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5.14 WATER RESOURCES

Hydrogen Energy International LLC (HEI or Applicant) is jointly owned by BP Alternative Energy North America Inc. and Rio Tinto Hydrogen Energy LLC. HEI is proposing to build an Integrated Gasification Combined Cycle (IGCC) power generating facility called Hydrogen Energy California (HECA or Project) in Kern County, California. The Project will produce low-carbon baseload electricity by capturing carbon dioxide (CO_2) and transporting it for CO_2 enhanced oil recovery (EOR) and sequestration (storage)[1].

The 473-acre Project Site is located approximately 7 miles west of the outermost edge of the city of Bakersfield and 1.5 miles northwest of the unincorporated community of Tupman in western Kern County, California, as shown in Figure 2-1, Project Vicinity. The Project Site is near a hydrocarbon-producing area known as the Elk Hills Field. The Project Site is currently used primarily for agricultural purposes. Existing surface elevations vary from about 282 feet to 291 feet above mean sea level (msl).

The Project will gasify petroleum coke (petcoke) (or blends of petcoke and coal, as needed) to produce hydrogen to fuel a combustion turbine operating in combined cycle mode. The Gasification Block feeds a 390-gross-megawatt (MW) combined cycle plant. The net electrical generation output from the Project will provide California with approximately 250 MW of low-carbon baseload power to the grid. The Gasification Block will also capture approximately 90 percent of the carbon from the raw syngas at steady-state operation, which will be transported to the Elk Hills Field for CO_2 EOR and Sequestration. In addition, approximately 100 MW of natural gas generated peaking power will be available from the Project.

The Project Site and linear facilities comprise the affected study area and are entirely located in Kern County, California. These Project components are described below.

Major on-site Project components will include, as shown on Figure 2-5, Preliminary Plot Plan:

- Solids Handling, Gasification, and Gas Treatment
  - Feedstock delivery, handling and storage
  - Gasification
  - Sour shift/gas cooling
  - Mercury removal
  - Acid gas removal

- Power Generation
  - Combined cycle power generation
  - Auxiliary combustion turbine generator
  - Electrical switching facilities

[1] This carbon dioxide will be compressed and transported via pipeline to the custody transfer point at the adjacent Elk Hills Field, where it will be injected. The CO_2 EOR process involves the injection and reinjection of carbon dioxide to reduce the viscosity and enhance other properties of the trapped oil, thus allowing it to flow through the reservoir and improve extraction. During the process, the injected carbon dioxide becomes sequestered in a secure geologic formation. This process is referred to herein as CO_2 EOR and Sequestration.

- Supporting Process Systems
  - Natural gas fuel systems
  - Air separation unit (ASU)
  - Sulfur recovery unit/Tail Gas Treating Unit
  - Zero liquid discharge (ZLD) units for process and plant waste water streams
  - Carbon dioxide compression
  - Raw water treatment plant
  - Other plant systems

The Project also includes the following off-site facilities, as shown on Figure 2-7, Project Location Map:

- **Electrical Transmission Line –** An electrical transmission line will interconnect the Project to Pacific Gas & Electric's (PG&E) Midway Substation. Two alternative transmission line routes are proposed; each alternative is approximately 8 miles in length.

- **Natural Gas Supply –** A natural gas interconnection will be made with PG&E or SoCalGas natural gas pipelines, each of which are located southeast of the Project Site. The natural gas pipeline will be approximately 8 miles in length. Horizontal Directional Drilling (HDD) will be used to install the pipeline under the Outlet Canal, the Kern River, the Kern River Flood Control Channel (KRFCC), and the California Aqueduct.

- **Water Supply Pipelines –** The Project will utilize brackish groundwater supplied from the Buena Vista Water Storage District (BVWSD) located to the northwest. The raw water supply pipeline will be approximately 15 miles in length. Potable water for drinking and sanitary use will be supplied by West Kern Water District (WKWD) to the southeast. The potable water supply pipeline will be approximately 7 miles in length. HDD will be used to install the pipeline under the Outlet Canal, the KRFCC, and the California Aqueduct.

- **Carbon Dioxide Pipeline –** The carbon dioxide pipeline will transfer the carbon dioxide captured during gasification from the Project Site southwest to the custody transfer point. Two alternative carbon dioxide pipeline routes are proposed; each alternatives will be approximately 4 miles in length. HDD will be used to install the pipeline under the Westside Canal, the KRFCC, and the California Aqueduct.

The Project components described above are shown on Figure 2-8, Project Location Details, which depicts the region, the vicinity, the Project Site and its immediate surroundings.

The proposed BVWSD well field for the Project's process water supply is located approximately 15 miles northwest of the Project Site. The approximate well field location is a northwest-oriented rectangular area on the western side of the BVWSD service area near Seventh Standard Road and the California Aqueduct. It includes portions of Sections 34 and 35 of Township 28S, Range 22E and portions of Sections 1, 2, and 12 of Township 29S, Range 22E. While the exact location of the wells has yet to be determined, the conceptual design is for a northwesterly trending line of five wells (three operational and two redundant). The wells are expected to be spaced at approximate intervals of 0.25 mile, although final spacing will be determined during well field installation and testing activities. The proposed wells are expected to extend to depths of 300 to 400 feet below grade.

In its water resources formulation and evaluation of water resource options, the Project considered the benefits and potential impacts on subjects ranging from environmental to financial. Each subject was considered on a local, regional, state, and federal basis, where appropriate. The Project's water source evaluation criteria included the following:

- Project objectives
- Existing water-related conditions and water demands in the surrounding Project area
- Projected future needs of the county, including regional coordination with irrigation and other districts on water matters
- Applicable laws, ordinances, regulations, standards and policies
- Project source water and wastewater demands (at maximum annual load), and their inter-dependency
- Mitigation needs and plans, where appropriate

The Project's evaluation and preferred raw water source and wastewater disposal option are presented in this section. The water resources data and information for the area, and the water demand data, were used to identify and evaluate the potential effects of the Project on local water resources, and to identify mitigation measures that will reduce potential significant impacts (if any) to a level of insignificance. Details of this evaluation are presented below.

5.14.1 Affected Environment

5.14.1.1 Physiographic Setting

The Project Site is located in the Central Valley as shown on Figures 2-1 and 2-7, Site Location. Figure 5.14-1 shows the Project Site on USGS topographic mapping (i.e., at a scale of 1:24,000). The Project is located in the southern end of the Central Valley region of California. The topography at the Project Site is characterized by relatively flat, low-lying terrain that slopes very gently from southeast to northwest.

Several regional irrigation and water supply canals are located in the vicinity of the Project Site (see Figure 5.14-1). The Outlet and West Side Canals are located approximately 0.1 mile and 0.2 mile south of the Project Site, respectively. The East Side Canal is located approximately 0.25 mile east of the Project Site boundary. The California Aqueduct, which was constructed in the 1970s and supplies agricultural and municipal areas in Southern California, is located parallel to, and west of the West Side and Outlet Canals, approximately 0.5 mile south of the Project Site. The California Aqueduct generally runs north-south and is the major conveyance feature for the California State Water Project that brings water from Northern to Southern California. The aqueduct is 444 miles long and is mostly an open concrete-lined canal. The canal width and depth vary along the length of the aqueduct, but it is generally approximately 50 feet wide and approximately 30 feet deep.

An irrigation canal extends generally from the east to the west from Tupman Road along the southern border of the Project Site. This irrigation canal connects the East Side Canal with the West Side and Outlet Canals.

An irrigation ditch crosses the Project Site from south to north and then runs diagonally through the natural fertilizer manufacturing plant area and ends just south of Adohr Road. This ditch is approximately 7 feet deep and feeds the smaller irrigation ditches that traverse the Project Site from north to south and east to west around the crop fields. These irrigation ditches are fed by the West Side Canal and the East Side Canal.

5.14.1.2 Climate

The climate of the Central Valley in the vicinity of the Project can be characterized as semi-arid. The valley experiences long, hot, dry summers and relatively mild winters. Monthly average, maximum, and minimum temperature data based on a 69-year record for the Bakersfield World Service Office (WSO) Airport, Station No. 040442, are presented in Table 5.14-1, Monthly Temperature Data for Bakersfield, California. Based on 69 years of record, the average annual temperature for Bakersfield is 65.4 degrees Fahrenheit (°F).

Table 5.14-1
Monthly Temperature Data for Bakersfield, California (°F)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max	82	87	92	101	107	114	115	112	112	103	91	83
Mean	47.8	53.3	57.4	63.0	71.0	78.2	84.1	82.6	76.8	67.8	55.8	47.5
Min	20	25	31	34	37	45	52	52	45	29	28	19

Source: Western Regional Climatic Center; Bakersfield WSO Airport, Station Number 040442, Period of Record October 1, 1937 to December 31, 2006.

Notes:
ºF = degrees Fahrenheit
max = maximum
min = minimum
WSO = Weather Service Office

Precipitation in the area is characterized by long, dry summers and intermittent wet periods. Based on the 69-year record of precipitation, the average annual precipitation is 6.23 inches. See Table 5.14-2, Average Monthly Precipitation Bakersfield, California.

Table 5.14-2
Average Monthly Precipitation
Bakersfield, California (inches)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.08	1.17	1.16	0.68	0.22	0.07	0.01	0.04	0.11	0.30	0.60	0.79

Source: Western Regional Climatic Center; Bakersfield WSO Airport, Station Number 040442, Period of Record October 1, 1937 to December 31, 2006.

Notes:
ºF = degrees Fahrenheit
WSO = Weather Service Office

5.14.1.3 Flooding

According to the Federal Emergency Management Agency (FEMA), Flood Insurance Rate Maps (FIRM), the Project Site is not located within an area identified as having flood hazards or shallow groundwater (FEMA 2008).

The Kern River Flood Control Channel is located approximately 0.5 mile south of the Project Site. This channel conveys overflows from the Kern River during flood events. The floodplain associated with this channel does not extend onto the Project Site.

The United States Army Corps of Engineers (USACE) completed a flood study for a hypothetical failure of Isabella Dam located on the Kern River, approximately 56 miles northeast of the Project Site. The maps prepared for this study show the areas around metropolitan Bakersfield that would likely be flooded in the unlikely event that Isabella Dam would fail. Based on a worst-case scenario of complete dam failure with the lake full, the results indicate that the Project Site at its existing (pre-construction) elevation could be inundated by as much as 2 feet of water, if such an event were to occur (Northwest Hydraulic Consultants 2008).

5.14.1.4 Groundwater Conditions

Geology

Project Site

The Project Site is situated in the asymmetrical San Joaquin Valley basin, a structural trough that comprises the southern portion of the Great Central Valley of California. It is defined by the Coast Ranges to the west, the San Emigdio and Tehachapi Mountains to the south, the Sierra Nevada to the east, and the delta of the San Joaquin and Sacramento rivers to the north. The axis of the valley is closer to the Coast Ranges than to the Sierra Nevada (Belitz and Heimes 1990). The oldest rocks in the valley comprise a mass of plutonic and metamorphic rocks commonly referred to as the Sierra Nevada batholith of pre-Tertiary age.

The valley is filled with up to 32,000 feet of marine sedimentary rock eroded from the Diablo coastal range and granitic, sedimentary, and metamorphic rock eroded from the western Sierra Nevada. Sierran sands do not generally extend very far west of the axis of the valley trough; as such, in the Project vicinity, the geology is dominated by Coast Range alluvium. The continental sediments form an alluvial wedge that thickens toward the valley axis (DWR 2006).

The Project Site is located approximately 2 miles north of the Elk Hills, an east-trending anticlinal uplift consisting of a series of low hills, also known as the Elk Hills oil field. The Elk Hills form the surface expression of an anticline composed of gravel and mudstone derived from the Coast Ranges to the west. The Elk Hills are being dissected by numerous streams that redeposit the material on an apron of small coalescing fans along the northeast flank of the hills which abut the much larger Kern River fan to the north. The Elk Hills are composed of Tertiary to Quaternary rocks, of which the Tulare Formation is the shallowest unit. An unconformity separates the Elk Hills from the flatter portion of the valley on which the Project Site is located.

The surficial deposits in the vicinity of the Project Site are Quaternary alluvial gravel and sand. Bedrock underlying alluvium at the Project Site is the Pliocene- to Pleistocene-age Tulare Formation, which consists of alternating beds of sand and mudstone. According to Dibblee (2005), these deposits are stream-laid, weakly indurated, light gray pebble gravels, sands, and clays; pebbles are primary composed of Monterey siliceous shale and debris from bedrock in the adjacent Temblor Range (URS 2009).

The soils at the Project Site consist of Lokern clay and Buttonwillow clay (NRCS 1988). These soils are very deep and somewhat poorly drained. Both soil types formed in alluvium weathered mainly from granitic rock, but a variety of rock sources are included. Typically, in units, the surface layer is dark gray clay about 21 to 28 inches thick. The underlying material is light yellowish brown sandy loam to a depth of 60 inches or more. In some areas, the surface layer is loamy sand.

Permeability of the Buttonwillow clay is moderately rapid between depths of 28 and 55 inches and slow below a depth of 55 inches, while the permeability of the Lokern clay is slow. Available water capacity is moderate or high for both soil types. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight.

A preliminary geotechnical investigation was conducted at the Project Site in January 2009 (see Appendix P for summary report). The field exploration program included drilling and sampling of five borings and eight cone penetration test (CPT) probes, as well as conducting percolation tests at two locations. Results indicate that the upper 10 feet of soils materials are generally fine-grained materials (e.g., sandy clays or silty sands). The underlying sandy soils consist of interbedded layers of sands, silty sands and sandy silts with varying degrees of consistencies from medium dense to very dense. Below 30 feet below grade, the sandy soils become dense, grading denser to the maximum depth explored in the borings (100 feet below grade) (URS 2009).

Proposed Well Field

The proposed Project process water supply well field is located approximately 15 miles northwest of the Project Site, as shown on Figure 5.14-2, Water Supply Well Field Locations. The geology for the proposed well field area is similar to that described for the Project Site above. The approximate location of the well field is located 6 miles north of the Elk Hills and approximately 8 to 10 miles northeast of the Temblor Range, a northwest-trending, Miocene to Plio-Pleistocene assemblage of marine sedimentary rocks. Temblor Range and Sierra Nevada derived sediments, interbed under and east of the well field area, predominantly consist of sands and gravels with some silt and clay layers of minor thickness and extent. They are vertically and laterally discontinuous as evidenced in local geophysical logs described below.

A 1991 study prepared by Kern County Water Agency (KCWA) (referred to as the “Clay Study”) characterized the area geology within 2,000 feet below grade as alluvial, fluvial, and lacustrine clastic sediments dominated by sands and silts, with clays being less common and typically associated with oxbow lake depositional settings or, alternatively, small lacustrine settings within basin lows (KCWA 1991).

Due to a paucity of geologic logs, spontaneous potential (SP) and resistivity geophysical logs for wells located in and around the proposed well field were reviewed to evaluate the geology of the proposed well field area. The logs available generally are not deeper than 500 to 600 feet below grade. The logs reveal that the sediments below the well field and in the vicinity are dominated by coarser-grained material (sand or gravel). The proportion of coarse-grained material generally decreases with depth. However, the sediments are consistently coarse-grained at depth. Fine-grained layers were observed in some of the logs, possibly correlative with the Corcoran Clay (see *Hydrogeology* below), although the distance between logs (i.e., typically from 0.5 to 3 miles) precluded the correlation of these layers over large distances.

Hydrogeology

Project Site

The Project Site is located in the Kern County subbasin (DWR Subbasin No. 5-22.14) of the San Joaquin Valley groundwater basin. The subbasin is bounded by the Kern County line and the Tule groundwater subbasin on the north, by granitic bedrock of the Sierra Nevada foothills and Tehachapi Mountains on the east and southeast, and by the marine deposits of the San Emigdio Mountains and Coast Ranges on the southwest and west (DWR 2006).

The southern San Joaquin Valley, of which the Kern County subbasin is part, has been further divided into additional hydrogeological subbasins that are bounded by distinct structural highs due to folding or faulting. These subbasins may contain isolated hydrogeological systems (KCWA 1991). The Project Site is located in what is termed as the Buttonwillow Subbasin which is separated from the Jerry Slough Subbasin to the east and the Tulare Subbasin to the north and west as shown on Figure 5.14-3, Groundwater Subbasins in Kern County.

Shallow-to intermediate-depth water-bearing sediments in the Kern County subbasin are dominated by Tertiary and Quaternary continental deposits (KWBA 2009). In the project vicinity, the two main water-bearing units consist of the Plio-Pleistocene Tulare Formation and the overlying Pleistocene “older” alluvium/steam deposits (DWR 2006)

The Tulare Formation, primarily derived from the Coast Range, is moderately to highly permeable and consists of up to 2,200 feet of interbedded sands, gypsiferous clays, and gravels (DWR 2006). In the Project vicinity, the Tulare gently dips to the northeast beneath the valley (Page 1986).The Tulare Formation is included in undifferentiated non-marine strata approximately 2,580 feet thick encountered in the upper portion of nearby gas wells (DOGGR 1998). Much of the San Joaquin Valley north of the Project Site includes the Corcoran Clay, which is an extensive lacustrine deposit of low permeability that divides the groundwater flow system into a lower confined zone and an upper semi-confined zone. While the Corcoran Clay has been encountered in the San Joaquin Valley north of the Project Site, it does not appear to be present in the Project area (Williamson, et al. 1985 and KCWA 1991).

Above the Tulare Formation, older alluvium/stream deposits are up to 250 feet thick and are dominated by loosely consolidated to cemented clay, silt, sand, and gravel. These are mainly exposed at the subbasin margins and are moderately to highly permeable (DWR 2006). Together with the Tulare Formation, the older alluvium/stream deposits constitute the main water-bearing body of the subbasin.

Based on information available from the KWBA (KWBA 2009), the upper 200 feet of the aquifer within the Kern Water Bank area east of the Project Site consists of discontinuous, thick sand intervals interbedded with gravel and silt, characterized as an unconfined aquifer. Below 200 feet, strata are dominated by interbedded sand, gravel, silt, and clay of limited lateral continuity. There are no widespread confining beds in the area. However, based on pumping response and the occurrence of downward leakage within the Kern Water Bank area, the deeper portion of the water-bearing zone is consistent with a semiconfined aquifer. As such, the aquifer below the Project area is characterized as a combination of an unconfined and a semiconfined system.

Proposed Well Field

In the well field vicinity, the two main water-bearing units consist of the Plio-Pleistocene Tulare Formation and the Pleistocene "older" alluvium/stream deposits (DWR 2006). The Clay Study proposed further subdivision of the Kern County Subbasin, whereby the Project Site and proposed well field are located within a northwest-trending subbasin ("Buttonwillow Subbasin") within the Kern County Subbasin bounded by subsurface structural highs (anticlines) mapped from borehole and seismic data (KCWA 1991).

The regional hydrogeology for the well field is similar to that described for the Project Site. However, unconsolidated sediments underlying the approximate well field area include Temblor Range marine sediments from the west interbedding with alluvial sediments from the Sierra Nevada (Kern Fan) from the east. These sediments predominantly consist of sands and gravels with some silt and clay layers of minor thickness and extent (vertically and laterally discontinuous as evidenced in local geophysical logs described in the well field geology section). Figure 5.14-4, Generalized Hydrogeologic Cross Section, is a generalized cross section of the hydrogeologic system (tending southwest to northeast) from the Temblor Range to the well field area. Figure 5.14-5, Example Geophysical Log, is a geophysical log from a representative boring/well nearby the proposed well field that depicts the predominance of sands and gravels with minor interbeds of silts and clay. The dominance of coarse-grained alluvium and stream deposits, in combination with the presence of discontinuous lacustrine clay lens(es), suggest that the aquifer below the proposed well field is a combination of an unconfined and a semiconfined system.

The dominant recharge source in the subbasin is applied irrigation water (DWR 2006). Although water levels in different parts of the subbasin have varied over the last several decades (e.g., 25-foot decrease in the Bakersfield area and 30-foot increase in the Lost Hills/Buttonwillow areas), average groundwater levels in the subbasin have been relatively stable since 1970 (DWR 2006). Data provided by the Buena Vista Water Storage District (BVWSD) for 2008 indicate that depth to groundwater in the proposed well field area is approximately 30 feet below grade, which corresponds to a groundwater elevation of approximately 220 feet msl. Information provided by the BVWSD indicates that in 2008 depths to water ranged from 20 feet below grade in the north to 130 feet below grade in the south near the Project Site (see Figure 5.14-6, 2008 Depth to Groundwater). BVWSD also reports perched groundwater zones in the northern-most portions of the Buttonwillow Service Area with depths to water ranging from less than 5 feet below grade to 10 feet below grade.

Aquifer Characteristics

DWR estimates of specific yield (Sy) for Kern County range from 8 to 19.5 percent, with the highest specific yield values for the subbasin associated with the Kern River alluvial fan west of Bakersfield and east of the Project Site (DWR 2006). Information provided by the BVWSD indicates that the local aquifer system is prolific, of high permeability and yields high volumes of water to wells (typical pumping rates are 1,500 to 2,000 gpm in most of BVWSD's service area agricultural wells). No pumping test data is known to exist in the vicinity of the proposed well field area. Personal communications with Dr. Robert Crewdson of Sierra Scientific Services (BVWSD's Hydrogeologic Consultant), indicate there has been very little pumping impact (i.e., minimal drawdown) in local agricultural wells and that the local aquifer system responds similarly to and most likely exhibits similar hydraulic characteristics to nearby Kern County areas already studied in detail (Sierra Scientific Services 2003, 2004, 2007a, and 2007b). Sy values reportedly range from 10 to 20 percent and hydraulic conductivity (K) values is estimated to be in the range of 57 feet/day (426 gpd/ft^2) for the sandy zones which appear to predominate the well field area. The aquifer is characterized as unconfined (shallow – water table portion) to semi-confined (due to apparent lack of thick or laterally continuous clay or aquitard-like deposits). The aquifer is also anisotropic with high anisotropic ratios (i.e., horizontal K to vertical K [Kh/Kv]) on the order of 30 to 50 or more. This means that water flows quicker in the horizontal rather than vertical direction because the unconsolidated alluvial sediments comprising the aquifer system were deposited in horizontal layers. The aquifer thickness in the well field area is as deep as 2,000 feet thick.

Assumptions for the aquifer parameters included in the groundwater model used to evaluate aquifer response to Project-specific pumping are summarized in Table 5.14-3, Aquifer Parameters. Sensitivity analyses for various parameters were also performed to account for uncertainties associated with a lack of site-specific hydraulic data in the well field area and to evaluate model response to the parameters. See Appendix O2, Groundwater Model Documentation for additional information.

Table 5.14-3
Aquifer Parameters

Aquifer Parameter	Assumed Value for Model[1]
Hydraulic Conductivity, K	57 feet/day
Specific Yield, Sy	0.18 for unconfined zone
Specific Storage, (Ss)	0.000055 for semi-confined zone
Anisotropic Ratio	30
Aquifer Thickness	2,000 feet
Sand Percentage	75 percent

Notes:
1. See Groundwater Model Documentation in Appendix O2, Groundwater Model Documentation for additional information on the aquifer parameter assumptions used in the groundwater model.

Groundwater Occurrence and Flow

Regional

On a regional scale, the development of irrigated agriculture in the western San Joaquin Valley has significantly altered the groundwater flow system. Percolation of irrigation water past crop roots has caused a rise in the elevation of the water table. Pumpage of groundwater from wells has caused a lowering of the potentiometric surface of the confined zone over much of the western valley. Percolation of irrigation water from agricultural fields, drainage ditches and canals has replaced infiltration of intermittent streamflow as the primary mechanism of recharge. Pumpage of groundwater from wells and crop evapotranspiration have replaced natural evapotranspiration and seepage to streams in the valley trough as the primary mechanisms of discharge. Decreases in groundwater pumping following delivery of surface water have allowed consequent recovery in hydraulic head throughout the groundwater flow system. The present-day groundwater flow system is in a transient state and is adjusting to the stresses placed upon it in both the past and present (Belitz and Heimes 1990).

The dominant recharge source in the subbasin is applied irrigation water (DWR 2006). Although water levels in different parts of the subbasin have varied over the last several decades, the average groundwater level in the subbasin has been relatively stable since 1970 (DWR 2006). A groundwater divide is approximately located at the Kern River (Dale et al. 1966). The Elk Hills, together with the nearby Buena Vista Hills, restrict groundwater movement from the Buena Vista Valley (Page 1986).

The average subbasin water level is essentially unchanged from 1970 to 2000, after experiencing cumulative changes of approximately -15 feet through 1978, a 15-foot increase through 1988, and an 8-foot decrease through 1997. However, net water level changes in different portions of the subbasin were quite variable through the period 1970 to 2000. These changes ranged from increases of over 30 feet at the southeast valley margin and in the Lost Hills/Buttonwillow areas to decreases of over 25 and 50 feet in the Bakersfield area and McFarland/Shafter areas, respectively.

The Kern Water Bank Authority recharges, stores, and recovers groundwater in the Bakersfield area. The western boundary of the approximately 20,000-acre water bank property is located 1 mile east of the Project Site. The Kern Water Bank, which receives water from the California Aqueduct, the Kern River, and the Friant-Kern Canal, can store over 1 million acre-feet of water and can recover up to 240,000 acre-feet of water per year (KWBA 2009). Banking facilities, including recharge basins, occupy approximately 7,000 acres of water bank property. Eighty recovery wells, with total depths ranging from 700 to 1,000 feet below grade, are located throughout the water bank, and are capable of being pumped at rates ranging from 2,500 to 5,000 gpm (KWBA 2009).

Project Site

The Project Site is in an area of relatively deep groundwater conditions. A BVWSD 2008 Depth to Groundwater Map indicates that first groundwater at the Project Site should be encountered at between 120 and 130 feet below grade (Figure 5.14-6). The groundwater surface was not encountered within 60 to 100 feet of the ground surface based on the geotechnical borings and CPT probes (URS 2009). During the onsite geotechnical investigation conducted in late January 2009, one boring was drilled to approximately 100 feet below grade, four borings were drilled to approximately 60 feet below grade and eight CPT probes were advanced to approximately 60 to 80 feet below grade. No groundwater was observed in the five borings or eight CPTs at the time of the investigation. Anecdotal information provided by the property owner during the geotechnical investigation suggests that groundwater could be expected to be encountered at approximately 50 to 100 feet below grade. In the vicinity of the Project Site, spring-time groundwater elevations based on regional data from the DWR have ranged from approximately elevation 180 to 250 above msl in recent years, which corresponds to approximately 40 to 110 feet below grade (DWR 2000 through 2006).

Proposed Well Field

Groundwater in the proposed BVWSD water supply well field area occurs under unconfined to semi-confined conditions depending on the depth of the water bearing zones. As stated previously, the well field is located in the Buttonwillow Subbasin (KCWA 1991). Geophysical logs suggest that the aquifer system at and adjacent to the well field is interconnected laterally and vertically with a dominance of coarse-grained sediments and a lack of aquitard-like sediments. The depth to water in the well field area is approximately 20 to 30 feet below grade with general groundwater flow direction to the east and northeast (Figures 5.14-6, 2008 Depth to Groundwater, and 5.14-7, 2008 Groundwater Elevations).

Groundwater in Storage

Kern County Water Agency estimates that the total volume of groundwater in storage in the Kern River subbasin is approximately 40,000,000 acre-feet. The dewatered aquifer storage is estimated to be approximately 10,000,000 acre-feet. These estimates consider areas of the subbasin which are known to overlay useable groundwater, which is estimated to be about 1,000,000 acres (DWR 2006).

From 1962 to 2000, BVWSD's operations in the Buttonwillow Service Area have resulted in a positive groundwater balance of approximately 46,000 acre-feet per year (afy). Based on future projections by BVWSD for the Buttonwillow Service Area, a positive groundwater balance of approximately 25,000 afy is estimated (BVWSD and Sierra Scientific Services 2009). Therefore, even though the southern San Joaquin Valley has been classified by the DWR as an overdrafted groundwater basin, the BVWSD has historically been able to achieve a positive groundwater balance. As stated previously, water levels in the BVWSD Buttonwillow Service Area (which includes the proposed Project well field area) have and are expected to continue to rise in response to BVWSD's positive water balance operations. This may be attributed to the BVWSD's Buttonwillow Service Area location within the Buttonwillow subbasin (KCWA 1991), which may be partially isolated from adjacent hydrogeological subbasins by structural highs due to folding or faulting (see Figure 5.14-3).

Aquifer storage in the Buttonwillow Service Area is approximately 7,000,000 acre-feet (af) (Sierra Scientific Services 2009).

Groundwater Wells

Project Site

According to the Environmental Data Resources, Inc. (EDR) report that was compiled for the Phase I Environmental Site Assessment (see Appendix M of this AFC), there is one water well on the Project Site. The EDR report cites the Federal USGS database as the source of this information. Its Well ID is USGS3175424 and it is located in the northwest quadrant of the Project Site. No information on well depth or water table elevation was available, per the EDR report. The employees of the natural fertilizer facility do not use water from the domestic well for drinking water, and instead use bottled water.

The EDR report listed one DOGGR-registered oil and gas well that is located on the Project Site. It is approximately near the center of the Project Site and is identified as API Well Number 02952932. The EDR report refers to this well as a plugged and abandoned dry hole as of November 18, 1950.

Proposed Well Field

An EDR well search for the proposed Project water supply well field area and a 0.5-mile buffer around the well field was conducted. The locations of wells within the boundaries of the search area are presented on Figure 5.14-8, Well Location Map. The BVWSD reports that the Buttonwillow Service Area has over 200 agricultural supply wells as shown on Figure 5.14-9, BVWSD and Private Water Well Location Map. According to BVWSD, typical agricultural wells are of large diameter, are completed to depths up to 450 feet below grade and are typically capable of pumping between 1,500 and 2,000 gpm of groundwater.

According to BVWSD, there are ten private landowner water supply wells at nine locations and no BVWSD supply wells located within 0.5 mile of the proposed well field. Four of the wells are located within the proposed well field area and the other six are located within the buffer zone. The EDR well search report provided information on wells located within 0.5 mile of the proposed well field culled from two databases: the USGS National Water Inventory System and the DWR Water Well Database. Eleven wells were listed in the USGS database and eight wells were listed in the DWR database. Based on latitude and longitude information provided in the EDR report, it is likely that the eight DWR database wells correspond to eight of the USGS wells, indicating that the well listings are duplicative, although it is not possible to determine this definitively.

Comparison of well location information provided by BVWSD to the EDR database reveals that six of the EDR well locations correspond to BVWSD well locations. At one of the EDR well locations with a BVWSD equivalent, two wells are listed as being present. Three of the nine BVWSD well locations do not have equivalent listings in the EDR report; at one of these locations, two wells are listed as being present, according to BVWSD. Therefore, accounting for duplicative listings in the BVWSD database and the EDR report, there are at least 15 private landowner water supply wells at 13 locations located within 0.5 mile of the proposed well field.

Groundwater Quality

Groundwater within the Coast Range alluvium is generally considered to be of relatively low quality due to the presence of water-soluble deleterious minerals within the parent rocks (Gilliom et al. 1989).

Groundwater in the Project area is primarily sodium sulfate to calcium-sodium sulfate type. The average total dissolved solids (TDS) of groundwater is 400 to 450 milligrams per liter (mg/L) with a range of 150 to 5,000 mg/L. Shallow groundwater presents problems for agriculture in the vicinity of the Project with high concentrations of TDS, sodium chloride, and sulfate.

In the vicinity of the proposed water supply well field, groundwater quality exhibits elevated TDS. As shown on Figure 5.14-10, Total Dissolved Solids – Summer 2001, TDS concentrations in summer 2001 were about 3,000 mg/L. According to BVWSD, TDS concentrations in groundwater in this area are expected to range from approximately 1,000 to 4,000 mg/L. BVWSD water quality information indicates that within the Buttonwillow Service Area, sulfate (SO_4) can range up to 1,200 mg/L and chloride (Cl) can range up to 900 mg/L. Water of this quality is consistent with the California State Water Resources Control Board Resolution No. 75-58 Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Power Plant Cooling (CWRCB Res. No. 75-58) definition of brackish water which includes all waters with a salinity (i.e., TDS) range of 1,000 to 30,000 mg/L and a chloride concentration of 250 to 12,000 mg/L. According to BVWSD, the only use for groundwater in the well field area is agricultural but the impaired groundwater is considered objectionable by local users because it is unsuitable for good crop yields and crop diversification.

5.14.1.5 Water Supply History and Future Projections

Water Supply History

Water supply within Kern County is provided by groundwater, the Kern River and other surface water imports, which include deliveries by the California State Water Project via the Friant-Kern Canal and the federally operated Central Valley Project via the California Aqueduct. In Kern County, about 60 percent of the water used for domestic and agricultural use is pumped from groundwater and agricultural uses comprise almost 90 percent of the total amount of water used in the region (Kern County Planning Department 2004). Several water agencies in Kern County manage groundwater and surface-water supply resources for both domestic and agricultural uses. Water agencies with service areas in the vicinity of the project are shown on Figure 5.14-11, Water Districts in Vicinity of Project, and include Buena Vista Water Storage District, West Kern Water District and the Kern Water Bank Authority (KWBA). Also numerous private water supply wells are located within the region.

Buena Vista Water Storage District

The BVWSD is located northwest of the Project Site, as shown on Figure 5.14-11, Water Districts in Vicinity of Project. The area served by the BVWSD consists primarily of irrigated farmland. The BVWSD Buttonwillow Service Area covers approximately 50,000 acres and the underlying aquifer has a storage capacity of approximately 7,000,000 acre-feet.

Early farmers in the BVWSD made use of surface and groundwater for irrigation. Water supplies for the BVWSD include a 2nd Point Kern River entitlement of 150,000 afy average. In 1973, the BVWSD contracted with the State Department of Water Resources via the Kern County Water Agency for an additional surface water supply. The contract provided for an annual firm entitlement of 21,300 acre-feet and surplus entitlement of 3,750 acre-feet. The BVWSD currently has access to five turnouts from the California State Water Project, that provide the system with about 850 cubic feet per second of added gravity inflow capacity directly into the District's distribution system.

BVWSD consumptive use demand is about 100,000 afy which is met by a combination of canals and groundwater pumping. As stated previously, with its water allocations, the BVWSD has been able to maintain a historic positive groundwater balance amounting to approximately 47,000 afy above groundwater withdrawals. This balance is projected to be approximately 30,000 afy in the future.

A local issue in the BVWSD's Buttonwillow Service Area is the movement of poor quality, high TDS, groundwater from the west to the east entering the shallow aquifer system. The TDS is derived from dissolution of salts from the marine sediments as groundwater flows eastward entering the western part of the BVWSD's service area. Figure 5.14-10 is a contour map of TDS concentrations in groundwater for summer 2001. Elevated TDS in groundwater presents crop yield and diversification issues that have prompted the BVWSD to develop a Brackish Groundwater Remediation Project (BGRP), which includes extraction of groundwater in the elevated TDS area of BVWSD's service area. BVWSD began developing the BGRP long before this Project was proposed. The BGRP is Component 4 of the BVWSD Groundwater Management Plan (GMP) for which an EIR is currently under preparation. The BVWSD GMP states that the problem areas will require "...new and innovative solutions and corresponding management practices to enable the area to continue as a viable farming area over the long term."

West Kern Water District

The West Kern Water District (WKWD) service area covers approximately 250 square miles of western Kern County south of the Project Site (see Figure 5.14-11). This water district serves a population of approximately 25,000 people, residing in the communities of Taft and Maricopa, and other unincorporated communities (WKWD 1997). The district also serves industrial users. WKWD obtains its potable water supply from local groundwater. The district has eight groundwater wells located within the Kern River groundwater basin on the western edge of the Kern River Alluvial Fan (WKWD 2007). The well field is located in the Tupman area. In water year 1995-1996 the total water demand from the district was approximately 13,000 acre-feet (WKWD 1997). Water demands have been steadily increasing and currently are estimated to be on the order of approximately 20,000 afy (BVWSD, 2009).

Other sources of WKWD's water supply include State Water Project water deliveries and agreements with various Kern County water agencies.

Kern Water Bank Authority

Kern Water Bank Authority (KWBA) owns approximately 20,500 acres of land along the Kern River in Kern County southwest of Bakersfield and east of the Project Site. This land is used for groundwater recharge and banking operations. The water bank receives water from the Kern River, the California Aqueduct and Friant-Kern Canal. This water is recharged into the underlying water supply aquifer and then later extracted and distributed for beneficial use by the member agencies via a system of wells, pipelines and canals. The KWBA has appropriated water rights to store 500,000 afy of which most is allocated for irrigation use (490,000 afy) and the remainder for municipal and industrial uses (5,000 afy each). Of the total area owned by the KWBA, only approximately 5,900 acres are used for recharge basins and approximately 481 acres are used for water bank facilities. The remainder is used for habitat preservation, farming, conservation banking, and other uses (KWBA 2007). The nearest recharge area to the Project Site is located approximately 1 mile east of the site's eastern boundary (see Figures 5.14-1 and 5.14-11).

5.14.1.6 Project Water Use

Project Water Needs

The Project proposes to construct and operate a facility producing approximately 250-MW low-carbon baseload power. The Project will consist of one General Electric (GE) 7FB combustion turbine-generator (CTG), a heat recovery steam generator (HRSG), and one condensing steam turbine generator. The heat recovery steam generator (HRSG) will be equipped with supplementary firing (duct burner) for use during peak electrical demand. The Project will use two conventional mechanical-draft cooling towers (21 cells total) to support the following processes:

- Power block
- Gasification including air separation unit (ASU)
- GE's LMS100®

As described in Appendix X, Water Usage Minimization Study, it was determined that dry and hybrid cooling systems were not economically feasible at this Project Site. Air cooling of the steam turbine generator (STG) has not been selected because it results in a substantial increase in parasitic electrical demand, an increase in capital costs, and a dramatic decrease in STG output. All of these effects result in a markedly negative impact on cost and availability of electricity.

The Project will use approximately 4.2 million gallons per day (mgd) of water supply on a calendar year average basis, peaking to 6 mgd during hot summer days. Of this quantity, 0.5 mgd is a high quality demineralized water stream intended for gasifier make-up and boiler make-up, and the remainder is lower quality industrial generic plant water supply intended for cooling tower make-up and other miscellaneous uses. The raw water supplied by BVWSD will be treated to meet the specific use requirements.

Potable water consumption for personnel, typically 80 persons on site at any one time, is estimated to be 1,200 gallons per day (gpd). The peak potable water demand is not expected to exceed 1,800 gallons per day (gpd). Estimated average annual consumption is approximately 1.3 afy.

Average daily water usage during construction (compaction, dust control, hydrotesting and sanitary purposes) is estimated at 10,000 gpd. During hydrotesting, a maximum daily water usage of approximately 100,000 gallons is anticipated. WKWD will provide water for construction use. Water would be transported to the Project Site via the proposed potable water pipeline.

The water balance diagrams (Figure 5.14-12, Mass Water Balance – Average Full Load Flows, and Figure 5.14-13, Mass Water Balance – Average Flows for Hottest Day) show the potable and process water flow streams for the maximum use day and the average day. These correspond to the Heat and Mass Balance Diagram (Table 2-12 in Section 2, Project Description), which provides further information for various ambient temperatures.
Table 5.14-4, Daily and Annual Water Flows, shows the maximum daily, average daily, and average annual water supply and demand flows.

Table 5.14-4
Daily and Annual Water Flows

	Maximum Daily (gal/day)	Average Daily (gal/day)	Average Annual (acre-ft/year)[4]
Available Water Supply			
Plant Water	8,800,000[1]	6,700,000	7,500
Water Requirements			
Water Use			
Cooling tower (evaporation)	5,000,000	3,450,000	3,900
Process water	335,000	335,000	375
Evaporative cooler (evaporation)	85,000	20,000	25
Demineralized water	500,000	425,000	475
Total Requirement[2]	**5,920,000**	**4,230,000**	**4,775**
Recycled Water[3]			
Cooling tower blowdown	1,150,000	700,000	790
Water supply treatment	960,000	685,000	770
Evaporative cooler blowdown	20,000	5,000	6
Mixed bed polisher reject	26,000	25,000	30
Miscellaneous	35,000	35,000	40
Recycled Subtotal	**2,191,000**	**1,450,000**	**1,636**

Source: HECA Project.

Notes:
[1] Current will serve letter as provided in Appendix O1, Water Resources Information, provides documentation for the supply of 6,700,000 gpd on an annual basis with capacity to peak to 8,800,000 gpd.
[2] Other sections of this AFC present the total required gal/day as rounded values 6 and 4.2 mgd, respectively.
The maximum daily use is based on 24 hours of full load operation during the design hottest day (115ºF day/ 80ºF night, 97 ºF average). The average daily use is 24 hours of the average of the full load use at the average monthly temperatures for every month.
[3] Reject water volumes listed are captured and recycled via the Project ZLD unit and therefore do not increase overall Project water consumption.
[4] The average annual use is based on 8,760 hours/year at the average daily rate, corresponding to the maximum plant capacity factor of 100 percent.

ºF = degrees Fahrenheit
ft = feet
gal = gallon(s)
HRSG = heat recovery system generator

Project Water Supply Plan

Brackish groundwater provided by the BVWSD will be used at the Project for raw water supply. A copy of the will-serve letter from BVWSD is provided in Appendix O1, Water Resources Information.

The primary uses of the raw water supply will be for cooling tower makeup, evaporative cooling, fire water, gasification, service water, and steam generation. The BVWSD supply was selected as the process water supply as it was determined to be most optimal in terms of environmental impact, capital cost, technical risk, and volume availability/reliability. (See Section 6.0 (Alternatives) of this Revised AFC.) The BVWSD is a local water district with impaired groundwater sources not suitable for agricultural or drinking use without extensive treatment. These impaired groundwater sources are found in various locations within BVWSD's Buttonwillow Service Area. According to the BVWSD, the impaired groundwater is considered objectionable by local agricultural users because it is unsuitable for good crop yield or crop diversification. As such this water currently poses a negative impact on agriculture. Elevated TDS in groundwater has prompted the BVWSD to develop the Brackish Groundwater Remediation Project (BGRP). This program includes extraction of groundwater in elevated TDS areas.

With the desire to use poor quality groundwater for the proposed Project's process water needs, HEI has entered into discussions with BVWSD to purchase as much as 7,500 afy of groundwater. Accordingly, this water would come from a well field located in the elevated TDS area as shown on Figure 5.14-10. Extraction of water from the line of wells (i.e., picket fence well field) is directed toward impeding eastward flow of high TDS groundwater from the shallow aquifer system (first water up to 400 feet below grade) with the possibility of shifting the water quality divide in the eastern part towards the western part of BVWSD's service area. This project-specific pumping would also remove considerable volumes of TDS from the local groundwater system during the lifetime of project operation.

Recharge of the aquifer supplying the brackish groundwater will be provided by ongoing irrigation and replenishment activities in BVWSD's service area. There is sufficient brackish groundwater available to meet the needs of the Project. The use of brackish groundwater is consistent with California State Water Resources Control Board Resolution No. 75-58 Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Power Plant Cooling (CWRCB Res. No. 75-58).

Under normal operating conditions, the average process water requirement will be approximately 4.2 mgd, and the maximum daily water consumption will be approximately 6 mgd. BVWSD has stated that it will be able to provide brackish groundwater with an average TDS concentration of approximately 2,000 mg/L, with an acceptable range from about 1,000 to 4,000 mg/L, to the Project for the estimated life of the Project. Table 5.14-5, BVWSD Supply Water Quality, provides a summary of recent water quality analytical data from the currently-available brackish groundwater supply.

Table 5.14-5
BVWSD Supply Water Quality

General	Units	Projected Average	Projected Maximum
pH		7.25	7.25
TDS	ppm	2000	4000
Total Alkalinity	mg/L	238	328
Hardness	mg/L	897	1,561
Calcium	mg/L	300	500
Magnesium	mg/L	35	75
Sodium	mg/L	278	726
Potassium	mg/L	2	3
Bicarbonate	mg/L	250	400
Sulfate	mg/L	700	1,000
Chloride	mg/L	381	1,237
Nitrate-Nitrite	mg/L	0.2	0.2
Arsenic	mg/L	0.025	0.025
Boron	mg/L	2.5	5
Fluoride	mg/L	0.4	1
Silica	mg/L	30	35

Source: Values for the BVWSD source water represent a composite of historical laboratory test results on elevated TDS wells provided by BVWSD.

Notes:
Average of the water sample data provided by BVWSD
µS/cm = microSiemens per centimeter
< = less than
$CaCO_3$ = calcium carbonate
mg/L = milligrams per liter
N/A = not available
ppm = parts per million
TDS = total dissolved solids

Based on discussions with BVWSD, it is anticipated that the Project will pay for the improvements, but BVWSD will design, construct and operate the water supply system, which will supply the Project's water needs.

Process Water Uses

The raw water supply from BVWSD to the Project will be used for cooling tower makeup, evaporative cooling, fire water, gasification, service water, and steam generation.

Project Water Supply Facilities

Water from BVWSD will be conveyed to the Project by a pipeline that will be installed in the District's unpaved service road along the east bank of the West Side Canal.

The brackish water supply will be treated on site prior to use. Storage tanks will be used to maintain a backup supply of raw water, treated water, purified water, demineralized water, and fire water. Water storage tanks include: 0.8 million gallons (MGAL) demineralized water storage tank, 2.8 MGAL raw water storage tank, 1.9 MGAL treated water storage tank, and a 0.2 MGAL grey water storage tank. The onsite water storage that can be used if the raw water supply is interrupted is equivalent to about one day of operation at full capacity on coal or coal/petcoke feedstock. The onsite water storage is equivalent to about two days of operation on natural gas feedstock. The raw water storage tank has been sized to cover the expected time for maintenance and repair of the raw water pipeline. The raw water supply is provided by multiple wells that operate independently to supply the raw water pipeline. For this reason outages or maintenance of individual wells is not expected to have a significant impact on the raw water supply.

Project Water Treatment

Preliminary engineering indicates that BVWSD brackish water requires pre-filtration, nano filtration and some degree of ion removal prior to cooling tower and other utility use. Purified water is produced in the Wastewater Zero Liquid Discharge Unit. Additional treatment to the purified water consisting of mixed bed polishing of the ZLD unit distillate will be required to produce demineralized water for gasifier and HRSG make-up use.

Water for non-potable use (service water and fire protection) will be provided by treating the industrial supply water to appropriate quality levels by blending purified water and treated water to appropriate quality levels.

Demineralized Water

High quality water for use as boiler feedwater makeup will be produced by further treatment of ZLD distillate with mixed bed deionization.

Potable Water Supply

Potable water will be supplied by WKWD. The point of connection will be located near the intersection of State Route 119 and Tupman Road, which is southeast of the Project Site. The approximately 7-mile-long pipeline will be constructed and owned by WKWD. The pipeline route will generally follow existing roads (see Figure 2-7, Project Location Map). Construction of the pipeline will require crossing under the Outlet Canal, the KRFCC, and the California Aqueduct. The 6-inch pipeline will be installed up to 100 feet below grade using HDD under all of these crossings. Surface entry and exit pits approximately 100 feet by 200 feet will be located on the north and south sides of the Outlet Canal and the California Aqueduct (see Figure 2-8, Project Location Details in Section 2.0 (Project Description) of this Revised AFC).

Table 5.14-6, WKWD Supply Water Quality, provides a summary of recent water quality analytical data from WKWD's groundwater supply wells.

Table 5.14-6
WKWD Supply Water Quality

General	Units	Value
Conductivity	µS/cm	444
pH		7.98
Total Suspended Solids	ppm	N/A
TDS	ppm	294
Total Alkalinity	mg/L	N/A
Hardness	mg/L	90
Calcium	mg/L	33
Magnesium	mg/L	1.9
Sodium	mg/L	48
Potassium	mg/L	N/A
Bicarbonate	mg/L	135
Sulfate	mg/L	39
Chloride	mg/L	35
Nitrate-Nitrite	mg/L	1.59
Arsenic	mg/L	0.00121
Boron	mg/L	0.00014
Fluoride	mg/L	0.15
Silica	mg/L	N/A

Source: WKWD, 2007.

Notes:
Represents average water quality from WKWD's eight groundwater wells
µS/cm = microSiemens per centimeter
< = less than
$CaCO_3$ = calcium carbonate
mg/L = milligrams per liter
N/A = not available
ppm = parts per million
TDS = total dissolved solids

5.14.1.7 Project Wastewater

Wastewater Treatment and Recovery

The Project will recycle water to the maximum extent practical and will incorporate Zero Liquid Discharge (ZLD) technology; therefore there will be no wastewater discharge. Because the

Project is a ZLD facility, the wastewater is, by definition, completely recycled. The primary sources of wastewater at the Project treated and recovered in the process wastewater ZLD will be from raw water supply treatment and cooling tower blowdown. The previous Table 5.14-4, Daily and Annual Water Flows, shows the major wastewater streams and how they will be treated and recycled. Under normal operating conditions, the average wastewater treatment requirement will be approximately 1.5 mgd, and the maximum daily wastewater treatment requirement will be approximately 2.2 mgd. The cooling tower circulation water will be concentrated to the maximum practical extent. Cooling tower blowdown that cannot be recycled is sent to a plant ZLD unit where it is treated and recovered as high purity water and ZLD solids. The ZLD solids will be disposed of at an approved offsite facility in accordance with applicable laws, ordinances, regulations, and standards (LORS).

In addition, the gasifier will generate a low volume of process condensate. The process condensate may contain constituents in concentrations exceeding Resource Conservation and Recovery Act (RCRA) standards for classification as hazardous waste. Therefore, this low volume process condensate stream will be treated by a Process ZLD. The produced water will be recycled to the gasifier and the solid waste produced by the Process ZLD system will be disposed in accordance with applicable LORS.

Domestic/Sanitary Wastewater

No municipal sanitary sewer is available in the vicinity to serve the Project. The sanitary sewer system will consist of a septic collection and forwarding lift station system and holding tank designed to handle the sanitary sewer flow from the administration and control building and other restrooms, if any, located on the Project Site. The sanitary waste from the facility will be disposed of in an onsite leachfield in accordance with applicable LORS.

For purposes of designing the septic system, it is assumed that sanitary wastewater discharge rates will be based on a maximum plant population of 100 persons at 35 gpd per person in accordance with Table K-3 of the Uniform Plumbing Code for estimating sanitary wastewater flowrates.

5.14.1.8 Storm Water Runoff

Details of the Project's storm water management features are provided in Section 2.0 (Project Description) of this Revised AFC. The Project Site is relatively flat. All existing irrigation ditches within the Project Site will be abandoned and filled in to meet grade. The irrigation ditches only serve the current agricultural uses on the property and will no longer be needed once the Project Site is developed. The smaller irrigation ditches on the Project Site that serve the individual crop fields will also be abandoned and filled where not required for crop irrigation.

The Project intends to reuse stormwater runoff from the Project Site to the extent practical. All storm water runoff from the portion of the Project Site containing industrial activities will be directed to one of two lined storm water retention basins located on the Project Site (see Figure 2-36, Preliminary Storm Water Drainage Plan). The storm water retention basins will be sized to contain runoff from the Intermediate Storm Design Discharge (ISDD) five-day storm event in accordance with the Kern County Development Standards. The ISDD event is commonly referred to as the 10-year storm. The ISDD five-day storm event is similar to the volume produced during the 50-year 24-hour storm event for an impervious area. To further reduce the potential for off-site discharge, three unlined retention basins will collect stormwater runoff from non-process areas of the site. Storm water that has collected in the lined retention basins will be preferentially used for cooling tower make-up after testing to confirm suitability. Therefore, the probability of a discharge of storm water during the life of the Project is negligible. See Appendix O3, Hydrology Study, for preliminary hydrologic calculations for both pre- and post-project conditions.

5.14.2 Environmental Consequences

Project effects on water resources can be evaluated relative to significance criteria derived from the California Environmental Quality Act (CEQA) Appendix G checklist. Under CEQA, the project is considered to have a potentially significant effect on water resources if it would:

- Substantially alter the existing drainage pattern of the site or area, including the alteration of the course of a stream or river, in a manner which will result in substantial erosion or siltation on- or offsite, or in flooding on- or offsite.
- Create or contribute runoff water which will exceed the capacity of existing or planned stormwater drainage systems, or provide substantial additional sources of polluted runoff.
- Violate any water quality standards or waste discharge requirements, or otherwise substantially degrade water quality.
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there will be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells will drop to a level which will not support existing land uses or planned uses for which permits have been granted).
- Place within a 100-year flood hazard area structures that will impede or redirect flood flows.

5.14.2.1 Effect on Subbasin Water Balance

Process Water Supply

Even though the southern San Joaquin Valley has been classified by the DWR as an overdrafted groundwater basin, the BVWSD has historically been able to achieve a positive groundwater balance. Water levels in the BVWSD Buttonwillow Service Area aquifer (which includes the proposed water supply well field) have and are expected to continue to rise in response to BVWSD recharge and replenishment operations due to the partially-isolated nature of the Buttonwillow subbasin in which BVWSD is located.

Aquifer storage is approximately 7,000,000 af (Sierra Scientific Services 2009). Annual pumping for the Project may range from as low as 4,700 afy to a maximum of 7,500 afy. This amounts to 0.067 to 0.11 percent of total aquifer storage on an annual basis. The Project's annual extraction of up to 7,500 afy is part of the BVWSD's Brackish Groundwater Remediation Project which is currently planned to handle up to 12,000 afy (BVWSD EIR in progress). The Project's pumping volume would be offset by recharge from BVWSD's normal recharge and replenishment operations that maintain or increase overall aquifer storage. BVWSD has historically maintained a positive water balance and expects to maintain a positive balance of approximately 30,000 afy in the future. Overall Project-specific pumping is seen as a benefit to BVWSD in that it impedes eastward flow of poor quality groundwater and enhances westward flow of good quality groundwater.

As such, the use of impaired quality groundwater proposed by the Project will result in a less than significant impact to the subbasin water balance.

Potable Water Supply

The project will use a small amount of potable water (approximately 1 afy). This water will be supplied by WKWD. This is a very small amount of water compared to the overall water usage within the district's service area. The estimated average annual water usage is on the order of approximately 20,000 afy. The addition of the 100 personnel associated with the operation of the Project will not create significant additional demands on the potable water supply. Therefore the Project impact to potable water supplies in the area will be less than significant.

5.14.2.2 Water Level Drawdown Effects

Groundwater modeling was conducted to evaluate the potential effects of Project-specific pumping on drawdown of groundwater levels. The groundwater model documentation and results are included in Appendix O2, Groundwater Model Documentation. The groundwater model simulates probable drawdown effects associated with pumping from three of five wells located in the proposed water supply well field area (two additional wells are redundant and serve as backup wells for well maintenance and repairs). Simulated pumping rates total 4,650 gpm (i.e., 1,550 gpm per well with continuous pumping for 365 days per year for 25 years) to correspond to the maximum amount of impaired groundwater to be provided to the Project by BVWSD (i.e., 7,500 afy). The model results include simulated drawdowns in the pumping wells and at various distances from the well field. Normal BVWSD recharge activities that would offset Project-specific pumping were included in the model to simulate what would be expected during the Project lifetime. Sensitivity analyses were also performed to account for aquifer parameter uncertainties due to a lack of site-specific hydraulic data in the well field area.

The base case groundwater model results indicate that the net effect of Project-specific pumping is a cone of depression that extends approximately 1.4 miles to the north, south, and east of the well field and approximately 2.5 miles to the west of the well field. Beyond those distances drawdown is negligible, and to the north, south, and east water levels rise slightly due to BVWSD's positive water balance recharge. Maximum drawdown 0.5 mile from the pumping wells was simulated to be 5.2 feet to the east, 5.6 feet to the west, 3.9 feet to the north, and 3.9 feet to the south. Accordingly, wells within 0.5 mile of the pumping wells would be subject to greater drawdown. The model estimates the maximum drawdown at the central pumping well to be approximately 37 feet. As would be expected, drawdown decreases outward from the pumping wells, for example drawdown 200 feet east is estimated to be approximately 5.2 feet.

As noted in Section 5.14.1.4 under Groundwater Wells, there are at least 11 and as many as 20 wells located within 0.5 mile of the proposed Project water supply well field. All of these wells were located within the BVWSD's service area. Depending on location, drawdowns between 3.9 and 37 feet would be expected, but are not considered significant as this would be an acceptable operating condition for the BVWSD Brackish Groundwater Remediation Program. In fact some of the wells identified may be used as Project-specific pumping wells under the Brackish Groundwater Remediation Program.

Simulation results also indicate that maximum drawdown occurs within the first 9 years of the Project, after which overall water levels stabilize, with annual fluctuations of approximately 2 feet in response to the continued pumping cycle and 75 day annual recharge cycle. Approximately 90 percent of the drawdown would occur during the first three years of pumping, after which drawdown gradually continues to increase until maximum drawdown is reached at approximately year nine. Once Project-specific pumping stops in year 25, water levels would recover to pre-project conditions as an inverse to the above, with 90 percent recovery expected within the first three years and probably sooner as BVWSD's recharge program would be ongoing as part of their normal operations.

These groundwater modeling results are consistent with what the BVWSD has observed for high yield agricultural wells in the Buttonwillow Service area. Information provided by the BVWSD indicates that the local aquifer system is prolific, of high permeability, and yields high volumes of water to wells (typical pumping rates are 1,500 to 2,000 gpm in most of the service area agricultural wells). Personal communications with Sierra Scientific Services, indicate there has been very little pumping impact (i.e., minimal drawdown) in local agricultural wells in the vicinity of the proposed well field area. This response is similar to nearby Kern County areas already studied in detail (Sierra Scientific Services personal communications January through April 2009). Local hydrogeologic information supplied by the BVWSD based on over 40 years of observations indicates that there have been no impacts to wells in their Buttonwillow Service Area (which includes more than 200 agricultural supply wells).

Based on the modeling analysis described above, the Project's impact to water level drawdown will be less than significant.

5.14.2.3 Water Quality Effects – Groundwater

Process Water Supply

The use of impaired quality groundwater proposed by the Project will result in a less than significant impact on local groundwater quality and, in fact, will serve to improve local water quality during the project lifetime.

BVWSD will provide impaired quality groundwater from existing and/or new wells (that comprise a well field) located in the elevated TDS area as shown on Figure 5.14-10. Extraction of water from the line of wells (i.e., picket fence well field) is directed toward impeding eastward flow of high TDS groundwater from the shallow aquifer system (first water up to 400 feet below grade) while locally shifting the water quality divide in the eastern part towards the western part of the BVWSD's service area. Groundwater modeling (Appendix O2, Groundwater Model

Documentation) indicates that the net movement of groundwater is about 0.8 mile towards the well field for the 25-year lifetime of the Project. This project-specific pumping would also remove considerable volumes of TDS from the local groundwater system. Figure 5.14-14, TDS Concentration vs. Mass Removal Data, illustrates TDS mass removal in US tons per year for a range of TDS concentrations and pumping rates. For example, if the average TDS concentration is 2,000 mg/L, the estimated amount of TDS that would be removed from the aquifer would range from approximately 13,000 tons/year at a pumping rate of 4,700 afy to approximately 21,000 tons/year at the maximum pumping rate of 7,500 afy.

Use of the brackish groundwater for the Project would remove salts from the aquifer, thereby improving the aquifer's water quality. As a result, the Project will facilitate efforts by the BVWSD to improve local groundwater quality and agriculture. Therefore, the proposed use of the brackish groundwater will beneficially affect local groundwater quality and the Project's impacts to water quality will be less than significant.

Project Construction

Construction, operation, or maintenance of the facility could potentially affect groundwater quality through inadvertent spills or discharge that could then infiltrate and percolate down to groundwater. The Project Site is underlain by approximately 10 feet of clay, which would impede migration of any inadvertent spills to groundwater. Estimated depth of site excavation for the proposed Project is up to 40 feet. Excavation dewatering during construction is not anticipated since the depth to groundwater at the site is approximately 40 to 100 feet below grade. Due to the depth to groundwater, the Project is not expected to degrade groundwater and the impact to groundwater quality is less than significant.

Project Operation

The septic system will be designed and constructed in accordance with Kern County and the Central Valley Water Quality Control Board (CVWQCB) requirements, which will require the system to be protective of groundwater supplies. Current standards are provided in "Standards and Rules and Regulations for Land Development, Sewage Disposal, Water Supply and Preservation of Environmental Health" (KCEHSD 2008). No impacts to groundwater are anticipated. The design and operation of the septic system will comply with applicable LORS. Therefore, impacts to groundwater will be less than significant.

5.14.2.4 Water Quality Effects – Surface Water

Construction, operation, or maintenance of the Project could affect surface water quality of nearby canals through inadvertent spills or discharges. Construction activities could also increase the potential for erosion and uncontrolled runoff of stormwater contaminated with sediments or other pollutants that could impact surface water quality and sedimentation. The existing topography at the Project Site and vicinity is shown on Figure 2-7, Project Location Map and Figure 5.14-1. The preliminary site drainage and grading plans of the proposed facility after construction are shown on Figures 2-36, Preliminary Storm Water Drainage Plan and 2-41, Preliminary Grading Plan. Best management practices (BMPs) such as silt and hay bales will be used during construction to minimize the potential for erosion. A construction SWPPP will be prepared and implemented in accordance with the General Permit for Construction Activities. With implementation of Project design elements, and mitigation measures proposed in Section 5.14.4.2, the impacts to surface water quality will be less than significant.

For portions of pipelines that cross the West Side Canal, the Outlet Canal, the KRFCC, and the California Aqueduct, the HDD installation method will be used. Best management practices (BMPs) for HDD would include silt fencing around the drill sites, energy dissipation devices for discharging water from hydrostatic testing of the pipeline, selecting drilling fluids for environmental compatibility, and removing spent fluids from the areas immediately adjacent to the aqueduct and canals for safe disposal and to prevent potential discharge of pollutants into the waterways. In addition, soil erosion control measures to prevent runoff and impacts to water quality would be implemented. Therefore, the Project's impacts to surface waters will be less than significant.

Hydrotest water will be reused to test various Project equipment and piping features to the extent practicable. After all testing has been complete; the test water will be discharged to upland areas, to canals, or returned back to the source from which it was obtained. The water would be sampled prior to discharge and dispersed by an energy dissipation device to minimize erosion. Water discharged over land will be directed through containment structures such as hay bale structures and filter bags. The discharge rate will be regulated using valves and energy dissipation devices to prevent erosion, and the discharge will be monitored for residual materials being flushed from the tested pipe. Tie-in locations will be cleaned and restored after hydrostatic testing. The hydrotest water will not be stored in the pipes or tanks for an extended period of time. As such, no chemicals will be added to the test water during hydrostatic testing; therefore, it is expected that the quality of the test water will be similar to the quality of the source water. If hydrotest water is discharged to a canal, the duration and quality of the discharge will comply with applicable LORS. Therefore, impacts to surface waters will be less than significant.

The Project will be constructed such that runoff from industrial activities will be contained in a retention basin and infiltrated and/or reused at the Project Site. As there will not be any storm water discharges from industrial activities to waters of the United States, the Project will not be required to obtain coverage under the General Industrial Activity Storm Water Permit. Wastewaters will be discharged to ZLD facilities. Therefore, there will be no discharges to surface waters and no impacts to surface water quality.

5.14.2.5 Flooding

The Project Site is not located in a designated floodplain. The Project Site will be graded, as shown on Figure 2-41, Preliminary Grading Plan, to promote drainage to prevent onsite flooding. Stormwater runoff from onsite areas will be retained and reused, therefore, the volume of runoff leaving the site will be less than for existing conditions. No significant impacts related to flooding are expected as a result of the Project.

The potable water supply pipeline and natural gas pipeline, which will be co-located, as well as the carbon dioxide pipeline, will cross through a FEMA-designated floodplain area. All of these pipelines will be buried and installed at the canal crossings using the HDD method. Therefore, there will be no impacts to floodplains.

Portions of the Project Site will be graded and pads will be constructed a few feet above existing grade. As such, the Project's plant and equipment will be situated at an elevation above the USACE's hypothetical predictions of inundation due to a failure of Isabella Dam. Therefore, impacts due to a hypothetical dam failure flood will be less than significant.

5.14.3 Cumulative Impacts Analyses

Groundwater

The proposed water supply is consistent with the industrial beneficial use established for groundwater in the Kern River Valley in the Basin Plan adopted by the Central Valley Regional Water Quality Control Board (CVRWQCB 2004). Withdrawal of impaired quality groundwater to alleviate impacts on agriculture is consistent with the Drainage Control and Irrigation Conservation Programs described in the BVWSD Groundwater Management Plan (Boyle Engineering 2002) and is part of BVWSD's BGRP, which provides benefits for BVWSD's Buttonwillow Service Area.

The process water supply for the Project will consist of groundwater of impaired quality. Drawdown (lowered water levels) in response to pumping at the proposed water supply well field area will be localized around the well field itself and normal BVWSD recharge activities would offset project-specific pumping.

Overall Project-specific pumping is seen as a benefit to BVWSD in that it impedes eastward flow of poor quality groundwater, enhances westward flow of good quality groundwater, and removes a significant volume of TDS/Salts from the local aquifer system. The Project also would use groundwater that other users do not want and find objectionable for their needs. As such there is no cumulative impact expected, but rather a regional benefit.

Surface Water

Other reasonably foreseeable development projects could also result in temporary and permanent impacts to water quality and potentially exceed applicable water quality standards. Temporary impacts may result from land clearing, site disturbance, and grading associated with construction activities. Typical construction impacts include increased erosion, sediment transport, siltation, and on-site storage and use of lubricants and fuels. Temporary construction impacts could be minimized through use of project-specific BMPs and applicable federal, state, and local construction mitigation guidelines. Permanent water quality impacts could result from stormwater runoff from newly constructed impervious surfaces associated with agricultural, commercial and residential developments. Each development project would be expected to comply with applicable state regulations that require on-site attenuation and treatment of stormwater.

In summary, the cumulative development projects have potential to generate water quality impacts. However, it is expected that existing programs, policies, and regulatory requirements would prevent and/or minimize the potential water quality impacts to a level below a substantial impact. The limited water quality impacts associated with construction activities for the Proposed

Project, when compared to potential impacts of other development projects, are not expected to lead to substantial cumulative water quality impacts.

5.14.4 Mitigation Measures

This section discusses mitigation measures proposed by the Applicant that will be implemented to ensure that project-related impacts to water resources are less than significant.

5.14.4.1 Groundwater

As discussed above, the evaluation of water resources impacts considered both the occurrence and the quality of water in the area. For the occurrence of groundwater in the Project Site area and the proposed water supply well field area, the Project will have no significant impact on the depth to water in the aquifer, or water resources as a result of the drawdown caused by pumping of the aquifer system. Furthermore, the Project will not have any negative effect on the quality of groundwater in the area. In fact, the Project will have a net positive effect on groundwater quality and agricultural activity. The process water supply to the Project will consist of brackish groundwater. The BVWSD is a local water district with shallow brackish groundwater sources that are less than ideal for agricultural or drinking use without treatment. The brackish groundwater is found in the local aquifer and causes negative impacts on agriculture. Project consumption of the brackish groundwater will beneficially affect local groundwater quality and agriculture consistent with the BVWSD Groundwater Management Plan.

Thus, no mitigation is required for groundwater resources.

5.14.4.2 Surface Water

As discussed above in Section 5.14.2.4, no impacts to surface waters are anticipated due to the Project. However, the Project will implement the following best management practices to ensure that impacts to surface water are less than significant.

WR-1: Soil and Water 2: General Construction Activity Storm Water Permit

Prior to beginning any clearing, grading, or excavating activities associated with Project construction, and as required by the General Construction Activity Storm Water Permit, the Project will develop and implement an SWPPP prepared under the requirements of the General Construction Activity Storm Water Permit.

Verification

At least 30 days prior to the start of construction, the Applicant will submit a draft Construction Phase SWPPP to the Compliance Project Manager (CPM) for review and comment. Two weeks prior to the start of construction, the Applicant will submit to the CPM a copy of the final Construction Phase SWPPP for review and approval. The final SWPPP shall contain all the elements of the draft plan with changes made to address staff comments and the final design of the Project. Approval of the plan by the CPM must be received prior to the initiation of any clearing, grading, or excavation activities associated with Project construction.

WR-2: Erosion Control and Revegetation Plan

Prior to beginning clearing, grading, or excavation activities associated with Project construction, the Applicant shall submit an Erosion Control and Revegetation Plan to the CPM for approval. The final plan shall contain all the elements of the draft plan with changes made to address the final design of the Project.

Verification

One month prior to the initiation of any clearing, grading, or excavation activities associated with Project construction, the Applicant will submit the final Erosion Control and Revegetation Plan to the CPM for review and approval. Approval of the plan by the CPM must be received prior to the initiation of any clearing, grading, or excavation activities associated with Project construction.

5.14.5 Laws, Ordinances, Regulations, and Standards

The construction and operation of the Project will be in accordance with all applicable LORS relating to water resources. Applicable LORS are discussed in this section and are summarized in the following Table 5.14-7, Summary of LORS – Water Resources.

5.14.5.1 Federal Authorities and Administering Agencies

Clean Water Act of 1977 (including 1987 amendments) §402; 33 United States Code §1342; 40 Code of Federal Regulations Parts 122 – 136

The Clean Water Act (CWA) requires a National Pollutant Discharge Elimination System (NPDES) permit for any discharge of pollutants from a point source to Waters of the United States. This law and its regulations apply to storm water and other discharges into Waters of the United States. The CWA requires compliance with a general construction activities permit for the discharge of storm water from construction sites disturbing 1 acre or more. This federal permit requirement is administered by the State Water Resources Control Board (SWRCB), but designated to the Regional Water Quality Control Board (RWQCB).

Construction activities at the Project Site will be performed in accordance with a Construction Phase SWPPP and associated monitoring plan that is required in accordance with the NPDES General Permit for Storm Water Discharges Associated with Construction Activities issued by the SWRCB. The SWPPP will include control measures including best management practices (BMPs) to reduce erosion and sedimentation as well as other pollutants associated with vehicle maintenance, material storage and handling, and other activities occurring at the Project Site.

Clean Water Act §311; 33 United States Code §1342; 40 Code of Federal Regulations Parts 122 – 136

This portion of the CWA requires reporting of any prohibited discharge of oil or hazardous substance. The Project will conform by proper management of oils and hazardous materials both during construction and operation. The administering agency is the Central Valley RWQCB and the California Department of Toxic Substances Control (DTSC).

5.14.5.2 State Authorities and Administering Agencies

Water Code Section 13552.6

This portion of the California Water Code (CWC) relates to the use of potable domestic water for cooling towers. Use of potable domestic water for cooling towers is unreasonable if a suitable non-potable source, including recycled water or brackish groundwater, is available. The Project will use a brackish groundwater supply in compliance with this requirement. SWRCB Resolution No. 75-58 addresses this issue; the administering agency is the Central Valley RWQCB (see Table 5.14-7, Summary of LORS – Water Resources).

Table 5.14-7
Summary of LORS – Water Resources

LORS	Applicability	Conformance and Timing
Federal		
CWA §402; 33 USC §1342; 40 CFR Parts 110, 112, 116	Requires NPDES permits for construction and industrial storm water discharges. Requires preparation of an SWPPP and Monitoring Program.	Project proposes to retain and re-use industrial storm water discharges... As such, the Project would comply with the zero discharge exemption under the NPDES industrial storm water permit. NOI for coverage under NPDES construction storm water permit will be filed prior to construction and power plant operation. An SWPPP will also be prepared for construction activity.
CWA §311; 33 USC §1342; 40 CFR Parts 122-136	Requires reporting of any prohibited discharge of oil or hazardous substance.	The Project will conform by proper management of oils and hazardous substances both during construction and operation.
State		
CWC §13552.6	Use of potable domestic water for cooling towers is unreasonable use if suitable recycled water is available.	Project has determined that brackish groundwater is feasibly available in the vicinity of the Project Site at this time and will be utilized for cooling tower make-up.
California Constitution Article 10 §2	Avoid the waste or unreasonable uses of water. Regulates methods of use and diversion of water.	Project includes appropriate water conservation measures, both during construction and operation (e.g., ZLD). The Project will comply with this requirement as well as SWRCB Resolution No. 75-58.
SWRCB, Resolution No. 75-58	Addresses sources and use of cooling water supplies for power plants which depend on inland waters for cooling and in areas subject to general water shortages.	Project has determined that brackish water is feasibly available at the site at this time and will be used for cooling water supply.

Table 5.14-7
Summary of LORS – Water Resources (Continued)

LORS	Applicability	Conformance and Timing
Porter-Cologne Water Quality Act of 1972; CWC §13000-14957, Division 7, Water Quality	Requires state and RWQCBs to adopt water quality initiatives to protect state waters. Those criteria include identification of beneficial uses, and narrative and numerical water quality standards.	Project will conform to applicable state water standards, both qualitative and quantitative, prior to power plant operation. Use of brackish groundwater for industrial supply is consistent with designated beneficial use.
Title 22, CCR	Addresses the use of recycled water for cooling equipment.	Project proposes to use treated brackish groundwater for cooling tower make-up. Sufficient quantities of recycled water supply are not available. Project proposes to recycle cooling tower circulation water and process condensate from gasification to the maximum extent practicable. The Project uses ZLD technology to recycle plant wastewater to the maximum extent possible.
The Safe Drinking Water and Toxic Enforcement Act of 1986 (proposition 65), Health and Safety Code 25241.5 *et seq.*	Prohibits the discharge or release of chemicals known to cause cancer or reproductive toxicity into drinking water sources.	Project will conform to all state water quality standards, both qualitative and quantitative.
CWC Section 461	Encourages the conservation of water resources and the maximum reuse of wastewater, particularly in areas where water is in short supply.	Project proposes to use treated brackish groundwater for cooling tower make-up. The Project uses ZLD technology to recycle plant wastewater to the maximum extent possible. Project proposes to recycle cooling tower circulation water and process condensate from gasification to the maximum extent practicable.
California Public Resources Code §25523(a); 20 CCR §§1752, 1752.5, 2300 – 2309, and Chapter 2 Subchapter 5, Article 1, Appendix B, Part (1)	The code provides for the inclusion of requirements in the CEC's decision on an AFC to assure protection of environmental quality and requires submission of information to the CEC concerning proposed water resources and water quality protection.	The Project will comply with the requirements of the CEC to assure protection of water resources.
CWC §§13271 – 13272; 23 CCR §§2250 – 2260	Reporting of releases of reportable quantities of hazardous substances or sewage and releases of specified quantities of oil or petroleum products.	Project will conform to all state water quality standards, both qualitative and quantitative.
CWC § 13260 – 13269; 23 CCR Chapter 9	Requires the filing of a Report of Waste Discharge (ROWD) and provides for the issuance of WDRs with respect to the discharge of any waste that can affect the quality of the waters of the state.	An NOI will be filed for coverage under the NPDES General Construction Permit. Otherwise, there will be no discharges to waters of the state.

Table 5.14-7
Summary of LORS – Water Resources (Continued)

LORS	Applicability	Conformance and Timing
CEQA, Public Resources Code §21000 *et seq*.; CEQA Guidelines, 14 CCR §15000 *et seq*.; Appendix G	The CEQA Guidelines (Appendix G) contain definitions of projects which can be considered to cause significant impacts to water resources.	The Project will comply with the requirements of the CEC to assure protection of water resources.
Local		
Kern County General Plan-Land Use Element: Resource Goals, Objectives, and Policies Policy LU 1.9.11	Minimize the alteration of natural drainage areas. Require development plans to include necessary mitigation to stabilize runoff and silt deposition through utilization of grading and flood protection ordinances.	The Project will implement BMPs, including erosion control measures and will comply with the Kern County Grading Ordinance 17.28.
Kern County General Plan-Land Use Element: Resource Goals, Objectives, and Policies Policy LU 1.9.20	Areas along rivers and streams will be conserved where feasible to enhance drainage, flood control, recreation, and other beneficial uses while acknowledging existing land use patterns.	The Project will not impact canal levees and will not discharge into the canals. The Project Site is not located in a floodplain. The Project will not increase stormwater runoff offsite and therefore will not contribute to offsite flooding.
Kern County General Plan-Land Use Element: Resource Goals, Objectives, and Policies Policy LU 1.10.6.34	Ensure that adequate water storage, treatment, and transmission facilities are constructed concurrently with Plan.	The Project includes water supply pipelines, storage tanks and water treatment facilities.
Kern County General Plan-Land Use Element: Resource Goals, Objectives, and Policies Policy Public Facilities and Services-Policy 1.4.5	Ensure that adequate supplies of quality (appropriate for intended use) water are available to industrial users.	BVWSD will provide the Project with brackish water for process uses.
Kern County General Plan-Land Use Element: Resource Goals, Objectives, and Policies Policy Public Facilities and Services-Policy 1.4.6	Provide a healthful and sanitary means of collecting, treating, and disposing of sewage and refuse.	The Project will have an onsite septic system constructed, designed and operated in accordance with Kern County and RWQCB requirements.
Kern County Zoning Ordinance 14.08	Provides standards and requirements for the design, construction, reconstruction, abandonment, and destruction of wells. The administering agency for the above authority is Kern County.	Any existing onsite wells will be abandoned or destroyed in accordance with Kern County requirements.

Table 5.14-7
Summary of LORS – Water Resources (Continued)

LORS	Applicability	Conformance and Timing
Kern County Zoning Ordinance 17.28	Sets forth rules and regulations to control excavation, grading and earthwork construction, including fills and embankments; establishes the administrative procedure for issuance of permits; and provides for approval of plans and inspection of grading construction.	The Project will obtain a grading permit.
Kern County Zoning Ordinance 17.48	Restricts or prohibits uses which are dangerous to health, safety, and property loss due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities; requires that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction; controls the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel flood waters; controls filling, grading, dredging, and other development which may increase flood damage; and prevents or regulates the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards in other areas.	The Project is not in a floodplain and will not increase stormwater discharges offsite. Pipeline crossings that cross the Kern River Flood Channel will be constructed using the HDD method and will not impede flood flows or impact floodplains.

Source: HECA Project.

Notes:
CCR = California Code of Regulations
CEC = California Energy Commission
CEQA = California Environmental Quality Act of 1970
CFR = Code of Federal Regulations
CWA = Clean Water Act
CWC = California Water Code
HECA = Hydrogen Energy California
LORS = laws, ordinances, regulations, and standards
N/A = not applicable
NOI = Notice of Intent
NPDES = National Pollutant Discharge Elimination System
RWQCB = Regional Water Quality Control Board
SWPPP = storm water pollution prevention plan
SWRCB = State Water Resources Control Board
USC = United States Code

State Water Resources Control Board, Resolution No. 75-58 (18 June 1975)

SWRCB prescribes state water policy on the use and disposal of inland water used for power plant cooling. A discussion of this resolution as it applies to the Project is presented in the Chapter 6 Alternatives of this Revised AFC. The administering agencies for this resolution are the SWRCB and the Central Valley RWQCB.

California Porter-Cologne Water Quality Control Act 1998; California Water Code § 13000 – 14957; Division 7, Water Quality

The Porter-Cologne Water Quality Control Act authorizes the state to develop and implement a statewide program for the control of the quality of all waters of the state. The Act establishes the SWRCB and nine RWQCBs as the principal state agencies with primary responsibility for the coordination and control of water quality. Under §13172, siting, operation, and closure of waste disposal sites are regulated. The SWRCB requires classification of the waste and the disposal site. Discharges of waste must comply with the groundwater protection and monitoring requirements of RCRA of 1976, as amended (42 United States Code [USC] Section 6901 *et seq.*), and any federal acts which amend or supplement RCRA, together with any more stringent requirements necessary to implement this revision or Article 9.5 (commencing with Section 25208) of Chapter 6.5 of Division 20 of the Health and Safety Code. The Project will comply with the regulations set forth in this Act.

The administering agencies for the above authority are the CEC, SWRCB, and the Central Valley RWQCB.

Title 22, California Code of Regulations Division 4, Chapter 3.

This regulation requires maximum use of reclaimed water in the satisfaction of requirements for beneficial uses of water. The Project satisfies this requirement in that it complies with the Central Valley Region Basin Plan's designated beneficial uses for local groundwater. It also meets this requirement as it relates to SWRCB Resolution No. 75-58. The administering agency is the Central Valley RWQCB.

California Public Resources Code §25523(a); 20 California Code of Regulations §§1752, 1752.5, 2300 – 2309 and Chapter 2 Subchapter 5 Article 1, Appendix B, Part (1)

The code provides for the inclusion of requirements in the CEC's decision on an AFC to assure protection of environmental quality and requires submission of information to the CEC concerning proposed water resources and water quality protection. The administering agency for the above authority is the CEC.

California Water Code §§13271 – 13272; 23 CCR §§2250 – 2260

These code sections require reporting of releases of specified reportable quantities of hazardous substances or sewage (§13272), when the release is into, or where it will likely discharge into, waters of the state. For releases into or threatening surface waters, a "hazardous substance" and its reportable quantities are those specified at 40 Code of Federal Regulations (CFR) §116.5, pursuant to §311(b)(2) of the CWA, 33 USC §1321(b)(2). For releases into or threatening groundwater, a "hazardous substance" and its reportable quantities are those specified at 40 CFR §116.5, pursuant to §311(b)(2) of the CWA, 33 USC §1321(b)(2). For releases into or threatening groundwater, a "hazardous substance" is any material listed as hazardous pursuant to the California Hazardous Waste Control Act, Health and Safety Code §§25100 – 2520.24, and the reportable quantities are those specified at 40 CFR Part 302. Although such releases are not anticipated, the Project will comply with the reporting requirements.

The administering agencies for the above authority are the Central Valley RWQCB and the California Office of Emergency Services.

California Water Code §13260 – 13269; 23 California Code of Regulations Chapter 9

The code requires the filing of a Report of Waste Discharge (ROWD) and provides for the issuance of WDRs with respect to the discharge of any waste that can affect the quality of the waters of the state. The WDRs will serve to enforce the relevant water quality protection objectives of the Central Valley Region Basin Plan and federal technology-based effluent standards applicable to the Project. With respect to potential water pollution from construction activities, the WDRs may incorporate requirements based on the CWA §402(p) and implementing regulations at 40 CFR Parts 122 *et seq*., as administered by the Central Valley RWQCB. The administering agency for the above authority is the Central Valley RWQCB.

California Environmental Quality Act, Public Resources Code §21000 et seq.; CEQA Guidelines, 14 California Code of Regulations §15000 et seq.; Appendix G

The California Environmental Quality Act (CEQA) Guidelines (Appendix G) contain definitions of projects that can be considered to cause significant unmitigated impacts to water resources. The Project is not expected to cause significant impacts to water resources, as described in Section 5.14.2, Environmental Consequences. The administering agency of the above authority is the CEC.

5.14.5.3 Local Authorities and Administering Agencies

The primary source of water supply will be provided by the BVWSD. This supply will be provided in accordance with the terms and conditions of the water supply agreement provided in Appendix O1, Water Resources Information.

Kern County General Plan

The Kern County General Plan provides guidance on the types of development activity and allowable uses within the county limits. In particular the Land Use element pertains to the protection and management of groundwater and surface water resources within the county (Kern County Planning Department 2007). The administering agency for the above authority is Kern County.

Kern County Zoning Ordinance Title 14 Utilities, Chapter 14.08 Water Supply Wells

Provides standards and requirements for the design, construction, reconstruction, abandonment, and destruction of wells. The administering agency for the above authority is Kern County.

Kern County Zoning Ordinance Title 17 Building and Construction, Chapter 17.28 Grading Code

Sets forth rules and regulations to control excavation, grading and earthwork construction, including fills and embankments; establishes the administrative procedure for issuance of permits; and provides for approval of plans and inspection of grading construction. The administering agency for the above authority is Kern County.

Kern County Zoning Ordinance Title 17 Building and Construction, Chapter 17.48 Floodplain Management

Restricts or prohibits uses which are dangerous to health, safety, and property loss due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities; requires that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction; controls the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel flood waters; controls filling, grading, dredging, and other development which may increase flood damage; and prevents or regulates the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards in other areas. The administering agency for the above authority is Kern County.

5.14.5.4 Industry Codes and Standards

With regards to water resources and the related Project facilities, including pipelines, sewers, and other facilities, all construction will be in compliance with LORS mentioned in this report section or state and local building codes.

5.14.5.5 Involved Agencies and Agency Contacts

See the following Table 5.14-8, Agency Contacts, for agency contacts.

Table 5.14-8
Agency Contacts

Agency	Contact	Title	Telephone/Email
California Regional Water Quality Control Board, Central Valley Region 1685 E Street Fresno, CA 93706	Doug Patteson	Senior Water Resource Control Engineer	(559) 445-5146
West Kern Water District 800 Kern Street PB Box 1105 Taft, CA 93268-1105	J.D. Bramlet	Associate Manager	(661) 763-3151
Buena Vista Water Storage District 525 North Main Street PO Box 756 Buttonwillow, CA 93206	Dan Bartel	District Manager	(661) 324-1101

5.14.6 Permits Required and Permit Schedule

The water-related permits that are required for the Project are identified in Table 5.14-8, Agency Contacts, Summary of LORS – Water Resources. The timing for the preparation of each permit is noted in Table 5.14-7. These permits include:

- General Construction Activity Storm Water Permit. Notice of Intent (NOI) to comply with this general permit to be prepared and submitted to the SWRCB at least 2 weeks prior to the start of Project operation.
- Draft of Construction Activity SWPPP to be prepared and submitted to CPM at least 30 days prior to the start of construction for review and comment. A final plan to be submitted to the CPM no later than 2 weeks prior to the start of construction.

5.14.7 References

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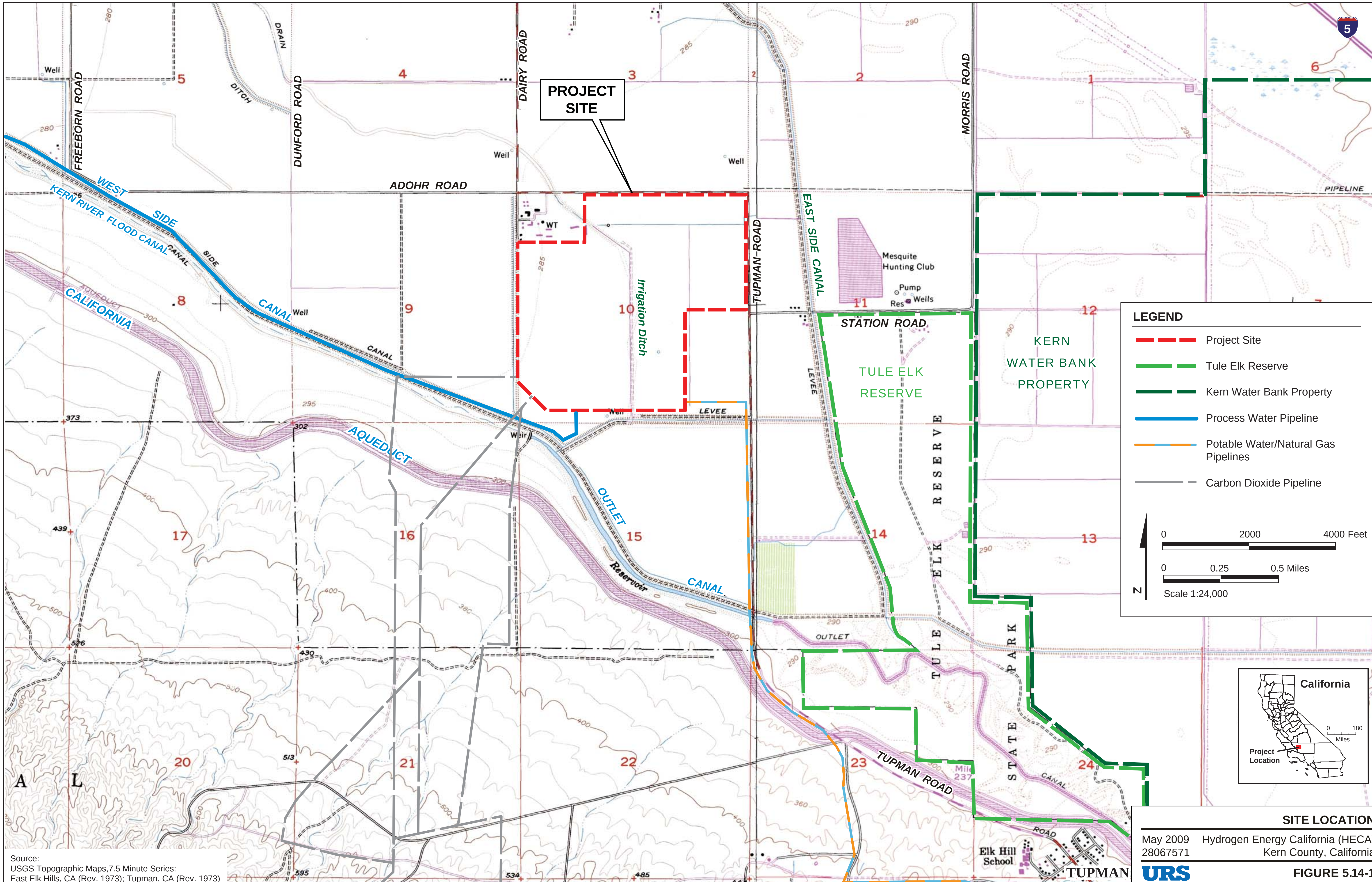


Source:
USGS Topographic Maps,7.5 Minute Series:
East Elk Hills, CA (Rev. 1973); Tupman, CA (Rev. 1973)

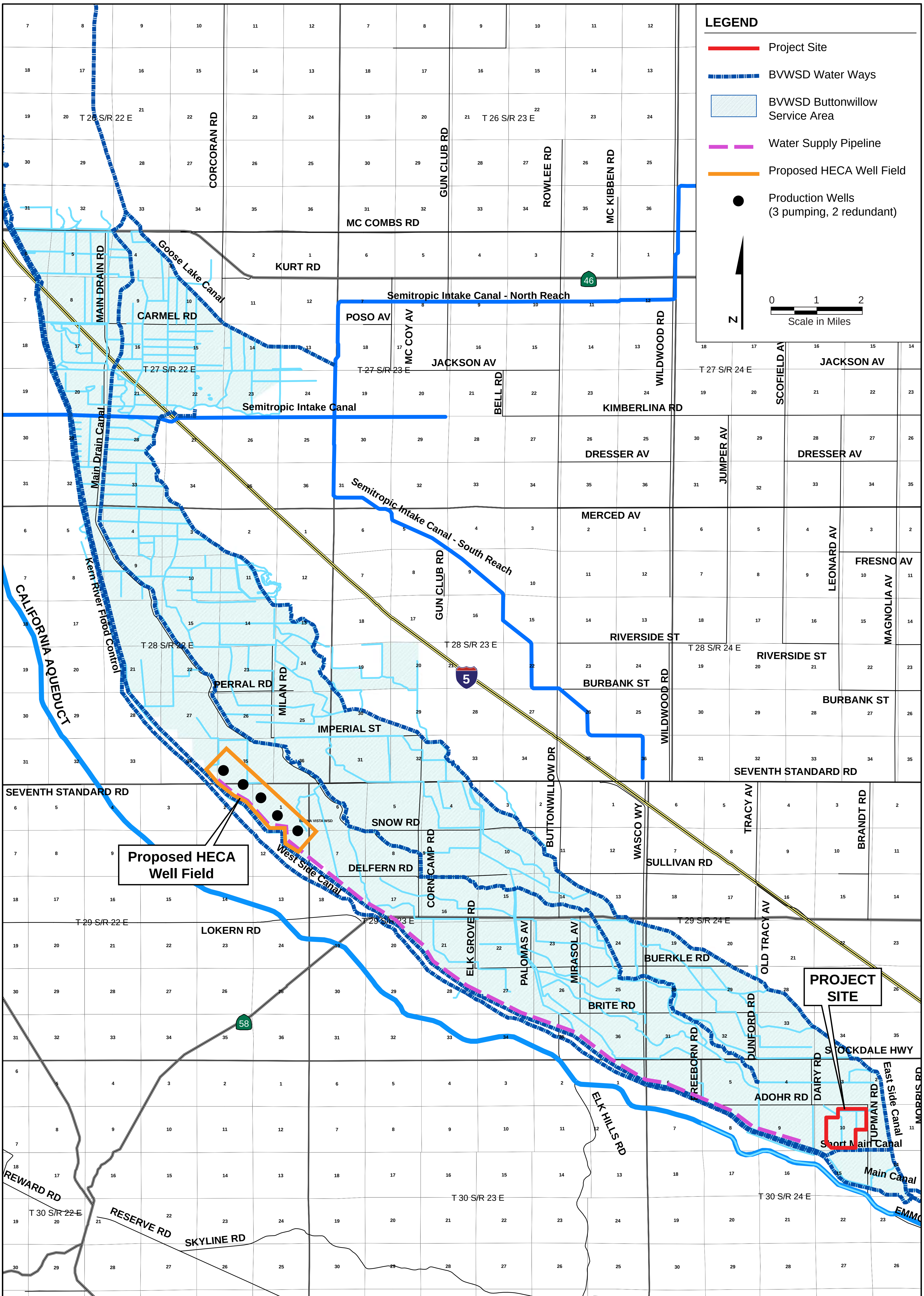
SITE LOCATION

May 2009 Hydrogen Energy California (HECA)
28067571 Kern County, California

URS

FIGURE 5.14-1

5/21/09 vsa..T:\HECA\GRAPHICS\5.14 Water\5.14-1_site loc_usgs_052109.ai



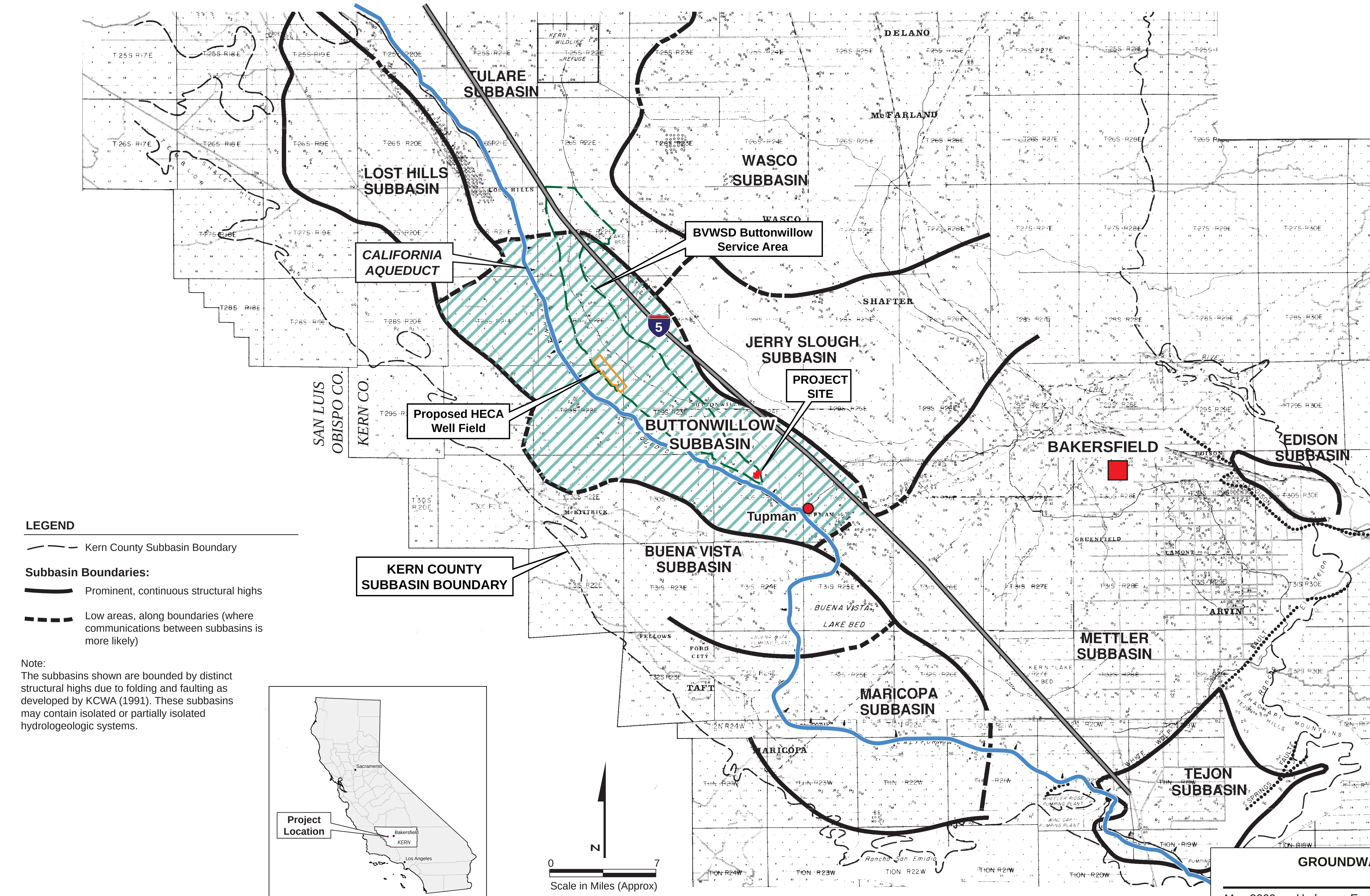
WATER SUPPLY WELL FIELD LOCATION

May 2009 Hydrogen Energy California (HECA)
28067571 Kern County, California

URS

FIGURE 5.14-2

4/30/09 vsa..T:\HECA\GRAPHICS\5.14 Water\5.14-2_well field loc.ai



Source:
Kern County Water Agency, 1991

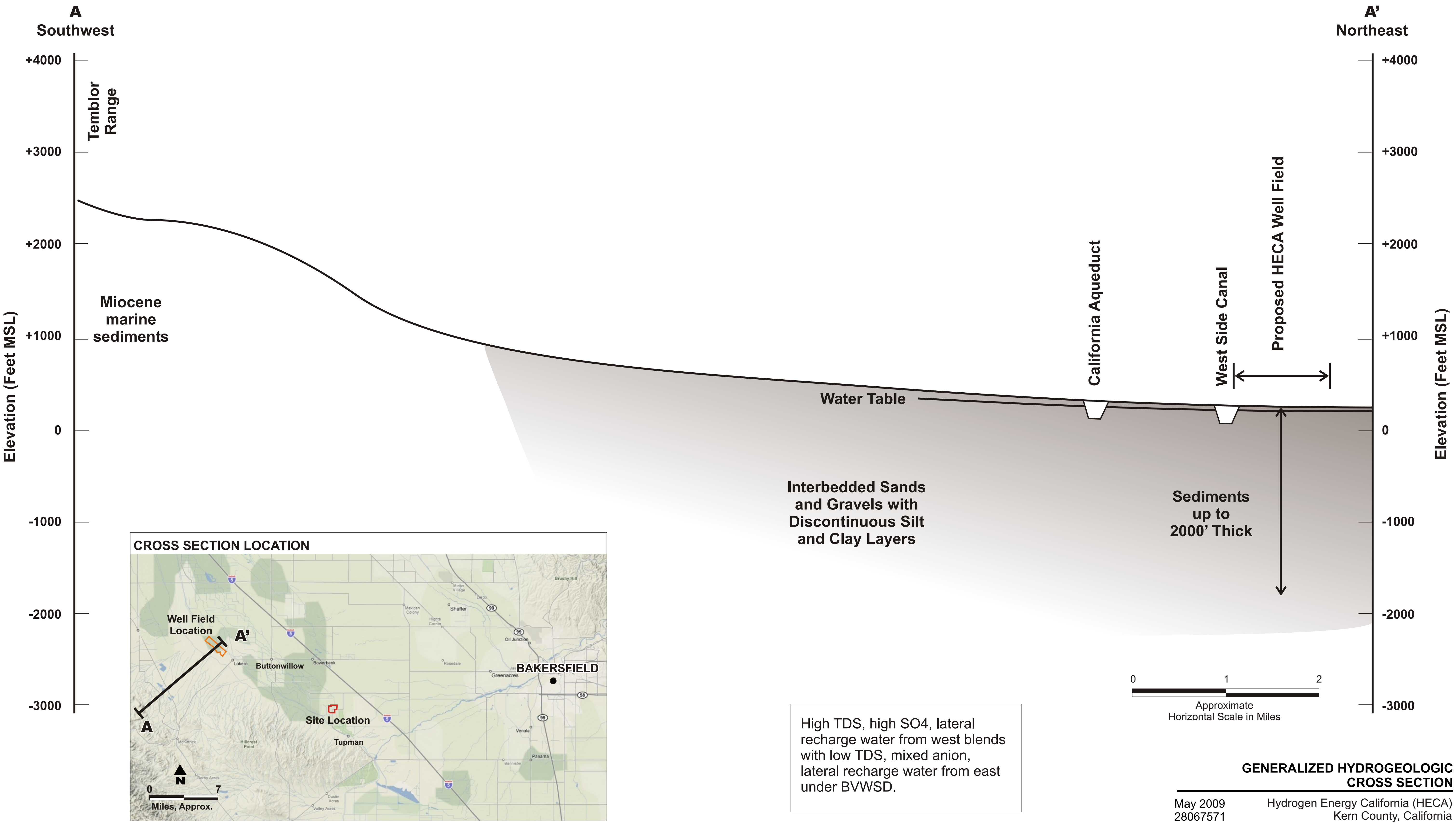
GROUNDWATER SUBBASINS IN KERN COUNTY

May 2009 | Hydrogen Energy California (HECA)
28067571 | Kern County, California

URS

FIGURE 5.14-3

5/15/09 vsa..T:\HECA\GRAPHICS\5.14 Water\5.14-3_subbasins-kern.ai



GENERALIZED HYDROGEOLOGIC CROSS SECTION

May 2009
28067571

Hydrogen Energy California (HECA)
Kern County, California

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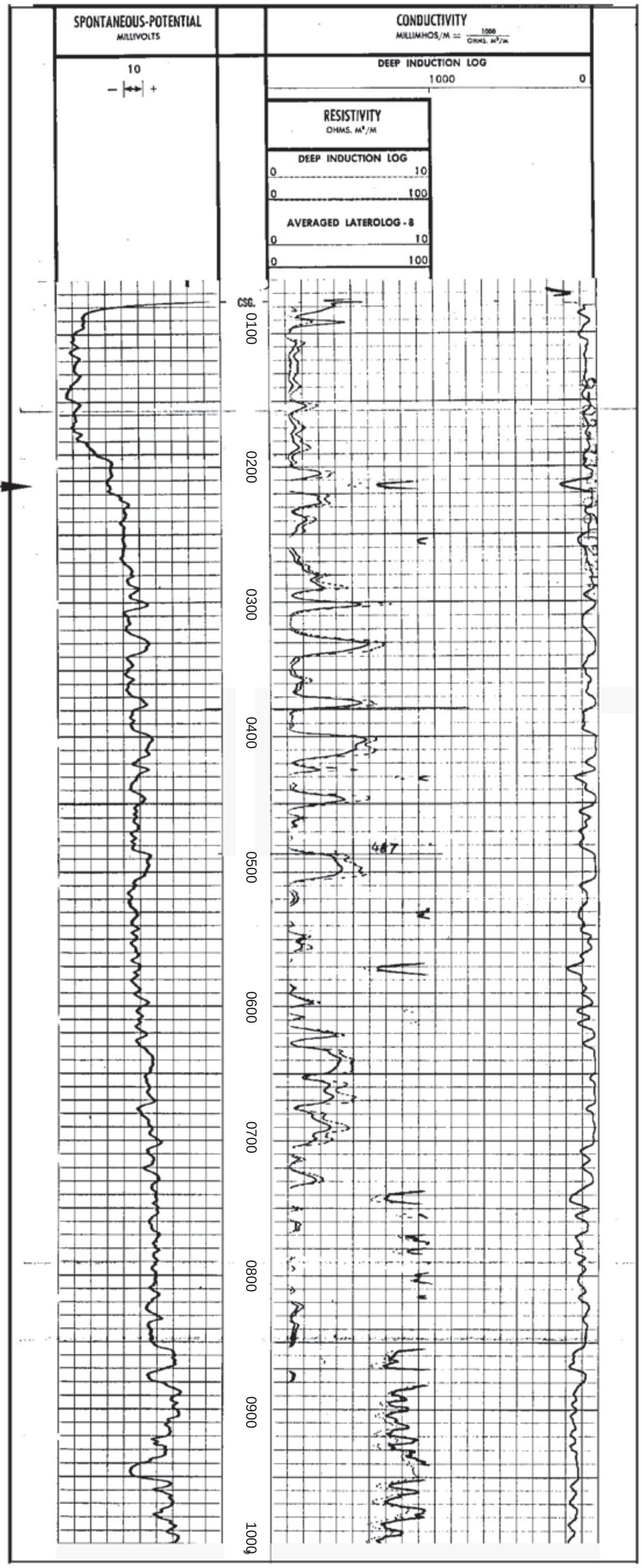
FIGURE 5.14-4

4/28/09 hk/vsa ..T:\HECA\GRAPHICS\5.14 Water\5.14-4_gen cross-section AA.cdr

Greater proportion of sand or coarser-grained material

Proportion of coarse-grained material decreases with depth



Notes:

1. Well log is for Mobil-Gulf-Tupman-USL #1-10 located in T28S-R23E-10N.
2. Depths are in feet below ground surface.

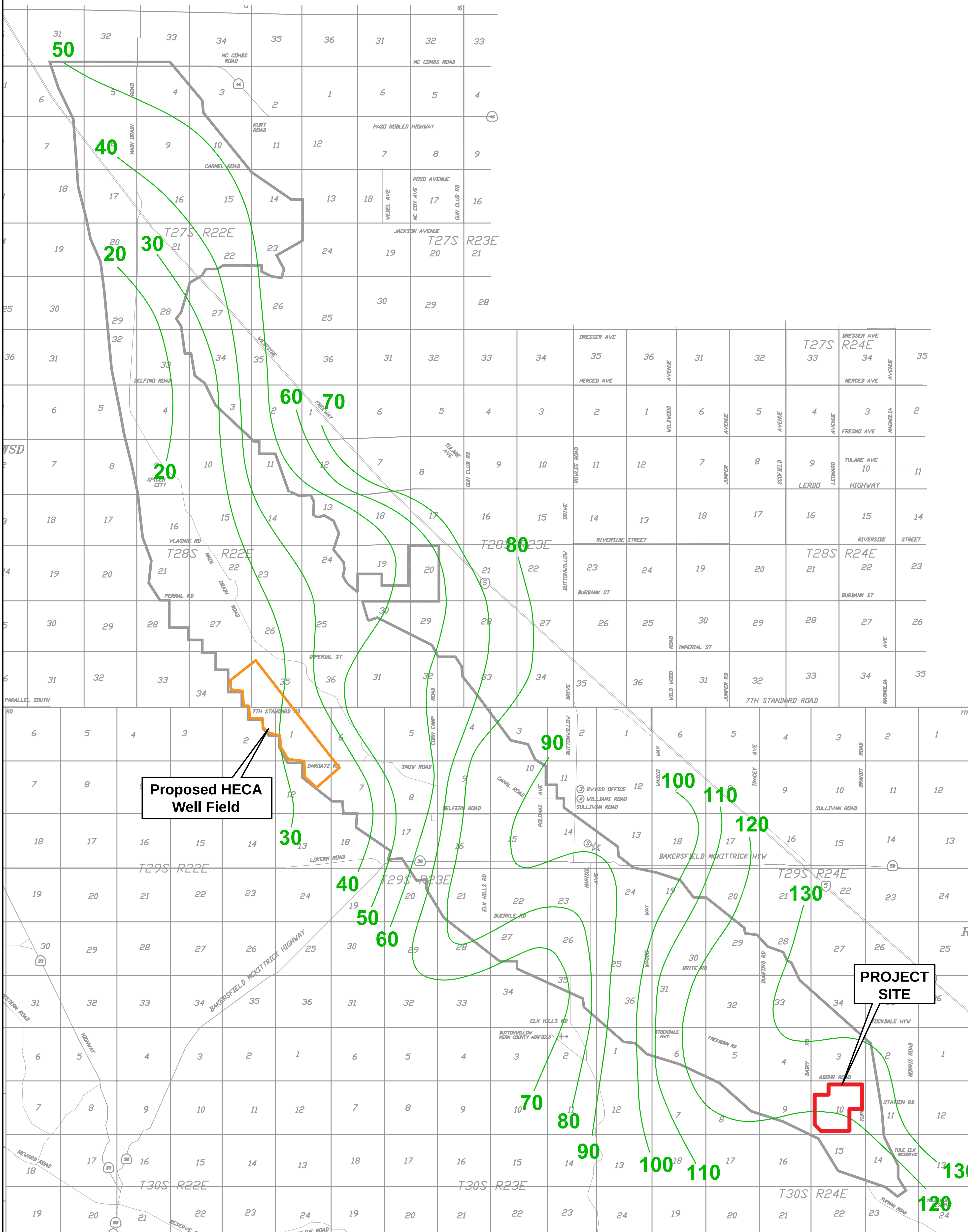
EXAMPLE GEOPHYSICAL LOG

May 2009 — Hydrogen Energy California (HECA)

28067571 — Kern County, California

URS

FIGURE 5.14-5



LEGEND

- Project Site
- BVWSD Buttonwillow Service Area
- 40 — 2008 Depth to Groundwater, feet

Source:
Buena Vista Water Storage District

N

0 1 2
Scale in Miles (Approx.)

2008 DEPTH TO GROUNDWATER

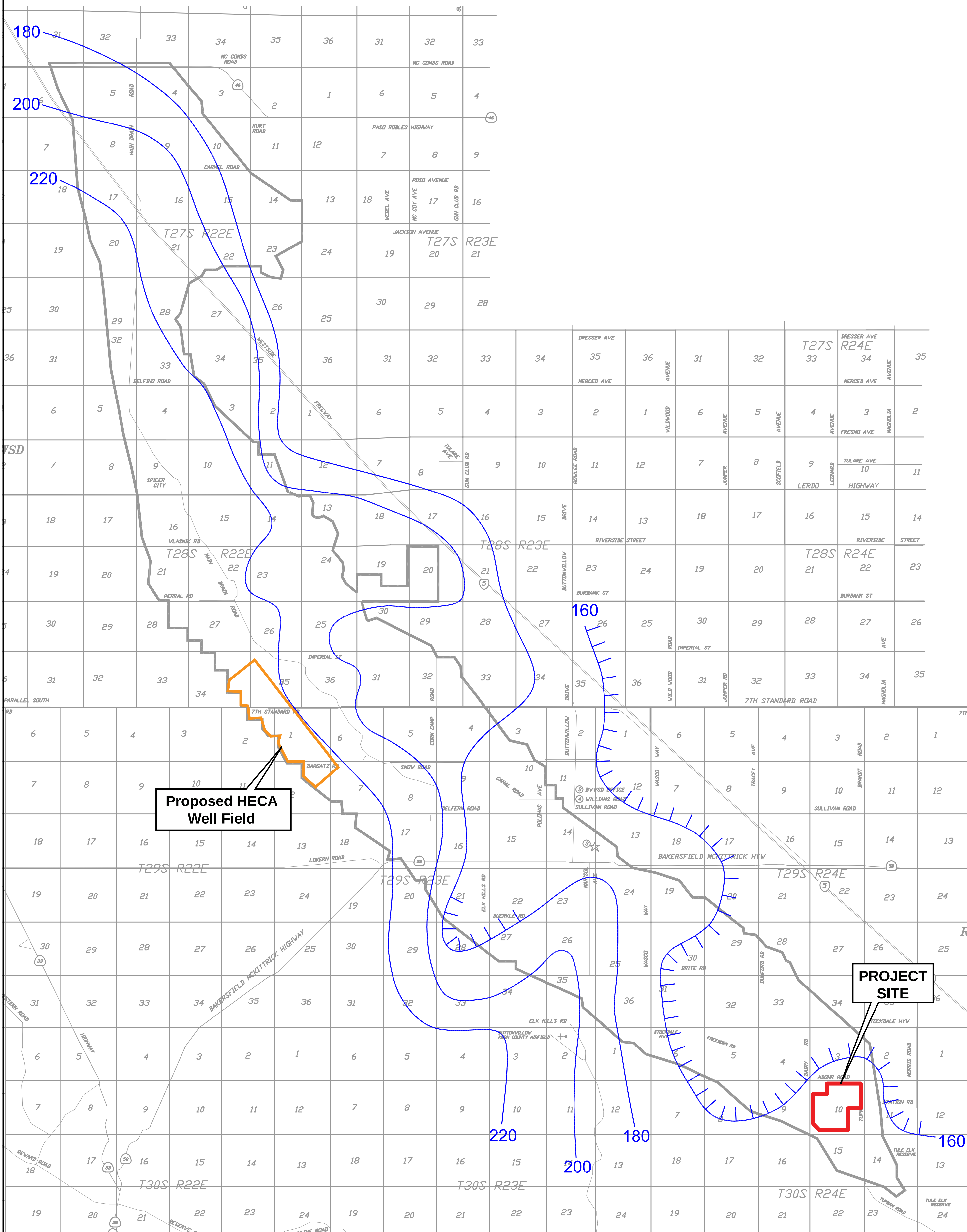
May 2009
28067571

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.14-6

5/15/09 vsa..T:\HECA\GRAPHICS\5.14 Water\5.14-6_BVWSD 2008 GW Depth.ai



LEGEND

(red line)	Project Site
(gray line)	BVWSD Buttonwillow Service Area
200 (blue line)	2008 Groundwater Elevation, feet, msl

N

0 1 2

Scale in Miles (Approx.)

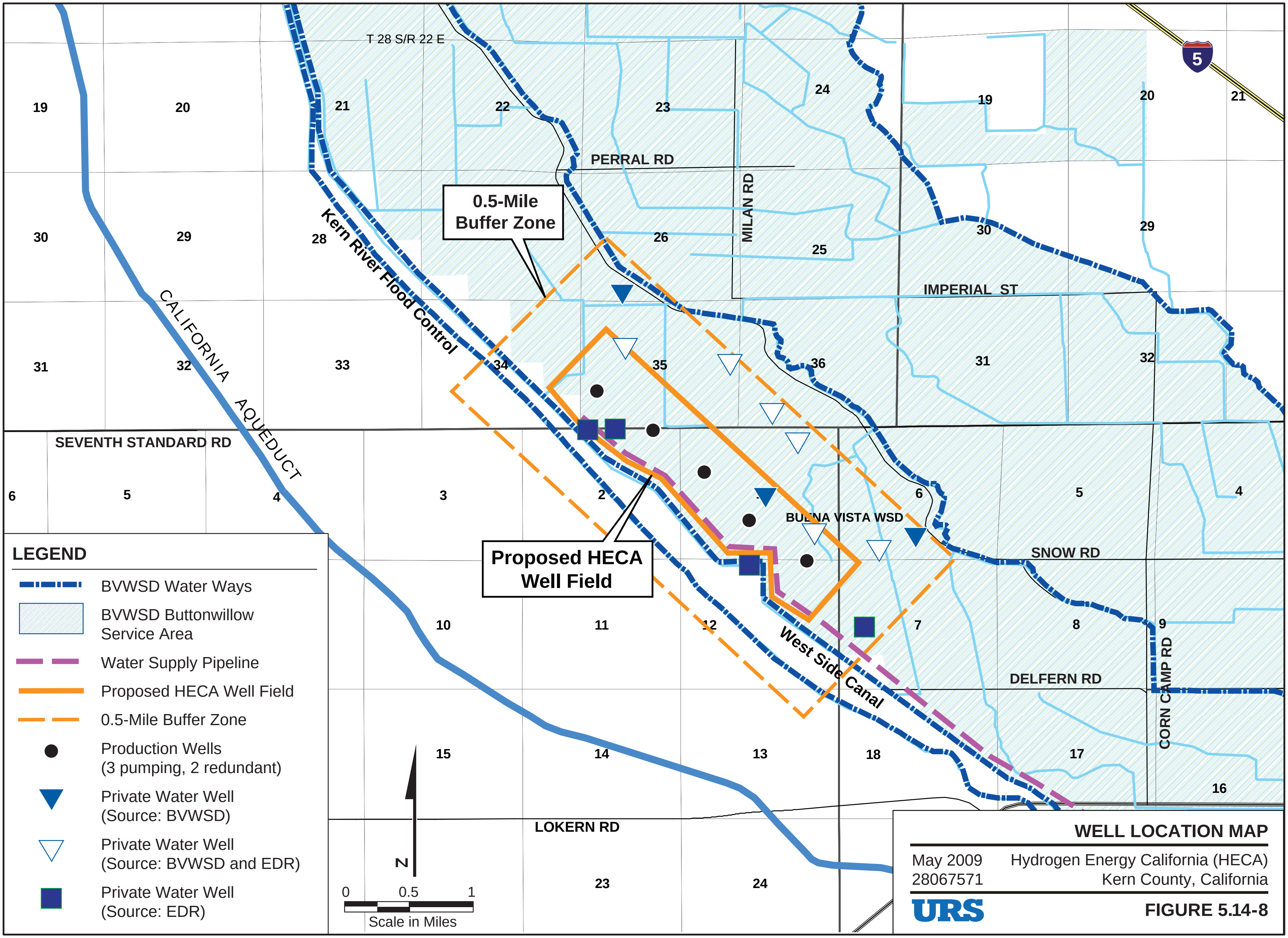
Source:
Buena Vista Water Storage District

2008 GROUNDWATER ELEVATIONS

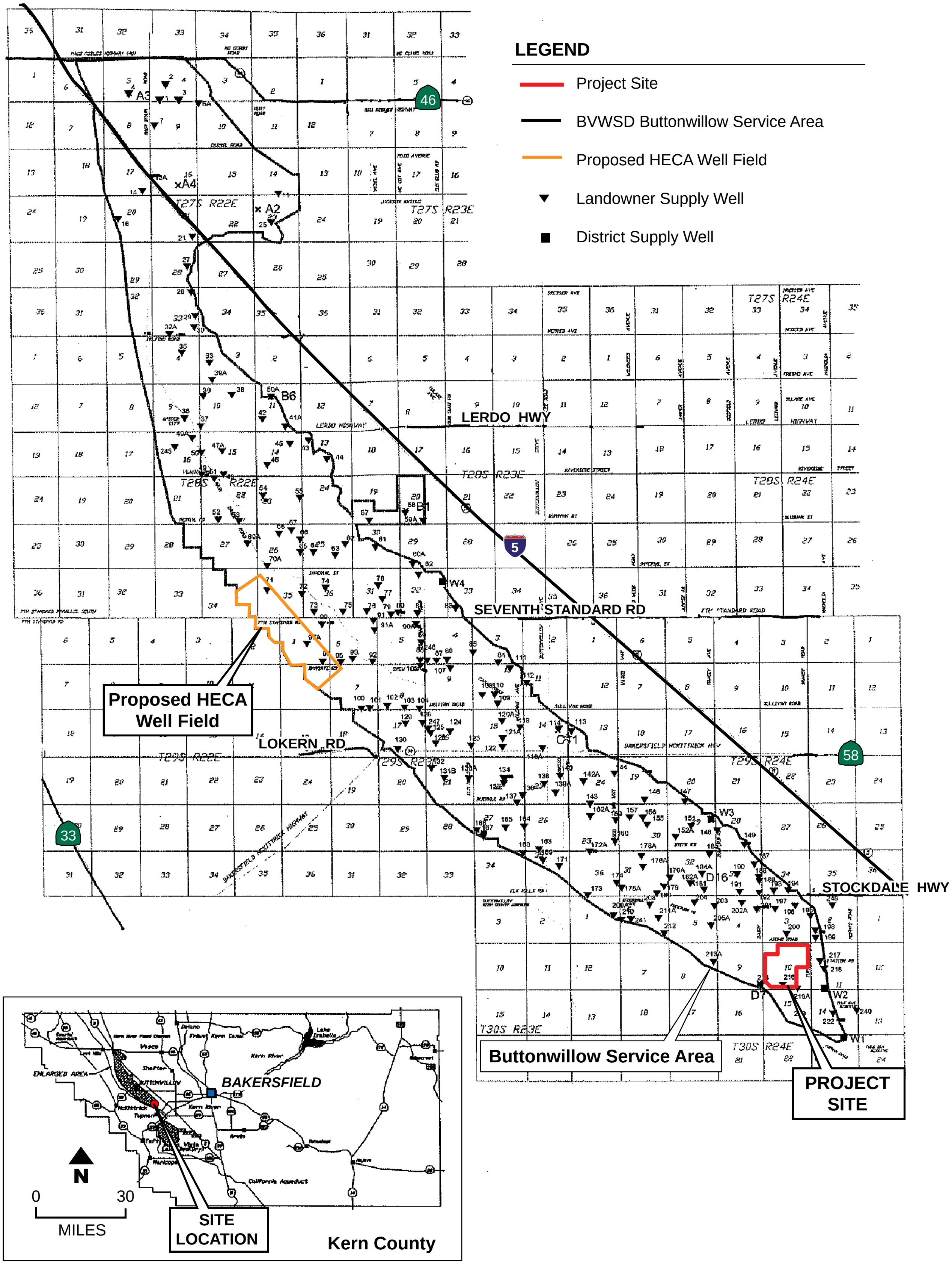
May 2009 Hydrogen Energy California (HECA)
28067571 Kern County, California

URS

FIGURE 5.14-7



5/19/09 vsa..T:\HECA\GRAPHICS\5.14 Water\5.14-8_well loc map.ai



BVWSD AND PRIVATE WATER WELL LOCATION MAP

May 2009 Hydrogen Energy California (HECA)

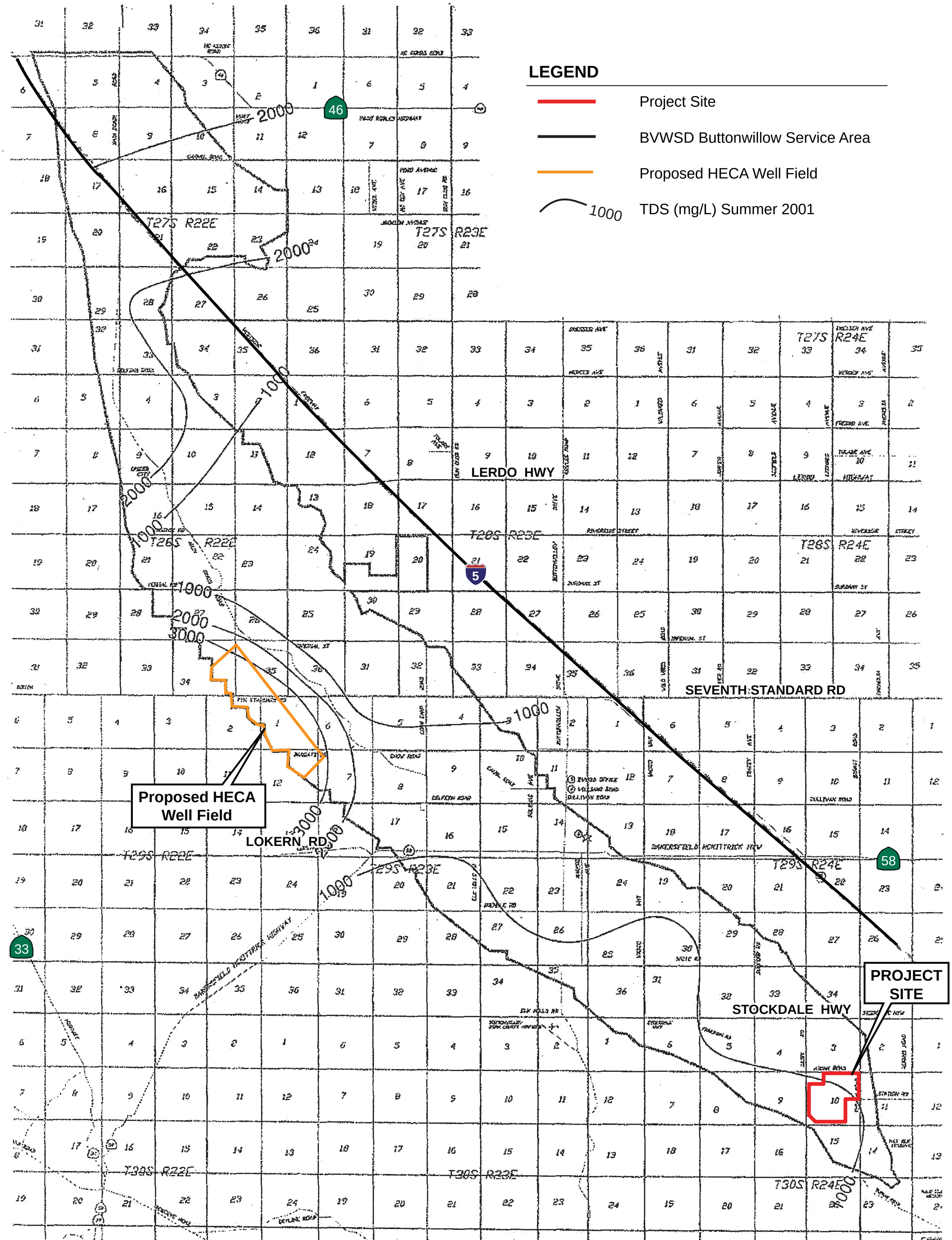
28067571 Kern County, California

URS

FIGURE 5.14-9

Source:
Buena Vista Water Storage District

5/18/09 vsa..T:\HECA\GRAPHICS\5.14 Water\5.14-8_District-Private Water Well Locs.ai



Source:
Buena Vista Water Storage District

TOTAL DISSOLVED SOLIDS – SUMMER 2001

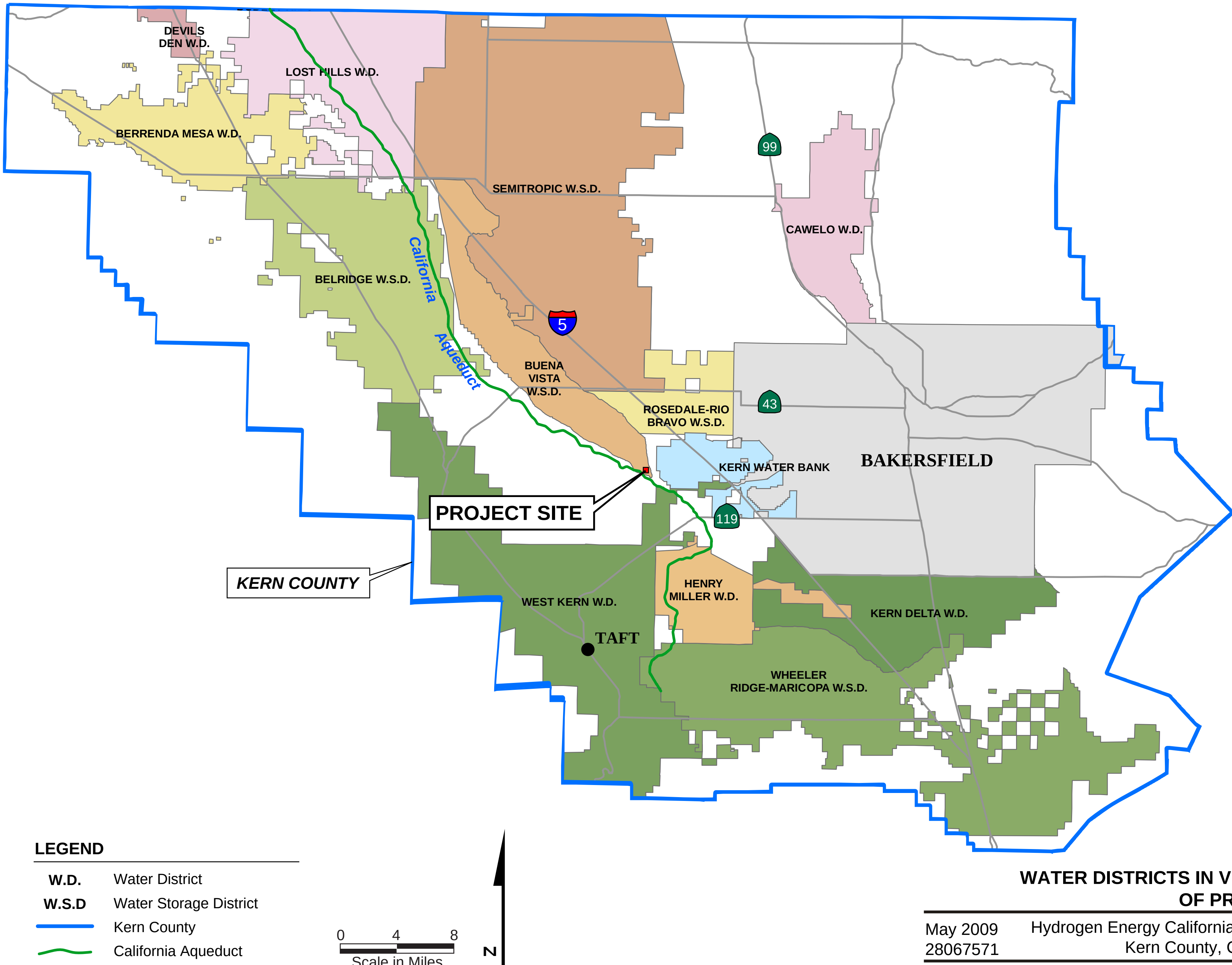
May 2009
28067571

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.14-10

5/15/09 vsa..T:\HECA\GRAPHICS\5.14 Water\5.14-10_BVWSD TDS 2001.ai



WATER DISTRICTS IN VICINITY OF PROJECT

May 2009
28067571

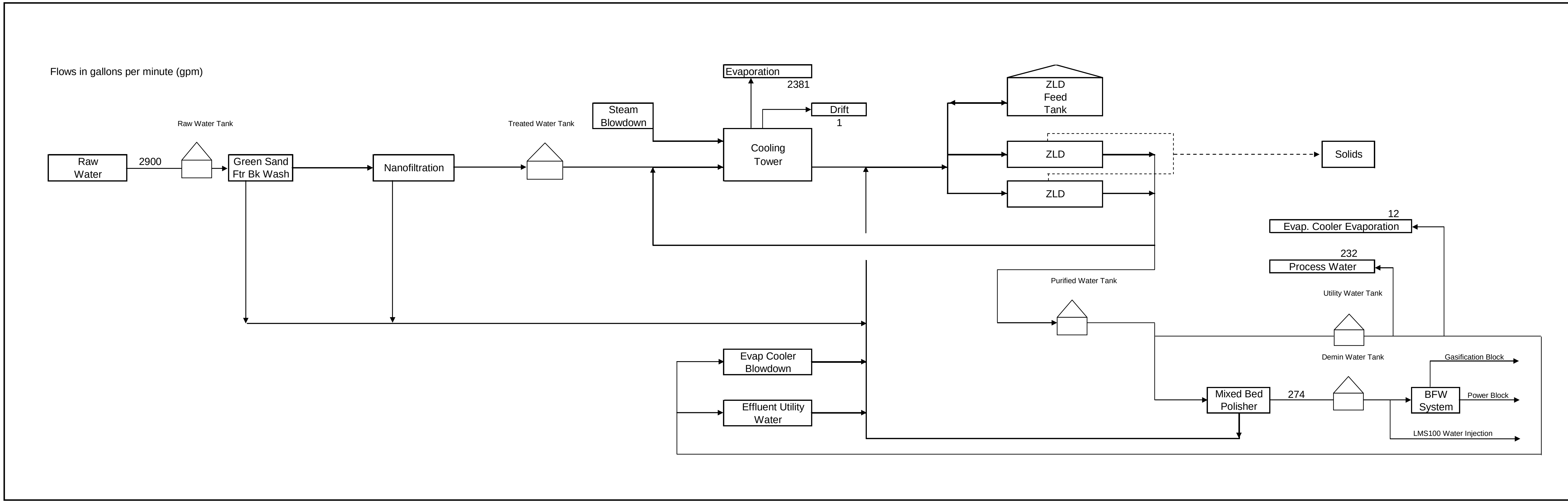
Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.14-11

5/18/09 vsa..T:\HECA\GRAPHICS\5.14 Water\5.14-11_water districts.ai

WATER BALANCE @ 65°F



Note:
Water balance corresponds to heat balance in Table 2-12.

Source:
Fluor; Hydrogen Energy California, Kern County Power Project;
Water Balance @ 65 F° - 100% Petroleum Coke Case
Drawing No: A3RW-PFD-25-013A, Rev. 2 (05/04/09)

MASS WATER BALANCE – AVERAGE FULL LOAD FLOWS

May 2009
28067571

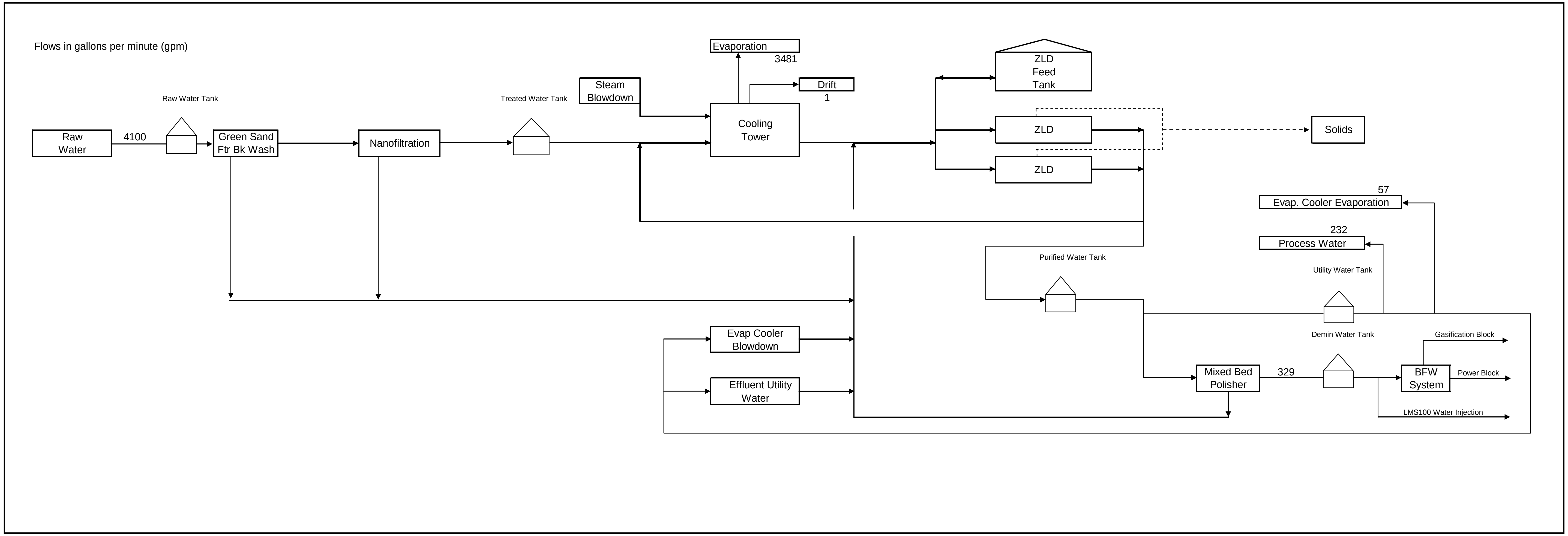
Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.14-12

5/22/09 vsa..T:\HECA\GRAPHICS\5.14 Water\5.14-13_water balance_65F.ai

WATER BALANCE @ 97°F



Note:
Water balance corresponds to heat balance in Table 2-12.

Source:
Fluor; Hydrogen Energy California, Kern County Power Project;
Water Balance @ 97 F° - 100% Petroleum Coke Case
Drawing No: A3RW-PFD-25-013B, Rev. 2 (05/04/09)

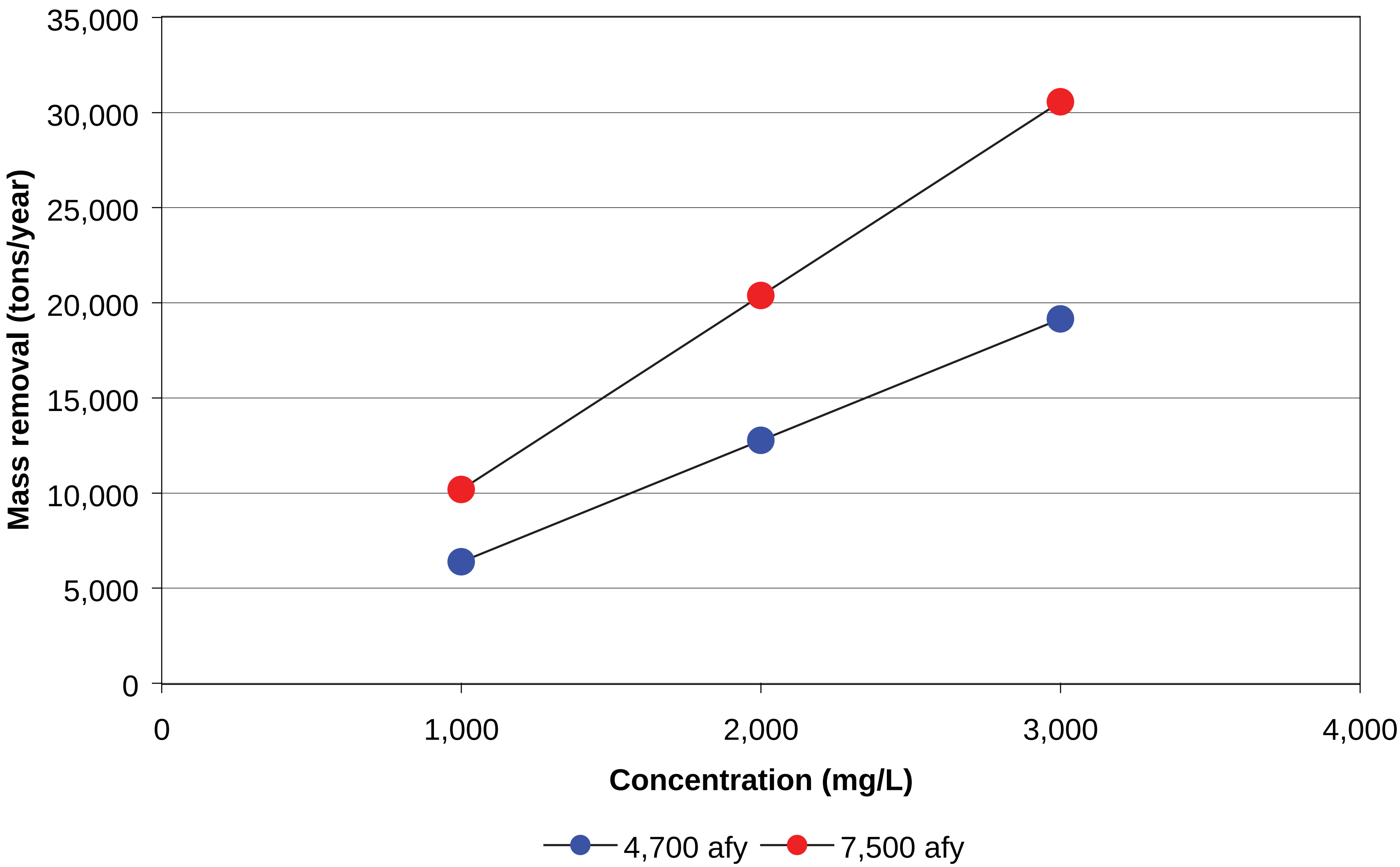
MASS WATER BALANCE – AVERAGE FLOWS FOR HOTTEST DAY

May 2009
28067571

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.14-13



TDS CONCENTRATION VS MASS REMOVAL RATE

May 2009 Hydrogen Energy California (HECA)
28067571 Kern County, California

URS

FIGURE 5.14-14

5/22/09 vsa..T:\HECA\GRAPHICS\5.14 Water\5.14-14_TDS conc vs mass.ai

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. 0 Date ____

Technical Area: **Water Resources**

Project: ____

Technical Staff: ____

Project Manager: ____

Docket: ____

Technical Senior: ____

SITING REGULATIONS	INFORMATION	AFC PAGE NUMBER AND SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (g) (1)	...provide a discussion of the existing site conditions, the expected direct, indirect and cumulative impacts due to the construction, operation and maintenance of the project, the measures proposed to mitigate adverse environmental impacts of the project, the effectiveness of the proposed measures, and any monitoring plans proposed to verify the effectiveness of the mitigation.	Section 5.14.1, p. 5.14-3 Section 5.14-2, p. 5.14-22 Section 5.14-3, p. 5.14-27 Section 5.14-4, p. 5.14-28		
Appendix B (g) (14) (A)	All the information required to apply for the following permits, if applicable, including:			
Appendix B (g) (14) (A) (i)	Waste Discharge Requirements; National Pollutant Discharge Elimination System Permit; and/or a Section 401 Certification or Waiver from the appropriate Regional Water Quality Control Board (RWQCB);	Sections 5.14.6, p. 5.14-37 Table 5.14-7, p. 5.14-31		
Appendix B (g) (14) (A) (ii)	Construction and Industrial Waste Discharge and/or Industrial Pretreatment permits from wastewater treatment agencies;	N/A		
Appendix B (g) (14) (A) (iii)	Nationwide Permits and/or Section 404 Permits from the U.S. Army Corps of Engineers; and	N/A		
Appendix B (g) (14) (A) (iv)	Underground Injection Control Permit(s) from the U.S. Environmental Protection Agency, California Division of Oil and Gas, and RWQCB.	N/A		

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. 0 Date ____

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Project: ____

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Technical Senior: ____

SITING REGULATIONS	INFORMATION	AFC PAGE NUMBER AND SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (g) (14) (B)	A detailed description of the hydrologic setting of the project. The information shall include a narrative discussion and on maps at a scale of 1:24,000 (or appropriate scale approved by staff), describing the chemical and physical characteristics of the following nearby water bodies that may be affected by the proposed project:	Section 5.14.1.1 Figure 5.14-1		
Appendix B (g) (14) (B) (i)	Ground water bodies and related geologic structures;	Section 5.14.1.4, p. 5.14-5		
Appendix B (g) (14) (B) (ii)	Surface water bodies;	Section 5.14.1.1, p. 5.14-3		
Appendix B (g) (14) (B) (iii)	Water inundation zones, such as the 100-year flood plain and tsunami run-up zones;	Section 5.14.1.3, p. 5.14-5		
Appendix B (g) (14) (B) (iv)	Flood control facilities (existing and proposed); and	Section 5.14.1.3, p. 5.14-5		
Appendix B (g) (14) (B) (v)	Groundwater wells within ½ mile if the project will include pumping.	Section 5.14.1.4, p. 5.14-5 Figures 5.14-8 and 5.14-9		
Appendix B (g) (14) (C)	A description of the water to be used and discharged by the project. This information shall include:			
Appendix B (g) (14) (C) (i)	Source(s) of the primary and back-up water supplies and the rationale for their selection;	Section 2.1.7.4, p. 2-15 Section 5.14.1.6, p. 5.14-15 Section 6 for selection rationale		

Adequacy Issue:	Adequate ____	Inadequate ____	DATA ADEQUACY WORKSHEET	Revision No. 0	Date ____
Technical Area:	**Water Resources**		Project: ____	Technical Staff:	____
Project Manager:	____		Docket: ____	Technical Senior:	____

SITING REGULATIONS	INFORMATION	AFC PAGE NUMBER AND SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (g) (14) (C) (ii)	The expected physical and chemical characteristics of the source and discharge water(s) including identification of both organic and inorganic constituents before and after any project-related treatment. For source waters with seasonal variation, provide seasonal ranges of the expected physical and chemical characteristics. Provide copies of background material used to create this description (e.g., laboratory analysis);	Section 5.14.1.6,#p. 5.14-15 Section 5.14.1.7, p. 5.14-21		
Appendix B (g) (14) (C) (iii)	Average and maximum daily and annual water demand and waste water discharge for both the construction and operation phases of the project;	Section 2.1.8.4, p. 2-15 Section 2.1.9.5, p. 2-18 Section 5.14.1.6, p. 5.14-15 Table 5.14-4, p. 5.14-16		
Appendix B (g) (14) (C) (iv)	A detailed description of all facilities to be used in water conveyance (from primary source to the power plant site), water treatment, and wastewater discharge. Include a water mass balance diagram;	Section 2.1.6, p. 2-5 Section 2.1.8.4, p. 2-15 Section 2.1.9.5, p. 2-18 Section 2.4.4, p. 2-41 Section 2.4.5, p. 2-41 Section 5.14.1.6, p. 5.14-17 Section 5.14.1.7, p. 5.14-21 Figures 5.14-12 and 5.14-13		

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. 0 Date ____

Technical Area: **Water Resources** Project: ____ Technical Staff: ____

Project Manager: ____ Docket: ____ Technical Senior: ____

SITING REGULATIONS	INFORMATION	AFC PAGE NUMBER AND SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (g) (14) (C) (v)	For all water supplies intended for industrial uses to be provided from public or private water purveyors, a letter of intent or will-serve letter indicating that the purveyor is willing to serve the project, has adequate supplies available for the life of the project, and any conditions or restrictions under which water will be provided. In the event that a will-serve letter or letter of intent can not be provided, identify the most likely water purveyor and discuss the necessary assurances from the water purveyor to serve the project;	Section 5.14.1.6, p. 5.14-15 Appendix O1		
Appendix B (g) (14) (C) (vi)	For all water supplied which necessitates transfers and/or exchanges at any point, identify all parties and contracts/agreements involved, the primary source for the transfer and/or exchange water (e.g., surface water, groundwater), and provide the status of all appropriate agencies' approvals for the proposed use, environmental impact analysis on the specific transfers and/or exchanges required to obtain the proposed supplies, a copy of any agency regulations that govern the use of the water, and an explanation of how the project complies with the agency regulation(s);	N/A		
Appendix B (g) (14) (C) (vii)	Provide water mass balance and heat balance diagrams for both average and maximum flows that include all process and/or ancillary water supplies and wastewater streams. Highlight any water conservation measures on the diagram and the amount that they reduce water demand; and	Section 5.14.1.6, p. 5.14-15 Figures 5.14-12 and 5.14-13 Table 2-12, p. 2-22 Table 5.14-4, p. 5.14-16		

Adequacy Issue: Adequate ____ Inadequate ____ **DATA ADEQUACY WORKSHEET** Revision No. 0 Date ____

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Project Manager: ____ Docket: ____ Technical Senior: ____

Siting Regulations	**Information**	**AFC Page Number And Section Number**	**Adequate Yes Or No**	**Information Required To Make AFC Conform With Regulations**
Appendix B (g) (14) (C) (viii)	For all projects which have a discharge, provide a copy of the will-serve letter, permit or contract with the public or private entity that will be accepting the wastewater and contact storm water from the project. The letter, permit or contract, if possible, shall identify the discharge volumes and the chemical or physical characteristics under which the wastewater and contact storm water will be accepted. In the event that a will-serve letter, permit, or contract cannot be provided, identify the most likely wastewater/storm water entity and discuss why the applicant was unable to secure the necessary assurances to serve the project's wastewater/storm water needs. Also, discuss the term of the wastewater service to the project, whether the wastewater entity has adequate permit capacity for the volume of wastewater from the project and has adequate permit levels for the chemical/physical characteristics of the project's wastewater and storm water for the life of the project, and any issues or conditions/restrictions the wastewater entity may impose on the project.	N/A		
Appendix B (g) (14) (D)	Identify all project elements associated with stormwater drainage, including a description of the following:			
Appendix B (g) (14) (D) (i)	Monthly and/or seasonal precipitation and stormwater runoff and drainage patterns for the proposed site and surrounding area that may be affected by the project's construction and operation;	Section 5.14.1.2, p. 5.14-4 Table 5.14-2, p. 5.14-4		

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. 0 Date ____

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Project: ____

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Project Manager: ____

Docket: ____

Technical Senior: ____

SITING REGULATIONS	INFORMATION	AFC PAGE NUMBER AND SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (g) (14) (D) (ii)	Drainage facilities and the design criteria used for the plant site and ancillary facilities, including but not limited to capacity of designed system, design storm, and estimated runoff;	Section 5.14.1.8, p. 5.14-22 Section 2		
Appendix B (g) (14) (D) (iii)	All assumptions and calculations used to calculate runoff and to estimate changes in flow rates between pre- and post construction; and	Appendix O3		
Appendix B (g) (14) (D) (iv)	A copy of applicable regional and local requirements regulating the drainage systems, and a discussion of how the project's drainage design complies with these requirements.	N/A		
Appendix B (g) (14) (E)	An impacts analysis of the proposed project on water resources and a discussion of conformance with water-related LORS and policy. This discussion shall include:	Section 5.14.5, p. 5.14-29		
Appendix B (g) (14) (E) (i)	The effects of project demand on the water supply and other users of this source, including, but not limited to, water availability for other uses during construction or after the power plant begins operation, consistency of the water use with applicable RWQCB basin plans or other applicable resource management plans, and any changes in the physical or chemical conditions of existing water supplies as a result of water use by the power plant;	Section 5.14.5, p. 5.14-29		
Appendix B (g) (14) (E) (ii)	If the project will pump groundwater, an estimation of aquifer drawdown based on a computer modeling study shall be 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 shall be provided;	Section 5.14.2.2, p. 5.14-23 Appendix O2		

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. 0 Date ____

Technical Area: **Water Resources**

Project: ____

Technical Staff: ____

Project Manager: ____

Docket: ____

Technical Senior: ____

SITING REGULATIONS	INFORMATION	AFC PAGE NUMBER AND SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (g) (14) (iii)	The effects of construction activities and plant operation on water quality and to what extent these effects could be mitigated by best management practices;	Sections 5.14.4.1, p. 5.14-28 Section 5.14.4.4, p. 5.14-29		
Appendix B (g) (14) (iv)	If not using a zero liquid discharge project design for cooling and process waters, include the effects of the proposed wastewater disposal method on receiving waters, the feasibility of using pre-treatment techniques to reduce impacts, and beneficial uses of the receiving waters. Include an explanation why the zero liquid discharge process is “environmentally undesirable,” or “economically unsound;”	N/A Project will use zero liquid technology		
Appendix B (g) (14) (v)	If using fresh water, include a discussion of the cumulative impacts, alternative water supply sources and alternative cooling technologies considered as part of the project design. Include an explanation of why alternative water supplies and alternative cooling are “environmentally undesirable,” or “economically unsound;”	N/A Project will use impaired quality local groundwater for process water needs		
Appendix B (g) (14) (vi)	The effects of the project on the 100-year flood plain, flooding potential of adjacent lands or water bodies, or other water inundation zones; and	Section 5.14.2.5, p. 5.14-27		
Appendix B (g) (14) (vii)	All assumptions, evidence, references, and calculations used in the analysis to assess these effects.	Section 5.14.2, p. 5.14-22 Section 5.14.7, p. 5.14-38		

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. 0 Date ____

Technical Area: **Water Resources**

Project: ____

Technical Staff: ____

Project Manager: ____

Docket: ____

Technical Senior: ____

SITING REGULATIONS	INFORMATION	AFC PAGE NUMBER AND SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (i) (1) (A)	Tables which identify laws, regulations, ordinances, standards, adopted local, regional, state, and federal land use plans, leases, and permits applicable to the proposed project, and a discussion of the applicability of, and conformance with each. The table or matrix shall explicitly reference pages in the application wherein conformance, with each law or standard during both construction and operation of the facility is discussed; and	Section 5.14.5, p. 5.14-29 Table 5.14-7, p. 5.14-31		
Appendix B (i) (1) (B)	Tables which identify each agency with jurisdiction to issue applicable permits, leases, and approvals or to enforce identified laws, regulations, standards, and adopted local, regional, state and federal land use plans, and agencies which would have permit approval or enforcement authority, but for the exclusive authority of the commission to certify sites and related facilities.	Section 5.14.5, p. 5.14-29 Table 5.14-7, p. 5.14-31		
Appendix B (i) (2)	The name, title, phone number, address (required), and email address (if known), of an official who was contacted within each agency, and also provide the name of the official who will serve as a contact person for Commission staff.	Section 5.14.5.5, p. 5.14-37 Table 5.14-8, p. 5.14-37		
Appendix B (i) (3)	A schedule indicating when permits outside the authority of the commission will be obtained and the steps the applicant has taken or plans to take to obtain such permits.	Section 5.14.6, p. 5.14-37		