CALIFORNIA ENERGY COMMISSION
1516 Ninth Street
Sacramento, California 95814
Main website: www.energy.ca.gov

NOTICE OF STAFF WORKSHOP TO DISCUSS STAFF'S ANALYSIS OF THE PETITION TO EXTEND THE PERIOD TO INJECT THE BACKUP WATER SUPPLY FOR HIGH DESERT POWER PROJECT (97-AFC-1C)

California Energy Commission staff will conduct a workshop/meeting to discuss the enclosed Staff Analysis of the High Desert Power Project (HDPP), LLC's petition to amend SOIL AND WATER Condition S&W-4 to extend the period of time to inject State Water Project water into the regional aquifer as a backup supply for project operations.

Monday, June 12, 2006
5:30 p.m. to 7:30 p.m.
The Hook Community Center
14973 Joshua Street
Victorville, CA 92394
(Wheelchair Accessible)

If you wish to participate in the meeting by phone,
please call 916-654-3936 by 5:30 p.m.,
at least one working day prior to the meeting date.

Purpose

The purpose of the workshop is to provide an opportunity for members of the public, the applicant or any interested party to discuss the Staff Analysis with representatives of the Energy Commission, HDPP, LLC, and other interested parties and agencies who may attend.

Background

HDPP is an 830 megawatt natural gas-fired combined cycle facility. The project was certified on May 3, 2000, and began commercial operation on April 22, 2003. The facility is located in the City of Victorville, San Bernardino County, California.

Written Comments

Written comments on the workshop topics must be submitted by 5:00 p.m. on June 26, 2006. Please include the docket number 97-AFC-1C and HDPP Water Injection Petition in the subject line or first paragraph of your comments. Please hand deliver, or mail to:

Steve Munro, Compliance Project Manager
California Energy Commission
1516 Ninth Street, MS# 2000
Sacramento, CA 95814-5512

Written comments may also be submitted by FAX to (916) 654-3882. The Energy Commission encourages comments by e-mail. Please include your name or your organization's name in the e-mail. Those submitting comments via e-mail should provide them in either Microsoft Word format, or as a Portable Document File (PDF), to: smunro@energy.state.ca.us. One original paper copy must also be sent to the Energy Commission's Docket Unit, 1516 Ninth Street, MS# 15, Sacramento, CA 95814-5512.

Participants may also provide the original with 10 copies at the beginning of the workshop. All written materials relating to this workshop will be filed with the Dockets Unit and become part of the public record in this proceeding.

Public Participation

The Energy Commission's Public Adviser, Margret J. Kim, provides the public assistance in participating in Energy Commission activities. If you want information on how to participate in this forum, please contact the Public Adviser's Office at (916) 654-4489 or toll free at (800) 822-6228, by FAX at (916) 654-4493, or by e-mail at [pao@energy.state.ca.us]. If you have a disability and require assistance to participate, please contact Lou Quiroz at (916) 654-5146 at least five days in advance.

Please direct all news media inquiries to Claudia Chandler, Assistant Executive Director, at (916) 654-4989.

For technical questions on the subject matter, please call Steve Munro at (916(654-3936.

Date: 5/24/06

ROGER E. JOHNSON, Manager
Siting and Compliance Office
Systems Assessment & Facilities Siting Division

Mail List: 707

Enclosures

HIGH DESERT POWER PROJECT (97-AFC-1C)

STAFF ANALYSIS OF PETITION TO AMEND CONDITION OF CERTIFICATION SOIL & WATER-4 WATER-BANKING SCHEDULE

Prepared by Linda Bond

May 26, 2006

Introduction

The High Desert Power Project (HDPP) has submitted a petition to amend the water-banking schedule for its backup water supply, which is specified in section (b) of Condition of Certification **SOIL&WATER-4** (HDPP 2005b). The original petition, submitted on September 30, 2005, has been supplemented and revised with additional information that was submitted by HDPP on November 28, 2005 (HDPP 2005c), December 5, 2005 (HDPP 2005d), March 10, 2006 (HDPP 2006a) and March 16, 2006 (HDPP 2006b). This staff assessment addresses the final, revised terms of the petition.

Setting

HDPP is an 830 megawatt natural gas-fired combined-cycle facility located in the City of Victorville, in San Bernardino County. The power plant, owned by Constellation Energy Group, has been operational since April 2003. The primary water supply for HDPP is surface water purchased from the State Water Project (SWP), which is an interruptible supply. Because the primary water supply is interruptible, both the CEC and the Mojave Water Agency (MWA), the project's SWP supplier, require HDPP to maintain a backup water supply. Development of the project's backup water supply, provided through water banked in the local aquifer, is subject of this amendment.

Description of Proposed Modification

The water-banking schedule, which HDPP proposes to modify, defines the time limit that the project owner is permitted to establish the HDPP groundwater bank. **SOIL&WATER-4** currently specifies a time limit of five years from the commencement of the commercial operation for the HDPP to inject State Water Project (SWP) water into the regional groundwater aquifer to establish a backup water-supply reserve of 13,000 acre-feet. Commercial operation commenced on April 22, 2003, and filling of the water bank was to be completed by April 21, 2008. The petition seeks to extend this time limit to January 1, 2016, which represents approximately eight (8) additional years, for a total banking period of almost thirteen (13) years from the commencement of the commercial operation. The petition does not request a modification in the amount of backup water to be banked.

Purpose of Requested Modification

The purpose of the petition is to request a revised schedule that reflects an attainable annual injection rate, given water quality conditions. HDPP seeks to amend the schedule because the project has not been able to inject water at the rate that was anticipated at the time of Certification. HDPP has halted injection several times because, during part of each of the first three years of operation, the water quality of treated SWP water has not met two of the conditions of the project's Waste Discharge Requirement (WDR) waiver issued by the Lahontan Regional Water Quality Control Board (RWQCB), which is required under **SOIL&WATER-11**. The project owner reports that the average concentrations of total dissolved solids (TDS) and the precursors of trihalomethanes (THM) contained in the raw SWP water used for injection have been significantly greater than were anticipated at the time of Certification. Consequently, the concentrations of TDS and THM in the treated SWP water have severely restricted injection operations, preventing HDPP from establishing the full groundwater backup supply according to the schedule specified in **SOIL&WATER-4.**

To address the problem of THM, HDPP plans to install an ultraviolet disinfection system (UV) to minimize the formation of THM (HDPP 2006a). Installation of an effective UV would allow HDPP to meet the THM limits imposed by the WDR waiver and would increase HDPP's annual capability to inject groundwater.

However, although the UV treatment will increase HDPP injection capability, HDPP anticipates that TDS concentrations in the raw water supply, which are highly variable, will continue to limit the project's injection capabilities. Therefore, to ensure that RWQCB water quality goals are met, HDPP is requesting an extension in the injection schedule to complete the development of the water bank. The petition does not request a modification of the water quality requirements for the injected water.

Applicable Laws, Ordinances and Regulations and Standards (LORS)

Staff has reviewed the Laws, Ordinances, Regulations, and Standards (LORS) referenced in the Final Commission Decision for the Application of Certification for the HDPP (CEC 2000) that are applicable to this proposed amendment. Relevant LORS include:

- Lahontan Regional Water Quality Control Board Waste Discharge Requirement Waiver
- Mojave Water Agency (MWA) Ordinance No. 9,
- Mojave River Basin Watermaster's Uniform Rules for Storage Agreements (Section 23), and

- California Department of Fish and Game (CDFG) Incidental Take Permit.

Lahontan Regional Water Quality Control Board Waste Discharge Requirement Waiver

The RWQCB is the local SWRCB permitting agency for HDPP's water-banking injection operations, which operates under a WDR waiver. HDPP informed the Energy Commission in November 2005 (HDPP 2005c) that the assumptions regarding injection rate and water quality treatment described in HDPP's initial petition (HDPP 2005b) had proved to be unattainable and would not allow HDPP to comply both with its current WDR waiver and with the proposed water-banking schedule. HDPP's proposed modification to the water banking schedule, installation of ultraviolet pre-injection treatment and adoption of staff's recommended modifications to the **SOIL&WATER-4** would enable HDPP to remain in compliance with its WDR waiver.

Mojave Water Agency Ordinance No. 9

HDPP obtains SWP water from MWA for its water-banking injection operations. As required in **SOIL&WATER-1,** the project owner must obtain water from MWA in a manner consistent with MWA Ordinance No. 9. Ordinance No. 9 establishes the rules and regulations for the sale and delivery of SWP water. The ordinance limits all purchase agreements for SWP water to a term of one year, requiring existing customers to submit a new application each year. Therefore, the extension of the HDPP injection schedule would not affect the project's ability to obtain SWP water for injection.

Mojave River Basin Watermaster's Uniform Rules for Storage Agreements

MWA is also the authorizing agency for the groundwater banking for the HDPP project. Under Section 23 of the adjudication of the Mojave River Basin, agreements for water storage, including groundwater banking, are required. Water storage agreements are regulated by the MWA, as the court-appointed Watermaster of the Mojave River Basin.

HDPP stores and recovers backup supply water through a contract between the Victor Valley Water District (VVWD) and the MWA that was established specifically to serve HDPP. The term of the water storage agreement for the HDPP project currently limits the period for injecting 13,000 acre-feet of SWP water to five years. Articles three and four of the water storage agreement state, "Supplemental Water stored pursuant to this Agreement shall not exceed an annual cumulative balance of 13,000 acre-feet. Storer may store up to the amount specified for not more than five (5) years from the date of this Agreement" (MBAW-VVWD 2002). However, the agreement includes provisions to extend the storage agreement in five year increments. Two extensions would be required to cover the additional seven years HDPP is requesting to establish their water bank.

To remain in compliance, the project owner of HDPP would be required to provide a copy of each extension of the storage agreement to the CPM within

fifteen (15) days of the renewal of the agreement under the conditions of **SOIL&WATER-2.**

California Department of Fish and Game Incidental Take Permit

The CDFG requires prior notification regarding any substantial diversion of flow of any river to allow the department to propose measures necessary to protect fish and wildlife. Groundwater discharge to the Mojave River has historically provided the base flow of the river. During the original assessment of the HDPP, the CDFG determined that HDPP's proposed use of groundwater for its backup water supply would constitute a potential substantial diversion from the Mojave River, affecting listed riparian species and, therefore, required an incidental take permit. The CDFG granted Incidental Take Permit (No. 2081-1999-050-6), contingent on the establishment of HDPP water bank, which was designed to mitigate groundwater use impacts to the flow of the Mojave River. Accordingly, CDFG determined that an additional incidental take permit for riparian species was not necessary. (An incidental take permit was granted for two terrestrial species (desert tortoise and Mohave ground squirrel) in relation to other identified project related impacts,)

The conditions of approval for HDPP's Incidental Take Permit (No. 2081-1999-050-6) incorporate by reference the Energy Commission's Soil&Water-1 through Soil&Water-19 Conditions of Certification for HDPP. Correspondingly, any amendment to the Energy Commission's conditions of certification would normally require a parallel amendment to HDPP's Incidental Take Permit with the CDFG. Accordingly, HDPP submitted a request for revisions to its Incidental Take Permit to the CDFG on December 6, 2005 (HDPP 2005e). However, it is staff's understanding that CDFG has determined that an amendment to the permit is not necessary, based on their initial review of HDPP's proposal, because the extension of the water-banking schedule will have no significant impact on the flows of the Mojave River (CDFG 2006). Although staff does not anticipate any additional requirements by CDFG regarding the proposed schedule change, staff will take into consideration CDFG's final review and recommendations on this amendment to **SOIL&WATER-4.**

Conclusion of Staff LORS Review

Staff concludes that the proposed amendment to **SOIL&WATER-4** would comply with all applicable federal, state and local laws, ordinances, regulations and standards.

Staff Analysis

The scope staff's analysis is to evaluate two issues posed by the requested change in schedule. The first issue is to evaluate whether the extension would cause any potential significant impacts that are substantially different than those impacts caused by the original five-year schedule adopted in the Conditions of Certification. The second issue to evaluate is whether the requested water-banking schedule extension is feasible. The successful completion of the water bank is necessary for the proposed modification to **SOIL&WATER-4** to

adequately condition the project and to fully mitigate all potential significant impacts, in accordance with the Final Commission Decision (CEC 2000).

Analysis of Potential Adverse Impacts

The HDPP's location within the Mojave River Basin and potential use of groundwater largely defines the project's potential for significant impacts because the basin is both overdrafted and adjudicated. Local groundwater and surface water supplies are fully allocated and tightly regulated within the Mojave River Basin. Any unmitigated use of local water supplies by the project would have significant impacts to the environment and local water users. Accordingly, HDPP was required to import water to meet all of the project's water demands.

The HDPP has two water supplies, a primary surface-water supply and a backup groundwater supply. The primary water supply for the project is imported surface water from the SWP and purchased from the MWA. Water deliveries from the SWP are routinely suspended for a few days each year for canal maintenance and potentially could be suspended for longer periods during severe drought. Therefore, HDPP's primary water supply is an interruptible supply.

Accordingly, certification of the project required that HDPP obtain a backup water supply to provide water to the project during interruptions of the primary supply. Because the Mojave groundwater basin is overdrafted and no existing groundwater reserves are available, HDPP was permitted to establish a groundwater bank to provide a backup water supply. The groundwater bank is being developed by HDPP through the importation and injection of surface water from the SWP into the local aquifer to be used on an as-needed basis. HDPP was granted five years to establish a 13,000 acre-foot backup water supply, according to the original time schedule specified in **SOIL&WATER-4**.

The amount of banked groundwater available to the project is defined as the amount of water injected by project minus groundwater extracted by the project minus groundwater dissipation minus 1,000 acre-feet. Groundwater dissipation is defined as groundwater discharge to the Mojave River that is caused by the project's injection operations. Dissipation varies according to the rate of injection and the total period over which water is stored in the aquifer. One thousand acre-foot of water would not be used by the project but, rather, left in the aquifer to buffer any potential environment impacts that might occur if the water bank dissipation was underestimated.

Originally, the 13,000 acre-feet backup water supply and the period to establish the groundwater bank were developed during the Application for Certification (AFC) review process. The backup supply of 13,000 acre-feet is equal to a 3-year supply for an annual maximum project demand of 4,000 acre-feet plus the 1,000 acre-foot environmental reserve. However, it should be noted that the amount of the backup supply was not based on a system reliability analysis of the SWP. While the Department of Water Resources anticipates that the

frequency and duration of interruptions in the SWP deliveries are likely to increase in the future, it cannot quantify future shortfalls because of uncertainty in statewide demand, policies and weather conditions. Therefore, the backup supply of 13,000 acre-feet represents a negotiated estimate of a worst-case scenario that was agreed to by the HDPP applicant, CEC staff, CDFG, MWA and the intervener, California Unions for Reliable Energy. The period needed to establish the groundwater bank was based on the anticipated project injection capacity. During the AFC review process, the HDPP applicant estimated that it would be able to bank approximately 4,000 acre-feet of water annually and calculated that it could establish the groundwater bank in 3 years if all conditions were ideal. It was agreed by all participants that 5 years to establish the groundwater bank would be a more realistic schedule. However, the current water quality injection limitations were not anticipated at the time.

Extending the injection schedule would have two effects. Lengthening the period of injection would increase the total amount of dissipation because more water will discharge to the Mojave River in 13 years than it would in 5 years. In addition, the project would have less than a full backup reserve for a longer period of time. However, neither of these effects would result in a significant impact to the region's water resources because **SOIL&WATER-1** specifically prohibits the project from operating if neither surface water nor groundwater reserves are available. As long as the project's groundwater use is less than or equal to the water bank reserve, the project will not contribute to the overdraft of the Mojave Groundwater Basin.

Under these conditions, extending the period of time HDPP takes to establish the groundwater bank would not diminish the effectiveness of the water bank. Therefore, the requested water banking extension would not cause significant impacts that were substantially different than those caused by the original five-year schedule evaluated during the certification process.

Analysis of Feasibility of Proposed Schedule

The second issue to evaluate is whether the requested water-banking schedule extension would provide sufficient time to establish the required 13,000 acre-feet backup water reserve. The feasibility of the proposed schedule depends on three factors: (a) the achievable injection rate, (b) the amount of banked groundwater required for project operation during the banking period, and (c) the rate of water-bank losses to the Mojave River (groundwater dissipation). As specified in **SOIL&WATER-4:**

> "By the end of the fifth (5) year of commercial operation, the amount of water injected minus the amount of banked groundwater used for project operation, minus the amount of dissipated groundwater shall meet or exceed thirteen thousand (13,000) acre-feet."

Injection Rate

HDPP has recalculated its potential injection rate based on the following operational estimates:

- Design injection flow rate = 9.5 acre-feet/day
- Aquifer banking system capacity factor = 85%
- Water quality injection limitation factor = 40%

Estimates regarding the design injection flow rate and aquifer banking capacity factor are based on HDPP's operational experience. The water quality limitation factor reflects new information HDPP has presented in its petition.

Water Quality Limitations on Injection

As explained in the introduction, the primary reason why HDPP is requesting amendment of the water banking schedule is because injection operations have been significantly limited by THM and TDS concentrations in injection water, which have exceeded water quality limits specified by its WDR waiver for extended periods of time. Determining an achievable injection rate, given the WDR water quality requirements, is the key to determining a feasible water banking schedule.

HDPP's WDR waiver specifies that treated injected water must meet the mean annual limits of 248 milligrams per liter (mg/L) for TDS and 0.5 micrograms per liter (μg/L) for THM (RWQCB 2002). TDS concentrations of treated injection water may not exceed 400 mg/L, and THM concentrations may not exceed 5.0 μg/L.

Table 1. HDPP Waste Discharge Requirement Waiver: Water Quality Injection Limits for TDS and THM (RWQCB 2002)

Constituent	Annual Mean	Maximum
Total Dissolved Solids (TDS)	248 mg/L	400 mg/L
Trihalomethanes (THM)	0.5μg/L	5.0 μg/L

Although these concentration limits were considered achievable when the WDR waiver was formulated and the HDPP water treatment system was selected, the concentrations for TDS and THM of water intended for injection have exceeded the mean limits set by the WDR waiver since the start of water banking operation. Consequently, the annual mean limits for THM and TDS have curtailed the project's water banking operations and prevented HDPP from establishing its backup water supply on schedule. (The maximum limits of the WDR waiver have not significantly restricted injection.)

Trihalomethanes

THM concentrations in the HDPP injection water have severely limited HDPP's ability to inject water. Because there are no detectable concentrations of THM in

the local groundwater, the RWQCB set HDPP's WDR waiver limit for mean THM concentrations at a very low concentration, 0.5 μg/L.

HDPP constructed a pre-injection ultrafiltration (UF) water treatment process that was designed to remove organics and pathogens (precursors for THM) from the raw SWP water supply. In addition, to ensure that any remaining pathogens in the water were eliminated, chloramine disinfection is included in the pre-injection treatment process. However, chloramine combines with any remaining organics in the water to produce THM. Unfortunately, the amount of remaining organics in the treated water has consistently produced unacceptable concentrations of THM in HDPP's injection water. Although HDPP has worked to improve the effectiveness of the UF treatment system and to minimize the use of chloramine, mean THM concentrations have continued to exceed the WDR waiver limits and curtail injection operations.

Therefore, HDPP proposes to add an ultraviolet treatment system (UV) to disinfect raw SWP water, which should be a much more effective for treating pathogens than the UF water treatment system (HDPP 2006a). HDPP anticipates that UV treatment will reduce the need for chloramination and the formation of THM to a minimum. HDPP has submitted manufacturer's information that states the proposed UV system can be configured to be 99.9% effective for flow rates that range from 1.25 to 10 million gallons per day (4 to 30 acre-feet/day) (HDPP 2006b). Based on this information, the UV system should function effectively for HDPP's water banking operation, which has a design injection flow rate of 9.5 acre-feet/day. With the addition of UV pre-treatment, HDPP anticipates that THM concentrations would no longer limit the project's ability to inject water.

HDPP's proposed revision of the water banking schedule assumes that the project would implement the UV treatment by the end of 2006. Staff supports HDPP's plan and recommends that HDPP provide an installation and operation report to the CEC by the end of the fourth year of commercial operation and a UV performance report by the end of the fifth year of commercial operation to verify the system has been successfully installed and is operating effectively.

Total Dissolved Solids

With the installation of a UV system, TDS concentrations in the SWP water supply would be the remaining water quality factor that would limit injection. In its petition, HDPP explains that the original sampling period used to estimate the mean TDS concentration of the raw water supply was too short to accurately predict the range of TDS levels in the water delivered to the project. HDPP has proposed a revised water banking schedule based on a longer period of data sampling.

Staff has reviewed the original analysis of the expected TDS concentrations for HDPP water supply. The WDR waiver limit for TDS and the selection of HDPP's water treatment system were based on an analysis of SWP water samples

collected at the Tehachapi Afterbay (SWP Check 41) by the California Department of Water Resources (DWR) during the period from June 1994-2000. This sampling station was selected for analysis because the Tehachapi Afterbay is the nearest SWP sampling station located upstream of HDPP that is maintained by DWR.

According to HDPP's Report of Waste Discharge (ROWD), submitted to the RWQCB (HDPP 2001), TDS concentrations averaged 233 mg/L and ranged from 73 mg/L to 481 mg/L during this period. Using these data, the RWQCB set a TDS mean of 248 mg/L with a maximum of 400 mg/L for the injection water for HDPP. Based on this analysis and the WDR waiver limits, HDPP concluded that TDS concentrations in the source water supply would not require reduction through pre-injection reverse osmosis (RO) water treatment, which was originally proposed in HDPP's application for certification (AFC).

However, since the start of water banking operations, TDS concentrations have been higher than anticipated. Staff reviewed historic SWP water quality data for Tehachapi Afterbay that are currently available on the DWR website (DWR 2006). Historical electric conductivity measurements for the Tehachapi Afterbay are available for over 3,500 days from June 1994 through March 2006. Using a simple conversion factor (TDS = electric conductivity x 0.6), these measurements can be converted to approximate TDS concentrations. Figure 1 provides a plot of the mean daily TDS concentration for the Tehachapi Afterbay. Based on these data, staff confirms that the mean TDS concentration for SWP water at the Tehachapi Afterbay since the start of HDPP injection operations have exceeded the original calculation of mean TDS (Table 2).

Table 2. Mean Annual Concentration of Total Dissolved Solids (TDS) State Water Project Tehachapi Afterbay

Period of Record	Total Dissolved Solids (mg/L)
6/1994-2000 [a]	233
2003 [b]	268
2004 [b]	273
2005 [b]	260

a. HDPP Report of Waste Discharge Table 8.
b. Source: California Department of Water Resources internet website for the State Water Project, Operations and Maintenance, Current Automated Station Data accessed on March 31, 2006, http://wwwomwq.water.ca.gov/AutoStationPage/index.cfm. TDS values based on mean daily electric conductivity (EC) measurement for water samples collected at the Tehachapi Afterbay. Conversion factor: EC X 0.6 (μS/cm) = TDS (mg/L).

Staff has determined that the calculation of mean TDS based on the 1994-2000 period of record was a poor predictor of the water quality for the HDPP's water banking supply for two reasons. First, staff agrees with HDPP that the period of record used to calculate was too short to accurately determine the system

mean. Second, this initial analysis also failed to recognize the extreme annual variability of TDS concentrations in the raw water supply.

For this petition, HDPP analyzed TDS data for a longer period of record to determine a new injection schedule (HDPP 2006b). HDPP analyzed monthly TDS concentrations for a period of 17 years, based on single grab samples from the Tehachapi Afterbay, from 1989 to 2005. Based on its analysis, HDPP has projected that its water quality injection limitation factor would be 40%.

Staff also performed an injection frequency analysis using a somewhat different approach. Staff analyzed mean daily concentrations to determine the number of days each year that HDPP could have injected water without exceeding either its mean or maximum WDR waiver limit for TDS. Staff's frequency analysis is based on the assumption that injection would commence in each of the sampled years on the first day that TDS concentrations (following pre-treatment) were less than or equal to 248 mg/L and that injection would occur any subsequent day of the year, as long as the average cumulative TDS remained under 248 mg/L. According to staff's analysis, if water quality conditions for the past 12 years were repeated, HDPP's annual potential injection frequency would range from 95% to 0.4% (Figure 2), with an average water quality injection limitation factor of 55%.

Figure 1. Mean Daily Total Dissolved Solids (mg/L)
State Water Project - Tehachapi Afterbay

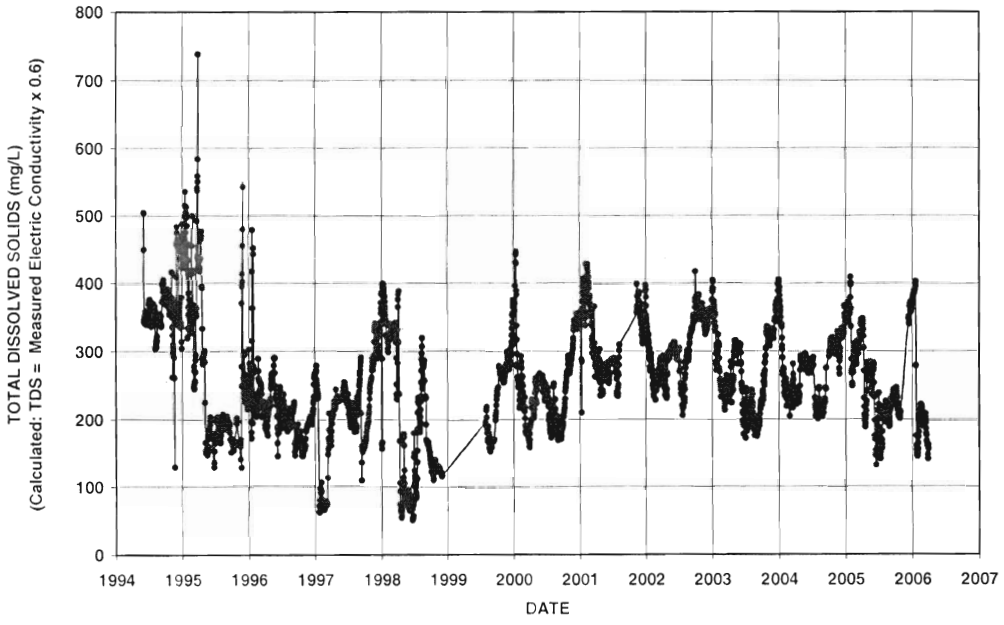
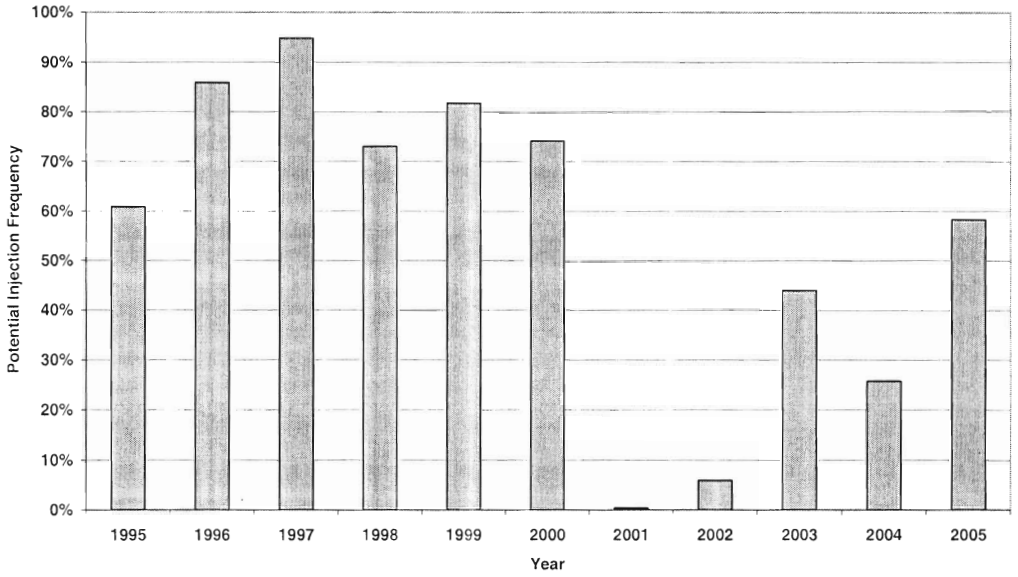


Figure 2. Frequency Analysis of Potential Injection for HDPP Aquifer Banking Program Based on the Historical Concentrations of Total Dissolved Solids State Water Project - Tehachapi Afterbay



However, although both of these new analyses provide better estimates of the future achievable injection frequency for the HDPP project than the original analysis, staff has concluded that data from a twelve or seventeen-year record is also too limited to accurately determine the long-term mean and variability of the system. The available data is insufficient because the TDS data from the Tehachapi Afterbay clearly represents a time-dependent series, indicating both seasonal and multi-year fluctuations. This means that TDS concentrations do not vary randomly from day to day.

Consequently, a data set for this hydrologic system would be defined as one full multi-year cycle; ten or more data sets would be required to accurately determine the mean and standard deviation of the system, according to standard statistical principles of analysis. Assuming a full cycle would span at least ten years, more than 100 years of data would be needed to accurately determine the mean and standard deviation of TDS concentrations for HDPP's raw water supply. Therefore, the amount of data available for HDPP's water supply significantly reduces our ability to accurately estimate future TDS concentrations. Furthermore, the term of the HDPP water banking operation is, in fact, too short to reflect long-term conditions.

Therefore, while it is reasonable to base the revised HDPP water banking schedule on the best available estimate of average TDS conditions, staff recommends three additions to HDPP's proposed amendment to **SOIL&WATER-4**. To address the uncertainty of future TDS concentrations, staff recommends the inclusion of (1) two additional years to HDPP's proposed schedule

extension, (2) periodic milestones to monitor injection progress, and (3) a contingency plan to increase the rate of injection.

The two additional years would simply add a measure of flexibility to the schedule to accommodate moderate deviation from the expected concentrations of TDS. The water banking schedule would be extended to fifteen years from the start of project operations, to April 2018.

The milestones would be designed to determine if injection is progressing on schedule. Two initial status reports on the installation and the performance of the UV system would be followed by annual cumulative injection evaluations beginning in April 2011. The milestones would identify if the injection operations were to fall significantly behind schedule. If future TDS concentrations are higher than anticipated and continue to prevent injection at the revised estimated rate, the milestone evaluations would trigger the contingency plan.

The contingency plan would call for the installation of a pre-injection reverse osmosis water treatment system. Reverse osmosis would reduce TDS concentration in the raw water supply and consequently enable HDPP to inject water at the system-design rate during most of the year. With the elimination of TDS constraints on injection, the project could rapidly fill the water bank at a rate of about 2,900 acre-feet/year within a predictable period of time. Staff's proposed contingency plan would be implemented only if necessary but in time to ensure that the water bank would be completed on schedule.

With the inclusion of two additional years to the proposed schedule extension, periodic milestones and the contingency plan, the proposed modification to the water banking schedule, in terms of injection rate, would adequately condition the project and would still fully mitigate all potential significant impacts, in accordance with the Final Commission Decision (CEC 2000).

Use of Banked Groundwater

The second factor that will affect the feasibility of the proposed schedule is the amount of banked groundwater that the project uses during the water bank development period. By design, the backup water from the water bank is used whenever the primary surface water supply is not available for plant operation. Backup water is also used whenever project wells are tested or redeveloped.

HDPP's proposed water banking schedule assumes minor use of banked groundwater over the proposed 13-year term of the revised schedule. HDPP identifies two periodic events that will require the use of banked groundwater. First, approximately twelve (12) acre-feet of water will be used annually to test and redevelop project wells. Second, banked groundwater will be used for plant operation when surface water deliveries are suspended during scheduled maintenance of the SWP Aqueduct. SWP Aqueduct maintenance is conducted once every five years for a period of 7 days. The project will use approximately 93 acre-feet of banked groundwater during these maintenance periods, or 19

acre-feet/year, pro-rated over five years. Total scheduled interruptions would average 31 acre-feet/year.

Staff has also considered the potential impact of unscheduled use of the backup water supply, in case of drought, on the water banking schedule. The backup water supply has been sized to be used for plant operations if critical drought conditions caused the SWP to cutback or suspend water deliveries. HDPP reports that its annual water use averages about 3000 acre-feet. In addition to water for its plant operation requirements, HDPP also purchases water for its injection operations during the water banking period. If water deliveries were curtailed, the available water would preferentially be used for plant operation and injection operations would be curtailed. If injection operations experience a significant unscheduled interruption during the water banking period, it would clearly cause a delay in the schedule. Furthermore, if the amount of surface water available to the project were less than 3000 acre-feet during any year, backup water would be used, which would deplete banked water reserves and set back the water banking schedule. (It should be noted that although critical drought could require the use of banked water and refilling would require additional effort, the water bank would be used for the purpose for which it was designed.)

HDPP's proposed water banking schedule assumes no unscheduled interruption of surface water deliveries would occur during the proposed 13-year term of the revised schedule. If an unscheduled interruption of the plant's primary water supply or the injection operations were to occur during the water banking period and extended more than a couple of months, it is unlikely that HDPP would be able to complete the filling of the water bank within the 13-year proposed schedule.

Staff recommends two modifications to the water banking plan that HDPP has proposed to accommodate potential unscheduled water delivery interruptions. First, staff's recommendation that the revised water banking schedule be extended to 15 years, rather than 13 years, would allow flexibility for a limited degree of unscheduled interruptions. An extended interruption or use of backup water would require implementation of the contingency plan. Based on staff's analysis, if HDPP consumes 1000 acre-feet or more of groundwater during the latter part of the water banking period, the contingency plan to install a reverse osmosis (RO) water treatment system would be needed to complete the filling of the water bank on schedule. If a severe drought extended for a year, HDPP would need almost three years of injection to replace one year's use of backup water for project operations without RO because the power plant consumes about 3000 acre-feet of water annually. However, under most circumstances, the installation of RO would enable the project to recover from one or more years of severe drought requiring backup water use and still complete the water banking deadline on schedule.

With the inclusion of these two modifications recommended by staff, the proposed modification to water banking schedule, in terms backup water

extraction, would adequately condition the project and would still fully mitigate all potential significant impacts, in accordance with the Final Commission Decision (CEC 2000).

Groundwater Dissipation

The third factor that will affect the feasibility of the proposed schedule is the rate of water-bank losses to the Mojave River (groundwater dissipation). Accounting for dissipation is a critical factor in ensuring that extraction from the backup water supply does not adversely impact the Mojave River.

Although dissipation varies depending on the actual rates of injection, groundwater model simulations for a range of injection scenarios indicate that the cumulative dissipation for a 15-year injection period would be less than 7 percent (±2%) of the total amount of water banked. In other words, to establish a banked groundwater reserve of 13,000 acre feet by year 15, HDPP's net injection (injection minus withdrawals) should equal about 14,000 acre-feet (14,000 acre-feet minus 7 percent = 13,000 acre-feet).

HDPP's calculation to determine the length of its proposed water banking schedule includes a reasonable estimate for dissipation. No additional time in the schedule should be needed to accommodate dissipation. The proposed modification to water banking schedule, in terms of dissipation, would adequately condition the project and would still fully mitigate all potential significant impacts, in accordance with the Final Commission Decision (CEC 2000).

Conclusions and Recommendations

HDPP has proposed a thirteen-year schedule for developing a 13,000 acre-foot water bank to provide a backup supply to the project. HDPP's proposed schedule is based on a number of assumptions including plant operation processes, the mean TDS concentration for SWP water, interruptions of injection and consumption of banked groundwater, and dissipation of banked groundwater.

Plant operational assumptions include the design injection flow rate, the aquifer banking system capacity factor, and the installation of a UV pre-injection system. HDPP has submitted information provided by the UV manufacturer that indicates that the system will eliminate unacceptable THM formation that has been a primary impediment to water bank injection. Based on this information, staff has verified that the performance of the UV system will be adequate to avoid significant TDS formation and assumes that HDPP's other assumptions regarding plant operation are accurate.

Staff has verified that HDPP's proposed modifications to **SOIL&WATER-4** are based on new TDS concentration data that was not available during the original licensing proceedings and that these modifications retain the intent of the original Commission Decision. HDPP's calculation regarding the mean TDS

concentration of the SWP water supply and its corresponding assumption regarding estimated injection are reasonable, given the available data.

However, staff has determined that the new data available on TDS concentrations are too limited, the data range is too broad and the injection period is too brief to determine with confidence that the water bank can be filled within the proposed thirteen-year period. To address this uncertainty, staff recommends that two additional years be added to HDPP's proposed schedule extension and that milestones and a contingency plan be included in the terms of the amended condition. The additional years would add a measure of flexibility to the schedule. The milestones are designed to track project performance and to assess whether contingency measures must be implemented to complete injection on time. The contingency plan would be triggered to implement RO in time to complete the water banking on schedule, except for years 14 or 15. If the project failed to meet the 14-year milestone, RO would be installed during year 15 and the water bank would be completed in year 16. If the project failed to meet the 15-year milestone, RO would be installed during year 16 and the water bank would be completed in year 17. Staff has also concluded that HDPP's assumptions regarding interruptions of injection and consumption of banked groundwater do not incorporate provisions for the uncertainty of future events. HDPP's proposed water banking schedule includes no provision for unscheduled interruptions, such as critical drought. Staff's recommended schedule extension, milestones and contingency plan would also provide the schedule flexibility, monitoring and contingency plan needed to increase injection, if drought or some other unscheduled interruption occurs.

Finally, staff has concluded that HDPP has incorporated a reasonable estimate for dissipation into its proposed schedule. Accounting for dissipation in the proposed modifications is essential to ensuring that **SOIL&WATER-4** adequately conditions the project to fully mitigate all potential significant impacts to the Mojave River Basin water supply.

The following time table summarizes staff's recommendation for the injection schedule, milestones and contingency plan. Staff recommends that the milestones and contingency plan shown in this table be included in the amendment of **SOIL&WATER-4**.

Table 3. Time Table of Staff's Recommendations

Historical Water Banking Record						
Start of Commercial Operation		Reported Annual Net Injection (1)	Reported Cumulative Injection	Calculated Water Banking Reserve (2)		
Water Banking Year	Anniversary Date					
0	April 21, 2003	0	0	0		
1	April 21, 2004	1934	1934	1932		
2	April 21, 2005	-2.3 (3)	1931	1919		
		HDPP Proposed Schedule			Staff Recommendations	
Water Banking Year	Anniversary Date	Anticipated Net Injection (4)	Anticipated Cumulative Injection	Anticipated Water Bank Reserve (5)	End of Year Milestones (6)	Contingency Plan: Criteria for Installation of Reverse Osmosis
3	April 21, 2006	791	2723	2687		
4	April 21, 2007	702	3425	3382	Verification: UV Installed and Operational Report	
5	April 21, 2008	1148	4573	4496	UV Performance Report - Goal: Annual Mean THM ≤ 0.5 μg/L	
6	April 21, 2009	1148	5721	5599		
7	April 21, 2010	1148	6869	6691		
8	April 21, 2011	1148	8017	7772	Water Banking Goal	Calculated Water Bank Reserve ≤2500 ac-ft
9	April 21, 2012	1148	9165	8843	Water Banking Goal	Calculated Water Bank Reserve ≤5400 ac-ft
10	April 21, 2013	1148	10313	9902	Water Banking Goal	Calculated Water Bank Reserve ≤8300 ac-ft
11	April 21, 2014	1148	11461	10951	Water Banking Goal	Calculated Water Bank Reserve ≤ 9,200 ac-ft
12	April 21, 2015	1148	12609	11990	Water Banking Goal	Calculated Water Bank Reserve ≤ 10,100 ac-ft
13	April 21, 2016	1148	13757	13018	Water Banking Goal	Calculated Water Bank Reserve ≤ 11,000 ac-ft
14	April 21, 2017	Additional Year 14 (5)			Water Banking Goal	Calculated Water Bank Reserve ≤ 12,000 ac-ft
15	April 21, 2018	Additional Year 15 (5)			Water Banking Goal	Calculated Water Bank Reserve < 13,000 ac-ft

(1) Net Injection = Injection minus Extraction.
(2) CEC-Calculated Water Bank Reserve = Injection minus Extraction minus Dissipation. (Amount of water available to HDPP is equal to Injection minus Extraction minus Dissipation **minus** 1000 acre-feet, as defined in **SOIL&WATER-6.**)
(3) The Reported Annual Net Injection in Water Banking Year 2 was negative because extraction exceeded injection.
(4) Anticipated net injection based on HDPP's estimated mean TDS concentrations for SWP water (calendar year). Assumes no unscheduled interruptions in surface water deliveries and excludes dissipation.
(5) HDPP-estimated water bank reserve = Injection minus Extraction minus Dissipation. (HDPP 2006b) Assumes no unscheduled interruptions in surface water deliveries.
(6) Milestones are designed to determine if injection falls significantly behind schedule.
(7) Additional years 14 and 15 have been added to schedule to allow for overestimate of mean injection rate and unscheduled interruptions.

Based on these findings, staff concludes that amendment to **SOIL&WATER-4** would not result in any unmitigated project-specific or cumulative significant impacts to soil or water resources and would comply with all LORS with the adoption of the modifications to the Conditions of Certification listed below.

RECOMMENDED REVISIONS TO CONDITION OF CERTIFICATION

Staff recommends the following changes to the Condition of Certification **Soils & Water-4** (additions shown by underline, deletions by ~~strikeout~~):

SOIL&WATER-4 Injection Schedule:

a. The project owner shall inject one thousand (1000) acre-feet of SWP water within twelve (12) months of the commencement of the project's commercial operation.

b. By the end of four years and two months from the start of commercial operation, the project owner shall install and begin operation of a pre-injection ultraviolet (UV) disinfection system.

c. By the end of the fifth year of commercial operation, the project shall submit a report to the CPM demonstrating that HDPP has maintained an average THM concentration level consistent with the WDR permit requirements.

d. The project shall install and implement a pre-injection reverse osmosis treatment system within one (1) year if the water banking goal is not met, as defined in the following table.

Table of Milestones for Calculated Water Bank Reserve (1)

Water Banking Year	Anniversary Date (2)	End of Year Milestones (3)	Contingency Plan: Criteria for Installation of Reverse Osmosis
8	April 21, 2011	Water Banking Goal	Calculated Water Bank Reserve ≤ 2,500 ac-ft
9	April 21, 2012	Water Banking Goal	Calculated Water Bank Reserve ≤ 5,400 ac-ft
10	April 21, 2013	Water Banking Goal	Calculated Water Bank Reserve ≤ 8,300 ac-ft
11	April 21, 2014	Water Banking Goal	Calculated Water Bank Reserve ≤ 9,200 ac-ft
12	April 21, 2015	Water Banking Goal	Calculated Water Bank Reserve ≤ 10,100 ac-ft
13	April 21, 2016	Water Banking Goal	Calculated Water Bank Reserve ≤ 11,000 ac-ft
14	April 21, 2017	Water Banking Goal	Calculated Water Bank Reserve ≤ 12,000 ac-ft
15	April 21, 2018	Water Banking Goal	Calculated Water Bank Reserve < 13,000 ac-ft

(1) Calculated Water Bank Reserve = Injection minus Extraction minus Dissipation. (Amount of water available to HDPP is equal to Injection minus Extraction minus Dissipation **minus** 1000 acre-feet, as defined in **SOIL&WATER-6.**)
(2) Start of Commercial Operation: April 22, 2003.
(3) Milestones are designed determine if injection falls significantly behind schedule.

~~d~~e. No later than ~~By~~ the end of the fifteenth (15) ~~fifth~~ year of commercial operation, the amount of water injected minus the

amount of banked groundwater used for project operation, minus the amount of dissipated groundwater shall meet or exceed thirteen thousand (13,000) acre-feet.

~~e~~f. After the requirement of section e. has been satisfied~~After the fifteenth (15) fifth year of commercial operation~~ and until three (3) years prior to project closure, the project owner shall replace banked groundwater used for project operation as soon as SWP water is available for sale by MWA. The project owner may choose to delay replacement of a limited quantity of banked groundwater used for project operations during aqueduct outages until the cumulative amount of groundwater withdrawn from the bank reaches one thousand (1,000) acre-feet. Once the limit of one thousand (1,000) acre-feet has been reached, the project owner shall replace banked groundwater used for project operation during aqueduct outages as soon as SWP water is available for sale by MWA.

Verification: The project owner shall submit an installation and operation report describing the pre-injection ultraviolet disinfection system (UV) by the end of the fourth year of commercial operation. The project owner shall submit a UV performance report by the fifth year of commercial operation. For other related items, ~~See~~see the verification to **Condition 5**. See also the verification to **Condition 12**.

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