DATA RESPONSE SUPPLEMENT #1

FOR

INLAND EMPIRE ENERGY CENTER

SUBMITTAL 6

Compiled by

FOSTER WHEELER ENVIRONMENTAL CORPORATION
1940 E. Deere Avenue, Suite 200
Santa Ana, CA 92705

May 17, 2002

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SOIL AND WATER SUPPLMENTAL DATA

At a meeting on April 4, 2002, the CEC staff requested that the Applicant provide some follow-up information to clarify prior data responses. The supplemental information is provided below and is numbered to correspond to the original data response followed by an "A" signifying it is the first supplement to the Data Response. Based upon the notes from the meeting as documented in a Record of Conversation prepared by John Kessler, Applicant believes that in providing this information, it has responded to all outstanding questions from the staff in the area of Soil and Water Resources.

Response #82A - Eastern MWD has provided a clarifying letter regarding its will-serve commitment to the IEEC. As requested, the letter clarifies that brackish groundwater is not available to serve the energy center. A copy of that letter is attached, see Water Resources Attachment 1-Supplemental Response Data.

Response #83A - Table 5.4.5 in the AFC reproduces projections of recycled water use by customer type that are contained in EMWD's Urban Water Management Plan. These projections were prepared in 1999 and published in 2000. Table 83-2 (located in Volume I of the IEEC Data Responses-Submittal #1 dated 2/13/02) presents actual data on recycled water use.

Response #85A - With respect to the design water quality, the Applicant has conservatively assumed a worst case analysis based on the highest concentration of each constituent found in the three water sources; 1) Perris Valley RWRF recycled water, 2) Moreno Valley RWRF recycled water, and 3) San Jacinto Tunnel raw water. Because the raw water will be injected into the recycled water distribution system at a location well north of the IEEC, it is likely that the raw water will be used in the north part of the system and that very little, if any, will actually make it as far south as the IEEC. Nonetheless, a conservative design would allow for the demands of the IEEC to be served by any combination of the three water sources. Because the Applicant intends to own and operate the IEEC for 30 years or more, it is prudent for the Applicant to include conservatism in the design. From a water consumption standpoint, this conservatism as it relates to the design of the reverse osmosis (RO) system, has little impact. The water balances included in the AFC (Figures 3.4-6 and 3.4-7) were prepared assuming an RO system recovery rate of 75 percent. Even if the RO recovery rate were increased to 90 percent (assuming this were feasible), the peak plant water demand would only be reduced by 3 gpm, or 0.06 percent.

As indicated in the Applicant's response to Data Request #98, the primary water treatment processes (microfiltration, reverse osmosis, and demineralization) will be provided with redundant units (e.g. two 100 percent or three 50 percent capacity units). In that response the Applicant described "near 100% availability of process equipment" to represent the fact that even though redundant units would be provided, the availability of each unit would be less than 100 percent. For instance, two 100 percent capacity units, each with an availability of 90 percent, would result in an overall system availability of 99 percent, or "near 100 percent".

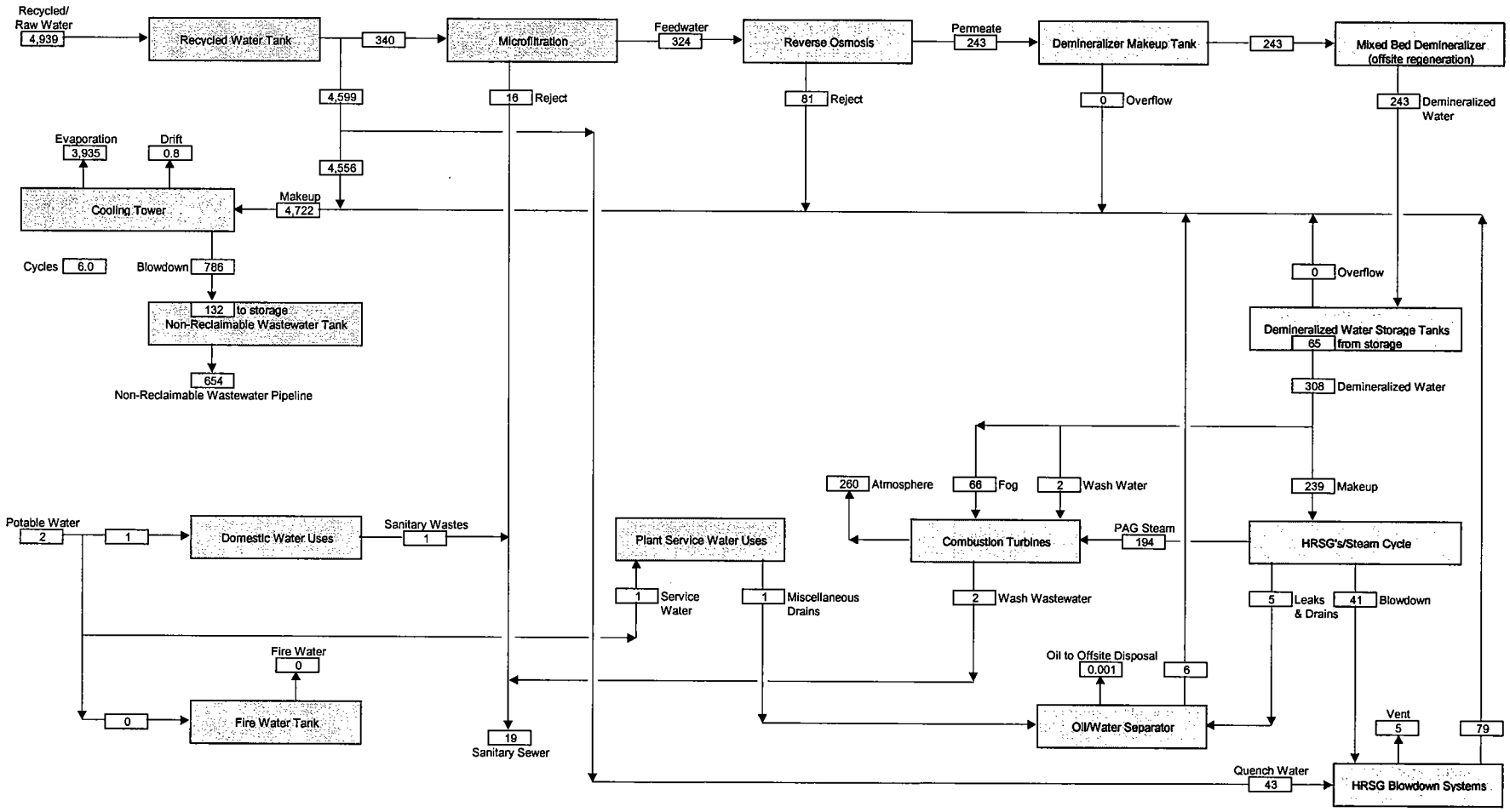
Response #87A - The Applicant has conservatively assumed a worst case water quality based on the highest concentration of each constituent found in the three water sources; 1) Perris Valley RWRF recycled water, Moreno Valley RWRF recycled water, and San Jacinto Tunnel raw water. While the San Jacinto Tunnel raw water is higher in many scale-forming constituents,

with advanced treatment chemistry, it can actually be cycled higher in the cooling tower than either of the recycled water sources. The Applicant estimates that with the San Jacinto Tunnel raw water alone, 10 to 12 cycles of concentration could be achieved, whereas only 6 to 8 cycles of concentration would be possible using recycled water. The reason for this is that the silica concentration in the two recycled water sources (23.4 mg/l for Perris Valley RWRF and 18.7 mg/l for Moreno Valley) is so much greater than that of the raw water source (9 mg/l). Because of the location of the IEEC within Eastern Municipal Water District's (EMWD) recycled water distribution system, the IEEC will normally receive recycled water from the Perris Valley RWRF, which has historically has had effluent with higher silica concentrations than that from the Moreno Valley RWRF. In order to conservatively estimate project water demands and wastewater production, the water balances included in the Application for Certification (Figures 3.4-6 and 3.4-7) were prepared assuming 5 cycles of concentration, thus providing a worst-case analysis from a flow perspective. For comparison purposes, Figures 87A-1 and 87A-2 (located in this submittal) present peak day water balances based on 6 cycles of concentration, representing use of Perris Valley RWRF recycled water, and 8 cycles of concentration, representing use of Moreno Valley RWRF recycled water.

The Applicant objected to Data Request.100 on the basis that evaluation of exotic treatment at this time is an unwarranted and unnecessary expense given the project is already designed to cycle the water at least 5 times. Evaluation of such treatment alternatives seems especially burdensome in light of the use of recycled water at the IEEC, and that without an identified impact, extensive feasibility analyses are simply not warranted. Nonetheless, the following are brief assessments of several alternative means for increasing cooling tower cycles:

- **Use of scale inhibitors, dispersants, and alkalinity control and/or sidestream filters.** The Applicant fully intends to use scale inhibitors/dispersants and alkalinity control in order to reduce the potential for scaling and thus maximize the cooling tower cycles of concentration. In fact, the stated 6 to 8 cycles while using recycled water assumes the use of advanced chemical treatment. In addition, the Applicant will use special materials within the circulating water system so as to not limit the cycles of concentration because of corrosion concerns. Side-stream filters would remove suspended solids from the circulating water. In the case of the IEEC, side-stream filters would be of little value as silica, not suspended solids, limits the cycles of concentration.
- **Use of make-up or side-stream softening to reduce silica, hardness, and alkalinity.** While the main objective of side-stream softening is typically to reduce hardness, it can also help to reduce, but not eliminate, silica. Large quantities of magnesium oxide (over 700 lbs/day) would need to be added to assist in the reduction of silica. Side-stream softening would also require large quantities of calcium oxide, or lime, and soda ash (up to 6 tons/day) and would result in the production significant quantities of chemical sludge (up to 8 tons/day). The chemical sludge would need to be dewatered and disposed of in a landfill. In addition, silica reduction through lime softening works best at high temperatures (greater than 90 deg. F) with the effectiveness quickly falling off at lower temperatures. Maintaining high circulating water temperatures to aid in silica removal is counter to the need to minimize circulating water temperatures to maximize the steam turbine power generating efficiency. Also, the circulating water temperature changes with changes in ambient temperatures and plant output, thus making it difficult to optimize silica reduction through lime softening. At 6 to 8 cycles, or even 5 cycles, side-stream

Notes:
1. All flow rates are in gallons per minute.
2. Water treatment system designed for 16.0 hrs/day of PAG with 24 hrs/day of demin water production.
3. Fire flow shown is normal operation. Fire flow capacity is 2000 gpm.



Rev.	Description	By	Date
D	Changed name of NRW rank.	JBM	01/27/02
C	Changed multi-media filter to microfilter.	JBM	07/02/01
B	Revised format, added demin and brine equalization	JBM	04/29/01
A	Issued to EMWD	JBM	11/28/00

Design Case: Peak Day

Configuration:	2 x 1, HPD	Site Altitude:	1,440 ft
Dry Bulb Temp.	97 deg F	Wet Bulb Temp	72 deg.F
Fogging:	Yes		
Power Augmentation:	Yes		
Duct Firing:	Yes		

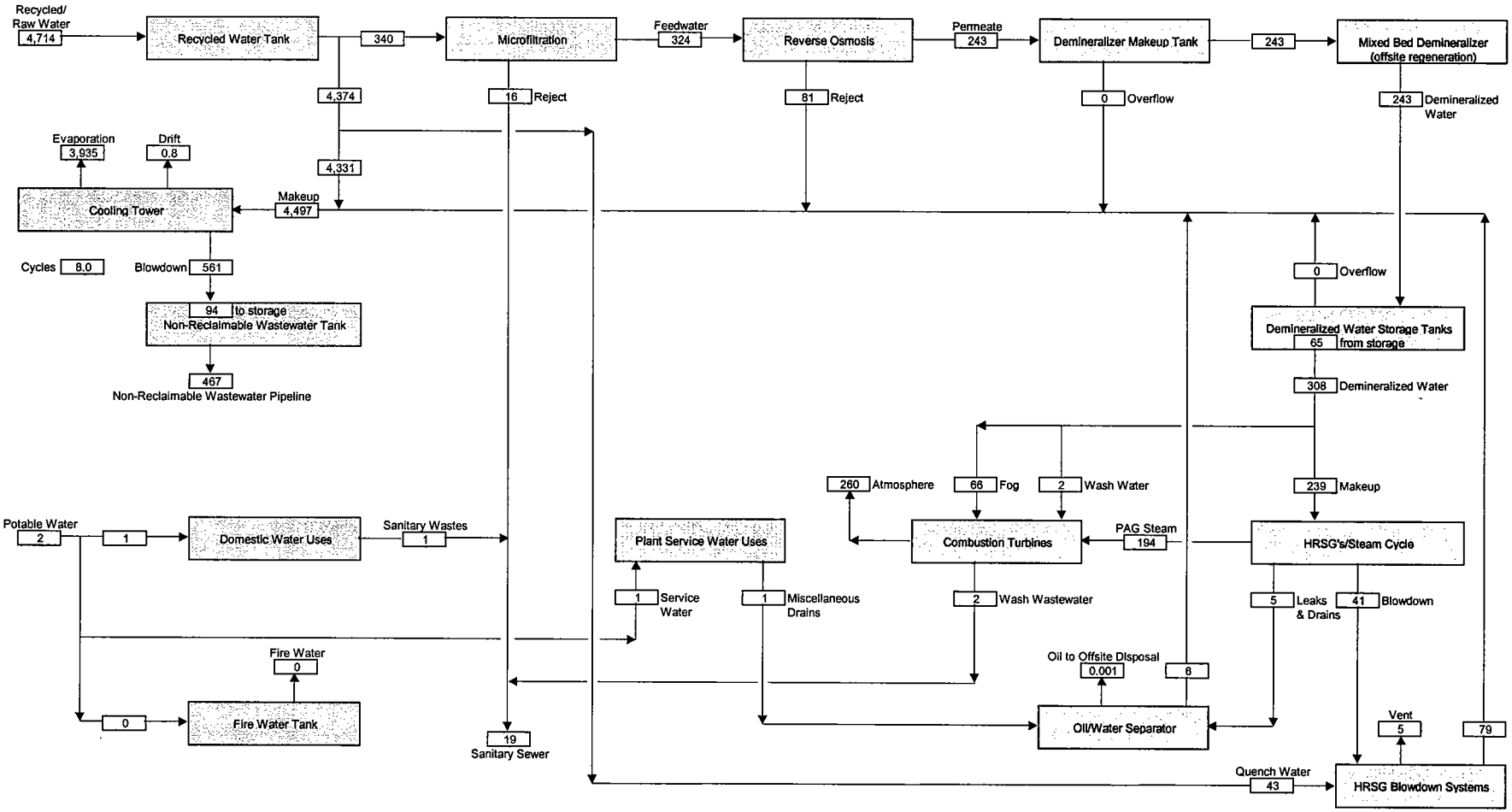
CALPINE

Inland Empire Energy Center

Peak Water Balance - 6 Cycles

Figure 87A-1 Rev. D

Notes:
1. All flow rates are in gallons per minute.
2. Water treatment system designed for 16.0 hrs/day of PAG with 24 hrs/day of demin water production.
3. Fire flow shown is normal operation. Fire flow capacity is 2000 gpm.



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Fogging:	Yes		
Power Augmentation:	Yes		
Duct Firing:	Yes		

CALPINE

Inland Empire Energy Center

Peak Water Balance - 8 Cycles

Figure 87A-2 Rev. D

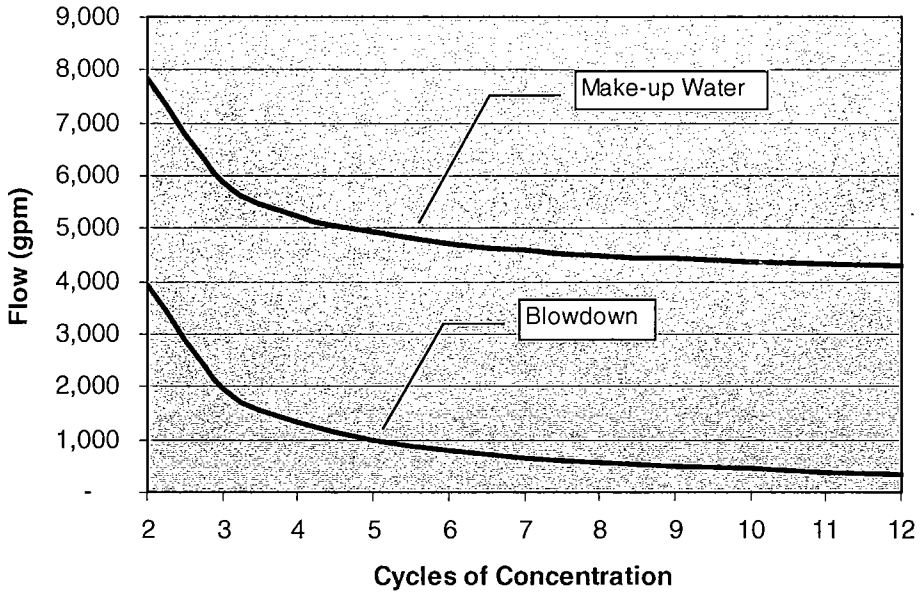
softening would not be warranted as a means to reduce makeup water. Given that the cycles of concentration are already within an acceptable range, the Applicant would only consider side-stream softening if the project was a zero-liquid discharge (ZLD) project, and even then, it may or may not be the most cost-effective process. Given the proximity of the IEEC to the non-reclaimable waste system, there is no basis for making IEEC a ZLD project. The non-reclaimable waste system was built specifically for uses such as the discharge of high-TDS cooling tower blowdown in order to allow salts to be discharged directly to the ocean.

- **Membrane processes, such as spiral wound Reverse Osmosis (RO), electrodialysis reversal (EDR), or Direct Osmosis (DO).** Similar to side-stream softening, with the high cycles of concentration presently proposed, the Applicant would only consider using membrane processes to further concentrate the cooling tower blowdown if part of a ZLD process or if it is determined to be a cost-effective means of reducing discharge to the non-reclaimable wastewater system, justified by the cost savings resulting from the reduced flow rate. At 5 to 8 cycles of concentration in the cooling tower, the Applicant would generally not consider these processes as a feasible means to reduce plant water demands. Even at 5 cycles of concentration, the cooling tower by itself could be compared to the operation of a membrane treatment process having a recovery rate of 80 percent. Further concentrating the cooling tower reject stream, or blowdown, using conventional membrane processes would be problematic as the same constituent which limits the cooling tower cycles of concentration, silica, would also cause scaling of the membranes.
- **Thermo-mechanical evaporator, such as a multiple effect or vapor compression evaporator.** Evaporation processes are typically used as the final step of ZLD systems, resulting in either a very highly concentrated brine or salt cake. Similar to side-stream softening and membrane processes, evaporation technologies would not be considered justified unless part of a ZLD project, and would not be considered an economic means to reduce plant water demands. Evaporation equipment is extremely expensive and energy-intensive to operate. Staff suggests that low-grade steam might be used. It should be noted that in combined cycle power plants utilizing condensing steam turbine generators, there is no low-grade steam available that isn't already being used to generate electricity. Thus, diverting steam from the steam turbine for use in an evaporator would result in a decrease in plant electrical output. The Applicant does not believe it prudent to sacrifice a non-renewable resource (natural gas) to conserve a renewable resource (raw or recycled water). Furthermore, concentrating wastewater to the extent feasible using evaporation processes would likely render the high-TDS wastewater unsuitable for discharge to EMWD's non-reclaimable waste system.

From our meeting with staff and consultants, it is the Applicant's understanding that staff desires to evaluate potential increase in the cooling tower cycles of concentration in an effort to reduce plant water demands and thus eliminate the need for supplemental raw water during the early years of the project. As shown in the water balances included in the AFC (Figures 3.4-6 and 3.4-7), cooling tower makeup is the largest water demand within the plant. As previously stated, the Applicant has conservatively estimated project water demands using 5 cycles of concentration. At 5 cycles, approximately 80 percent of the makeup water goes toward replacing that lost to evaporation and drift (with the drift being less than 1 gpm). The remaining 20 percent

goes toward replacing the water discharged through cooling tower blowdown. As the cycles of concentration are increased, the blowdown is decreased, but evaporation and drift losses remain the same. Figure 87A-3 is a graph of cooling tower makeup and blowdown flow rates versus cycles of concentration, assuming an evaporation rate of 3,935 gpm (per the IEEC peak day water balance). As can be seen from this graph, once beyond about 4 cycles, the curves flatten out with diminishing reductions in makeup and blowdown flows for increasing cycles of concentration. For this reason, exotic means to increase cycles of concentration typically are not considered for cooling towers operating at 4 cycles or better, unless there is a need to eliminate wastewater entirely.

Figure 87A-3
Cooling Tower Makeup and Blowdown versus Cycles of Concentration



EMWD estimates that their recycled water supplies will need to be supplemented with very little raw water to meet IEEC water demands. Figure 87A-4 shows the projected raw and recycled water demands over the first 30 years of operations, based on 5 cycles of concentration and a maximum annual demand of almost 5,000 AF (ref. Table 81-4 of Data Response 81). Under these conditions, the supplemental raw water would equate to about 8 percent of the total IEEC water demand over the first 6 years of operation and less than 2 percent of the demand over the first 30 years. Figure 87A-3 shows similar data based on 5 cycles of concentration and an average annual demand of 4,150 AF (ref. Table 81-3 of Data Response 81). Under average conditions, supplemental raw water would equate to about 7 percent of the total IEEC water demand over the first 6 years of operation and less than 1.4 percent of the demand over the first 30 years. EMWD has assured the Applicant that this minor use of raw water during the initial years of operation would not adversely impact the adequacy of their supplies or ability to serve other customers. It should be noted that, even if the cooling tower cycles of concentration were increased to 30 through the use "near ZLD-type" treatment processes, this would not negate the need for supplemental raw water during the first four years of the project.

Staff also suggests that exotic water treatment processes should be considered as a means of minimizing the use of non-reclaimable wastewater (NRW) system capacity. Although the Applicant has had preliminary discussions with EMWD regarding rates and charges associated with discharge to the NRW system, EMWD has not yet established a final rate structure for this system. Again, for the purpose of evaluating the impacts of the IEEC, the Applicant has attempted to represent the worst-case scenario with respect to the quantity of wastewater to be discharged to the NWR system. For questions regarding the construction cost, materials, annual cost, and user fees associated with the NRW system, the Applicant suggests that staff communicate directly with EMWD

Figure 87A-4
Estimated Raw and Recycled Water Demands for First 30 Years of Operation Based on Maximum Annual Demand of 5,000 AF

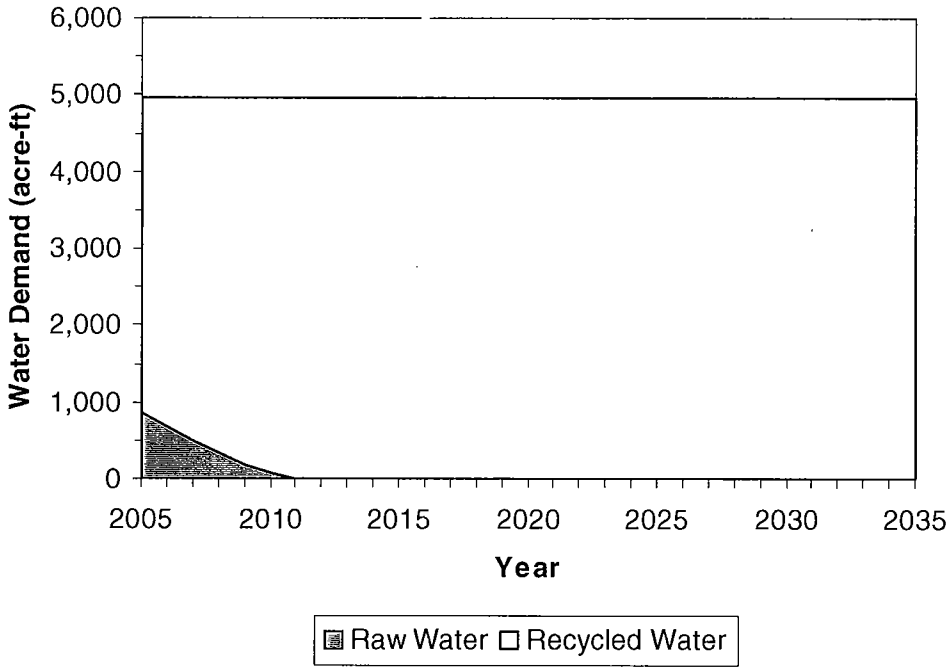
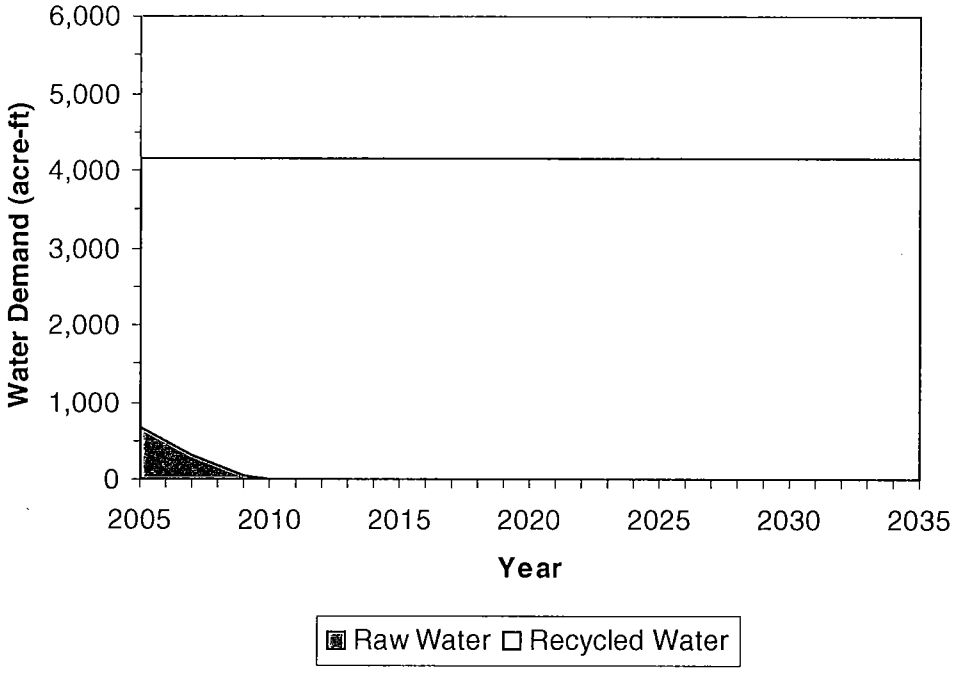


Figure 87A-5
Estimated Raw and Recycled Water Demands for First 30 Years of Operation Based on Average Annual Demand of 4,150 AF



WATER RESOURCES ATTACHMENT 1

SUPPLEMENTAL RESPONSE DATA

EASTERN MUNICIPAL WATER DISTRICT
SINCE 1950

April 26, 2002

Mr. Michael Hatfield
Project Development Manager
Calpine Western Region Office
4160 Dublin Boulevard
Dublin, CA 94568

Dear Mr. Hatfield:

Subject: Water and Sewer Services for the Inland Empire Energy Center

EMWD is pleased to provide clarification regarding our prior "will-serve" letter and subsequent Memorandum of Understanding regarding water and sewer services to the proposed Inland Empire Energy Center (IEEC).

As you are aware, it is projected that in order to serve reclaimed water to the project, it will be necessary to supplement the reclaimed water system with untreated water purchased from the Metropolitan Water District. Metropolitan is forecasting that under all circumstances, imported water supplies would be adequate to meet EMWD's needs during this period. Accordingly, EMWD anticipates that the indirect use of raw water for this limited period would not affect the adequacy of water supplies within EMWD's service area, nor would it adversely impact the adequacy of Metropolitan-supplied water to others.

Further clarifying the terms of our Memorandum of Understanding, EMWD has determined that the IEEC's process and cooling demands could be satisfied with reclaimed water, supplemented with raw water. Other potential sources of water would not be utilized to serve the IEEC. Specifically, brackish groundwater will not be used. EMWD has embarked upon a brackish groundwater desalination program, which over time will fully develop brackish groundwater resources. The product water from the desalination program is high-quality potable water, which benefits all of the District's customers and will not be available to meet the non-potable needs at the energy center.

If you have any questions, please feel free to call me at (909) 928-3777, ext. 4461.

Sincerely,

Charles J. Bachmann
Assistant General Manager
Engineering

CJB:cdd

d:\word\letters\IEEC Will Srv.doc

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