CHAPTER 6.0 WATER SUPPLY

6.1 INTRODUCTION

This chapter describes the quantity of water and proposed sources of water supply for process makeup, domestic uses, fire protection, and plant services required by the Kings River Conservation District Community Power Plant (KRCD CPP). This chapter also provides a description of the treatment facilities and facilities required to convey the water to the KRCD CPP.

6.2 WATER USE

The KRCD CPP will require a constant and reliable water source to meet the process and cooling water demands. Assuming a 100-percent Equivalent Availability Factor (EAF)[1], approximately 3,485-acre-feet (AF) of process and cooling water will be required for the KRCD CPP (exclusive of water required for filter backwash, which is returned to the City of Parlier Waste Water Treatment Plant (WWTP)). This demand will fluctuate monthly as ambient conditions affect the energy generation and heat rejection processes. The estimated average process water demands by month are shown in Table 6-1.

Table 6-1
Estimated Average Process Water Demands
KRCD CPP

Month	Acre-Feet (AF)	Gallons Per Minute (gpm)
January	254	1,920
February	239	1,800
March	274	2,070
April	280	2,110
May	309	2,330
June	317	2,390
July	343	2,590
August	338	2,550
September	315	2,380
October	300	2,260
November	261	1,970
December	255	1,920

[1] As described further in Chapter 2, Project Description, the EAF is a more refined measure of plant availability that considers partial outages (e.g., outage of only one combustion turbine generator). During a partial outage, the availability of a plant would be zero even though it may still be generating at part load. However, its EAF would be positive, and equal to the percentage of full capacity still available.

Table 6-1 Estimated Average Process Water Demands KRCD CPP		
Month	**Acre-Feet (AF)**	**Gallons Per Minute (gpm)**
Average	290	2,190
Total Acre-feet per Year (AFY)	**3,485**	**-**

The water required on a daily and hourly basis will also vary due to fluctuations in hourly temperatures and deviations from mean temperatures. Average and maximum process water demands are provided in Table 6-2.

Table 6-2 Average and Maximum Process Water Demands KRCD CPP		
	Average	**Maximum**
Hourly Demand	2160 gpm	3256 gpm
Daily Demand	3.11 mgd	4.22 mgd(1)
(1) equates to average of 2930 gpm over the entire day mgd = million gallons per day		

The majority of process water will be used for evaporative cooling towers. The remainder will be used for fogging or evaporative cooling of the combustion inlet air and for process water makeup.

Water will also be required for plant services, domestic uses, landscape irrigation and fire protection. Plant service water includes water needed for eye wash stations, plant hose stations and general wash down of the plant as part of typical cleanup activities. It is estimated that three acre-feet per year (AFY) is required for these uses.

6.3 RECLAIMED WATER SUPPLY

The primary source of process and cooling water makeup will be secondarily treated reclaimed water from the City of Parlier WWTP and City of Sanger WWTP (collectively "WWTPs"). In 2005, the Parlier WWTP discharged approximately 1,670 AFY and the Sanger WWTP discharged approximately 1,902 AFY to their respective percolation ponds. As with most valley communities, the effluent from the Parlier and Sanger WWTPs has elevated levels of dissolved salts. These salts are presently dispersed in the groundwater when the WWTP effluent is percolated. By diverting effluent to the power plant, these salts will no longer be added to the

groundwater, but will instead be removed and disposed of at a permitted landfill. Appendix 6-1 provides a summary of the quality of the reclaimed water from the existing WWTPs.

The cities of Sanger and Parlier will enter into waste water supply agreements with KRCD to provide reclaimed water to the KRCD CPP. The agreement with the City of Parlier will also provide that the WWTP will accept the tertiary treatment filter backwash water and domestic sanitary waste from the KRCD CPP. Will-serve letters have been received from the cities of Sanger and Parlier are provided in Appendix 6-2.

The Parlier WWTP will divert waste water into existing percolation ponds dedicated for reclaimed water storage. Waste water will then flow on an as-needed basis through a gravity flow pipe into the water control structure. A meter will be installed on the pipe to measure delivery quantities prior to entering the structure. Waste water will then either gravity flow or be pumped to the KRCD CCP tertiary treatment plant where it will be filtered and disinfected (as discussed below).

Reclaimed water from the Sanger WWTP will be conveyed to the KRCD CCP via a proposed pipeline interconnection to the Sanger WWTP Lincoln Ponds, which approximately five miles northwest of the project site. Currently two options are being considered for the water pipeline interconnection to Lincoln Ponds (i.e., Water Supply Pipeline Option 1 and Option 2). The pipeline is expected to have a diameter of 18 inches, and will include pumping facilities capable of delivering up to 3,300 gallons per minute (gpm) to the power plant. The water supply pipeline to Lincoln Ponds will be primarily constructed in public rights of way. Option 1 involves the crossing of a few private parcels and Option 2 will be constructed within the public right-of-way. KRCD will obtain any required easements with the applicable private landowners. The pipeline will terminate at a concrete water control structure located on the KRCD CPP project site. A meter will be installed on the pipeline to measure delivery quantities prior to entering the structure. Water in excess of plant demands will remain at Lincoln Ponds where it will be stored for short-term future use. It is anticipated that water will not be stored at Lincoln Ponds for long-term storage as the water readily percolates into the groundwater. The water pipeline route (Option 1 and Option 2) is shown on Figure 1-3, in Chapter 1, Executive Summary.

6.4 BACKUP WATER SUPPLY

During periods of high plant process demand there may be a need to supplement WWTP water with water from new shallow groundwater wells drilled on the KRCD CPP project site aimed at collecting water that has percolated into the ground from the Parlier WWTP ponds. Data on reclaimed water availability for the year 2005 indicates that there will is a deficit of 210 AF. In 2010, it is projected that the effluent discharged from both WWTPs will be adequate to meet

over 95 percent of the process water demands. In order to supplement the process water supply during these periods of shortfall, up to four new shallow wells recovering percolated effluent will be drilled and constructed in conformance with Regional Water Quality Control Board (RWQCB), Department of Health Services, Fresno County and normal construction standards for wells. These wells will also serve as an operational backup should the flow of reclaimed water be interrupted from either WWTP.

Water recovered with these wells will be sent to the KRCD CPP chlorine contact tank where the water will be treated with sodium hypochlorite prior to being sent to the recycle water makeup tank.

6.5 SERVICE, FIRE PROTECTION AND POTABLE WATER SUPPLY

Water for domestic uses including water for drinking, showers, sinks, eye wash/safety showers and general sanitary purposes will be provided by a new potable groundwater well. Potable water will be filter and treated as necessary to meet plant and health department requirements prior to delivery plant potable water system. This well will also provide fire protection water and plant service water. Service and fire water will be pumped directly to a 500,000 gallon above ground service and fire water storage tank. The service and fire water storage tank will provide two hours of fire protection water storage at a flow rate of 2,000 gpm. The tank will have a standpipe to ensure fire protection water requirements can be meet.

6.6 LANDSCAPE IRRIGATION WATER SUPPLY

Existing irrigation well at the southwest corner of the site will either be converted over to landscape irrigation use by installing a smaller-energy efficient pump or will be abandoned in accordance with county rules/procedures. If not utilized, landscape irrigation will come from potable water. It is estimated that one AFY of supply will be required for landscaping.

6.7 TERTIARY TREATMENT SYSTEM

The California Code of Regulations (CCR) outlines restrictions and requirements for the use of recycled water (or wastewater effluent and herein referred to as reclaimed water). In particular, Title 22, Section 60306 – Use of Recycled Water for Cooling, states:

> "Recycled water used for industrial or commercial cooling or air conditioning that involves the use of a cooling tower, evaporative condenser, spraying or any mechanism that creates mist shall be disinfected tertiary recycled water".

This regulation is intended to protect power plant personnel from bacteria and viruses in the water mist. Therefore, to be used as cooling water, the wastewater effluent must receive tertiary

disinfection. The Sanger and Parlier WWTPs only treat their water to a secondary level, so construction and operation of tertiary treatment facilities on the KRCD CPP project site will be needed to use the water at the power plant.

To meet the tertiary requirement requires the construction of a new 4.2 mgd capacity treatment plant at the power plant site. The treatment plant will be located near the recycled water storage tank as shown on Figure 2-1 in Chapter 2, Project Description.

The secondary treated effluent will be delivered directly from the WWTPs to storage/pumping vault where the water will be pumped to the new tertiary treatment plant. Constructing a single treatment plant at the project site is more economical and practical than constructing and operating separate plants at each WWTP facility (i.e., Parlier and Sanger). The following is a description of the new tertiary treatment system.

Water from the WWTPs will be transferred to the project site and will enter the storage/pumping vault. The storage capability of the ponds is estimated to be 70 AF. The vault will have three 50 percent capacity vertical pumps with variable speed drives that transfer the secondarily treated water to the tertiary treatment system. The pumped water will initially go through one of four disk filters (three on-line and one standby) designed to remove turbidity from the secondary effluent. Two turbidimeters will be provided, one on the filter influent line, and one on the filter effluent. Any time the filter influent flow exceeds five nephelometric turbidity units (NTU) or the filter effluent flow exceeds two NTU, polymer from an on-site storage tank will be added at an injection point upstream of the filters. Between normal filter cycles, each of the cloth filter disks will be backwashed using filtered water.

Filter effluent will then flow to a chlorine contact tank, after being injected with sodium hypochlorite solution. Sodium hypochlorite will be stored in solution on-site in a chemical storage tank, and pumped to the injection point by means of a chemical metering pump. The contact tank will contain baffle walls to induce a serpentine flow through the tank, thus providing sufficient contact time for disinfection. Two 100 percent capacity vertical turbine pumps located at the downstream end of the contact tank will then pump the filtered treated water to the power plant.

Redundancy and standby power requirements will be provided throughout the tertiary treatment plant. Four filters will be provided (three on-line and one standby), with sufficient capacity to filter the design flow with one unit out of service. A second chemical metering pump will also be provided for redundancy in the chlorine dosing. The chlorine contact tank will include a center wall dividing the contact tank in half with each half of the contact tank designed for the

complete 4.22 mgd flow. Two vertical turbine pumps will be provided at the end of the contact tank, each also having capacity to pump the entire flow. Standby power generator will be provided by a natural gas backup generator that will allow the power plant's critical systems to operate during a power outage. Additional information on the tertiary treatment system, including a schematic of the proposed tertiary treatment facility, is provided in Section 8.5, Water Resources.

The tertiary treatment facility will remove some volume of solids in the filtering process. An estimate of the volume of solids removed can be approximated with a manufacturer's assumption that, based on experience, 3.7 percent of flow through the filters will become backwash water. Using this assumption, the treatment of 3,485 AF annually will generate about 115,000 gallons per day of backwash water. On-site processing of the filter backwash water is very expensive and thus the backwash water be returned to the Parlier WWTP and treated as ordinary wastewater.

6.8 COMPLIANCE WITH LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

State Water Policy

Applicable water codes and policies encourage the conservation of water resources and the maximum reuse of wastewater, particularly in areas where water is in short supply. In the 2003 Integrated Energy Policy Report, the California Energy Commission states:

> "The (State Water Resources Control) Board states that it "encourages…power generating utilities and agencies to study the feasibility of using wastewater for power plant cooling" and "encourages the use of wastewater for power plant cooling where it is appropriate". The Board also lists specific "discharge prohibitions" to limit the discharge of blowdown and waste waters from cooling facilities so as to "maintain existing water quality and aquatic environment of the state's water resources."

KRCD proposes to use wastewater effluent for over 99 percent of the power plant water demands, which is consistent with these policies. The power plant will also employ a zero liquid discharge (ZLD) system that will eliminate any liquid blowdown and prevent degradation of the State's water resources. A description of the LORS that pertain to the construction and generation of the water supply is included in Section 8.5, Water Resources. A discussion of other alternative water supplies that were considered is included in Chapter 9, Alternatives.