, W.B. and Miller, R.E., 1975. *Land Subsidence Due to Ground-Water Withdrawal in the Los Banos-Kettleman City Area, California. Part 1, Changes in the Hydrologic Environment Conducive to Subsidence.* U.S. Geological Survey Professional Paper 437-E.
7 Gilliom, R.J. and others, 1989. *Preliminary Assessment of Sources, Distribution, and Mobility of Selenium in the San Joaquin Valley, California.* U.S. Geological Survey Water-Resources Investigation Report 88-4186.

In an effort to assess the movement of selenium in groundwater in relation to the sources and movement of groundwater, N.M. Dubrovsky and S.J. Deverel (1985) estimated the relative age and origin of groundwater in different parts of the aquifer system using data on changes in the flow system over time and isotopic composition. They found that concentrations of selenium greater than 10 micrograms per liter (ug/L) occur deeper than detectable tritium at well cluster sites like USGS well cluster P5 (located less than ½ mile northeast of the PEC). In combination with the water-table history, this indicates that irrigation-derived groundwater that recharged the regional aquifers prior to 1952 contained high concentrations of selenium. These data also indicate that some of the deepest water with high selenium concentrations may be derived from natural processes. Where groundwater is not close to the ground surface (like the conditions at the PEC), the main process affecting the distribution of groundwater salinity and selenium concentrations is leaching of soil salts and soluble selenium during infiltration of irrigation water. Based on soil samples collected from the Panoche Creek alluvial fan in 1946 and 1985, soil samples from areas that were irrigated after 1940 were higher in extractable selenium than those from areas that were irrigated before 1940. Because values for extractable selenium in soil samples collected from the same locations in 1985 decreased to about 10 percent of the 1946 values, it appears that most selenium in presently irrigated soils is in forms that are resistant to leaching. In general, selenium concentrations range from about 10 to 50 ug/L within the first 10 to 20 feet below the water table, and are commonly 50 to more than 1,000 ug/L within the upper 20 to 150 feet of groundwater. Water in this interval is derived principally from recharge of early irrigation water. Selenium concentrations in both of these upper depth intervals that are associated with irrigation recharge generally are in the highest part of the stated concentration ranges where natural soils are the most saline. In the middle-fan area of the ephemeral-stream deposits between the Panoche Creek and Cantua Creek fans, groundwater has dissolved solids concentrations generally between 3,000 and 5,000 milligrams per liter (mg/L), and as high as 10,000 mg/L. The first few decades of irrigation probably leached most of the readily soluble forms of soil selenium and other salts into the shallow groundwater.[8]

As a result of land subsidence, increased pumping lifts, and limitations on groundwater use because of high dissolved solids, surface water was imported to the western valley from the Sacramento-San Joaquin River Delta. Beginning in 1967, surface water imported via the California Aqueduct began to replace groundwater as the primary source of irrigation supply in the area south of Mendota. The availability of surface water led to an increase in the total quantity of water applied, whereas the quantity of water removed from the aquifers by wells decreased. The marked decrease in pumpage allowed a recovery in hydraulic head throughout the aquifer system. Increased rates of recharge resulting from percolation of irrigation water compared to pre-development recharge rates combined

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8 Dubrovsky, N.M. and Deverel, S.J., in Gilliom, R.J. and others, 1989. *Preliminary Assessment of Sources, Distribution, and Mobility of Selenium in the San Joaquin Valley, California.* U.S. Geological Survey Water-Resources Investigation Report 88-4186.

with the rapid post-1967 decrease in pumpage, caused a rise in the elevation of the water table over much of the western valley.[9]

As of August, 2009, the depth to water within monitoring well MW4 at the PEC was approximately 168 feet bgs. Water quality sample data has been provided to the RWQCB in previous submittals. The groundwater encountered is of poor quality, with total dissolved solids concentrations of approximately 4,500 mg/L.

In summary:

- Prior to development of irrigated agriculture in the area in about 1915, the depth to groundwater in the upper-semi-confined aquifer was approximately 240 feet bgs in the PEC area.
- Prior to development of irrigated agriculture in the area in about 1915, the water quality was poor with total dissolved solids in the range of 3,100 mg/L.
- Irrigation in the area surrounding the present day PEC began between 1940 and 1950.
- Recharge of the aquifer system increased to about 40 times the estimated pre-development rate after large-scale irrigation was introduced to the area. This caused an increase in the elevation of the groundwater in the aquifer system, and likely produced the shallower depth to groundwater of about 168 feet bgs underlying the PEC.
- Extensive study of the aquifer system due to problems with selenium in agricultural drainage found that selenium concentrations in shallow groundwater in Coast Range sediments are highly correlated with salinity and the distribution of dissolved solids in shallow groundwater is similar to that of selenium.
- In the middle-fan area of the ephemeral-stream deposits between the Panoche Creek and Cantua Creek fans, groundwater has dissolved solids concentrations generally between 3,000 and 5,000 mg/L, and as high as 10,000 mg/L.
- The first few decades of irrigation (i.e., approximately 1940s to 1960s) probably leached most of the readily soluble forms of soil selenium and other salts into the shallow groundwater.

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9 Belitz, K. and Heimes, F.J., 1990. *Character and Evolution of the Ground-Water Flow System in the Central Part of the Western San Joaquin Valley, California.* U.S. Geological Survey Water-Supply Paper 2348.

URS

Douglas K. Patteson, RCE
RWQCB

The shallow groundwater underlying the PEC contains high concentrations of dissolved solids due to geologic materials that comprise the Panoche Creek alluvial fan, past groundwater recharge and movement, and irrigation practices, especially in the first few decades following irrigation in the area.

We trust that this letter provides useful information for your evaluation of the ROWD. We look forward to obtaining a RWQCB staff determination regarding the conceptual acceptability of the UWSI at the earliest opportunity. Please do not hesitate to contact us if you have any questions or require additional information.

Sincerely,
URS Corporation

PROFESSIONAL GEOLOGIST • JASON M. MOORE • No. 2434 CERTIFIED ENGINEERING GEOLOGIST Exp. 12/31/10 • STATE OF CALIFORNIA

Jason Moore, PG, CEG
Project Geologist

REGISTERED PROFESSIONAL ENGINEER • STUART BRIAN ST. CLAIR • No. C 60945 Exp. 12/31/10 • CIVIL • STATE OF CALIFORNIA

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Project Civil Engineer

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