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SECTION 7.0

Water Supply

This section describes the proposed water supply sources for the CPP. Section 7.1 discusses the cooling water sources, the water supply and effluent, and the associated water quality elements. Section 7.2 discusses domestic use water, and Section 7.3 discusses process makeup water. Sections 7.4 and 7.5 discuss backup supply and alternatives, respectively. References are in Section 7.6. A map of the proposed water supply line alignment is shown on Figure 7.1-1.

7.1 Cooling Water

The District has an ample, high quality water supply available from the Folsom-South Canal, capable of accommodating a new power plant at the Rancho Seco site. An existing water service contract between the District and the U.S. Bureau of Reclamation (Reclamation), dated November 20, 1970, (Appendix 7A) provides for delivery of a maximum of 75,000 acre-feet per year (AFY) through the Folsom-South Canal to the site. Of this amount, 15,000 acre-feet is water originally assigned to the District by the city of Sacramento (referred to as water rights water), and the remaining 60,000 acre-feet is Central Valley Project (CVP) water to which the District is entitled by the contract. At present, negotiations are in progress for the first two proposed assignments of 15,000 acre-feet each of the District's entitlement of CVP water to the Sacramento County Water Agency (SCWA). A new water service contract between the District and Reclamation is also currently under negotiation.

Most of the 75,000 AFY water supply was originally intended to serve the needs of the Rancho Seco Plant (RSP), which is now being decommissioned. Approximately 13,000 AFY of the District's water rights water, and about 1,600 AFY of the CVP water, is currently used at Rancho Seco for a variety of purposes associated with operating and maintaining the power plant site during decommissioning. The District's 75,000 AFY water entitlement is tentatively allocated as follows:

Rancho Seco Existing Uses	15,000 AFY
SCWA Water Assignment	30,000 AFY
Future Projects (including the proposed CPP)	30,000 AFY

The CPP would require approximately 8,000 AF of water in a typical year, and as high as 9,000 AFY in peak demand years. Folsom-South Canal originates at Lake Natoma on the American River in east Sacramento, and carries water south to the RSP. When the Folsom South Canal was constructed, there was the intent to extend it further south, but this additional construction was never implemented, so the canal terminates just south of Twin Cities Road. For all intents and purposes, the District is the sole user of this water at this time. However, it is possible that the canal may be extended and used by at least one other CVP water service contractor in the future. The canal is generally straight, trapezoidal, concrete-lined, and fenced on both sides.

The point of delivery of the CVP water is through a turnout from the canal located at a point on the canal approximately 700 feet upstream from the inlet transition of the Laguna Creek siphon. At the turnout, the water passes through traveling screens, and enters the site water supply pump station (3 pumps). The water then passes through a meter, and is pumped west through the 66-inch diameter canal pipeline to the Rancho Seco Plant. Water for CPP is diverted through a 12-inch pipe between the booster pump station and the CPP. The booster pump station pumps to the Rancho Seco Reservoir via the 48-inch diameter pump station. The reservoir pipeline can also gravity flow from the reservoir to plant facilities if the water supply pump station at Folsom-South Canal is not operational. Water coming from the reservoir can be routed through strainers before being used at the plant facilities. Table 7.1-1 shows the estimated monthly water demand of the project.

An on-site water treatment system would treat and condition the incoming raw water for use in the cooling towers, potable domestic water system, plant service water, and to produce demineralized water for fogging combustion turbine inlet air and HRSG makeup water.

TABLE 7.1-1
Estimated Monthly Water Requirements for CPP

Water Demand Type	Monthly Requirements (acre-feet)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
Raw Water	600	600	600	600	600	800	800	800	800	600	600	600	8,000
Other (for domestic uses)[a]	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	2
Total Monthly Water Use	600	600	600	600	600	800	800	800	800	600	600	600	8,000

[a] Water for domestic purposes would consist of water from Folsom-South Canal treated to meet DHS Title 22 requirements.

Based on the reference 1,000 MW cycle, the maximum water demand is 10.8 million gallons per day (gpd) or 9,000 AFY.

The project would not use groundwater on the project site for any purpose. Therefore, withdrawals for water supply would not adversely affect other groundwater users in the vicinity.

7.1.1 Raw Water Quality

Water quality from Folsom-South Canal is very high quality, with low concentrations of dissolved solids and no significant contaminants. Estimated water quality data are shown in Table 7.1-2.

TABLE 7.1-2
Folsom-South Canal Raw Water Sampling Results

Constituent/Limits Parameter	Estimated Water Quality
Nitrate (μg/L)	30
Bromide (μg/L)	10
Orthophosphate as P (μg/L)	14
Phosphate (μg/L)	25

TABLE 7.1-2
Folsom-South Canal Raw Water Sampling Results

Constituent/Limits Parameter	Estimated Water Quality
BTEX (μg/L)	
Benzene	ND
Toluene	ND
Ethylbenzene	ND
Xylenes (total)	ND
Other (mg/L)	
Total Hardness	25
Total Alkalinity as $CaCO_3$	28
Total Nitrogen	ND
Total Organic Carbon (TOC) (mg/L)	3.1
TSS	ND
Silica	12
Biochemical Oxygen Demand	ND
Chemical Oxygen Demand	ND
PH	8.1
TDS	47
Metals (μg/L)	
Aluminum	12
Antimony	ND
Arsenic	ND
Barium	16
Beryllium	ND
Boron	23
Cadmium	ND
Chromium, Hexavalent	5.2
Cobalt	ND
Copper	19
Fluoride	ND
Iron	99
Lead	2.8
Manganese	22
Mercury	ND
Molybdenum	ND
Nickel	ND
Silicon	5700
Silver	ND
Selenium	ND
Strontium	66
Thallium	ND
Vanadium	ND
Zinc	43

The table was developed from historical and recent water samples.
ND Not detected
mg/L milligrams per liter
μg/L L micrograms per liter

7.1.2 Cooling Tower Water Quality

Based on the average and maximum constituent levels in the Folsom-South Canal surface water analysis and the estimated NPDES discharge permit limits, the project should be able to cycle up to 10 cycles of concentration in the cooling tower. Increasing the cycles of concentration on an annual average from 3 to 10 will reduce the cooling tower blowdown and makeup demand by approximately 1,260 gallons per minute (gpm). The cooling target chemistry for either cycles of concentration is shown in Table 7.1-3.

TABLE 7.1-3
Cooling Tower Target Chemistry (mg/L)

Constituents	3 Cycles of Concentration	10 Cycles of Concentration
Calcium	23	75
Magnesium	5	18
Sodium	8	28
Potassium	4	13
Bicarbonate	102	328
Sulphate	5	18
Chloride	5	17
TDS	141	470

The above predictions are based on information from several sources. Actual cycles of concentration will be based on meeting requirements of the NPDES permit.

7.1.3 Cooling Tower Blowdown Quality

The cooling tower blowdown quality will be similar to the cooling tower target chemistry on average. The cooling tower blowdown will be mixed with the HRSG blowdown and wastewater treatment system effluent prior to discharge to surface water.

7.1.4 Condensate Makeup and Feedwater Water Chemistry

Most high-pressure combined-cycle power plants use condensate polishing equipment for their raw water source to remove contaminants so that the water is suitable for direct feed to the HRSG. Therefore, the plant condensate makeup water chemistry is the same as the feedwater chemistry discussed below. The feedwater chemistry is typically specified by the HRSG supplier and the fogging water quality by the gas turbine supplier.

Typical specifications for the high purity feedwater makeup water system quality are provided in Table 7.1-4.

TABLE 7.1-4
Specifications for the High Purity Feedwater Makeup Water System Quality

Constituent	Specifications
Sodium	≤ 0.003 mg/l as mg/l Na^+
Chloride	≤ 0.003 mg/l as mg/l Cl^-
Total (reactive +colloidal) Silica	≤ 0.020 mg/l as total SiO_2
Specific conductance	≤ 0.1 uS/cm
Total Organic Carbon	≤ 0.200 mg/l as TOC
Turbidity	≤ 0.2 NTU

7.1.5 Water Conditioning System Quality

The entire makeup water to the power plant is not expected to require treatment prior to storage in the raw water storage tanks. Cooling tower makeup water will not require treatment for use. The circulating water cooling tower water would be dosed periodically to maintain the proper water chemistry.

The design for a HRSG feedwater water treatment system for the CPP project would consist of Ultrafiltration (UF), double-pass Reverse Osmosis (DPRO) and Mobile Mixed Bed Demineralizer. This demineralized water will also be used for cooling the gas turbine combustion air through fogging. There would be no wastewater associated with the mobile mixed bed demineralizers since they are regenerated offsite.

Boiler blowdown will be sent to the cooling tower as makeup. Cooling tower blowdown will be fed to a clarifier system where some of the heavy metals are removed before discharge to Clay Creek. A final gravity sand separator will be used to reduce turbidity to less than 1 NTU prior to discharge into Clay Creek. The suspended solids remaining from the clarifier are concentrated in a sludge holding tank and processed by a filter press prior to trucking offsite. Sludge will be disposed of as appropriate based on the final sludge composition.

The water discharged to Clay Creek will first be cooled by cascading down a canal consisting of multiple notched weirs and steps that mix and aerate the water to promote cooling through evaporation.

7.1.6 Clarifier Mixture Quality

The UF wastewater effluent and cooling tower blowdown mixture is estimated to have an average and maximum TDS of 250 ppm and 150 ppm, respectively, based on 3 cooling tower cycles; and 250 ppm and 500 based on 10 cooling tower cycles.

Sludge collected in the clarifier is further processed through a press filter where the water is returned to the clarifier influent stream and the press cake is disposed of offsite in a manner consistent with the final cake composition. It is not expected that the cake will be hazardous.

7.1.7 Water for Construction

Approximately 3,000 gpd will be used for dust control during construction on the site, and an additional 3,000 gpd on the linears. Water for construction on the site will come from the District's contracted water in the Folsom-South Canal, delivered from a hydrant at the RSP. Water for construction on the linears will be from the same source or contracted from Sacramento County at a location more proximate to construction.

7.2 Domestic Use Water

Domestic water for drinking, showers, sinks and general sanitary purposes would be provided by treated water from the Folsom-South Canal. A package treatment plant, such as the US Filter Water Boy© or equivalent system would be used. The potable water system will consist of a bulk storage tank, transfer pumps, pressurized tank, chlorine dosing system, and distribution system. Potable water will pass through the same ultra-filter as used by the reverse osmosis feed, and stored in a 2,500 bulk tank. Water is withdrawn from the bulk tank to replenish the pressurized 250-gallon water tank, when the tank pressure falls below a prescribed level. This water, as it is being transferred to the pressurized tank, will be dosed with chlorine to meet the chlorination requirements for drinking water. Upon demand from the potable water system, water under pressure will be withdrawn from the pressurized water tank. This water will sampled and tested periodically to ensure it meets all potable water purity requirements. The US Filter Water Boy© meets all DHS requirements for potable water supplies, is a pre-engineered package plant using microfiltration and UV disinfection to provide high quality drinking water. The water supply needed for domestic water is estimated at less than 2 AFY.

7.3 Process Makeup Water

Process makeup water would generally be provided from a portion of the incoming raw water supply. Details of the plant water cycle and process makeup water treatment are discussed in Section 2.0.

7.4 Backup Water

In the case of a failure in the cooling water delivery system for any reason, the CPP project would operate from on-site storage, 5 million gallons in aboveground storage tanks, and, if necessary could draw water from Rancho Seco Reservoir, which contains 2,850 acre-feet. A portion of this would provide a backup water supply for 2 days without significant disruption to the lake level.

7.5 Alternatives

The following sections describe alternative water supplies and alternative alignments for water supply linears that were considered for the project.

7.5.1 Alternative Water Supplies

The State Water Resources Control Board Policy 75-58 specifies that to protect water quality and quantity, cooling water for power plants should come from the following sources (in order of preference):

- Wastewater being discharged into the ocean
- Ocean
- Brackish water from natural sources or irrigation return flow
- Inland wastewater of low TDS
- Other inland waters

In the case of CPP, one of the dominant reasons the site was selected was the availability of an adequate but currently under utilized water supply intended to support power generation. The District contracted and paid for a substantial amount of water to be used for cooling water in a major generating facility, which is now being decommissioned (RSP). Thus, use of the District's existing supply for power generation at the Rancho Seco site is consistent with the purposes for which the water was developed years ago. Thus, no new source of water is required; rather, the District will put its existing water supply to beneficial use.

The following sections address each of the alternative sources as required by Policy 75-58.

The proposed CPP is more than 50 miles from the ocean, therefore, the first two alternatives are not feasible. Similarly, there are no sources of naturally brackish water in the vicinity. The dominant agricultural uses in the project area are unirrigated pasture, which is gradually being replaced with drip-irrigated vineyards. Therefore, there are no significant irrigation return flows available for cooling water.

Because the original RSP was located far from other developments, there are no sources of inland wastewater of low TDS in the vicinity. The Galt Wastewater Treatment Plant is located approximately 13 miles southwest of the site and does not currently provide tertiary treated wastewater. The Sacramento Regional Wastewater Treatment Plant (SRWTP) could provide treated wastewater; but because the plant is nearly 26 miles from the proposed project site, this option is infeasible and cost prohibitive, given that a source of water is already present and available for use at the proposed site. Further, use of present supply obviates the need to disturb the environment by constructing additional conveyance facilities to bring the treated wastewater to the site. In addition to requiring additional pipelines, pumps, treatment, and DHS permitting, implementation of either of these alternatives would be less reliable and more costly than using the water currently delivered to RSP.

Also, using treated wastewater would have an adverse impact on the feasibility of discharging wastewater to Clay Creek. The high quality of the Folsom-South Canal water supply will allow the District to use and cycle the water 3 to 10 times before discharge. Using this quality of water, the discharged water will support the beneficial uses downstream of the project in Hadselville and Laguna Creeks and the Cosumnes River.

Because other sources of cooling water are not available, and because the District already has the delivery system, contracts and permits for a high-quality supply from the Folsom-South Canal, the District believes using this water supply is appropriate and consistent with both its responsibility to its shareholders and Policy 75-58.

7.5.2 Alternative Water Line Routes

The proposed water line route between the existing pump station on RSP property and the proposed CPP site was selected with the following objectives:

- Minimize length to reduce costs of construction and increase reliability
- Minimize potential for adverse environmental impacts
- Minimize the area of additional ground disturbance that increases the project "footprint"

The proposed pipeline is the shortest distance between the existing facility and the CPP site, and runs within the corridor designated for the transmission lines. Construction of the pipeline would require construction disturbance (open-trenching), but potential adverse impacts could be mitigated to less-than-significant. Therefore, no alternatives could be identified that would be environmentally preferable, and no other alternatives were considered.

7.6 References

Sacramento Municipal Utility District. 2001. *Rancho Seco Energy Center Water Supply/Effluent, Technical Memorandum.* Prepared by Analytical Environmental Services.

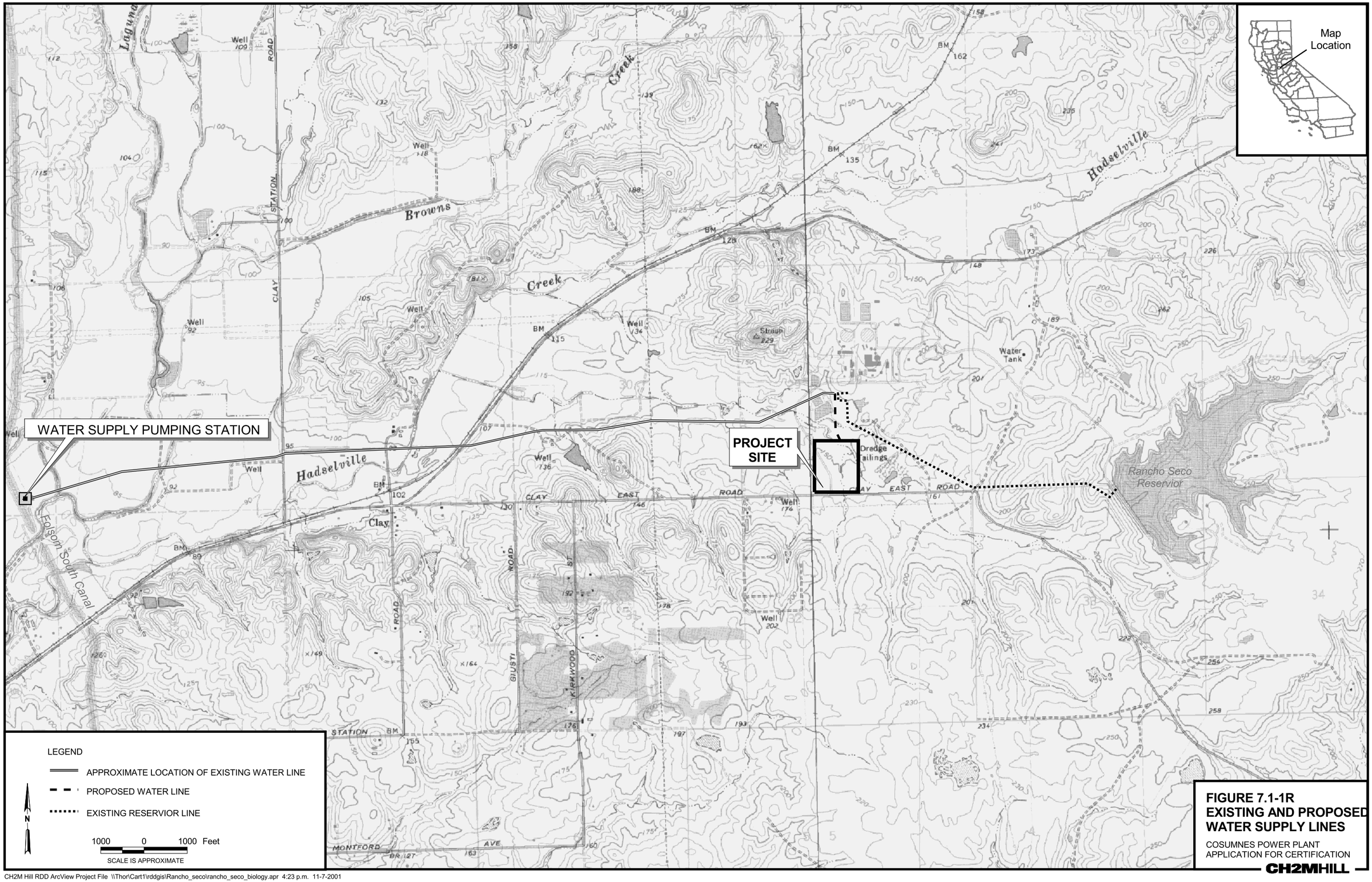

FIGURE 7.1-1R
EXISTING AND PROPOSED WATER SUPPLY LINES

COSUMNES POWER PLANT
APPLICATION FOR CERTIFICATION

CH2MHILL

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