5.5 WATER RESOURCES

In its water resources formulation and evaluation of most-plausible water resource options, Bullard Energy Center (BEC) considered benefits and impacts on subjects ranging from environmental to financial. Each subject was considered on a local, regional, state and federal basis, where appropriate. Areas of evaluation included:

- The existing water-related conditions and water demands in the surrounding project area
- The City's projected future needs, including regional coordination with irrigation and other districts on water matters
- Water statutes, regulations, jurisdictions and policies
- The BEC source water and wastewater demands (at maximum annual load), and their inter-dependency
- Mitigation needs and plans, where appropriate
- Common goal/opportunity advantages

BEC's evaluation and general plans 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 would reduce potential significant impacts (if any) to a level of insignificance. Details of this evaluation are presented below.

5.5.1 Existing Site Conditions

5.5.1.1 Site Location

The BEC site is located at 5829 North Golden State Boulevard within the City of Fresno, as shown in Figure 3.1-2, Site General Vicinity. The site is in an industrial area and is currently used as a truck depot and truck storage facility. Power line easements are located along the southeastern boundary of the site. The laydown and parking area consists of a 12-acre site immediately north of the plant site.

The site is essentially flat, with a slight slope to the south. The site elevation is about 300 feet above mean sea level and slopes gently to the southeast at approximately 1 percent grade. The surface is composed of sands, silts, and clays. The site topography is shown in Figure 3.3-1, Site Grading and Drainage Plan.

5.5.1.2 Physiographic Setting

The BEC site is located in the City of Fresno in the eastern San Joaquin Valley, which forms the lower two-thirds of the Central Valley. The Central Valley comprises about 20,000 square miles and extends from the north near Red Bluff to the south near Bakersfield, a distance of about 400 miles.

5.5.1.3 Climate

The climate of the Central Valley in the vicinity of the BEC 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 128-year record for the Fresno weather station are presented in Table 5.5-1, Monthly Temperature (°F) Data for Fresno, California. Based on 128 years of record, the average annual temperature for Fresno is 63.2°F.

TABLE 5.5-1
MONTHLY TEMPERATURE (°F) DATA FOR FRESNO, CALIFORNIA

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max	53.6	61.3	66.1	74.0	82.7	90.9	96.6	94.8	88.8	78.1	63.0	53.4
Mean	46	51.4	55.5	61.2	68.8	76.1	81.4	79.9	74.6	65.0	52.7	45.2
Min	38.4	41.4	44.9	48.4	54.9	61.2	66.1	64.9	60.4	51.9	42.3	37.0

Notes:
ºF = degrees Fahrenheit
max = maximum
min = minimum

Precipitation in the area is characterized by long dry summers and intermittent wet periods. The Fresno weather station (No. 043257) has a 128-year record of precipitation. Based on this record, the average annual precipitation is 11.23 inches. See Table 5.5-2, Fresno Average Monthly Precipitation (inches).

TABLE 5.5-2
FRESNO AVERAGE MONTHLY PRECIPITATION (INCHES)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2.11	1.91	1.89	1.00	0.37	0.15	0.01	0.01	0.17	0.53	1.17	1.58

The area surrounding the BEC site flows to the San Joaquin River, approximately two miles north of the project site. However, runoff from the BEC site will be directed to a groundwater recharge retention basin to be constructed on the west end of the facility.

5.5.1.4 Demographics and Land Use

Demographics and land use are presented in Section 5.9, Land Use. The area within the City of Fresno in which BEC plans to build and operate is zoned M-1 for light industrial. The site presently serves as trucking company fueling/washrack depot (by owner) and an independent construction company (by tenant). Residential receptors are located approximately 750 feet to the east of the project site.

5.5.1.5 Geology

The San Joaquin Valley is an asymmetrical basin defined by the Coast Ranges to the west, the 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 trough is closer to the Coast Ranges

than to the Sierra Nevada (Belitz and Heimes 1990). The oldest rocks in the area are basement complex rocks underlying the basin that forms much of the Tehachapi Mountains, San Emigdio Mountains, and the southern Sierra Nevada. The basement rocks are composed of a mass of plutonic and metamorphic rocks commonly referred to as the Sierra Nevada batholith of pre-Tertiary age. The basin is filled with more than 14,000 feet of rocks of Jurassic, Cretaceous, Tertiary, and Quaternary age (Croft 1972).

5.5.1.6 Hydrogeology

The hydrogeology of the San Joaquin Valley is summarized in California Groundwater Bulletin 118-2003 (DWR 2003) Refer to Figure 5.5-1, Schematic Hydrogeologic Cross-Section, for a schematic hydrogeologic cross-section of the Fresno area.

The Kings Sub-basin aquifer system consists of unconsolidated continental deposits; an older series of relatively fine-grained Tertiary and Quaternary age deposits is overlain by a younger series of relatively coarse-grained deposits of Quaternary age (DWR 2006). Nearly all of the fresh groundwater is contained in the continental rocks and deposits younger than Eocene age (Bertoldi et al. 1991).

Groundwater Sub-basins

The BEC is located in the Kings Sub-basin (DWR No. 5-22.08) of the San Joaquin Valley Groundwater Basin. The Kings Sub-basin is bounded on the north by the San Joaquin River. The northwest corner of the sub-basin is formed by the intersection of the east line of the Farmers Water District with the San Joaquin River. The west boundary of the Kings Sub-basin is the eastern boundaries of the Delta-Mendota and Westside sub-basins. The southern boundary runs easterly along the northern boundary of the Empire West Side Irrigation District, the southern fork of the Kings River, the southern boundary of Laguna Irrigation District, the northern boundary of the Kings County Water District, the southern boundaries of Consolidated and Alta Irrigation Districts, and the western boundary of Stone Corral Irrigation District. The eastern boundary of the sub-basin is the alluvium-granitic rock interface of the Sierra Nevada foothills (DWR 2003; 2006).

Aquifer Characteristics

The older alluvium is an important aquifer in the sub-basin. It is composed of intercalated lenses of clay, silt, silty and sandy clay, clayey and silty sand, sand, gravel, cobbles, and boulders. The younger alluvium is a sedimentary deposit of fluvial arkosic beds that overlies the older alluvium and is interbedded with flood-basin deposits. The lithology is similar to that of the older alluvium. Beneath river channels, the younger alluvium is highly permeable. Beneath floodplains, it may be of poor permeability. The flood basin deposits occur along the Fresno Slough and James Bypass and are west of the BEC (DWR 2006).

The Quaternary age deposits exposed over most of the area yield more than 90 percent of the water pumped from wells (Page and LeBlanc 1969). Most wells in the area penetrate only the upper part of the coarse-grained sediments (Mitten 1984).

The aquifer system is generally unconfined except to the west, where three clay layers act as confining beds and in other local areas where intercalated clays cause partial confinement

(Mitten 1984). The Corcoran Clay (E-clay) member of the Tulare Formation is the most extensive of these clay deposits and occupies the western one-quarter to one-third of the sub-basin (DWR 2006).

Groundwater Occurrence and Flow

Throughout much of the valley three distinct bodies of groundwater occur. In downward succession they are a body of unconfined and semi-confined fresh water which occurs in alluvial deposits of Recent, Pleistocene, and possibly very late Pliocene age overlying the widespread lacustrine diatomaceous clay bed (Corcoran Clay), a body of fresh water confined beneath the clay bed in alluvial and lacustrine deposits of late Pliocene age, and a body of saline connate water contained in marine sediments of middle Pliocene or greater age which underlies the fresh-water body throughout the valley. Much of the eastern and southern parts of the valley, including the area of the BEC, are not underlain by the confining clay, and there the fresh water body is in general unconfined to semi-confined (Davis et al. 1959).

Precipitation on the valley floor is mostly lost to evapotranspiration. Groundwater recharge occurs from river and stream seepage, deep percolation of irrigation water, canal seepage, and intentional recharge (DWR 2006). The majority of recharge from infiltration of streamflow occurs on the east side of the valley and is influenced by precipitation in the mountains surrounding the valley.

Groundwater in the Fresno area generally flows in southward to westward directions. Groundwater flow directions are dependent on groundwater conditions in the Westside Sub-basin and are complicated by groundwater depressions and groundwater mounding in the area. Notable groundwater depressions include one centered in the Fresno-Clovis urban area and one centered approximately 20 miles southwest of Fresno in the Raisin City Water District (DWR 2006). On average, groundwater levels in Fresno have declined approximately 34 feet since 1985 (City of Fresno).

Groundwater pumpage greatly exceeding the natural recharge rate has dramatically altered the groundwater flow in the Central Valley. During the 1960s and 1970s, the recharge rate was more than five times that of the predevelopment period and was largely derived from percolation of imported surface water or recirculated pumped groundwater rather than precipitation and recharge from streams. Prior to development, most groundwater was discharged as evapotranspiration, but in recent years, most discharge has been well pumpage. Vertical movement of groundwater in the Central Valley has been artificially enhanced by many of the 100,000 irrigation wells that contain long intervals of perforated casing (Bertoldi et al. 1991).

Groundwater in Storage

Page and LeBlanc (1969) indicate that the specific yields in the Kings Sub-basin (N.5-22.08) range from a low of 0.2 percent to 36 percent. To calculate storage capacity in the 10- to 200-foot depth range, Davis and others (1959) used a range of specific yields from approximately 6 percent to 18 percent. Williamson and others (1989) used an average specific yield of 11.3 percent in the area of the Kings Sub-basin for computer modeling purposes (DWR 2006). Specific yield is the ratio of the volume of water that a rock or soil will yield by gravity drainage (Fetter 1994).

The U.S. Geological Survey (USGS) estimated the groundwater in storage within the Kings Sub-basin in 1961 was 93 million acre-feet. This estimate was to a depth of less than or equal to 1,000 feet (Williamson et al. 1989) and is an estimate of the volume of groundwater contained in the saturated aquifers in the Kings Sub-basin. The volume of water can be approximated by multiplying the area of the basin (976,000 acres) by the thickness of the saturated zone and the specific yield.

Groundwater Quality

Post-Eocene continental deposits constitute the primary fresh groundwater reservoir in the Central Valley. Fresh water in the Central Valley is defined as water that has a specific conductance of less than (<) 3,000 micromhos per centimeter at 25 degrees Celsius (ºC). This corresponds to about 2,000 milligrams per liter (mg/L) of dissolved solids. Beneath the body of fresh water is saline water. In general, the salinity of the water beneath the base of the fresh water increases gradually with depth, but may increase rapidly at certain locations (Williamson et al. 1989).

The groundwater is predominantly of bicarbonate type. The major cations are calcium, magnesium, and sodium. Total dissolved solids (TDS) in the Fresno area rarely exceed 600 mg/L but 2,000 mg/L TDS groundwater has been encountered at greater depths. A typical range of groundwater quality in the basin is 200 to 700 mg/L TDS. Average TDS in 414 samples collected from water supply wells regulated under California Code of Regulations (CCR) Title 22 was 240 mg/L with a range of 40 to 570 mg/L (DWR 2006). The depth to the base of fresh groundwater underlying the BEC is estimated to be between about 1,360 feet and 1,000 feet below ground surface (bgs) (Page and LeBlanc 1969; Page 1973). Logs of deep wells indicate that the base of fresh water is underlain by a basal, saline water body of a sodium chloride water type. Because very few wells yield water from near the base of fresh water, it is not known what type of water occurs there, but probably in most areas it is a mixture between the local directly overlying water type and the underlying sodium chloride water (Page 1973).

Local concentrations of boron, chloride, and nitrate in the groundwater of the Central Valley are large enough to be a problem either to crops or humans. Pesticides such as dibromochloropropane (DBCP) associated with agricultural application and nitrates can be found in groundwater along the eastern side of the sub-basin. Shallow brackish groundwater can be found along the western portion of the sub-basin. Elevated concentrations of fluoride, boron, and sodium can be found in localized areas of the sub-basin (Bertoldi et al. 1991; DWR 2006).

5.5.1.7 Water Supply History and Future Projections

Municipal Water Supply

The City of Fresno delivers potable water to about 122,000 urban residential, commercial, and industrial customers in more than 110 square miles of the City of Fresno and some County of Fresno islands within the city's sphere of influence (SOI). Groundwater is the primary source of supply and is supplemented with treated surface water. Using nearly 250 wells, the City of Fresno Water Division pumps about 146 million gallons of water per day (mgd) out of the aquifer.

Potable water distribution systems in the City of Fresno were constructed based on dispersed wells and a local distribution system of relatively small water mains. Most of the systems are characterized by 12-inch mains in a one-half-mile grid. Wells are generally spaced at one-half to 1 mile. The loss of wells has created local areas of low pressures during peak demand periods and inhibited the ability of the systems to meet peak demands (CH2MHill 1992).

In response to issues of concern that include groundwater contamination, groundwater overdraft and increasing water demands, the City of Fresno invited other local water agencies to participate in the development of the Fresno Metropolitan Water Resource Management Plan (CH2MHill 1992) to ensure the Fresno metro area has a reliable water supply through 2050. An Environmental Impact Report (EIR) was prepared for the Fresno Metropolitan Water Resource Management Plan (CH2MHill 1995) and the plan was adopted by the Fresno City Council in 1996. This plan calls for a conjunctive use program, combining groundwater, treated surface water, artificial recharge and an enhanced water conservation program. This plan is being implemented and is currently being updated.

Rainfall and stream flow replace about half of the groundwater pumped by the City each year. The City of Fresno holds entitlements to surface water from Millerton Lake and Pine Flat Reservoir. This water is used to replace the other half of the pumped groundwater. Through a cooperative program with the Fresno Irrigation District (FID) and the Fresno County Metropolitan Flood Control District (FCMFCD), surface water released from each reservoir is delivered through canals to flood control basins for groundwater recharge and “Leaky Acres,” a City-owned intentional recharge facility.

While groundwater has been the major source of water for Fresno, treated surface water supplements this system with water delivered directly from the Sierras to the Surface Water Treatment Facility (SWTF). The SWTF supplies about 20+ mgd of water. During the peak demand season, the facility supplies approximately 15 percent of Fresno’s potable water. During the low demand periods, the facility supplies more than 30 percent of the community’s supply (City of Fresno 2006).

5.5.2 Project Water and Wastewater Needs

The LMS100’s unique design uses an intercooler for the inlet air as it is compressed, allowing for approximately 10 percent greater thermal efficiency than existing commercial simple-cycle peaking units. This design also requires an efficient methodology to reject the intercooled air heat.

Use of dry (fin fan) cooling technology was evaluated in the design of the BEC project to limit the water requirements. However, this cooling technology was rejected due to the following considerations:

- The use of dry cooling would negate the efficiency advantage of the LMS100 design at this site. These losses would be most pronounced at temperatures above 95ºF, when power demands are greatest. Dry cooling results in power output decreases up to 25 megawatts (MW) per unit under peak load demand conditions where full output is required under the power purchase agreement (PPA). This resulting decrease in electrical output would require an additional 50 MW electrical supply source to achieve Pacific Gas and Electric (PG&E) the 200 MW contractual requirement. Use of dry cooling would result in a decrease in thermal efficiency; increase in fuel burned and increased air pollutant emissions.
- The PPA with PG&E calls for delivery of 200 MW to the electric grid. Dry cooling is not practical for ambient temperatures of up to 114ºF during peak conditions, as required by the contract, when power is most critical to the citizens of California.
- The BEC will not operate as a baseload station. Rather, it will operate at a maximum 5,000 hours per year as a peaking and intermediate load facility when energy demands are greatest. This limits the water requirements at the BEC and further reduces the economic feasibility of dry cooling technology.
- The BEC uses evaporative cooling to increase fuel efficiency, rather than for steam condensation. This requires substantially less cooling water than required for a conventional steam power plant.

The water balance diagrams (Figure 3.4-4A, Mass Water Balance - Average Full Load Flows, and Figure3.4-4B, 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. Table 5.5-3, Daily and Annual Water Flows, shows the maximum daily, average daily, and average annual water supply and disposal flows. Water needs at the BEC are considerably lower with the use of simple-cycle combustion generation technology rather than more water-intensive steam generation technology.

TABLE 5.5-3
DAILY AND ANNUAL WATER FLOWS

		Maximum Daily (gal/day)	Average Daily (gal/day)	Average Annual (acre-ft/year)
Water Supply				
Cooling tower makeup		598,000	342,000	219
Demineralizer system		288,000	314,000	201
Evaporative cooler supply		389,000	389,000	249
Plant service water		5,000	5,000	3
	Total	1,279,000	1,049,000	671
Wastewater Injection				
Cooling tower blowdown		402,000	301,000	192
RO system rejects		115,000	126,000	80
Facilities (sanitary, etc.)		5,000	5,000	3
	Total	521,000	431,000	276

Notes:
The maximum daily use is based on 24 hours of full load operation during the design hottest day (114ºF day/80ºF night).
The average daily use is 24 hours of the average of the full load use at the average monthly temperatures for every month.
The average annual use is based on 5,000 hours/year at the average daily rate, corresponding to the maximum plant capacity factor of 57 percent.
ft = feet
gal = gallon(s)
RO = reverse osmosis

5.5.2.1 Alternative Water Supplies

Following is a list of the alternative water supplies that were evaluated for BEC:

- Surface water – Water present in lakes, streams and rivers.
- Herndon Canal – Operated by the FID and located approximately 0.5 mile south of the project site.
- Reclaimed water – Wastewater treatment plant (WWTP) effluent that has received tertiary treatment.
- Municipal supply – Water available via the municipal water supply system.
- Agricultural wastewater – Drainage water from irrigation practices.
- Upper aquifer groundwater – Groundwater located in the uppermost aquifer beneath the project site.
- Lower aquifer groundwater – Groundwater located below the upper aquifer beneath the project site.
- Ocean water – Water from the Pacific Ocean.

Water Supply Alternatives Decision Analysis

The following hierarchy of "tests" was applied to each water supply alternative:

Test 1 – Is the alternative water supply feasibly available at the BEC? (If not, then disregard this alternative. If yes, proceed to Test 2.)

Test 2 – Will the subject water supply alternative satisfy California Water Policy? (If not, then disregard this alternative. If yes, proceed to Test 3.)

Test 3 – Is the subject water supply alternative technologically sufficient (quantity and quality) to guarantee high safety and reliability (98 percent availability?) (If no, then disregard this alternative. If yes, proceed to Test 4.)

For water supply alternatives passing Tests 1 – 3, apply Tests 4 – 6:

Test 4 – Rate other impacts associated with each water supply alternative, including transportation, biological, energy, health and safety, etc. (50 to 100, with lowest impact alternative rated 100)

Test 5 – Rate relative capital costs of each remaining water supply alternative. (50 to 100, with lowest cost rated 100)

Test 6 – Rate relative operations and maintenance (O&M) costs of each of the remaining water supply alternatives. (50 to 100, with lowest cost rated 100)

The scores from application of Tests 4 – 6 were weighted and totaled for each water supply alternative, with the highest scoring alternative selected.

Surface Water

The San Joaquin River is located approximately two miles north of the BEC site. This source failed Test 1 as the BEC does not have water rights for the use of water from the San Joaquin River. In addition, because surface waters generally are identified as having municipal supply as a beneficial use, it is anticipated that this source would fail to pass Test 2 without an offset to comply with the California Water Policy (State Water Resources Resolution No. 75-58). This alternative was eliminated from further consideration.

Herndon Canal

The Herndon Canal, owned and operated by the FID, is located approximately 4,000 feet southeast of the BEC site. This canal is used to transport surface water supplies from the San Joaquin and Kings rivers to agricultural users to the west of the City of Fresno. This water originates in the Sierra Nevada to the east. Snowmelt is a major component of the flow in these rivers, generally contributing runoff well into the summer months. Water is generally present in the canal from mid-March through mid-August, depending on the availability of supply.

The water quality characteristics of this supply are described in Table 5.5-4, Herndon Canal Supply Water Quality. This water would require filtration for the removal of suspended solids prior to further treatment for industrial use at the BEC.

The Herndon Canal failed to pass Test 3 as a primary source of water supply as it is dry most of the year and cannot provide a reliable source of water to the BEC. In addition, as surface waters generally are identified as having municipal supply as a beneficial use, it is anticipated that this source would require an offset to comply with the California Water Policy. This alternative was provisionally eliminated from further consideration as a primary source of water supply at this time. However, the City has unused rights to water in the Herndon Canal and has expressed interest in future use of this supply by the BEC. To the extent that the Herndon Canal could be directly utilized as a source of water supply, BEC demands on groundwater supplies (and the need for groundwater replenishment) would be reduced. BEC and the City will continue to evaluate opportunities to utilize water from the Herndon Canal as a future supplemental source of water supply to the project.

TABLE 5.5-4
HERNDON CANAL SUPPLY WATER QUALITY

General	Units		Chemicals mg/L	As Such
Conductivity	µS/cm	21		
pH		7.0		
Total Suspended Solids	ppm	6.2		
TDS	ppm	34	Silica	5.5
Total Organic Carbon	ppm	3.8	Silicon	2.6
Total Suspended Solids	ppm	6.2	Strontium	0.0165
Turbidity	NTU	3.7	Zinc	0.026
Hardness		7.3		
Barium		0.092		
Calcium		2.1		
Magnesium		0.50		
Sodium		1.7		
Phosphorous		0.16		
Sulfate		2.0		

Source: Data from grab sample collected September 29, 2006 at North Golden State Boulevard Bridge.
Notes:
µS/cm = microsiemens per centimeter
< = less than
mg/L = milligrams per liter
NTU = Nephelometric turbidity units
ppm = parts per million
TDS = total dissolved solids

Municipal Supply

Municipal supply is available via a 14-inch main located in North Golden State Avenue in the front of the BEC site. The quality of this water is presented in Table 5.5-4, Herndon Canal Supply Water Quality. The municipal supply is abundant in the vicinity of the BEC at relatively

low TDS content of approximately 205 mg/L. However, the municipal supply exhibits high silica concentration (~62 parts per million [ppm]). As silica concentrations in the circulating water system greater than 150 ppm will begin to deposit and severely foul the cooling tower equipment, the circulating water in the cooling tower will be limited to approximately 2.4 cycles of concentration. These high levels of silica are also found in the reclaimed wastewater and groundwater supplies.

Although municipal supply is the least preferred source under the California Water Policy, a program to offset this use to achieve consistency with this policy has been identified. A "Will-Serve" letter has been received from the City of Fresno stating that the system has adequate supplies and capacity to meet the needs of the BEC (see Appendix U, City of Fresno Letters). The City, FID and FCMFCD have developed and are implementing the Fresno/Clovis Metropolitan Water Resources Management Plan which includes an aggressive program to recharge groundwater with surface water sources. As the groundwater basin in the Fresno/Clovis area is in a condition of overdraft, BEC is committed to working with the City of Fresno, FID and the FCMFCD to identify opportunities to enhance their existing groundwater recharge program to replace groundwater consumptively used by the facility. BEC has initiated discussions with these agencies toward this objective.

Reclaimed Wastewater

Reclaimed wastewater is WWTP effluent that has received tertiary treatment. The nearest source of reclaimed water is from the Fresno-Clovis Regional Water Reclamation Facility (RWRF) located approximately 10 miles south of the BEC site. Use of this source would require construction of a transmission pipeline through developed areas and installation and operation of a series of pump stations. The quality of this water is presented in Table 5.5-5, Reclaimed Supply Water Quality. As the concentration of dissolved solids in the reclaimed wastewater is 2.5 times higher than found in the municipal supply, disposal of wastewater would be difficult. In addition, it is anticipated that silica concentrations would be equivalent to or greater than found in municipal supply and similarly limit the number of cycles of concentration.

TABLE 5.5-5
RECLAIMED SUPPLY WATER QUALITY

General	Units		Chemicals, mg/L	As Such
Conductivity	µS/cm	840	Arsenic	0.016
pH		7.4	Boron	0.20
Total Suspended Solids	ppm	N/A	Fluoride	N/A
TDS	ppm	510	Silica	N/A
Ion Chemistry, mg/L	as $CaCO_3$			
Total Alkalinity		270		
Hardness		230		
Calcium		120		
Magnesium		110		
Sodium		180		
Potassium		12		
Bicarbonate		270		
Sulfate		44		
Chloride		120		
Nitrate-Nitrite		0.86		

Notes:
Average of the 45 samples collected in 2005

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

Reclaimed wastewater failed to pass Test 1 as a source of water supply at this time as it is not feasibly available to the BEC site. Due to the distance of the RWRF from the BEC site, the relatively minor amount of water that would be required for the BEC, the additional energy required to overcome elevation changes and the intermittent demands of the BEC for water supply, it would be infeasible to construct a pipeline to bring reclaimed water to the project site. In addition, the higher TDS concentrations in the reclaimed water would further reduce the number of cycles of concentration achievable in the cooling towers, substantially increasing the volume of wastewater requiring disposal to the RWRF. However, as reclaimed water service becomes available in the vicinity of the BEC site, use of this source will be reconsidered. This alternative was eliminated from further consideration at this time.

Agricultural Wastewater

Agricultural wastewater is drainage water from irrigation practices. This source failed to pass Tests 1 and 3 as drainage water from irrigation practices is not available in sufficient quantities in the vicinity of the project site nor would it be sufficiently reliable for use at BEC due to water quality variability. Therefore, this alternative was dropped from further consideration.

Upper Groundwater

The depth to the base of fresh water (water < 2,000 mg/L of dissolved solids) underlying the BEC is about 1,360 feet. The use of upper groundwater failed Test 1 as a supply of source water supply to the BEC as the City of Fresno prohibits the construction of groundwater supply wells outside of those for its own production. This alternative was dropped from further consideration.

Lower Groundwater

Brackish groundwater (water greater than 2,000 mg/L of dissolved solids) is located at a depth greater than 1,360 feet at the BEC site. The use of lower groundwater failed Test 1 as a source of water supply as it is not feasibly available to the BEC due to depth and the City's opposition to construction of new groundwater wells. In addition, this source failed Test 3 as the high levels of silica present in groundwater in this area limit the number of cycles of concentration achievable in the cooling towers. Use of a zero liquid discharge (ZLD) systems would not be feasible due to the large quantities of wastewater that would be generated relative to the amount of power produced. The high TDS levels of the brackish groundwater would also result in even more concentrated levels of TDS in the BEC wastewater than with use of other sources, requiring additional treatment and precluding discharge to the WWTP. Given these circumstances, use of brackish groundwater would not be feasible as a source of water supply to the BEC. This alternative was eliminated from further consideration.

Ocean Water

This source failed to pass Test 1 due to the distance of the BEC from the Pacific Ocean. This source also failed to pass Test 3 as the high concentration of dissolved solids renders this source of water unsuitable for the planned uses of production water at the BEC. This alternative was dropped from further consideration.

The scores from application of Tests 4 – 6 were totaled for each alternative, with the highest scoring alternative selected. Water supply options are summarized in Table 5.5-6, Evaluation of Water Supply Options.

TABLE 5.5-6
EVALUATION OF WATER SUPPLY OPTIONS

Supply Option	Test #1 Availability (pass?)	Test # 2 Satisfy LORS? (pass?)	Test #3 Techno-logically Feasible? (pass?)	Test #4 Environ-mental Impacts	Test #5 Relative Capital Costs	Test #6 Relative O&M costs	Relative Ranking
Surface Water	No	No	Yes	NA	NA	NA	NA
Herndon Canal	Yes	No	Yes	NA	NA	NA	NA
Municipal Supply	Yes	Yes	Yes	Low	Low	Low	1st
Reclaimed Wastewater	No	No	No	Medium	High	Low	NA
Agricultural Wastewater	No	NA	NA	NA	NA	NA	NA
Upper Groundwater	No	Yes	Yes	Low	Low	low	NA

TABLE 5.5-6
EVALUATION OF WATER SUPPLY OPTIONS

Supply Option	Test #1 Availability (pass?)	Test # 2 Satisfy LORS? (pass?)	Test #3 Techno-logically Feasible? (pass?)	Test #4 Environ-mental Impacts	Test #5 Relative Capital Costs	Test #6 Relative O&M costs	Relative Ranking
Lower Groundwater	No	No	No	NA	NA	NA	NA
Ocean Water	No	NA	NA	NA	NA	NA	NA

Notes:
BEC's water resource evaluation has determined that the use of City potable water with mitigation is the most plausible option.
LORS = laws, ordinances, regulations, and standards
NA = not applicable
O&M = operations and maintenance

Note that only the Municipal Supply option met all of the required criteria of Tests 1-3. As such, BEC's water resource evaluation has determined that the use of City potable water with mitigation is the most plausible option.

5.5.2.2 Wastewater Disposal Alternatives

Following is a summary of the alternative wastewater disposal alternatives that are discussed in greater detail in Section 4, Alternatives, of this document:

- ZLD system – A mechanical system using membrane technology and heat to effectively reduce liquid wastes to a dry waste for landfill disposal.
- Evaporation pond – Large, lined surface impoundment for disposal of wastewater via atmospheric drying, resulting in a sludge that must be disposed in a landfill system.
- Deep injection well – Disposal of wastewater via well discharge to a geologic formation that is unsuitable for potable water production and isolated from aquifers.
- Disposal to WWTP – Discharge to a sanitary sewer discharging to a publicly owned treatment works.
- Surface discharge – Discharge of wastewater to the ground or receiving waters, including lakes, rivers and streams.
- Off-site treatment – Hauling of the wastewater to a facility in another location employing one or more of several technologies by a contracted service company.

Wastewater Disposal Alternatives Decision Analysis

The following hierarchy of "tests" was applied to each alternative:

Test 1 – Is the wastewater disposal alternative feasibly available at the BEC? (If not, then disregard this alternative. If yes, proceed to Test 2.)

Test 2 – Will the subject alternative satisfy applicable laws, ordinances, regulations, and standards (LORS)? (If not, then disregard this alternative. If yes, proceed to Test 3.)

Test 3 – Is the subject alternative technologically sufficient to guarantee high safety and reliability (98 percent availability? If no, then disregard this alternative. If yes, proceed to Tests 4 – 6.)

For alternatives passing Tests 1 – 3, Tests 4 – 6 were applied and scored:

Test 4 – Rate other environmental impacts, including transportation, biological, energy, health and safety, etc.

Test 5 – Rate relative capital costs of each remaining alternative.

Test 6 – Rate relative O&M costs of each remaining alternatives.

The scores from application of Tests 4 – 6 were weighted and totaled for each alternative, with the highest scoring alternative selected.

ZLD System

This is a mechanical system using membrane technology and heat to reduce liquid wastes to a dry waste for landfill disposal. This alternative passed Tests 1 – 2, but failed Test 3 due to low reliability of known systems. In addition, this alternative has high capital, O&M costs, and requires landfill disposal of produced wastes.

Due to the high levels of silica in the source waters, the use of water supplies in the cooling tower will be limited to 2.4 cycles of concentration, resulting in the generation of relatively high volumes of wastewater relative to the amount of power production. The large volumes of wastewater that would need to be processed in the ZLD would result in unusually high O&M costs relative to other applications.

The parasitic energy losses associated with use of ZLD technology would prevent the BEC from meeting the PPA requirements with PG&E. These losses would be most pronounced at temperatures above 95ºF, when power demands are greatest. Finally, the BEC will not operate as a base load station. Rather, it will operate as a peaking and intermediate load facility when energy demands are greatest. A ZLD system must be operated continuously to work effectively. This mode of operation is not compatible with the forecasted peak and intermediate operations of the BEC. This alternative was dropped from further consideration.

Evaporation Pond

Evaporation ponds are large, lined surface impoundments for disposal of wastewater via atmospheric drying. This process results in a sludge that must be periodically removed and disposed in a landfill system. This wastewater disposal alternative failed Test 1 due to the lack of adequate area at the BEC site for large evaporation ponds. These ponds also have high installation costs and require large areas of land and may result in significant environmental impacts. The use of evaporation ponds for wastewater disposal was eliminated from further consideration.

Deep Injection Well

This alternative includes the disposal of wastewater via wells that discharge to a geologic formation that is unsuitable for potable water production and is isolated from aquifers. The following geologic conditions protective of an underground source of drinking water are required to obtain a permit to construct a Class I Deep Injection Well:

- A thick sequence of permeable sediments capable of accepting the injected wastewater.
- A thick sequence of impermeable sediments that would confine the injected wastewater, and prevent migration towards USDW.
- The injection operation should not facilitate the fracturing of the rocks or the integrity of the injection well.

Information about the stratigraphy beneath the BEC site was derived from geophysical well logs of exploratory oil wells. This alternative failed Test 1 as, based on the well logs, it was determined that the BEC site would not meet the requirements for installation of a deep injection well. The use of a deep injection well for wastewater disposal was eliminated from further consideration.

Disposal to WWTP

This method includes discharge to a sanitary sewer discharging to a publicly owned treatment works. As previously noted, high silica levels in the source waters will limit the cooling towers to three cycles of concentration, thereby also limiting the concentration of dissolved solids in the wastewater. Presuming that the municipal water supply is utilized, the resulting wastewater will have TDS levels within requirements for disposal to the sanitary sewer. A “Will-Serve” letter has been received from the City of Fresno stating that the sanitary sewer and WWTP can accept this waste. Therefore, disposal of wastewater to the WWTP would pass Tests 1 – 6 and has been identified as the preferred alternative.

Surface Discharge

This alternative would involve the discharge of wastewater to the ground or receiving waters including lakes, rivers, and streams. This method failed to pass Test 2 as the quality of the wastewater would not meet state and federal discharge limitations for direct discharge to surface waters. This alternative was dropped from further consideration.

Off-site Treatment

Hauling of the wastewater to a facility in another location employing one or more of several technologies by a contracted service company would be included in this option. This alternative provisionally passed Tests 1 – 3, pending identification of a feasibly accessible facility. Potential problems associated with this alternative may include transportation and operations costs.

The scores from application of Tests 4 – 6 were totaled for each alternative, with the highest scoring alternative selected. Wastewater disposal options are evaluated in Table 5.5-7, Evaluation of Wastewater Disposal Options.

TABLE 5.5-7
EVALUATION OF WASTEWATER DISPOSAL OPTIONS

Wastewater Option	Test #1 Availability (pass?)	Test # 2 Satisfy LORS? (pass?)	Test #3 Technologically Feasible? (pass?)	Test #4 Environmental Impacts	Test #5 Relative Capital Costs	Test #6 Relative O&M Costs	Relative Ranking
ZLD	Yes	Yes	No	NA	High	High	NA
Evaporation pond	No	No	Yes	High	High	Low	NA
Deep injection well	No	NA	No	Low	NA	NA	NA
WWTP	Yes	No	No	Low	Medium	Low	1st Choice
Surface discharge	Yes	No	Yes	NA	NA	NA	NA
Off-site treatment facility	Yes (Provisional)	Yes	Yes	Low	Low	High	NA

Notes:
LORS = Laws, Ordinances, Regulations, and Standards
NA = not applicable.
O&M = operation and maintenance
WWTP = wastewater treatment plant
ZLD = zero liquid discharge

Note that only the Municipal Wastewater Treatment Plant option meet all of the required criteria of Tests 1-3. As such, BEC's wastewater evaluation has determined that the use of City's WWTP is the most plausible option.

5.5.3 Water Resources and Wastewater Management

5.5.3.1 Project Water Resources Plan

Water will be used at the BEC for industrial, sanitary, and potable uses. The primary uses will be for cooling tower makeup, emissions control, and evaporative cooling. Under normal operating conditions, the BEC's average water requirement will be approximately 0.6 mgd (420 gallons per minute [gpm]), and the maximum daily water consumption will be approximately 1.3 mgd (888 gpm). The expected daily and annual water flows are presented in Table 5.5-8, Expected Municipal Supply Water Quality.

TABLE 5.5-8
EXPECTED MUNICIPAL SUPPLY WATER QUALITY

General	Units		Chemicals (mg/L)	As Such
Conductivity	µS/cm		Aluminum	23.3
pH		7.7	Arsenic	1.2
Total suspended solids	ppm	ND	Boron	ND
TDS	ppm	205	Silica	62.1
Ion chemistry, mg/L	as $CaCO_3$		Chromium	1.9
Total alkalinity		161	Molybdenum	4.1
Hardness		112	Nickel	6.7
Calcium		67	Strontium	0.3
Magnesium		45	Tin	6.3
Sodium		45	Vanadium	10.3
Potassium		6	Zinc	1.0
Bicarbonate		163		
Sulfate		7		
Chloride		10		
Nitrate-Nitrite		7		

Notes:
µS/cm = microsiemens per centimeter
$CaCO_3$ = calcium carbonate
mg/L = milligrams per liter
ND = non-detect
ppm = parts per million
TDS =total dissolved solids

Source of Project Water Supply

Municipal water provided by the City of Fresno was selected to meet the BEC process and other water needs as it is the only alternative water source that meets Tests 1 and 3 of the decision analysis described in Section 5.5.2.1, Alternative Water Supplies. In support of this option, the City of Fresno has provided BEC with a “Will-Serve” letter acknowledging that there is adequate water supply is available to support the BEC operations and that the City will provide this supply (see Appendix U, City of Fresno Letters). The BEC will interconnect to the water main located in North Golden State Boulevard. An offset program has been developed to ensure consistency with the goals of the State Water Policy. The typical water quality of the municipal supply is presented in Table 5.5-8, Expected Municipal Supply Water Quality. As described in the Fresno/Clovis Water Resources Management Plan, the City has adequate water supply to meet current and future demands through 2050 if properly managed.

Potable Supply Offset Project

The State Water Resources Control Board (SWRCB) has established a State Water Policy that discourages the use of potable sources of water for power plant cooling despite the City's ability to serve the project. To maximize consistency with the State Water Policy, BEC is also proposing to offset this use by providing resources to assist the City in producing potable water from contaminated groundwater in the Sunnyside area. BEC believes this water supply offset plan will achieve full consistency with the SWRCB's water policy and provide significant benefits to the City.

In 2005, the City water supply system provided approximately 54 billion gallons to approximately 480,000 people in a service area of approximately 100 square miles. Approximately 90 percent of this supply was groundwater provided by a network of approximately 250 production wells distributed throughout the city. The City of Fresno maintains exclusive water rights to all of these wells. The remainder of the supply was surface water originating from the Sierra Nevada mountain range and treated at the City's surface water treatment plant in northeast Fresno.

The City faces challenges in meeting the water demand in areas where groundwater supplies are contaminated by nitrates. This is due to the municipal water system being dependent on localized groundwater supply to meet the demand for the specific areas within the city. The potable water distribution system was constructed based on dispersed wells and a local distribution network of relatively small water mains. The loss of wells has created local areas of low pressures during peak demand periods and inhibited the ability of the system to meet peak demands. The lack of redundancy or reliability is a critical deficiency of the distribution system. For the existing system to adequately serve the needs in areas of well closures, the wells must be replaced or fitted with wellhead treatment.

To address this problem, the City commissioned the preparation of a Nitrate Management Plan, for which a Final Draft was published in June 2006. As recommended by the Nitrate Management Plan, the City has removed approximately 15 supply wells from service due to nitrate concentrations approaching or exceeding the CCR Title 22 maximum contaminant level of 45 mg/L. In addition, the City has evaluated treating some of the impacted wells either by blending with cleaner groundwater or using ion-exchange wellhead treatment systems to lower nitrate levels.

The Sunnyside area of southeast Fresno is an area of approximately 15 square miles of primarily residential land use. It is also one of the areas most impacted by nitrate contamination of groundwater supplies. Two major sources of nitrate contamination are suspected in this area. The first suspected source is septic systems. Much of the Sunnyside area uses on-site septic systems for wastewater disposal due to the lack of sanitary sewers in most of the area. Further, there is no established schedule to connect the properties to the sewer system, so on-site septic systems are expected to continue to contribute nitrate to the groundwater.

When the Sunnyside area does become fully reliant on the sanitary sewer system, the nitrate problem will persist until contaminated water is withdrawn and nitrate concentrations reduced to potable water standards. The second suspected source of nitrate contamination in this area is the proximity of irrigated cropland east of the Sunnyside area, which is up-gradient with respect to groundwater flow. The irrigated cropland receives nitrogen fertilizer applications. This, too, is

an ongoing problem, although it will likely lessen with time as cropland is developed for other uses. Depending on the rate of dilution and water withdrawal, this process could take many years, if not decades, to reach nitrate levels that meet public health standards.

The City has approximately 23 supply wells in the Sunnyside area. Six of these wells have been shut down due to nitrate concentrations approaching or exceeding public health standards. As one of the faster growing areas of the city, water demand is increasing in the Sunnyside area. Given this shut down of wells, potable water supplies in the Sunnyside area are inadequate to meet current and future needs during the summer months when water demand is greatest.

The City implemented an emergency project to provide a temporary reverse osmosis (RO) treatment system at an impacted well in the Sunnyside are to help meet peak summer demand during the summer of 2006. Water production from this temporary RO treatment system is blended with untreated water prior to introduction into the municipal supply system. This system produces approximately 517 gpm of treated water. The City would like to make this treatment system a permanent installation to help meet future demand, but has been unable to secure the necessary funds to do so.

The municipal supply at the BEC site is plentiful and the amount of supply needed by the BEC project will not impact availability to other users in the area. BEC has initiated discussions with the city regarding the concept of providing resources for treatment of nitrate-contaminated groundwater in the Sunnyside area to produce potable water for replenishment of the potable water supply. This is intended to offset the requested use of potable water for the BEC project to provide consistency with the State Water Policy. This will assist the City in addressing existing water supply needs in the Sunnyside area and in expediting cleanup of the groundwater basin.

To assist in meeting system water demands in the Sunnyside area and to offset BEC's use of the municipal water supply, BEC proposes to provide for a project that would treat nitrate-contaminated groundwater to meet potable water standards for nitrate as required in CCR Title 22. Under this offset plan, BEC would provide funding to the City equivalent to that required for the installation and O&M of a water treatment system of sufficient capacity to meet the equivalent of the needs of the BEC project on an annual basis. However, the City may expand the capacity of this system using local and/or grant funding if needed to more fully meet the supply needs of the Sunnyside area.

There are approximately 41,000 acre-feet of nitrate contaminated groundwater in the Sunnyside area. This is approximately three times the 14,000 acre-feet of water that will be required over the 20-year BEC term. In addition, the City has identified other contaminated plumes that the offset program can be applied to. Given that basin dynamics are of a regional nature, the reactivation of the wells will not adversely impact overdraft of the groundwater in the Sunnyside area inasmuch as adjacent wells not accessing areas of contamination are currently providing this supply.

The City and BEC have evaluated alternative technologies for the proposed wellhead treatment program. RO and electrodialysis reversal technologies were not selected due to the generation of waste brine that must be disposed. Use of a nitrate-selective resin system was selected to provide wellhead treatment. This will greatly reduce removal of other minerals, resulting in smaller resin vessels, less waste, and a less corrosive potable water product. This system generates a low volume of non-hazardous waste brine (approximately 166 gallons per day) that will be disposed of off-site by the resin system vendor. In addition, this system will be skid

mounted to provide for relocation in the event that nitrate concentrations at the well are reduced to public health standards.

This technology involves on-site installation of a skid-mounted IX system and two polyethylene storage tanks (one for fresh salt solution and one for waste brine). The final size of the IX system and the storage tanks will be determined after additional water chemistry data and wellhead site layouts are made available.

City of Fresno well No. PS-152 was selected for initial installation of the wellhead treatment system. This well operates at a rate of 800 gpm and currently exhibits a nitrate concentration of 40 mg/L. Additional wells impaired by nitrate contamination and available for wellhead treatment are identified in Table 5.5-9, Wells Impaired by Nitrate Contamination. The final size of the IX system and the storage tanks will be determined after additional water chemistry data and wellhead site layouts are made available.

TABLE 5.5-9
WELLS IMPAIRED BY NITRATE CONTAMINATION

Well Number	Location	Average Flow Rate (gpm)	Currently Operable	Nitrates (mg/L)
PS-152	Southwest corner of Church/Sabre	800	Yes	40
PS-253/2A	McKenzie and Willow avenues	NIS/500-800	No pump	>40
PS-276	Fowler and California avenues	NIS	No	
PS-274	Southwest of Liberty/Burgan	NIS/400	Yes	>40
PS-140	Millbrook/Fort Washington	NIS/800	No pump	41

Notes:
> = greater than
NIS = Not in service
gpm = gallon(s) per minute
mg/L = milligrams per liter

With the currently available water chemistry data for well PS-152 (nitrate 40 mg/L and no detectable concentrations of sulfate and iron), a stream of approximately 75 gpm would be treated to <1 mg/L nitrate, and blended with 425 gpm untreated well water. This would generate a continuous potable water flow of 500 gpm. An estimated 170 gpd of brine waste will be generated, and transported by large tanker trucks to an appropriate disposal facility.

In addition, BEC and the City would enter into a long-term water supply agreement. The City will be responsible for the selection of well(s) to be treated and designed, and O&M of the groundwater treatment system. The City may operate the system on an as-needed basis, but sufficient to meet the equivalent water needs of the BEC operations.

In addition to the “Will-Serve” letter noted above, the City has provided a letter supportive of the proposed water supply offset plan. This letter is attached to this AFC as Appendix U, City of Fresno Letters. The sequence of actions necessary to develop and implement the proposed offset follows:

- BEC and the City would enter into a formal agreement for the municipal supply offset program prior to issuance of the California Energy Commission (CEC) Authority to Construct (ATC). The term of this agreement will be 20 years, which is the projected term of the BEC project.
- BEC would provide the funding necessary for the installation and operation of the wellhead treatment. This funding would commence about 6-months prior to BEC's Commercial Operation Date (COD).
- The City would be responsible for design, O&M of the groundwater treatment system, wells and distribution system.
- The City may operate the treatment system on an as-needed basis, but sufficient to meet the equivalent annual water needs of the BEC operations.

Groundwater Use Offset

The groundwater basin in the City of Fresno is in overdraft. As the municipal water supply in the City is highly dependent on groundwater supplies, the consumptive use of this supply by the BEC will incrementally contribute to this overdraft. As described in Section 5.5.3, Water Resources and Wastewater Management, the City, FID and FCMFCD have developed and are implementing the Fresno/Clovis Metropolitan Water Resources Management Plan, which includes an aggressive program to recharge groundwater with surface water sources. To offset this use of groundwater, the BEC will provide resources to allow for additional recharge of the groundwater with surface water supplies equivalent to the consumptive use by the project. BEC is in discussions with the City, FID and FCMFCD to identify public and private facilities to provide for this additional recharge capability.

Future Use of Reclaimed Water

In the event that WWTP reclaimed water becomes feasibly available at the BEC site, BEC is amenable to entering discussions with the City toward an agreement for use of reclaimed water to supplant the nitrate treatment plan offset. To ensure that reclaimed water will be utilized when available, BEC will meet with the City to review the availability of reclaimed water at least once every five years from the date of the formal agreement. If sufficient reclaim water becomes feasibly available, BEC will use reclaimed water and will discontinue its offset funding program. An amendment to the AFC would be required to be approved by the CEC. Ongoing consistency with the State Water Policy will be reviewed during the amendment process. The current water quality of the reclaimed water currently produced by the WWTP is presented in Table 5.5-5, Reclaimed Supply Water Quality.

Future Use of Surface Water

In the event that surface water from the Herndon Canal becomes feasibly available at the BEC site, BEC is amenable to re-evaluating use as a supplemental supply.

Process Water Uses

Uses of the water supply will include fire protection water, plant service water, cooling tower makeup, combustion turbine generator (CTG) NO_x injection (after treatment), combustion turbine (CT) inlet air evaporative cooler makeup (partly from treated water) and domestic uses. The CTG injection water will be treated using a RO system, followed by a mixed-bed deionizer. The amounts of water used for each purpose are summarized in Table 5.5-3, Daily and Annual Water Flows.

Project Water Supply Facilities

Water for the BEC will be supplied via a connection to an existing 14-inch water main located in the right-of-way (ROW) of North Golden State Boulevard at the front of the BEC site.

Project Water Treatment

Cooling Tower Makeup Water: There will be one cooling tower for the facility. The tower will provide heat rejection for the intercooler and lube oil coolers connected to each of the facility's two LMS100 CTGs.

The raw water will be stored in a 300,000-gallon raw water storage tank. Cooling tower makeup water will be pumped from the tank to the cooling tower basin as required to replace water lost from evaporation, blowdown and drift. The circulating water blowdown rate will be continuously treated and controlled in order to achieve approximately 2.4 cycles of concentration in the circulating water. The concentration limit is determined by the high silica concentration (~62 ppm) in the water supply because silica concentrations in the circulating water system greater than 150 ppm will begin to deposit and severely foul the cooling tower equipment.

A chemical feed system will supply water-conditioning chemicals to the circulating water to minimize corrosion and control the formation of mineral scale and bio-fouling. Sulfuric acid will be fed into the circulating water system in proportion to makeup water flow for alkalinity reduction to control the scaling tendency of the circulating water. The acid feed equipment will consist of a bulk sulfuric acid storage tank and two full-capacity sulfuric acid metering pumps. The cooling tower operating characteristics are summarized in Table 5.5-10, Cooling Tower Operating Characteristics.

TABLE 5.5-10
COOLING TOWER OPERATING CHARACTERISTICS

Parameter	Cooling Tower[1] Average	Evaporative Coolers
Circulating Water, gpm	13,800	270
Number of Cells	3	--
Makeup, gpm	595	--
Blowdown, gpm	149	223
Drift, gpm	0.10	--
Evaporation, gpm	446	47

Notes:
[1] All numbers are estimates for full load at 114°F dry bulb, 74ºF wet bulb
-- = not applicable
gpm = gallons per minute

To further inhibit scale formation, a polyacrylate solution will be fed into the circulating water system as a sequestering agent in an amount proportional to the circulating water blowdown flow. The scale inhibitor feed equipment will consist of a chemical solution bulk storage tank and two full-capacity scale inhibitor-metering pumps.

To prevent bio-fouling in the circulating water system, sodium hypochlorite will be fed into the system. The hypochlorite feed equipment will consist of a bulk storage tank and two full-capacity hypochlorite metering pumps. Two full-capacity metering pumps will be provided for the feeding of either stabilized bromine or sodium bromide as supplemental biocides.

In general, the cooling tower water treatment system will be used to maintain the circulating water quality within the requirements of the cooling tower manufacturer and the limits of the WWTP, as shown in Table 5.5-11, Circulating Water Quality Limits.

TABLE 5.5-11
CIRCULATING WATER QUALITY LIMITS

Parameter	Concentration (ppm)
Alkalinity, as $CaCO_3$	100 to 500
Silica, as SiO_2	<150
Iron	<3.0
Manganese	<0.1
Sulfides	<1.0
Ammonia	<50
TDS	<500
Calcium as $CaCO_3$	<800
Chlorides, as Cl	<450
Sulfates as $CaCO_3$	<800
Nitrates, as NO_3	<300

Notes:
< = less than
$CaCO_3$ = calcium carbonate
Cl = chlorine
NO_3 = nitrate
ppm = parts per million
SiO_2 = silica dioxide
TDS = total dissolved solids

5.5.3.2 Demineralized Water

The water injected into the CTG for NO_x control must be free of contaminants. Raw municipal supply water will be filtered and treated with an RO system to remove all of the suspended solids and most of the dissolved solids from the water. The RO system rejects approximately 40 percent of the feed water, along with the impurities that were removed. The product water from the RO system is sent through a trailer-mounted demineralizer and then to a 120,000-gallon demineralized water storage tank. The demineralizers will be regenerated by an off-site contractor. In addition to being used for CTG NO_x control, a portion of the demineralized water will also be used for CTG compressor washing.

CTG Inlet Air Evaporative Coolers Makeup Water.

The makeup water to the CTG evaporative coolers will be a blend of water from the raw water storage tank and from the demineralized water storage tank. This will allow the coolers to operate at 4 to 6 cycles of concentration.

The fraction of demineralized water that is fed to the coolers will be adjusted to meet the manufacturer's recommended makeup water quality, as shown in Table 5.5-12, Evaporative Cooler Makeup Water.

TABLE 5.5-12
EVAPORATIVE COOLER MAKEUP WATER

Parameter	Concentration (mg/L)
Calcium Hardness, as $CaCO_3$	50 - 150
Alkalinity, as $CaCO_3$	50 - 150
Chlorides, as Cl	<40
Silica, as SiO_2	<150
Iron	<0.2
Vanadium	<1.0
Lead	<1.0
TDS	<500
TSS	<5

Notes:
< = less than
$CaCO_3$ = calcium carbonate
Cl = chlorine
mg/L = milligrams per liter
SiO_2 = silica dioxide
TDS = total dissolved solids
TSS = total suspended solids

5.5.3.3 Project Wastewater Management Plan

The BEC project will generate industrial and sanitary wastewater for disposal. An on-site stormwater pond will be constructed to accept stormwater generated at the site. The primary source of wastewater will be from cooling tower blowdown and RO reject. Minor amounts of wastewater will be generated by plant drains and sanitary wastes. The average daily wastewater volume will be approximately 431,000 gallons (299 gpm), the maximum daily wastewater volume will be 520,000 gallons (361 gpm), and the maximum hourly wastewater volume will be 21,700 gallons (362 gpm). Based on the municipal water supply characteristics near the BEC site, the TDS concentration of the wastewater will be approximately 500 mg/L.

Selected Wastewater Disposal Alternative

Based on the evaluation described in Section 5.5.2.2, Wastewater Disposal Alternatives, discharge to the sanitary sewer was identified as the superior alternative for disposal of wastewater. A “Will-Serve” letter has been provided by the City of Fresno acknowledging that adequate wastewater treatment capacity is available to support the BEC operations and that the wastewater will meet pretreatment requirements. The BEC proposes to interconnect to the City of Fresno’s 54-inch polyvinyl chloride (PVC)-lined reinforced concrete trunk sewer at a manhole in North Golden State Boulevard located 1,500 feet northwest of the BEC site via a 14-inch gravity line (see Figure 3.2-1, Proposed Linear Routes). The wastewater will be conveyed to the RWRF operated by the City of Fresno. The WWTP provides wastewater treatment services for the greater Fresno metropolitan area. On an average day, the WWTP receives 72 million gallons

of wastewater. Treatment consists of two major steps; primary and secondary treatment, and a process to treat solids removed in the process at the plant.

The WWTP has capacity to treat 80 mgd of wastewater. Treated or reclaimed wastewater is directed to 1,660 acres of infiltration ponds for groundwater recharge. A portion of the reclaimed wastewater is also supplied directly to nearby farmers to irrigate fodder and fiber crops, such as alfalfa and cotton.

Project Wastewater Streams

The combined industrial wastewater discharge from the plant will consist of cooling tower blowdown, RO rejects, evaporative cooler blowdown, and water effluent from the oil-water separator. Circulating (or cooling) water system blowdown will consist of potable makeup water that has been concentrated by evaporative losses in the cooling tower and residues of the chemicals added to the circulating water. These chemicals control scaling and biological growth in the cooling tower and corrosion of the circulating water piping and heat exchanger tubes. Cooling water treatment will require the addition of a pH control agent (acid), a mineral scale dispersant (polyacrylate polymer), corrosion inhibitors (phosphate based), and biocide (sodium hydroxide or equivalent). A portion of this concentrated water will then be removed from the cooling tower via the blowdown to prevent the mineral scale formation on heat transfer surfaces. Table 5.5-9, Wells Impaired by Nitrate Contamination, shows the major wastewater streams and the resultant wastewater for disposal. Refer to the water balances on Figure 3.4-4A, Mass Water Balance – Average Full Load Flows, and Figure 3.4-4B, Mass Water Balance – Average Flows for Hottest Day, for flows.

Table 5.5-3, Daily and Annual Water Flows, shows the major wastewater streams and the resultant wastewater for disposal. Refer to the water balances, Figure 3.4-4A, Mass Water Balance – Average Full Load Flows, and Figure 3.4-4B, Mass Water Balance – Average Flows for Hottest Day, for flow rates. Wastewater from the BEC will consist mainly of cooling tower blowdown, which is non-hazardous (see Table 5.5-12, Evaporative Cooler Makeup Water). The volumes of process wastewaters to be discharged to the sanitary sewer are summarized in Table 5.5-13, Process Waste Characterization. The expected wastewater composition is shown in Table 5.5-14, Estimated Wastewater Volumes.

TABLE 5.5-13
PROCESS WASTE CHARACTERIZATION

	Units	Supply Water	Cooling Tower Blowdown	RO System Rejects	Combined Wastewater
General					
Flows	gpm		209	87	296
pH		7.7	8.0	7.7	7.9
Total Suspended Solids	ppm	ND	<100	0	<75
Total Dissolved Solids	ppm	205	492	513	498
Ion Chemistry, mg/L as $CaCO_3$					
Total Alkalinity		161	150	403	224

TABLE 5.5-13
PROCESS WASTE CHARACTERIZATION

	Units	Supply Water	Cooling Tower Blowdown	RO System Rejects	Combined Wastewater
Hardness		112	262	280	267
Calcium		67	153	168	157
Magnesium		45	109	113	110
Sodium		45	108	113	109
Potassium		6	14	15	15
Bicarbonate		163	151	408	226
Carbonate		0	0	0	0
Sulfate		7	342	18	247
Chloride		10	24	25	24
Nitrate-Nitrite		7	16	17	16
Chemicals, mg/L	As Such				
Aluminum		23.3	55.9	58.3	56.6
Arsenic		1.100	2.640	2.750	2.672
Chromium		1.900	4.560	4.750	4.616
Molybdenum		0.004	0.010	0.010	0.010
Nickel		6.7	16.1	16.8	16.3
Silica		62.1	149.0	155.3	150.9
Strontium		0.258	0.619	0.645	0.627
Tin		0.014	0.034	0.036	0.034
Vanadium		0.010	0.025	0.026	0.025
Zinc		1.000	2.400	2.500	2.429

Notes:
< = less than
$CaCO_3$ = calcium carbonate
gpm = gallons per million
mg/L = micrograms per liter
ppm = parts per million
RO = reverse osmosis

TABLE 5.5-14
ESTIMATED WASTEWATER VOLUMES

Waste Stream	Daily Average	Daily Maximum
Cooling Tower Blowdown	301,000 gpd	402,000 gpd
RO System Rejects	126,000	115,000
Facilities (sanitary, etc.)	5,000 gpd	5,000 gpd
Total	432,000 gpd	522,000 gpd

Notes
gpd = gallons per day
RO = reverse osmosis

The average daily wastewater generation rate that will require disposal is expected to be 0.431 mgd, or approximately 299 gpm, the maximum daily wastewater volume will be 0.522 million gallons (362 gpm) and the maximum hourly wastewater volume will be 0.024 million gallons (400 gpm).

Domestic/Sanitary Wastewater

Sanitary waste will be disposed to the sanitary sewer.

Stormwater Runoff

Stormwater from the portions of the project site containing industrial activities will be conveyed by overland flow and swales to an infiltration basin located near the center of the BEC site. Stormwater runoff from areas of the BEC not containing industrial activities (employee parking areas, switchyards, administration buildings, open space) are not required to be permitted or managed and will run off the site as sheet flow. The infiltration basin will prevent discharges of stormwater runoff from the industrial areas of the site. The infiltration basin is sized to capture 85 percent of the annual stormwater runoff from the industrial areas of the site according to standards set in the "California Storm Water BMP Handbook" (California Stormwater Quality Association 2003). The infiltration basin will also serve to manage peak stormwater runoff during the 100-year 24-hour storm event. The peak runoff for the developed conditions will not exceed the peak runoff rate of the existing conditions. Appendix S, Traffic Counts, contains the stormwater calculations.

A Stormwater Pollution Prevention Plan (SWPPP) will be prepared prior to construction of the BEC. This plan will be implemented at the BEC site to control and minimize contamination of stormwater during the construction of the facility. The SWPPP will employ best management practices (BMPs) such as stabilized construction entrances, silt fencing, berms, hay bales, and detention basins to control runoff from all construction areas.

5.5.4 Effect of Project on Water Resources

5.5.4.1 Effect on Sub-Basin Water Balance

The BEC will have an insignificant effect on the sub-basin water balance due to the annual water demands relative to the volume of groundwater storage in the Fresno area. Nevertheless, as the groundwater basin is in an overdraft condition, the BEC project will facilitate recharge of groundwater with surplus surface supplies in a volume equivalent to the consumptive use of water at the facility. This will result in no net loss of groundwater due to operation of the facility.

The resumption of the use of wells receiving wellhead treatment under the potable water offset program will be offset by decreased use of adjacent wells currently supplying the Sunnyside area.

5.5.4.2 Water Level Drawdown Effects

The project will have an insignificant effect on the water level drawdown in the Fresno area due to the annual water demands relative to the volume of groundwater storage. Nevertheless, as the groundwater basin is in an overdraft condition, the BEC project is committed to work with the City of Fresno, FID and the FCMFCD to facilitate additional recharge of groundwater with surplus surface supplies in a volume equivalent to the water used at the facility. As reclaimed and surface water sources become available in the vicinity of the BEC site, use of these sources will be reconsidered to reduce the dependence on groundwater sources.

While about one half of the San Joaquin Valley has been affected by subsidence, the BEC site is located in an area with little or no subsidence (Poland et al. 1975, Ireland et al. 1984, Ireland 1986). Most of the subsiding area in the San Joaquin Valley is underlain by a continuous and extensive confining bed, and most of the pumping overdraft and compaction due to head decline occurs in the confined aquifer system beneath this bed. In Fresno County, the confining bed is the Pleistocene Corcoran Clay Member (E-Clay) of the Tulare Formation (Ireland et al. 1984). However, the eastern edge of the E-Clay is located about 18 miles west of the BEC, and thus the BEC site is not underlain by this confining bed (Page 1986).

5.5.4.3 Water Quality Effects

The withdrawal of groundwater with high nitrate levels under the proposed offset program with the City of Fresno will provide a net removal of nitrate from the groundwater in the Sunnyside area and reduce the further buildup of nitrate in the groundwater. By removal of nitrates, the produced water will be of sufficient quality for augmentation of the City's potable water supply to address localized water shortages. Wastes from the wellhead treatment system implemented in cooperation with the City will be disposed of off site. Additional recharge of the groundwater basin with surface water will contribute to reduction of levels of dissolved solids in groundwater in the vicinity of the recharge.

5.5.4.4 Cumulative Effects

By facilitating additional recharge of groundwater with surface supplies, the use of groundwater by the BEC will not further impact groundwater overdraft conditions. Implementation of the potable water offset project, whereby non-potable water contaminated with nitrate will be treated to produce an amount of potable water equivalent to the water used by the BEC on an annual basis, will result in a net balancing of the supply of potable water. However, the BEC is located in an area where there are plentiful water supplies and the treated water will be produced in an area of the City with deficient supplies.

5.5.5 Available Documents and Information

The geology and hydrogeology of the groundwater basins and sub-basins in the Central Valley have been studied by the USGS, California Department of Water Resources (DWR), the U.S. Bureau of Reclamation, Cities of Fresno and Clovis and the FID. The project is located within the service area of the City of Fresno. The City of Fresno monitors well facilities in the project area, and has performed and commissioned groundwater studies within its boundaries. The City of Fresno annually collects water quality and water level data and other water-related information for the project area and develops estimates of groundwater pumpage and depth and elevation contour maps. The available historic records document long-term hydrologic and water-related conditions in the area

5.5.6 Stipulated Conditions

The analysis of the effect of the BEC on water resources indicates that the project will have no significant effect on the water resources in the Fresno area. Implementation of the following Conditions of Certification (COC) will help ensure that the project conforms with the LORS as identified in Section 5.5.8, Water Related Laws, Ordinances, Regulations and Standards.

5.5.6.1 Soil and Water 1: General Industrial Activity Stormwater Permit

There will be no off-site runoff from the BEC project as it will be constructed to contain and infiltrate runoff from areas of industrial activities in a retention basin on the project site. Therefore, the facility will not be required to obtain coverage under the General Industrial Activity Stormwater Permit and a SWPPP will not be required.

5.5.6.2 Soil and Water 2: Stormwater Pollution Prevention Plan

Prior to beginning any clearing, grading or excavating activities associated with project construction, and as required by the General Construction Activity Stormwater Permit, the applicant will develop and implement a SWPPP prepared under the requirements of the General Construction Activity Stormwater Permit.

Verification

At least 30 days prior to the start of construction, the applicant will submit a draft 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 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.

5.5.6.3 Soil and Water 3: 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

Two weeks 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.

5.5.6.4 Soil and Water 4: Potable Water Supply Offset Program

Prior to issuance of the CEC ATC, BEC and the City will enter into a formal agreement to implement a program to treat non-potable groundwater to offset the volume of municipal supply with an equivalent volume of contaminated groundwater treated for potable use. The term of this agreement will be 20 years, which is the projected life of the BEC project.

Verification

The applicant will submit a draft agreement for implementation of the groundwater treatment offset agreement to the CPM for review and comment. Prior to the issuance of the CEC ATC the applicant will submit to the CPM a copy of the final offset agreement for review and approval. The final agreement shall contain the changes made to address staff comments. Approval of the plan by the CPM must be received prior to the issuance of the CEC ATC.

5.5.6.5 Soil and Water 4: Potable Water Supply Offset Program

At least every five years following issuance of the CEC ATC, BEC will meet with the City to review the availability of reclaim and surface water supplies from the Herndon Canal at the BEC site.

Verification

The applicant will submit a report updating the status of the availability of reclaim water and surface water from the Herndon Canal at the project site to the CPM for review and comment. The applicant will reconsider use of recycled water and/or surface water from the Herndon Canal for industrial purposes at the BEC when these sources become feasibly available to the project site.

5.5.6.6 Soil and Water 5: Groundwater Use Offset Program

As described in section 5.5.1.7.1, the City, FID and FCMFCD have developed and are implementing the Fresno/Clovis Metropolitan Water Resources Management Plan which includes an aggressive program to recharge groundwater with surface water sources. Prior to issuance of the CEC ATC, BEC and the City will enter into a formal agreement with the City, FID and FCMFCD to implement a program to increase the recharge of groundwater to offset the consumptive use of groundwater supplies. This program will provide for additional recharge of the groundwater with an amount of groundwater consumptively used by the project. The term of this agreement will be 20 years, which is the projected life of the BEC project. BEC has initiated discussions with the agencies to identify candidate facilities for this additional recharge.

Verification

The applicant will submit a draft agreement for implementation of the groundwater recharge offset agreement to the CPM for review and comment. Prior to the issuance of the CEC ATC the applicant will submit to the CPM a copy of the final groundwater recharge offset agreement for review and approval. The final agreement shall contain the changes made to address staff comments. Approval of the plan by the CPM must be received prior to the issuance of the CEC ATC.

5.5.7 Mitigation Measures

In relation to water resources, mitigation measures for the project would be applied in situations where the project has or would have an unmitigated significant impact. 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 area, the project will have no significant impact on the depth to water in the aquifer, or water resources in the area as a result of the incremental drawdown caused by pumping to supply the project. The project will support a City of Fresno project that will have a beneficial effect on the quality of groundwater in the Sunnyside area. This project will assist in alleviating an existing water supply deficiency and promote remediation of groundwater contaminated by elevated concentrations of nitrate. The project will also support a project with the City of Fresno, FID and FCMFCD to increase recharge of groundwater to offset use of groundwater by the project. Wastewater disposed to the WWTP will comply with pretreatment requirements and will be of sufficient quality for reuse for crop irrigation and power plant cooling following treatment at the WWTP. Thus, no mitigation is required for water resources.

5.5.8 Water-related Laws, Ordinances, Regulations and Standards

The construction and operation of the BEC will be in accordance with all federal, state, county and local LORS applicable to water resources. Applicable LORS are discussed in this section and are summarized in Table 5.5-14, Estimated Wastewater Volumes.

5.5.8.1 Federal Authorities and Administering Agencies

Clean Water Act of 1977 (including 1987 amendments) § 402; 33 USC § 1342; 40 CFR 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 U.S. This law and its regulations apply to stormwater and other discharges into waters of the U.S. The CWA requires compliance with a general construction activities permit for the discharge of stormwater from construction sites disturbing one acre or more. This federal permit requirement is administered by the SWRCB.

Construction activities at the project site will be performed in accordance with a 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 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. The administering agencies for the above authority are the Central Valley RWQCB.

Clean Water Act § 311; 33 USC § 1342; 40 CFR 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).

5.5.8.2 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. No non-potable water supply is feasibly available in the project area. The project will use municipal supply and implement an offset program to mitigate this use of potable water through treatment of an equivalent amount of non-potable groundwater with nitrate concentrations greater than 35 mg/L to produce potable water. SWRCB Resolution 75-58 addresses this issue and the administering agency is the Central Valley RWQCB (see Table 5.5-15, LORS Related to Water Resources).

TABLE 5.5-15
LORS RELATED TO 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 stormwater discharges. Requires preparation of a SWPPP and Monitoring Program.	No industrial stormwater discharges, so no coverage under NPDES industrial stormwater permit required. NOI for coverage under NPDES construction stormwater permit will be filed prior to construction and plant operation. A 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 recycled water is not feasibly available in the vicinity of the project site at this time. Use of recycled water will be reconsidered when it becomes feasibly available to the project site.
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. The project will comply with this as well as SWRCB Resolution 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 recycled and other alternative water supplies are not feasibly available at the site at this time. An offset program will be implemented in conjunction with the City of Fresno to offset the use of municipal supply with water produced by treating a non-potable supply. Use of recycled water will be reconsidered when it becomes feasibly available to the project site.
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, narrative and numerical water quality standards.	Project will conform to applicable state water standards, both qualitative and quantitative, prior to plant operation.

TABLE 5.5-15
LORS RELATED TO WATER RESOURCES

LORS	Applicability	Conformance and Timing
Title 22, CCR	Addresses the use of recycled water for cooling equipment.	Project has investigated the technical and economic feasibility of using reclaimed water and determined that this resource is not currently feasibly available. Use of recycled water will be reconsidered when it becomes feasibly available to the project site.
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 has investigated the technical and economic feasibility of using reclaimed water and determined that it is not available. However, an offset program will be implemented in conjunction with the City of Fresno to offset the use of municipal supply with water produced by treating a non-potable supply.
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 BEC 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.
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 BEC will comply with the requirements of the CEC to assure protection of water resources.
Local		
City of Fresno General Plan		
Water Quality Policies and Programs	Non-point sources of water pollution, such as runoff from urban areas, grading, construction, and agricultural activities shall be recognized as potentially significant impacts of development.	Project will conform to all water quality policies and programs, and will have zero discharge off-site from industrial activities. Grading and erosion control plans will prevent construction impacts.

TABLE 5.5-15
LORS RELATED TO WATER RESOURCES

LORS	Applicability	Conformance and Timing
Encroachment Permit	For construction in City ROW to construct wastewater disposal line.	
Well abandonment permit	To be obtained prior to activities to abandon existing well.	

Notes:
CEQA = California Environmental Quality Act of 1970
NOI = Notice of Intention
NPDES = National Pollutant Discharge Elimination System
ROW = right-of-way
RWQCB = Regional Water Quality Control Boards
SWRCB = State Water Resources Control Board
USC = U.S. Code

State Water Resources Control Board, Resolution 75-58 (June 18, 1975)

The 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 Section 5.5.3.1, Project Water Resources Plan, of this report. 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 the 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 the Resource Conservation and Recovery Act of 1976 (RCRA), as amended (42 U.S. 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, CCR 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 75-58. The administering agency is the Central Valley RWQCB.

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 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 & 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 would 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 CCR Chapter 9

The code requires the filing of a Report of Waste Discharge (ROWD) and provides for the issuance of Waste Discharge Requirements (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 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 CCR § 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 5.5.2, Project Water and Wastewater Needs. The administering agency of the above authority is the CEC.

5.5.8.3 Local Authorities and Administering Agencies

The City of Fresno will issue a Wastewater Discharge Permit that will specify quality limitations for the disposal of industrial wastewater to the sanitary sewer.

Fresno County Department of Community Health, Environmental Health System, California Well Standards Ordinance and California Well Standards, Bulletins 74-81 and 74-90

The Fresno County Environmental Health System regulates the construction of new water wells, the reconstruction, repair or deepening of existing wells and the destruction of abandoned wells in unincorporated Fresno County. The Environmental Health System regulates these activities through the provisions of the California Well Standards Ordinance and the construction standards set forth in the California Well Standards, Bulletins 74-81 and 74-90. The existing water supply well will be abandoned in accordance with this ordinance and these bulletins. The administering agency is the Fresno County Department of Community Health (FCDCH), Environmental Health System.

Fresno County General Plan, Water Quality Policies G-3

The purpose of these policies are to help control potentially significant impacts of development, including non-point sources of water pollution, such as runoff from urban areas, grading, construction, and agricultural activities. Project compliance with other LORS, such as the CWA, will result in general compliance with this objective.

5.5.8.4 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 the LORS mentioned in this report section or state and local building codes.

5.5.8.5 Agency Contacts and Permits

See Table 5.5-16, Agency Contacts, for agency contacts.

TABLE 5.5-16
AGENCY CONTACTS

Agency	Contact	Title	Telephone
California Regional Water Quality Control Board, Central Valley Region	Jo Anne Kipps	Senior Water Resource Control Engineer	559-445-5035
Fresno County Department of Environmental Health	Permit Officer on Duty		559-445-3537
City of Fresno Water Division	Lon M. Martin, P.E.	Water System Manager	559-621-8616
City of Fresno Wastewater Division	Steve Hogg		

The water-related permits that are required for the project are identified in Table 5.5-15, LORS Related to Water Resources. The timing for the preparation of each permit is noted in the table. These permits include:

- General Construction Activity Stormwater Permit. Notice of Intent to comply with this general permit to be prepared and submitted to the SWRCB at least two weeks prior to the start of project operation.
- Draft of 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 two weeks prior to the start of construction.
- Well Abandonment Permit. A well abandonment permit will be obtained from the Fresno County Health Department prior to abandonment of the existing water supply wells at the project site. This permit will be obtained at least one week prior to initiation of abandonment activities.

5.5.9 References

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Williamson, A. K., D.E. Prudic, and L.A. Swain. 1989. Ground-Water Flow in the Central Valley, California. U.S. Geological Survey Professional Paper 1401-D.

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. ____ 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.	3-2; 3.3, 5.5-1; 5.5.1, 5.5-17; 5.3, 5.5-28; 5.5.4		
Appendix B (g) (14) (A)	All information required by the Regional Water Quality Control Board in the region where the project will be located to apply for:	5.5-29; 5.5.6		
Appendix B (g) (14) (A) (i)	Waste Discharge Requirements; and	5.5-29; 5.5.6.1		
Appendix B (g) (14) (A) (ii)	a National Pollutant Discharge Elimination System Permit.	5.5-29; 5.5.6.2		
Appendix B (g) (14) (B)	A description of the hydrologic setting of the project. The information shall describe, in writing and on maps at a scale of 1:24,000, the chemical and physical characteristics of the following water bodies that may be affected by the project:	3-3; 3.3;		
Appendix B (g) (14) (B) (i)	Groundwater bodies and related geologic structures;	3-3; 3.3.3.2 5.5-3; 5.5.1.6		
Appendix B (g) (14) (B) (ii)	Surface water bodies; and	3-3; 3.3.3.1 5.5-9; 5.5.2.1		

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. ____ 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) (B) (iii)	Water inundation zones, such as the 100-year floodplain and tsunami run-up zones.	3-31; 3.5.9		
Appendix B (g) (14) (C)	A description of the water to be used and discharged by the project. This information shall include:	3-12; 3.4.7 5.5-17; 5.5.3.1.1 5.5-24; 5.5.3.3		
Appendix B (g) (14) (C) (i)	Source of the water and the rationale for its selection, and if fresh water is to be used for power plant cooling purposes, a discussion of all other potential sources and an explanation why these sources were not feasible;	3-12; 3.4.7 5.5-8; 5.5.2.1 5.5-17; 5.5.3.1		
Appendix B (g) (14) (C) (ii)	The physical and chemical characteristics of the source and discharge water;	5.5-17; 5.5.3.1 5.5-26; 5.5.3.3		
Appendix B (g) (14) (C) (iii)	Average and maximum daily and annual water demand and wastewater discharge for both the construction and operation phases of the project; and	3-12; 3.4.7.1 5.5-6, 5.5.2		
Appendix B (g) (14) (C) (iv)	A description of all facilities to be used in water conveyance, treatment, and discharge. Include a water mass balance diagram.	3.4.7.1 5.5-17; 5.5.3.1 5.5-24; 5.5.3.3		
Appendix B (g) (14) (D)	A description of pre-, and post-construction runoff and drainage patterns, including:	3-2; 3.3.1 3-30; 3.5.8 5.5-1; 5.5.1.1 5.5-20; 5.5.3.2.4 5.5-27; 5.5.3.3		

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. ____ 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) (D) (i)	Precipitation and storm runoff patterns; and	3-3; 3.3.3 5.5-2; 5.5.1.3 5.5-27; 5.5.3.3		
Appendix B (g) (14) (D) (ii)	Drainage facilities and design criteria.	5.5-27; 5.5.3.3		
Appendix B (g) (14) (E)	An assessment of the effects of the project on water resources. This discussion shall include:	5.5-17; 5.5.3.1		
Appendix B (g) (14) (E) (i)	The effects of project demand on the water supply and other users of this source;	5.5-28; 5.5.4		
Appendix B (g) (14) (E) (ii)	The effects of construction activities and plant operation on water quality; and	3-30; 3.5.8 5.5-17; 5.5.3.1		
Appendix B (g) (14) (iii)	The effects of the project on the 100-year floodplain or other water inundation zones.	3-30; 3.5.8		
Appendix B (h) (1) (A)	Tables which identify laws, regulations, ordinances, standards, adopted local, regional, state, and federal land use plans, and permits applicable to the project, and a discussion of the applicability of 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;	5.5-33; 5.5.8.2		

Adequacy Issue: Adequate ____ Inadequate ____

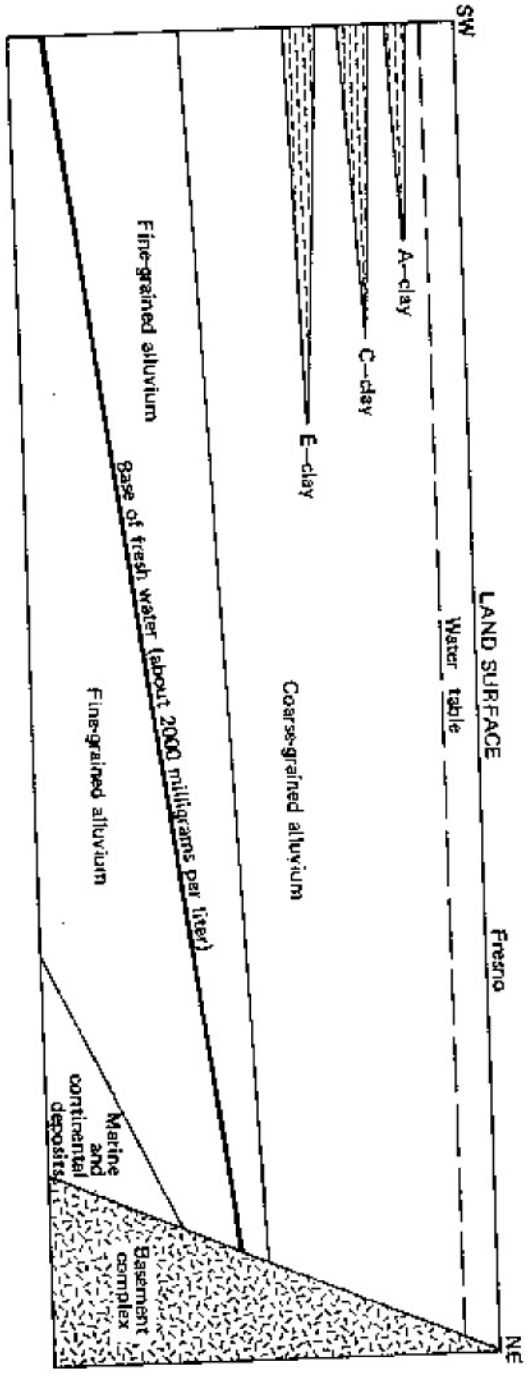
DATA ADEQUACY WORKSHEET

Revision No. ____ 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 (h) (1) (B)	Tables which identify each agency with jurisdiction to issue applicable permits 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.	5.5-33; 5.5.8.2		
Appendix B (h) (2)	A discussion of the conformity of the project with the requirements listed in subsection (h)(1)(A).	5.5-33; 5.5.8.2		
Appendix B (h) (3)	The name, title, phone number, and address, if known, of an official within each agency who will serve as a contact person for the agency.	5.5-37; 5.5.8.5		
Appendix B (h) (4)	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.	5.5-33; 5.5.8.2		



REFERENCE: Modified From Mitten, H.T. 1984. Groundwater in the Fresno Area, California -- Preliminary Report. U.S. Geological Survey Water-Resources Investigations Report 83-4246.

Schematic Hydrogeologic Cross-Section

Bullard Energy Center

URS

FIGURE 5.5-1

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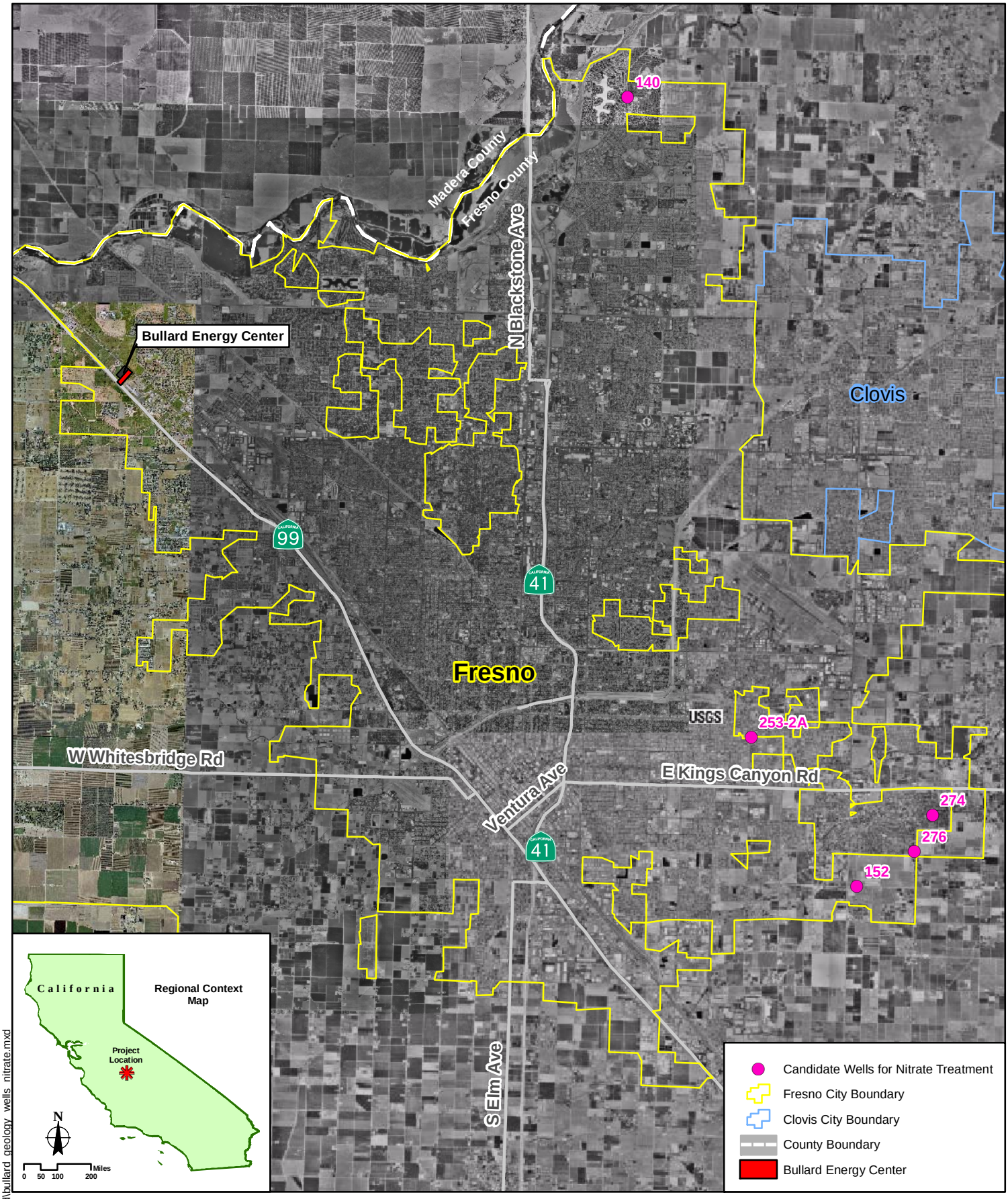

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6,000 0 6,000 12,000 Feet

SCALE: 1" = 12,000'

N

SOURCES:
US Geological Survey (aerial 1998);
Airphoto USA (color aerial Feb. 2005);
ESRI (county/city boundaries).

Candidate Wells for Nitrate Treatment

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FIGURE 5.5-2