State Of California | The Resources Agency of California

Memorandum

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To : Robert A. Laurie, Commissioner and Presiding Member
David A. Rohy, Vice Chair and Associate Member

From : California Energy Commission - Roger E. Johnson
1516 Ninth Street
Sacramento, CA 95814-5512
Siting Project Manager

Subject : **Staff Water Resources Rebuttal Testimony and Errata for Soil and Water Resources and Air Quality Testimony**

The Committee's August 19, 1999 ***Order Granting Extension of Time*** directed parties to file rebuttal testimony to Mr. Gary Ledford's direct testimony no later than September 30, 1999. Please filed attached staff's rebuttal testimony. Also attached are errata to staff's air quality and soil and water resources testimony. In order to make staff's errata to the water resources testimony more easily understood, staff is refiling the soil and water resources testimony in redline and ~~strikeout~~ format. We have also numbered the lines of the testimony and included previous errata filed on September 2, 1999. The errata to the soil and water resources testimony are editorial (e.g., correct errors and provide clarification) and do not change staff's conclusions and recommendations.

If you have any questions or comments, please call me at 916 653-1614 or email me at rbuell@energy.state.ca.us.

Attachments

rej:rej

cc: Rosella Shapiro
High Desert POS (97-AFC-1)
Randy Hill, VVWD
Norman Caouette, MWA
George Walker, USFWS

REBUTTAL TESTIMONY OF LINDA D. BOND TO THE DIRECT TESTIMONY OF GARY A. LEDFORD ON WATER AND RELATED MATTERS (EXHIBIT 121) AND REBUTTAL TESTIMONY OF TO THE TESTIMONY OF JOSEPH O'HAGAN AND LINDA BOND ON SOIL AND WATER (EXHIBIT 99) FOR THE HIGH DESERT POWER PROJECT

In Exhibits 99 and 121, intervenor Gary A. Ledford generally asserts that the California Energy Commission staff (staff) has not addressed cumulative impacts or the negative impacts on surface water and groundwater conditions that would specifically be caused by the proposed High Desert Power Project (HDPP). In response to these concerns expressed by Mr. Ledford, I briefly summarize the groundwater modeling analyses performed by staff on potential impacts from HDPP on groundwater resources and discuss its use in staff's analysis of cumulative impacts.

To begin, I note that, after completing its analysis, staff recommended Conditions for Certification that will fully mitigate the negative impacts that could otherwise be caused by the HDPP.

As part of the staff analysis, I used a 3-dimensional groundwater model to analyze the incremental effect of HDPP's proposed groundwater banking and subsequent pumping on the groundwater basin. With this modeling approach, staff was able to identify HDPP impacts independently of ongoing impacts caused by other groundwater users.

Although the incremental impact of HDPP was modeled independently, the results of the model simulations and the <u>significance</u> of the HDPP impacts in staff's analysis is explicitly evaluated in light of the existing and anticipated conditions of overdraft within the Mojave River Groundwater Basin. Correspondingly, staff's recommended Conditions are designed to ensure that the HDPP does <u>not</u> contribute to the overdraft or cause any other unmitigated negative direct or cumulative impacts.

It is correct that the model used by staff does not analyze the cumulative impacts of all the groundwater users in the Mojave River Groundwater Basin. A model that could provide that kind of information would be a basin wide, comprehensive model, such as the groundwater model currently being developed by the U.S. Geological Survey (USGS). Staff determined that to develop another comprehensive model to analyze the impacts of HDPP would be impractical and unnecessary. Such an effort would require several years to complete and would duplicate the work that the USGS has almost completed. Moreover, a modeling analysis of the entire groundwater system is unnecessary when the objective is to identify the potential effects of a single project and devise mitigation to ensure that no negative direct or cumulative impacts will occur. That is what staff has done.

I would also address specific statements made by Mr. Ledford in his rebuttal and direct testimony. Mr. Ledford has some specific misconceptions regarding the model analysis.

The analysis developed by staff has not been performed in a "vacuum" as Mr. Ledford expresses in his Rebuttal to staff's testimony on Soil and Water Resources (Exhibit 99, page 23). As an expert in groundwater modeling, I can testify that the modeling analysis is sound, both from technical perspective and in the interpretation of its results. The modeling approach used by the staff is a standard technical approach for identifying and quantifying the impacts of a new project on existing conditions. I should also emphasize that the final version of the staff's HDPP model will incorporate the calibrated aquifer parameter values developed with the USGS model (COC SOIL & WATER 9) and site-specific aquifer parameter values, as required in the recommended conditions of certification. Mr. Ledford is correct that the project must be evaluated within the context of the existing overdraft. And, in fact, staff has explicitly evaluated the results of the modeling analysis in terms of the existing cumulative impacts and conditions of overdraft, as discussed above.

Mr. Ledford concludes "the results of the modeling would have been significantly different" if projected growth of municipal pumping had been included in the model (Exhibit 99, page 23). However, given the technical approach and significance criteria used by the staff, the results generated by the staff's model will be comparable to the results of an analysis of the incremental effect of the HDPP project that would be generated by a comprehensive model.

Mr. Ledford also states in his direct testimony that HDPP would cause the following three negative impacts:

g. "proposed water banking water will be used by adjacent wells in the overdrafted basin and there will be no way to account for the water loss to other wells;

h. The project…well field will exacerbate the cone of depression with the cumulative pumping and overproduction in this pressure zone, lower water levels, creating a reverse pressure away from the river. This will cause negative impacts to the local base flow of the Mojave River;

i. the project's cumulative impacts with current overproduction and future proposed overproduction of non replenished ground water will cause negative impacts on Mojave River flow that will affect downstream communities;"

(Exhibit 121, page 120)

As I discuss, Mr. Ledford is incorrect as to all three assertions.

<u>Negative impact g:</u> Impacts of overdraft caused by the existing groundwater users, now and in the future, will occur whether or not the HDPP is constructed. Municipal water supply wells in the vicinity of the proposed HDPP well field will continue to pump groundwater regardless whether or not the HDPP is constructed. However, if a municipal well withdraws State Water Project (SWP) water that was banked by HDPP, the well will correspondingly leave native groundwater that it would have

otherwise used. Thus, the HDPP banking proposal will result in no changes to groundwater levels.

Negative impact h: If the staff's Conditions are adopted, HDPP will have no negative net impact on the existing cone of depression in the vicinity of the project, which can generally be described as the Victor Valley Water District (VVWD) Pressure Zone 2. Although groundwater levels will be lower than they would be without the project in the immediate vicinity of the HDPP well field during HDPP pumping, groundwater levels will be higher than they would be without the project during periods of groundwater banking by HDPP. Furthermore, HDPP would be required to inject more water than it will be permitted to withdraw because of dissipation of the mound of water banked beneath the well field site. As a result, HDPP would have no negative impact on long term groundwater levels in the basin.

In addition, staff explicitly analyzed HDPP's potential for reversing groundwater flows away from the river. If the staff's recommended Conditions are adopted, short-term fluctuations in groundwater levels in the vicinity of the HDPP well field would not cause negative impacts to the local base flow of the Mojave River at any time.

Negative impact i: As stated above, if the staff's recommended Conditions are adopted, there would be no incremental decrease in base flow to the Mojave River caused by HDPP and no negative impacts to downstream communities

In summary, staff has rigorously analyzed the potential for negative impacts by HDPP within the context of the overdraft of the Mojave River Groundwater Basin and of the cumulative impacts of existing and potential future groundwater use. Based on this analysis, the staff has recommended Conditions that are designed to ensure that the HDPP does not contribute to the overdraft or cause any other unmitigated negative direct or cumulative impacts.

ERRATA TO THE AIR QUALITY

Testimony of Tuan Ngo

The following changes should be incorporated in the proposed conditions of certification to make the condition consistent with the La Paloma Final Determination of Compliance:

AQ-17. ***The compliance test plan shall include a method for measuring CO/VOC surrogate relationship that can be use to demonstrate compliance with VOC hourly, daily and annual emission limits.*** ~~***Upon successful compliance with the sources test, ongoing compliance with the CO emission limits during normal operation shall be deemed compliance with the VOC emission limits during normal operation.***~~ ***Compliance with the VOC emission limit shall be demonstrated by the CO CEM data and the VOC/CO relationship determined by the CO and VOC source tests.***

Verification: ***See verification for Condition AQ-15.***

SOIL & WATER RESOURCES

Testimony of Joseph O'Hagan and Linda D. Bond

INTRODUCTION

This testimony analyzes the water and soil resource aspects of the High Desert Power Project (HDPP), specifically focusing on the following areas of concern:

- how the project's demand for water affects surface and groundwater supplies;
- whether project construction or operation will lead to accelerated wind or water erosion and sedimentation;
- whether project construction or operation will lead to degradation of surface or groundwater quality;
- whether or not the completed facilities will be vulnerable to flooding; and
- whether project compliance with all applicable laws, ordinances, regulations and standards.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

FEDERAL

The Clean Water Act, Title 33, United States Code section 1251 et seq., requires any construction activity (earth moving) disturbing five acres or more to operate under the provisions of the National Pollutant Discharge Elimination System (NPDES) General permit. In California, responsibility for administering the NPDES program has been delegated to the Regional Water Quality Control Boards.

STATE

To implement the NPDES program, the State Water Resources Control Board (SWRCB) adopted Order No. 92-08-DWQ, which established General Permit No. CAS000002, the California General Construction Activity Stormwater Permit. Under the order, a project, if it disturbs five acres or more, must comply with the requirements of this general permit. These requirements include the filing of a Notice of Intent with the Regional Water Quality Control Board (RWQCB), development of a stormwater pollution prevention plan incorporating best management practices for the control of erosion, sedimentation and runoff and implementation of the plan.

The SWRCB also adopted Order No. 97-03-DWQ that established General Permit No. CAS000001, California General Industrial Activities Stormwater Permit. Under the order, operating industrial facilities that discharge stormwater, must comply with the requirements of the general permit. These requirements include filing a Notice of Intent with the RWQCB, development of a stormwater pollution prevention plan incorporating best management practices for the control of erosion, sedimentation and runoff and implementation of the plan, including monitoring.

SWRCB Resolution 75-58, discourages the use of fresh inland water for power plant cooling and encourages the use of wastewater or other alternative non-potable water sources. California Water Code section 461 and Water Commission Resolution 77-1 encourages conservation of water resources and maximum reuse of wastewater, particularly in water-short areas.

SWRCB Policy 68-16, Statement of Policy with Respect to Maintaining High Quality of Waters in California (Anti-degradation policy) is a part of the Water Quality Control Plan for the Lahontan Region (Basin Plan), administered by the Lahontan RWQCB. The Anti-degradation Policy requires the Regional Board to ensure that all projects are conducted in a manner that will maintain the highest quality water that is feasible in consideration of technical, economic and social factors. Any degradation of water quality must be quantified and must be in the best interest of the people of California. To effectively implement the Anti-degradation Policy, the Regional Board may issue Waste Discharge Requirements, may issue a Waiver of Discharge Requirements or may waive the need for a responsible party to file a report of waste discharge for a specific project (Maxwell 1999c).

Fish and Game Code, §1603 requires that the California Department of Fish and Game be notified prior to any substantial diversion of flow or alteration of channel or bank of any stream, river or lake to allow the department to propose measures necessary to protect fish and wildlife.

LOCAL

MOJAVE WATER AGENCY

Mojave Water Agency (MWA) Ordinance No. 9 establishes the rules and regulations for the sale and delivery of State Water Project (SWP) water. An application for SWP water must be submitted to the Mojave Water Agency. The City of Victorville has filed an application for SWP water with the MWA. Section 3.02 of the ordinance limits all agreements for SWP water to a term of one year, thus existing customers must submit ~~an~~a new application each year. Section 3.05 of the ordinance states that SWP cannot be the sole source of water for a project and that a reliable source of water must be obtained prior to approval of any application to the MWA. Section 5.13 of the ordinance requires that, if there is a shortage in SWP water, deliveries to all parties shall be reduced proportionally. This section of the ordinance does allow MWA to a portion the water, if there is a shortage in SWP supply to ensure domestic, sanitary sewage and fire fighting needs are met.

~~STORAGE AGREEMENT~~

CITY OF VICTORVILLE

City of Victorville Ordinance No. 1500 requires a grading permit for earth moving activities exceeding 50 cubic yards.

SETTING

SITE AND VICINITY DESCRIPTION

The proposed site for the HDPP is located in northern San Bernadino County on the former George Air Force Base within the City of Victorville. This former base, which has been annexed by the City of Victorville is being developed by the Victor Valley Economic Development Agency (VVEDA) as the Southern California International Airport (SCIA).

The project area, as expected of a desert environment, is characterized by low precipitation, low humidity and high summer temperatures. Annual precipitation is approximately 5.7 inches while evaporation is fourteen times this amount. The geology of the SCIA is comprised of granitic alluvial fan and river terrace deposits. Topography at the former base is generally level, with average slopes of two to four percent.

SOILS

Soils developed in these deposits are generally deep, with low permeability and runoff. Surface textures are primarily sand with small amounts of clay and silt. The soil types affected by the different project elements with selected characteristics are shown in Table 1 below. As shown in this table, all of these soils have a high wind erosion hazard.

SOIL&WATER RESOURCES TABLE 1
Soils with Selected Characteristics Affected by the Project

Soil Name & Number	Percent Slope	Project Element(s)	Surface Texture	Runoff	Water Erosion Hazard	Wind Erosion Hazard
Bryman 105	2-9	Water & Gas Pipelines	Sand	Slow	Slight	High
Cajon 113	2-9	Water Pipeline	Sand	Slow	Slight-Moderate	High
Cajon 114	9-15	Water Pipeline	Sand	Slow	Slight-Moderate	High
Haplargids/ Calciorthids Complex 130	15-50	Gas & Sanitary Sewer Pipelines	Loamy Fine Sand to Sand	Medium-Rapid	Moderate-High	Moderate-High
Mohave 150	0-2	Water, Gas & Sanitary Sewer Pipelines, Power Plant	Loamy Sand	Medium	Slight	High

Source: HDPP 1997a Table 5.2-1; Soil Conservation Service 1986

The proposed power plant site is on the Air Force Installation Restoration Program (IRP) Site FT-20. This site was a fire training pit. Sampling at site FT-20 indicates the presence of low levels of chlorinated solvents in soil gas and low concentrations of total petroleum hydrocarbons in soil (Cass 1998). Because of the low level of contaminants in the soil, a No Further Action for soils at Site FT-20 will be issued (Cass 1998). A No Further Action indicates there is no need for further remediation measures. Groundwater contamination beneath the site will be discussed below under water quality.

SURFACE HYDROLOGY

The Mojave River is the major surface drainage within the project vicinity. The river flows approximately one mile east of the proposed power plant site. In this vicinity, the river has cut a channel about one mile wide and two hundred feet below the elevation of the project site. Surface flows of the river within the project area typically occur only during heavy rainstorms. The exception to this is at the Upper and Lower Narrows, located approximately five miles from the project site. The Narrows are formed by a bedrock ridge that acts as a barrier, forcing subsurface river flows to rise to the surface. A stream gage at the Lower Narrows shows that from 1931 to 1995 annual mean flows were 75.7 cfs (USGS 1998). Average annual flows from 1991 to 1997, were significantly higher than the ~~preceeding~~preceding 60 year period (Bookman-Edmonston 1999). Base flows in the river, however, have shown a marked decline over the last 20 years.

Northeast of the power plant site, the Victor Valley Wastewater Reclamation Authority (VVWRA) wastewater treatment plant discharges effluent to the Mojave River. In the 1995-1996 water year (October through September), the VVWRA facility discharged 8,475 acre-feet or approximately 7-cfs (MWA 1997b).

Drainage within the immediate power plant site vicinity flows to the north and east. Most runoff in this portion of the site is conveyed by an existing drain located immediately west of the power plant site. This drain flows into a natural arroyo to the north of the site, which then discharges into the river.

GROUNDWATER HYDROLOGY

The Mojave Water Agency (MWA 1994) estimates that in 1990 the Mojave River Groundwater Basin is overdrafted by approximately 68,000 acre-feet per year. Overdraft refers to the amount of water pumped from the basin compared to the amount recharged. Because of this overdraft, the groundwater basin was adjudicated. See the discussion on the adjudication below.

For water resource management purposes, the Mojave River Basin adjudication divided the basin into five subareas. The project area lies within the 600 square mile Alto Subarea. Groundwater levels in some portions of the Alto Subarea declined 25 feet between 1960 and 1990 (MWA 1994). The MWA (1994) estimate for groundwater overdraft within the Alto Subarea in 1990 was 19,900 acre-feet per year.

Recharge to the Mojave River Groundwater Basin occurs primarily by infiltration of precipitation runoff from the San Bernadino and San Gabriel Mountains. Hardt (1971) estimated that approximately 80 percent of the recharge to this basin is through coarse grained sediments, which are found within the Mojave River channel and some ephemeral drainages. During water years 1991-1992 and 1994-1995, there were exceptionally high flows within the Mojave River that provided significant recharge. Importation of water into the Alto Subarea over the 1991 through 1997 period only totaled 23,800 acre-feet. What other recharge occurs within the Alto Subarea results mainly from infiltration of water from irrigation and septic systems. Bookman-Edmonston (1999) data shows a decline in agricultural consumptive use from 11,500 acre-feet in water year 1990-1991 to 6,200 acre-feet in water year 1996-1997. Urban consumptive use of groundwater, averaging about 36,100 acre-feet, has been fairly consistent throughout this period.

The MWA (1994) Master Plan estimates that by the year 2000, given historic patterns of growth and water consumption, overdraft within the Alto Subarea will be 29,800 acre-feet of water, increasing to 45,400 acre-feet by 2020. By the year 2015, basin-wide the overdraft is anticipated to reach 92,800 acre-feet of water. These estimates also do not take into account the importation of SWP water. Full importation of MWA's SWP entitlement of 75,800 acre-feet of water would significantly lessen the amount of overdraft within the basin. MWA estimates about 10,000 acre-feet of SWP water will be recharged each year for the next few years (Caouette 1998b). No SWP water, however, will be imported in 1999 due to financial limitations (Caouette 1999).

The Mojave River Groundwater Basin is composed of two primary water-bearing units. These units have been variously named in different reports. In this report, these two units will be called the Mojave River Alluvial Aquifer and the Regional Aquifer. These two aquifers are underlain by a low permeability basement complex.

The Mojave River Alluvial Aquifer occupies the channel of the Mojave River and forms a narrow band of permeable sediments. In the project area, these sediments are less than a mile wide. This aquifer supports both riparian vegetation and highly productive wells. The Mojave River Alluvial Aquifer is underlain by the Regional Aquifer.

The Regional Aquifer, which is up to 1,000 feet thick, underlies the project area. It is composed of older alluvium and fan deposits of interbedded gravel, sand, silt, and clay. In some locations, including the Victorville area, the Regional Aquifer contains extensive, low permeability, old lake and lakeshore deposits (DWR, 1967). The regional groundwater flow is to the northeast, except near the Mojave River where the flow is to the east. It appears that the lower aquifer is hydraulically connected with the Mojave River Alluvial Aquifer, but the extent of this connection is not understood

In the SCIA area, old lake and lakeshore deposits support a perched aquifer, separated from the underlying water table of the Regional Aquifer by an unsaturated zone. This extensive layer of clay and silt retards the downward movement of water.

Isotopic studies indicate that, prior to the development of groundwater in the Victorville area, groundwater in the Regional Aquifer flowed to the northeast, discharging to the Mojave River (Izbicki, et al., 1995). Groundwater discharge comprises the base flow of the Mojave River. The historic pattern of regional groundwater gradients persisted through the early years of groundwater development; maps that plotted groundwater level contours for 1961 (DWR, 1967) illustrate this flow regime. This pattern, however, was disrupted by groundwater pumping (Mendez, et al., 1997). By the 1990's, a significant cone of depression had formed from pumping, presumably by supply wells for VVWD, the city of Adelanto, and GAFB. These wells capture groundwater that would otherwise discharge to the Mojave River.

If groundwater levels decline to elevations below the stream flow in the Mojave River for an extended period of time, regional gradients would be reversed and would induce recharge from the Mojave River to the Regional Aquifer. The Mojave River does recharge the Mojave River Alluvial Aquifer. This occurs because this aquifer is very permeable and responds rapidly to small changes in the elevation of the flow of the River. Although the river has a rapid impact on groundwater levels in the Mojave River Alluvial Aquifer, the Regional Aquifer responds very slowly to similar changes in head in the river. This difference occurs because the Regional Aquifer is much less permeable than the Mojave River Alluvial Aquifer. The permeability difference of the two aquifers has a damping effect on short-term changes on elevation in river flows and in the groundwater levels of the Mojave River Alluvial Aquifer.

GROUND WATER QUALITY

Groundwater quality in the project vicinity is generally good. Water quality data from VVWD wells in the project area meet all state and federal drinking water standards. Total dissolved solids (TDS), an important constituent for power plant use averages approximately 140 mg/l. In contrast , SWP water TDS levels averaged 218 mg/l during the 1995-1996 water year. The Department of Water Resources does not guarantee SWP water quality.

Groundwater contamination has been detected in the perched aquifer at the former George Air Force Base. A major trichloroethylene (TCE) plume has been detected in the north central portion of the base. This plume extends to the northeast off the base to the Victor Valley Reclamation Authority (VVRA) wastewater treatment plant. A second groundwater contamination plume resulting from leaked jet fuel (JP-4) is found in the central portion of the base. A small, isolated plume of TCE has also been found in the upper aquifer beneath the power plant site at IRP Site FT-20 (Cass 1998). Well samples indicate TCE levels within this plume are about 6.1 micrograms/liter (Montgomery-Watson 1997). A final decision regarding groundwater contamination at Site FT-20 has not yet been made (Plaziak 1999).

Water quality from wells in the vicinity of the proposed wellfields is good, with the exception of several wells where high levels of naturally occurring ~~flouride~~fluoride were encountered.

WATER SUPPLY

MOJAVE WATER AGENCY

The Mojave Water Agency (MWA) is a State Water Project (SWP) contractor. The MWA's initial entitlement was 8,400 acre-feet in 1972. An additional 2,300 acre-feet was added to the entitlement each year until 1990, when the full entitlement of 50,800 acre of SWP water was reached. In 1996, an additional 25,000 acre-feet entitlement to SWP water was acquired by the agency. Historically, SWP deliveries to the MWA have only been a fraction of the entitlement. The reason for deliveries being just a small fraction of the entitlement is due to a lack of money to pay for the water and the lack of facilities to deliver the water (Cauouette 1998).

In addition, direct use of SWP water for domestic consumption requires the water to be treated. There are no water treatment facilities available within the region. Another factor may simply be that pumping groundwater has been cheaper than paying for SWP water. Funds collected to ~~aquire~~acquire makeup water under the adjudication will allow MWA to buy more SWP water.

In 1995, the agency constructed the 71-mile long Morongo Basin Pipeline to provide water to the Lucerne and Yucca Valleys. In 1997, MWA began to build the Mojave River Pipeline to deliver water to the Alto and Centro Subareas. This pipeline, which is proposed to supply SWP to the HDPP, will also be 71 miles long when completed. The purpose of this pipeline is to provide groundwater recharge for the Alto and Centro Subarea. Recharge ponds are planned approximately 30 miles north and east of Victorville. The maximum amount of water that can be carried by the pipeline is 55,000 acre-feet per year.

SWP project deliveries to the MWA have been used for groundwater recharge since 1991. Until 1994, SWP water was released into the Mojave River at Lake Silverwood. Since then a turnout on the Morongo Basin Pipeline at Rocksprings has been used to release SWP water into the river. These discharges rarely flow on the surface more than a few miles before percolating into the ground.

The High Desert Water District (HDWD), which is located outside the adjudicated Mojave River Basin, is entitled to purchase up to approximately 15 percent of MWA's allocation of SWP water. SWP water is delivered to HDWD via an eight-mile pipeline that runs from the terminus of the Morongo Basin Pipeline. In 1997, SWP water deliveries to HDWD totaled 5,029 acre-feet of water. Planned SWP water deliveries to HDWD in 1998 are an estimated 5,450 acre-feet. In addition, HDWD and MWA have a conjunctive use program where SWP water, up to 10,000 acre-feet per year, is being stored within the Warren Valley Basin. This water could then be purchased from the MWA by HDWD whenever SWP water is not available in sufficient quantities.

SOIL&WATER RESOURCES Table 2
Mojave Water Agency State Water Project Entitlement and Deliveries
In Acre-feet

Year	Entitlement	Delivery	Percent
1980	27,200	4,000	14.7
1981	23,100	4,000	17.3
1982	22,843	10,500	46
1983	34,300	0	0
1984	36,700	0	0
1985	39,000	0	0
1986	41,400	0	0
1987	43,700	17	0.04
1988	46,000	9	0.02
1989	48,500	200	0.4
1990	50,800	0	0
1991	50,800	3,423	6.7
1992	50,800	10,686	21
1993	50,800	11,514	22.7
1994	50,800	16,852	33.2
1995	50,800	8,722	17.2
1996	50,800	14,600	28.7
1997	50,800	12,635	24.8

Source: DWR 1997; Caouette 1998b

Other SWP water deliveries for the MWA include 1,500 acre-feet per year for the Luz SEGS solar facility at Kramer Junction, which is located within the Centro Subarea. This water is delivered to the facility through an agreement with the Antelope Valley-East Kern Water Agency (AVEK). The remaining SWP water, 7,134 acre-feet in 1997, was released from the Rock Springs outlet of the Morongo Basin Pipeline. This water is released into the Mojave River channel for groundwater recharge in the Alto Subarea. Estimated releases from Rock Springs for 1998 are 8,050 acre-feet.

~~***Adjudication of the Mojave Groundwater Basin***~~

ADJUDICATION OF THE MOJAVE GROUNDWATER BASIN

In response to a lawsuit by the City of Barstow and the Southern California Water Company filed in 1990, the Mojave Water Agency (MWA) requested the Superior Court (Riverside Superior Court Case No. 208568) to declare the natural water supply of the Mojave Basin inadequate to meet existing water demand and to establish the water production rights of individual producers throughout the basin. Several years later negotiations led to a proposed settlement that the court included in a stipulated judgement. Eventually over 80 percent of the water producers with an annual production greater than 10 acre-feet per year signed the stipulated agreement. A trial was conducted over the claims of the non-stipulating parties in 1995. A Superior Court judgement in 1996 adopted the measures included within the stipulated agreement. This judgement was appealed to the Court of Appeal, which ruled in favor of the non-stipulating overlying water right claimants. The Court of Appeal ruling did not invalidate the judgement for stipulating parties but did hold that the plaintiffs are exempt from the Superior Court judgement. This decision was appealed to and accepted to be heard by the California State Supreme Court. Briefings in the case have been completed and a decision is anticipated this coming Fall.

The adjudication divided the Mojave Basin into five distinct, but hydrologically interrelated subareas. The proposed HDPP is located with the Alto Subarea. The judgement found each of the five subareas to be in overdraft due to the water demands of all producers within that area. As noted above, the Mojave Water Agency (1994) has identified an overdraft in 1990 for the entire basin of 68,000 acre-feet per year. The court also found that some of the subareas received water, either groundwater, surface water or both, from flows originating upstream. To maintain these flows, the judgement required the estimated flow between subareas, based upon the average annual historic flows between 1930 to 1990, to be met. Failure to meet the obligation requires the upstream subarea to provide makeup water to the downstream area.

Within each of the subareas, the adjudication established a free production allowance (FPA) based upon the producers' maximum water production between 1986 and 1990. The FPA was reduced 5 percent each year for four years. Any water produced in excess of the FPA must be replaced, usually by payment to the MWA, which the court appointed as watermasterWatermaster for the basin. In addition to these conditions, the court directed the MWA to develop a program to include the over 8,000-minimal producers who were not directly addressed in the adjudication. In light of the recent loss of over 400 acres of riparian habitat along the Mojave River in the vicinity of Oro Grande, the adjudication provided a fund to the Department of Fish & Game to acquire water to protect riparian resources adversely affected by groundwater drawdown.

The adjudication did not curtail the pumping of water in excess of the FPA nor are new wells prohibited. The underlying assumption of the judgement is that the adjudication is a physical solution in that it provides a mechanism to achieve production safe yield. This is a safe yield based upon water production, but not consumption because it assumes 50 percent of the water pumped and used for municipal and agricultural purposes percolates back into the aquifer. The adjudication does not quantify the safe yield for the basin because it assumes supplemental water will be available. Supplemental water includes imported water, water freed up due to water conservation and the purchase and retirement of FPAs. The adjudication determined that achieving safe yield entirely through reductions in pumping would be economically devastating to the region.

As noted above, once the Mojave River Pipeline is completed, this facility will be used to recharge portions of the Alto and Centro Subareas. Money to purchase SWP water for groundwater recharge comes from both general funds and from money provided from producers exceeding their free FPA. The MWA intends in the near future to start recharging about 10,000 acre-feet per year purchased with general fund monies (Caouette 1998). Currently, many groundwater producers are purchasing available FPAs from other producers and therefore, are not paying for makeup water to the MWA. MWA's staff anticipates that most of the available FPAs will be taken in the next few years and, therefore the makeup water fund to purchase SWP water for recharge should start to grow (Cauoette 1998).

Victor Valley Water District

The Victor Valley Water District (VVWD) encompasses an area of approximately 51 square miles and is the main water supply for most of the City of Victorville and adjacent unincorporated areas. VVWD's service area does not include the SCIA. Instead, the water distribution system on the former base is to be turned over to the City of Victorville. VVWD and the City of Adelanto have separate memorandums of understanding (MOU) with the City of Victorville to provide water to the boundary of the SCIA (Roberts 1998). The MOU between VVWD and the City of Victorville provides for a domestic flow of not less than 1,000 gpm and a fire flow of not less than 3,000 gpm. The MOU between the Cities of Adelanto and Victorville have similar provisions (Roberts 1998).

The VVWD's water supply is entirely from groundwater. From July 1995 to June 1996, VVWD delivered approximately 15,0009 acre-feet of water. The district pumps an average of 14 million gallons per day (mgd) but during the summer months this rises to 21 mgd. The district's Master Plan (1995) anticipates, assuming 500 new connections per year, the increase in maximum water demand to be 53 mgd by 2015. The district assumes that 500 new connections per year ~~is~~are a typical (average) rate of growth. VVWD is a participant in the stipulated judgement. The district's free production allowance (FPA) for 1998 is 10,683 acre-feet, well below actual production levels (MWA 1997). Therefore, the district is obligated to pay for makeup water for all production above the FPA.

Although the former Air Force base is now a part of the City of Victorville, the wells used to supply the base with water were leased from the City of Adelanto and will be returned to the city. The FPA for the base is 3,433 acre-feet per year. This is being allocated between the City of Victorville, which receives 60 percent, the City of Adelanto, which receives 20 percent and the Bureau of Prisons, which also receives 20 percent (Roberts 1998).

ALTERNATIVE SOURCES OF WATER

The applicant had originally identified tertiary treated effluent from the VVRA wastewater treatment plant, located approximately 2.5 miles northeast of the project site, as a possible water source for the project. As noted above, this facility discharged over 8,000 acre-feet of water to the Mojave River during the 1995-1996 water year. Concern was expressed by the California Department of Fish & Game (CDFG), however, over the possible diversion of this water to the project. Effluent from the wastewater treatment plant is important in maintaining surface flows in the river, which support fish populations and riparian vegetation. Furthermore, this discharge is counted under the adjudication towards the flow-through requirement of the Alto Subarea to the Centro Subarea. Shortfalls in the court determined flow-through levels must be compensated. Diversion of the effluent to the project may add to the financial burden of groundwater producers in the Alto Subarea through the need for the purchase of additional makeup water (Caouette 1998b).

Originally the applicant proposed three different potential configurations for the project. One was a simple cycle configuration ~~is~~ expected to operate up to 2,000 hours each year, producing approximately 832 MW (HDPP 1997a). Average annual water demand for the simple cycle is 20 acre-feet of water per year (Flour Daniel 1998). The majority of this water is used in the evaporative cooler that cools and humidifies the inlet air to the turbine. No cooling towers are required for this configuration. HDPP later decided to delete this alternative.

~~WET/DRY AND DRY COOLING TOWERS~~

WET/DRY AND DRY COOLING TOWERS

For a discussion of the issues regarding the use dry cooling towers or wet/dry hybrid cooling towers, see the testimony of Matthew Layton, dated April 9, 1999 regarding these cooling technologies.

IMPACTS

PROJECT SPECIFIC IMPACTS

EROSION

Activities associated with facility construction may require significant site disturbances in the form of excavation, grading, and earth moving. As indicated in Table 1, all of the soils affected by project elements have a high wind erosion hazard. The applicant (HDPP 1997a) estimates that, without implementation of mitigation measures, wind erosion during construction could be as high a five tons per acre per year. Although an arid environment, intense storms are common in the Mojave Desert and can lead to water erosion. Water induced erosion has a high potential where linear facilities construction of crosses natural drainages. During project operation, wind and water action can continue to erode unprotected surfaces. An increase in the amount of impervious surfaces can increase runoff, leading to the erosion of unprotected surfaces. The applicant (HDPP 1998b) has provided a draft Erosion Control and Revegetation Plan that identifies temporary and permanent erosion control and stormwater runoff measures. This plan is discussed further below. Furthermore, the applicant will have to prepare and implement a stormwater pollution prevention plan as required under the General Construction Activity Stormwater Permit issued by the SWRCB.

WATER SUPPLY

The water supply required for HDPP operations is largely determined by the selected method of cooling. The HDPP is proposing two different configurations of natural-gas fired combustion turbines operating in either a simple or combined cycle mode~~s~~. The two configurations are:

- Combined cycle with three trains of “F” class combustion turbines; and
- Combined cycle with two trains of “G” class combustion turbines.

The combined cycle using three trains of “F” class combustion turbines is expected to operate up to 8,760 hours each year producing 720 MW (HDPP 1997a).

Average water demand for this configuration is 2,376 gallons per minute (gpm) or approximately 3,832 acre-feet of water per year assuming 8,760 hours of operation (HDPP 1997a; Flour Daniel 1998). A significant portion of this water is for cooling tower blowdown. The combined cycle with two trains of “G” class combustion turbines is expected to operate also up to 8,760 hours each year producing 678 MW (HDPP 1997a; Flour Daniel 1998). Average water demand for this configuration is 2,049 gpm or approximately 3,305 acre-feet per year assuming 8,760 hours of operation (HDPP 1997a; Flour Daniel 1998). It should be noted that the Applicant’s (Flour Daniel 1998) revised average annual water demand figures in Tables 3.4-5 and 3.4-6 assumes maximum operation of 8,223 hours per year with the resulting total of 3,597 acre-feet for the “F” class configuration and 3,102 acre-feet for the “G” class configuration.

GROUNDWATER SUPPLY

The water supply for the proposed project is to be a combination of surface and groundwater. As noted above, groundwater essentially supplies all water used within the Mojave River area. For water year 1995-1996, 517 wells, pumping approximately 87,575 acre-feet in the Alto Subarea were identified by the MWA (Bookman-Edmonston 1998a). This number does not include smaller producers, generally pumping ten acre-feet or less per year. HDPP (Bookman-Edmonston 1998a) proposes that seven wells, constructed and operated by the Victor Valley Water District be located starting approximately three miles south of the power plant site. These wells will connect to a VVWD 16-inch pipeline being built to provide water to the SCIA.

Six of the new wells would serve as primary wells and the seventh would serve as a backup. It is estimated that each of the wells could have a production rate of 550 gpm or approximately 4,000 acre-feet per year. This would represent approximately a 4.6 percent increase in groundwater pumping in the Alto Subarea compared to 1995-1996 water production by major producers.

Supplying HDPP with 4,000 acre-feet of water per year would also represent an increase of almost 25 percent over the district's existing water demands. Furthermore, the proposed wellfield is located within Pressure Zone 2, a VVWD planning area that has seen the greatest population growth over the last ten years of any area with the VVWD boundary (So 1998). In 1994-1995, water demand within Pressure Zone 2 was 10,458 gpm while supply was only 7,207 gpm. Furthermore, this is the area the district anticipates the largest amount of growth over the next 15 years.

There are a total of 33 production wells within the vicinity of the proposed HDPP wellfield. Neighboring production wells include one VVWD well located within a one mile radius of the proposed wellfield while ten VVWD wells are within a two mile radius of the wellfield. Two wells that were installed for the still under construction Bureau of Prisons Facility on the SCIA are also within a two mile radius of the proposed wellfield. These two wells have been abandoned due to water quality concerns (Hill 1999). Eight additional VVWD wells are within a three mile radius of the proposed wellfield as well as six City of Adelanto wells and six George Air Force Base wells. As part of the base closure, these latter six wells are to be turned over to the City of Adelanto.

In light of the high number of existing production wells within a three mile radius of the proposed well field, the applicant (Bookman-Edmonston 1998b) and others (Geomatrix 1998; Fox 1998) conducted an analysis that estimated the effects of operating the proposed HDPP wells. In addition, staff modeled potential well drawdown effects from the proposed project. This modeling effort is discussed below under the Mitigation section.

The~~is~~ applicant's analysis, based upon the Theis equation, calculated the potential effect on groundwater levels and the pumping rates of adjacent wells. Drawdown of the aquifer by pumping HDPP wells would reduce the production of these wells accordingly. As discussed above, although Bookman-Edmonston (1998a) estimated in DWRSIM surface-water reservoir model simulations that the longest continuous period that the project must use groundwater would be two years, Bookman-Edmonston evaluated the effect of three years of continuous pumping period in the groundwater model. The model simulated three years of pumping at rate of 3,300 gpm (550 gpm per well) (Bookman-Edmonston 1998b). Subsequently, Bookman-Edmonston (1998c,d) expanded the study to model the impact of three years of injection, followed by three years of pumping, which is described below, under Mitigation~~)~~. Aquifer parameters used in the equation (transmissivity and storage coefficient~~-~~) were selected by Bookman-Edmonston, based upon published values for the area. The aquifer was assumed to be unconfined and isotropic (horizontal and vertical permeability is equal).

The results of the Bookman-Edmonston model run indicated that at the end of six years, the maximum drawdown on the nearest VVWD wells (Nos. 21 and 27) would be 11.3 and 11.9 feet, respectively. The potential decline in pumping capacity for these two wells would be 4.4 and 4.5 percent, respectively. The average reduction in groundwater levels and pumping capacity for the 25 VVWD production wells would be 2.7 feet and 7 gpm, respectively. The amount of drawdown would decline with distance from the HDPP proposed well locations.

To evaluate the Bookman-Edmonston study, VVWD engaged the consulting firm Geomatrix (1998) and CURE engaged Environmental Management (Fox, 1998). In addition to parameters considered by HDPP, VVWD and CURE expanded their evaluation of aquifer parameters and pumping period.

VVWD and CURE considered aquifer confinement and a range of transmissivities and storage coefficients. Of the aquifer conditions, the most significant factor would be the effect of aquifer confinement. Low permeability zones within the aquifer significantly affect the drawdown from wells. The horizontal bedding of coarse and fine materials create anisotropic conditions in the aquifer. This means that the aquifer is more permeable horizontally and less permeable vertically. Anisotropic conditions can delay dewatering of an unconfined aquifer. If the fine materials are thick and continuous, they can create confined conditions within the aquifer. In the case of HDPP, the lake deposits, if located within the saturated zone of the Regional Aquifer, could create confining conditions.

CURE also considered different estimates of the period of groundwater pumping. As mentioned above, the Bookman-Edmonston (1998b) study~~ied~~ used three years as a worse case. The Geomatrix (1998) study did as well, but pointed out that this time estimate does not reflect the full effect of groundwater pumping over the life of the project. Outside of the Mojave River Alluvial Aquifer, groundwater extraction exceeds recharge resulting in lowered groundwater levels over time. Without additional on-site recharge, even intermittent pumping by the project would be additive, leading to a long term drawdown of the aquifer, because of incomplete groundwater level recoveries (Geomatrix 1998; Fox 1998; Martin 1998). At the very least, HDPP will be pumping groundwater one month each year while repairs are made to the California Aqueduct. With no other interruptions in SWP deliveries, this still represents two and half years of pumping over the assumed 30-year life of the project. Additional pumping will be dictated by the availability of SWP water.

Geomatrix (1998) concluded that the aquifer drawdown estimates are reasonably correct given the assumptions and that alternative methods of calculating drawdown returned similar results. To more accurately represent aquifer conditions, Geomatrix used a more sophisticated groundwater model (MODFLOW) to evaluate the impact of three years of pumping. They evaluated six alternatives reflecting several different values for transmissivity and storage~~..~~. The result of Geomatrix's base case was consistent with Bookman-Edmonston's modeling result, but the results of the other five runs varied significantly, indicating much larger drawdowns, especially in the simulations that assumed the aquifer was confined. In these alternative runs, the drawdown in VVWD Well No. 21 was as great as 91 feet. However, Geomatrix (1998) agreed that the aquifer in the area of the HDPP wellfield is generally unconfined.

Fox (1998), utilizing data taken from work done at the former George Air Force Base and well logs, questions the aquifer transmissivity and storage coefficient values and the maximum length of potential surface water shortages used in the Bookman-Edmonston (1998b) study. Based upon information from the base and VVWD well logs, Fox (1998) suggests that the aquifer in the area of the HDPP well field may very well be confined. Recognizing the lack of site-specific information to resolve the issue, Fox (1998) ran six simulations reflecting a variety of aquifer conditions and a range of pumping periods. The results of some of these scenarios showed an even more drastic drawdown than the Geomatrix (1998) study.

A further issue of concern, raised by the California Department of Fish & Game and CURE, is the potential effect of groundwater drawdown from operation of the wellfield on the riparian vegetation found along the lower Narrows of the Mojave River. Drawdown at the Lower Narrows on the Mojave River was estimated to be a minimum of approximately one foot by Geomatrix (1998). Even a one-foot drawdown within the alluvial aquifer could adversely affect riparian vegetation as well as base flow in the river (Geomatrix 1998). The potential impact to this valuable habitat is discussed below under Mitigation. ~~still being evaluated by staff and staff of the California Department of Fish & Game and will be fully discussed in the Biological Resources section of the revised PSA or the FSA.~~

To address the issues raised by VVWD, CURE and Fish and Game, HDPP has proposed three actions. To address the first issue, the potential conflict with existing and future VVWD facilities, HDPP is proposing that the wells be installed, owned and operated by the water district (HDPP 1998o; HDPP 1997b). In light of VVWD's conditional approval to provide the wells, staff assumes that the district is confident that the issue of well interference can be resolved. Several of the conditions VVWD have placed on the proposed project are discussed below. To address the uncertainty in aquifer conditions, HDPP is proposing to conduct aquifer pumping tests to better characterize the groundwater aquifer in the vicinity of the proposed wellfield. This information, when available, will provide information to more accurately depict the effect of pumping by the proposed project. The third issue~~,~~ is the cumulative impact of pumping. Even the small amount of drawdown estimated by Bookman-Edmonston would contribute~~cause~~ a significant cumulative impact. Certainly, the greater levels of drawdown simulated by Geomatrix (1998) and Fox (1998) would cause a significant, project specific impact. In response to this issue, HDPP (1998c,d), has proposed a program of groundwater recharge to mitigate the impact of cumulative drawdown. This program is discussed further under mitigation.

SURFACE-WATER SUPPLY: STATE WATER PROJECT WATER

As noted above, the HDPP (1997a; Bookman-Edmonston 1998a,b) intends to use State Water Project water for the power plant water supply whenever this water is available. To ensure that the project receives SWP water, the City of Victorville in October 1998 applied on the project's behalf to the MWA for 4,000 acre-feet per year of water for the year 2002 (MWA 1998a). The application requests approximately 296 acre-feet per month for all months except June, July and August when the requested amount increases to approximately 447acre-feet. Ordinance

No. 9 of the MWA stipulates that contracts with the MWA for State Water Project water are for a single year. Furthermore, as discussed above, SWP deliveries are not firm.

The ability of the SWP to deliver water in a given year depends on rainfall, snowpack, runoff, water in storage, pumping capacity in the Delta and regulatory constraints. An example of the latter is the unexpectedly high entrainment of the federally protected Delta Smelt that led to significant reductions in SWP delta water diversions during May, June and July of this year. Although SWP pumping was reduced during this period, the Department of Water Resources (DWR) still anticipates delivering 100 percent of the water contracted for.

Total ~~MWA~~ entitlement to SWP water is approximately 4.2-million acre-feet. Actual deliveries of SWP water have totaled only about 2.8-million acre-feet (DWR 1998). The SWRCB (1998) and DWR (1998) simulated potential SWP delivery levels if the hydrologic conditions of the 73-year period from 1922 to 1994 were repeated. The model, known as DWRSIM, simulated SWP deliveries with existing facilities operated under the requirements of the SWRCB's interim Water Quality Control Plan for the San Francisco Bay-San Joaquin Delta Estuary. The model also took into account 1995 and estimated year 2020 levels of demand on the SWP, as depicted in the California Water Plan Update, Bulletin 160-98.

SWRCB (1998) and DWR estimates that the SWP has a 65 percent chance of delivering 3.25 million acre-feet and an 85 percent chance of delivering 2.0 million acre-feet in any given year under 1995 water demands. The calculated average annual delivery during a repeat of the 1928-1934 drought under these assumptions is estimated by SWRCB (1998) to be about 2.1 million acre-feet per year. For year 2020 estimated demands, the model shows that full deliveries (4.2 million acre-feet) will occur less than 25 percent of the time, but that approximately 3 million acre-feet will be available 70 percent of the time.

The DWRSIM model parameters do not take into account Delta export reductions due to take limits of protected or potentially species. Nor does the model reflect other ~~activites~~activities that may affect delta, such as the Calfed Bay-Delta Program and the Central Valley Project Improvement Act (Wilcox 1999).

Given the uncertainty, MWA (1994; 1998) estimates that on average 70 percent of the agency's SWP entitlement will available. This does not reflect other water sources that MWA may receive water from.

HDPP (Bookman-Edmonston 1998b) used the DWRSIM model to estimate the amount of SWP water that would be delivered to the MWA over the 1922 to 1994 period. This simulation model assumed that one-seventh of the SWP water delivered to MWA would go to the Morongo Basin, which is outside the adjudicated Mojave River Groundwater Basin. The model then was run with the assumption that the first 12,000 acre-feet delivered to MWA was reserved for the agency's own purposes, including the delivery of 1,500 acre-feet to the Kramer Junction solar facility. Based upon these assumptions, the model shows that the project would not be required to pump groundwater throughout the 73-year period. The exception to this is when the month long closure of the aqueduct occurs each fall.

Subsequent simulations allocated the first 20,000, 30,000 and 40,000 acre-feet of water to MWA prior to the project receiving its 4,000 acre foot allocation. The results of the 20,000 acre foot simulation indicates that groundwater pumping would only be required in two full years. The 30,000 acre foot simulation indicates that seven full years and one half year (2,000 acre-feet) of pumping will be required. This increases to nine full years of pumping for the 40,000 acre foot simulation.

Fox (1998) uses the Bookman-Edmonston DWRSIM model to estimate the time periods SWP water would not be available and groundwater pumping would be necessary. The simulations run by Fox varied from the Bookman-Edmonston model runs only in the amount of water required by MWA. The first simulation, (Scenario A in Fox) actually is the same as the first Bookman-Edmonston run. The results of this run shows that HDPP will not be required to pump groundwater, given the hydrological conditions found in the period 1922 to 1994. The second simulation (Scenario B) is predicated on MWA receiving 26,000 acre-feet per year SWP water prior to HDPP receiving 4,000 acre-feet. The 26,000 acre-feet of SWP water is based upon the 12,000 acre-feet assumed for MWA's use in the first simulation plus an additional 14,000 acre-feet of water identified in the 1994 MWA Water Management Plan. This figure, which was prepared prior to the final adjudication, was based upon very preliminary estimates, and only assumed a reduction in agricultural pumping (Caouette 1999).

The result of this second run indicates that HDPP would receive SWP water all but six years out of the 73 addressed by the model. Since six years represents 8.1 percent of the period modeled, Fox assumed that over the 30-year life of the project, SWP water would not be available 2.42 years. The third run (Scenario C) is based upon the assumption that 70,000 acre-feet per year of SWP would be required by MWA to address the adjudication before the project could receive SWP water. This 70,000 acre foot figure is again based upon the figure in the 1994 plan that shows 58,000 feet of replacement water being required by 2005 in addition to the 12,000 acre-feet identified in the original run. Based upon this simulation, HDPP would receive no SWP water (Fox 1998). The time groundwater pumping would be required by the project was used by Fox (1998) to estimate the well interference effects of the proposed project.

The unknown factor in these simulations is the actual amount of SWP water MWA will require for addressing the overdraft. As noted above, HDWD has the option to buy approximately 15 percent of the MWA's SWP allocation each year. MWA also has an agreement to provide approximately 1,500 acre-feet of SWP water to the solar facility at Kramer Junction through AVEK. The adjudication (1995) clearly identifies the reduction in groundwater pumping and the importation of water as the key elements in addressing the overdraft. The adjudication, however, is silent on the amount of water that needs to be recharged.

Other than these agreements discussed above, the MWA has no specific plan on how to allocate SWP water. MWA (1998) estimated annual imported water demand with and without the proposed project up to the year 2015. This estimate showed that even with the project, imported water demand would not exceed MWA's total entitlement and would only exceed the estimated average annual entitlement (70 percent of the total entitlement) about the year 2011. The estimated annual imported water was assumed to be 10,000 acre-feet per year without the project and 14,000 acre-feet per year with the project. Imported water demand was also assumed to include the 1,500 acre-feet per year for the Luz SEGS facility at Kramer Junction and for the HDWD, which received over 5,000 acre-feet of SWP water in 1997. The estimates also assume a two percent population growth rate for the basin and a five percent annual ramp down of free production allowance until production safe yield is reached. Currently, there has been no determination by MWA or the court for additional FPA rampdown. No rampdown was required for calendar year 1999 and, as yet, no decision has been made regarding a rampdown for calendar year 2000. As noted above, a firm estimate of production safe yield has also not been made and must wait until more hydrologic information is available (Caoutte 1999). This estimate also assumes SWP water importation will sharply increase after the year 2000 due to the fact that most FPAs that can be transferred will have been transferred and, therefore, the amount of payments to MWA for makeup water will increase. It should be noted that during SWP water shortages, use of SWP water for recharge, if deemed necessary by the ~~watermaster~~Watermaster, will take priority over non-recharge uses (Cauoette 1998b). In general, however, the MWA has the flexibility to purchase extra SWP (and other) water when available and recharge as much water as possible to compensate for the inevitable dry years. The availability of such water in the future is not known.

In case of reduced SWP deliveries, Section 3.03 of MWA Ordinance No. 9 indicates that "All applications shall be evaluated and deliveries authorized based upon the following priority uses: 1) municipal, 2) industrial, 3) agricultural..."~~–~~Ordinance No. 9 also states that during SWP shortages, all parties will be proportionately reduced. The ordinance does go on to allow MWA to allocate the water, if there is a shortage in SWP supply, to ensure domestic, sanitary sewage and fire fighting needs are met. In light of the lack of a water treatment facility, municipal demands for direct use of SWP water in the near future are not likely. Nonetheless, in the future, HDPP may be in competition for SWP water with other users when deliveries are reduced.

The MWA accepted for processing the application for SWP water for the HDPP on November 10, 1998. Section 3.05 of the Ordinance No. 9 states that SWP cannot be the sole source of water for a project and that a reliable source of water must be obtained prior to approval of any application to the MWA. Both the VVWD (1998) and the City of Victorville (Roberts 1998) indicated to the MWA that they will serve as an independent source of water for the project when imported water is not available. The application by reference included the 12 draft conditions of approval by VVWD (Rowe 1998). See discussion under groundwater impacts below. Final approval of the application to the MWA will follow certification of the project by the CEC. The MWA board included as well 12 measures to ensure project coordination with the various agencies involved and compliance of the permit approval with applicable requirements.

Staff assumes that SWP water will be available to the MWA to address the overdraft. Lacking information that clearly indicates that SWP deliveries will be significantly reduced, staff also assumes that the average allocation to MWA of 70 percent for planning purposes is a reasonable annual average. How this water is to be allocated within the basin to address both the existing overdraft and future growth is unknown at this time. The adjudication is designed to address the overdraft not only through importation of water but also through transfers of FPA and water conservation measures driven by water makeup charges. Lacking information that dictates a specific amount of the MWA's SWP entitlement is necessary to address~~ing~~ the existing overdraft, staff cannot argue that all of the imported water is necessary to address the overdraft and none would be available for the project.

Staff is concerned about the long-term availability of SWP water to the project. Since future conditions may change, there is no guarantee that this water will be allocated to the project. Court decisions about the adjudication, or competition for SWP water may limit the availability of this water. SWP water from MWA must be applied for each year. Clearly, Ordinance No. 9 was adopted to provide water on a single year basis to allow decision makers as much flexibility in allocating what may become a scarce resource as possible. This then becomes, however, a reliability question, not one of environmental impacts. Given the nature of the competitive market, one assumes that the liability of the project not operating due to no water rests with the project owner and not with society.

~~CUMULATIVE IMPACTS~~

CUMULATIVE IMPACTS OF GROUNDWATER USE

As discussed previously, the cumulative impacts of groundwater use in the Mojave River Groundwater Basin (Basin) have caused overdraft of the region's aquifers and the progressive decline in riparian habitat along the Mojave River. This overdraft problem is severe. Groundwater levels in some portions of the Alto Subarea portion of the Basin declined 25 feet between 1960 and 1990 (MWA 1994).

Base flow of the Mojave River, measured at the Lower Narrows, is currently 50 percent below the minimum flow of 21,000 acre-feet/year decreed by the court-approved judgment resulting for the adjudication of the Basin. In addition, even the extremely low current rate of base flow of the Mojave River is tenuous. Some of the discharge from the VVRA wastewater treatment plant, which comprises most of the current flow in the river, may soon be diverted for other purposes (Bilhorn 1999; Cauoette 1999). Therefore, there is a real potential for the project to contribute to a significant cumulative adverse impact to local groundwater supplies and base flows within the Mojave River.

The proposed HDPP wells would be located in the Regional Aquifer. If groundwater use by the project were unmitigated (e.g. no water was banked prior to pumping), it would worsen the cumulative impacts of overdraft. Unmitigated groundwater pumping could have deleterious effects on (1) the Mojave River system, including Mojave River base flows, groundwater levels in the Mojave River Alluvial Aquifer and downstream users, and (2) local water supply production wells.

As noted above, HDPP has recommended a groundwater banking program to mitigate any potential project contribution to the significant cumulative impacts. Staff's analysis of the proposed mitigation measures is present below under the Mitigation Section.

WATER QUALITY

The quality of SWP water varies with the inflow of fresh water into the Delta. Low runoff years generally lead to low mineral concentrations in SWP water (DWR 1997). Conversely, high flood water may greatly increase organic carbon levels. A comparison of SWP water quality with that of groundwater from VVWD production wells shows that total dissolved solids (TDS), chloride and sulfate levels may exceed those of the native groundwater (Bookman-Edmonston 1998d). To comply with water quality regulations, HDPP (Bookman-Edmonston 1998d) prepared and submitted a Report of Waste Discharge to the Lahontan RWQCB. The RWQCB staff not to act on the Report of Waste Discharge until after project certification (Maxwell 1999). At that time the RWQCB staff may issue a Waste Discharge Requirement or a Waiver of Discharge Requirements or may waive the need for the applicant to file a report of waste discharge (Maxwell 1999c).

As part of the Report of Waste Discharge, HDPP (Bookman-Edmonston 1998c,d) used a groundwater flow and solute transport model (FEMFLOW3D, U.S.G.S. 1997) to estimate the distance and the direction a particle, such as a chloride ion, would move under groundwater injection and extraction. This model provides 3-dimensional representation of the groundwater system, including taking into account the Mojave River Alluvial Aquifer. Groundwater parameters were based upon published data. HDPP evaluated the effects of three years of water injection immediately followed by three years of water extraction.

Bookman-Edmonston reports that the model indicates the direction and velocity of movement for a particle would be dominated by the regional gradient. Close to the injection wells, the model shows the particles traveling slightly faster than the regional gradient, with distance the velocity drops until it matches the gradient velocity. Thus in three years a particle would move about 1,370 feet from the injection well. The model indicates that it is unlikely that any particles would reach VVWD or City of Adelanto production wells. The model also shows that groundwater pumping would retard particle pumping, but complete recapture would not occur.

The primary problem with this analysis is that the effect of drawdown from the local municipal production wells was not included in the analysis. Because the drawdown of these production wells is likely to be a primary factor in the groundwater gradients that determine solute transport, the effect of the other wells in the immediate vicinity of the HDPP well field must be considered. The actual velocities and direction of particle movement and the potential for capture by municipal production wells would be significantly affected by the pumping of these nearby municipal productions wells.

It should be noted that water treatment is sufficient that the movement of injected water is not a concern unless there is an upset in the water treatment plant. (See the water treatment discussion below, under MITIGATION.) However, if the movement of the injected water is an issue of concern, this analysis should be corrected.

FACILITY CLOSURE

Typically, closure raises concerns ~~is~~ in regard to potential erosion. Since, however, there are no significant cut and fill slopes associated with HDPP, this is not a significant concern for the project. In addition, groundwater wells to be used by the project will be owned and operate by VVWD, their closure should not be an issue for the project.

MITIGATION

~~HIGH DESERT POWER PROJECT~~

~~*EROSION AND SEDIMENTATION*~~

EROSION AND SEDIMENTATION

The applicant (HDPP1997b; 1998n) has submitted a draft Erosion Control and Revegetation Plan. This plan addresses both the power plant and the associated linear facilities. Mitigation measures identified in the plan include control of stormwater runoff through the use of silt fences and straw bales to ensure sediment does not move off-site. The plan also identifies dust control measures including the use of gravel on roads, controlling traffic speed and the use of water on exposed area. For linear facilities, the plan identifies measures to protect stockpiled soil and to prevent sediment from reaching adjacent drainages. Permanent erosion control measures primarily deal with revegetation of the laydown area and along the linear facilities. The plan calls for the discing of compacted soils, stockpiling of topsoil and seeding with native species. Monitoring measures and remedial actions (for failed revegeation efforts) are also identified in the plan.

Staff finds the draft erosion and revegetation plan satisfactory to mitigate any potential erosion impacts. The applicant HDPP (1997a) has indicated it will prepare construction and industrial stormwater pollution prevention plans as required by the SWRCB.

~~*WATER SUPPLY*~~

WATER SUPPLY

WATER SERVICE AGREEMENTS

As a condition of their agreement with VVWD, HDPP ~~has agreed to 12~~ is negotiating a set of conditions for water service for plant operations. The specific conditions of importance here are:

- The HDPP and the VVWD will set rules under which groundwater service could be reduced or terminated by the VVWD, such as significant reductions in well levels within three miles of the project wells, restrictions in providing service to existing and future customers, or declaration of a stage three water shortage emergency by VVWD.
- The HDPP shall apply for permission from the Mojave Basin Area Watermaster to bank water in an amount specified by the service provider and consistent with the Watermaster rules and regulations in order to maintain a positive balance in the water bank at all times.
- The project wells will be designed to provide for direct injection so that recharge will occur in the same area as extraction.
- The HDPP shall treat all water before injection. Treatment will bring all water for injection into compliance with all federal, state, and local water quality standards and criteria.
- The HDPP shall provide monitoring wells to measure the impact on water levels and water quality of both extraction and injection.

FEASIBILITY OF GROUNDWATER BANKING

HDPP (Bookman-Edmonston 1998c,d) has evaluated the feasibility of banking SWP water in the groundwater aquifer. ~~The same model that was used to estimate groundwater drawdown from HDPP groundwater production, was used to estimate both the effects of injection and extraction on groundwater levels.~~ Basically, groundwater recharge creates a mound of elevated groundwater levels around the well. The height and areal extent of the mound and its rate of growth depend on the duration and rate of recharge, aquifer permeability and storage, and the saturation conditions of the zone of injection. ~~Bookman-Edmonston (1998d) estimated that after three years of groundwater injection at 4,000 acre-feet per year followed by three years of extraction at the same level would cause a decline of approximately three feet at the two closest VVWD wells. As discussed above, the drawdown at these two wells without recharge would be 11.0 and 11.5 feet. Modeling also indicated that residual mounding from the recharge would occur beyond a radial distance of approximately 2 miles from the center of the wellfield.~~

Staff's concern regarding the feasibility of the injection program is that clay layers contained in the regional aquifer could compromise the effectiveness of HDPP groundwater recharge. The regional aquifer is composed of interbedded clays and permeable aquifer zones. These clay layers provide favorable conditions for groundwater perching. If HDPP recharge water is injected by "free fall" rather than injected under pressure into the saturated portion of the aquifer, the injected water may become perched above the regional water table. When pumping subsequently occurs in these wells, drawdown of the water table may create separation and unsaturated conditions between the perched, recharged water and the active portion of the aquifer. These conditions would delay the recharge of the aquifer. The potential for perching of injected water and the corresponding impacts for recharge should be considered in the design of HDPP wells.

~~As noted above, the quality of SWP water varies with the inflow of fresh water into the Delta. Low runoff years generally lead to low mineral concentrations in SWP water (DWR 1997). Conversely, high flood water may greatly increase organic carbon levels. A comparison of SWP water quality with that of groundwater from VVWD production wells shows that total dissolved solids (TDS), chloride and sulfate levels may exceed those of the native groundwater (Bookman-Edmonston 1998d). To comply with water quality regulations, HDPP (Bookman-Edmonston 1998d) prepared and submitted a Report of Waste Discharge to the Lahontan RWQCB. The RWQCB staff not to act on the Report of Waste Discharge until after project certification (Maxwell 1999). At that time the RWQCB staff may issue a Waste Discharge Requirement or a Waiver of Discharge Requirements or may waive the need for the applicant to file a report of waste discharge (Maxwell 1999c).~~

~~As part of the Report of Waste Discharge, HDPP (Bookman-Edmonston 1998c,d) used a groundwater flow and solute transport model (FEMFLOW3D, U.S.G.S. 1997) to estimate the distance and the direction a particle, such as a chloride ion, would move under groundwater injection and extraction. This model allows a more sophisticated depiction of the groundwater system, including taking into account the Mojave River Alluvial Aquifer. Groundwater parameters were based upon published data.~~

~~BASIN OVERDRAFT~~

~~POTENTIAL IMPACTS ON MOJAVE RIVER SYSTEM~~

ANALYSIS FOR MITIGATION OF GROUNDWATER USE

The ~~transmission of water through~~ hydraulic interaction between the Regional Aquifer ~~to~~ and the Mojave River Alluvial Aquifer (Alluvial Aquifer) and the Mojave River must be understood to develop an effective mitigation plan for~~evaluate~~ the potential impacts of the project on regional water conditions. Prior to the development of wells and groundwater pumping~~Because there are no barriers to flow between the Regional Aquifer and the Alluvial Aquifer~~, all of the regional groundwater historically flowed through the Regional Aquifer, discharging into the Alluvial Aquifer and providing the base flow of the Mojave River. Thus, groundwater discharge from the Regional Aquifer has supported~~s~~ groundwater levels in the Alluvial Aquifer as well as the base flow of the Mojave River. Base flow, in turn, has sustained~~s~~ the riparian environment in the absence of rainfall runoff and has been~~is~~ essential to maintaining a live stream during dry periods, especially in a desert environment. This "hydraulic connection" between the two aquifers is the primary reason that pumping groundwater from the Regional Aquifer affects the Mojave River environment. Wells that have been installed in the Regional Aquifer have intercepted groundwater for agricultural and domestic use that would have otherwise flowed through the aquifers and discharged to the river. Hence, as pumping has reduced groundwater levels in the Regional Aquifer, groundwater levels in the Alluvial Aquifer and the base flows of the Mojave River have similarly declined. The applicant proposes to bank SWP water in the Regional Aquifer for pumping and use when SWP water is not available for purchase. This analysis evaluates the potential impact of the project on regional water conditions.

~~***Mojave River System***~~

MOJAVE RIVER SYSTEM

In the project area, the Regional Aquifer has become geologically connected to the Mojave River Alluvial Aquifer over time. The Mojave River has carved an alluvial channel into the Regional Aquifer and the underlying bedrock. The bedrock forms the eastern boundary of the river and the groundwater system, as a whole, in the vicinity of the project. Therefore, along its length, the river is flanked and underlain by either the Regional Aquifer or bedrock. As stated above, it is this ~~e~~ hydrogeologic connection between the Regional Aquifer, the Alluvial Aquifer, and the Mojave River in the project area that is the primary factor that would control the magnitude of the potential impacts of the proposed project.

To analyze the potential project pumping impacts on the riparian corridor, staff divided the river system in the vicinity of the project into three separate units on the basis of hydrogeologic conditions. The three units of the river system are the (1) Upper Reach, (2) the Narrows, and (3) the Lower Reach.

(1) The Upper Reach of the river, upstream and above the Narrows, is both flanked and underlain by the Regional Aquifer (Figure15). In the Upper Reach, there is no impediment to flow between the project well field and the Mojave River system. The portion of the Upper Reach that is directly above the Upper Narrows is closest to the well field, about 3 miles away. This downstream portion of the Upper Reach supports a live stream year round. The riparian corridor extends upstream about 12 miles south of the well field. The riverbed is usually dry in the upstream portion, but groundwater levels in the Alluvial Aquifer supports riparian vegetation. Project-induced reduction in base flow to the Upper Reach would decrease groundwater levels, shorten the length of the live stream, and reduce the flow of the river to the lower reaches of the river.

(2) The second reach of the river is called the Narrows. The Narrows, consisting of the Upper and Lower Narrows, is defined as the reach of the river that lies between two bedrock created constrictions in the riverbed (Figure16). The Narrows, located two to three miles from the HDPP well field, is the reach of the Mojave River that is closest to the project~~,~~ and would absorb about half of the impacts from the project.

Within the Narrows, the Regional Aquifer does not underlie the Mojave River system. The Mojave River and the Alluvial Aquifer rest directly on an uplifted block of bedrock, and bedrock also borders the east side of the river. The Alluvial Aquifer contacts the Regional Aquifer only on the west side of the river. The underlying bedrock block prevents direct flow between the lower layer of the Regional Aquifer and the Alluvial Aquifer such that only the upper layer of the Regional Aquifer contacts the Alluvial Aquifer.

As a result of this structural relationship, the hydraulic connection between the Regional Aquifer and the Alluvial Aquifer within the Narrows may be blocked. ~~i~~If groundwater levels in the Regional Aquifer are below the base of the Alluvial Aquifer, the groundwater connection between the aquifers is broken and groundwater cannot flow from the Regional Aquifer to the Alluvial Aquifer within the Narrows. Conversely, if the Regional and Alluvial Aquifers are hydraulically connected, any unmitigated impacts from the project likely would be transmitted to the Narrows, given the proximity of the project to the Narrows. Given the uncertainty of hydraulic connection, both these possible conditions - connection and no connection between the Narrows - were considered in the staff's analysis of potential project impacts.

(3) The third reach of the river, the Lower Reach, is located downstream of the Lower Narrows (Figure17). The closest portion of the Lower Reach is about two miles from the project well field and extends downstream, north from the site. This reach of the river is dry most of the year, but groundwater levels in the Alluvial Aquifer are critical to the survival of riparian vegetation in the Lower Reach and also support river flow to downstream users. Groundwater levels in the Lower Reach depend on the live stream flow that passes through the Lower Narrows and the base flow from the Regional Aquifer.

Although there is no impediment to flow between the aquifers in the Lower Reach, there is a fault barrier within the Regional Aquifer between the project well field and the Lower Reach of the Mojave River. The Turner Springs Fault, which extends from the Lower Narrow to the west, lies between the project well field and the Lower Reach of the Mojave River. USGS groundwater-modeling studies indicate that this fault impedes groundwater flow within the Regional Aquifer and would buffer direct impacts of the project on the Lower Reach. However, any increases or decreases in base flow caused by the project within the Narrows or the Upper Reach, would decrease the stream flow that passes through the Lower Narrows to the Lower Reach.

Well Interference

Staff also considered the potential for well interference between the proposed HDPP wells and the local production wells. Well interference is the result of overlapping drawdown from two or more pumping wells. Wherever the drawdown from separate wells overlaps, the drawdown is compounded, groundwater levels are lower and the cost for pumping lift increases. The magnitude of the impact of well interference depends on the number and proximity of the wells, the rate of pumping, and the physical parameters of the groundwater system. Staff analyses indicate that well interference would occur between the proposed HDPP well field and nearby water supply wells.

HDPP's proposed wells would be located within a VVWD planning area referred to as VVWD Pressure Zone 2 (Bookman-Edmonston 1998a). There are currently a total of 33 production wells within the vicinity of the proposed HDPP well field, including one VVWD well located within a one-mile radius of the proposed wellfield and ten VVWD wells are within a two-mile radius of the wellfield. Two wells, installed for the Bureau of Prisons Facility on the SCIA, which is still under construction, are also within a two-mile radius of the proposed wellfield. Twenty additional wells are within a three-mile radius of the proposed wellfield, including eight VVWD wells, six City of Adelanto wells and six former GAFB wells. (As part of the base closure, the GAFB wells are to be turned over to the City of Adelanto.)

As noted above, groundwater essentially supplies all water used within the Mojave River area. HDPP's annual water use would be 4,000 ~~af~~ acre-feet, which would represent an increase of almost 25 percent over the VVWD'S existing water demands. In 1994-1995, water demand within the VVWD Pressure Zone 2 was 10,458 gpm while supply was only 7,207 gpm. ~~Furthermore, this is the area the district anticipates the largest amount of growth over the next 15 years.~~ Pressure Zone 2 has seen the greatest population growth over the last ten years of any area within the VVWD boundary (So 1998). Furthermore, the district anticipates the largest amount of growth in this area over the next 15 years.

Well interference would be the largest in nearby wells during the time the HDPP wells were actively pumping. Drawdown from a pumping well forms a cone of depression, which radiates out from the well ~~like~~ as a pressure wave, decreasing in magnitude with distance from the well. The specific magnitude and rate of transmission of the drawdown impacts would depend on the rate of pumping, the location of the wells, and the groundwater system parameters in the area of the project. The impacts of the project pumping on groundwater levels were evaluated using a 3-dimensional groundwater model, based on the best current information on ~~estimates of~~ the groundwater system parameters. The result of this evaluation is described below in the section entitled ~~Quantitiative~~Quantitative Analysis of Project Impacts. Given the proposed location of the HDPP well field, the operational pumping requirements and the available information on aquifer conditions, some degree of well interference with nearby production wells during HDPP pumping periods would be unavoidable.

Significance Criteria: Definition of Negative Impacts

Staff derived significance criteria for evaluating impacts of the HDPP that directly take into account the acute overdraft of the region's aquifers, the progressive decline in riparian habitat, the ongoing reduction of Mojave River base flows in the vicinity of the project and to downstream users, and the extreme uncertainty surrounding the long-term availability of water in the vicinity of the project. Because of the severity of the current and projected future groundwater situation, Staff recommends that the Commission find that the project will not create a significant adverse impact only if it can conclude the following:

- ~~1.~~ That the project will cause no negative impacts to the local base flow of the Mojave River at any time.
- ~~2.~~ That the project will cause no negative impacts on Mojave River flow that would affect downstream communities at any time.
- ~~3.~~ That the project will cause no negative impacts to groundwater levels in the Mojave River Alluvial Aquifer at any time.
- ~~4.~~ That the mitigation for well interference with local water supply wells is acceptable to water supply producers

Applicant's Proposed Mitigation

The applicant and staff are in general agreement that unmitigated groundwater pumping would produce unacceptable negative impacts on the water supply conditions in the area. In response to concerns about overdraft in the Regional Aquifer and potential impacts from project groundwater pumping, HDPP has proposed the following mitigation measures:

- ~~5.~~ 12,000 ~~af~~ acre-feet of water would be banked by injecting SWP water into the aquifer to meet subsequent groundwater project demands (Bookman-Edmonston, 1998c,d);
- ~~6.~~ after any groundwater withdrawal, SWP water would injected to replenish the banked reserve;
- ~~7.~~ a supplement injection of 1000 ~~af~~ acre-feet of SWP water would be added to the groundwater bank at the onset of the project (CURE 1999);
- ~~8.~~ post-closure injection would be performed at the end of the project with the addition of SWP equal to half amount of the groundwater used during the last pumping period; this was updated to include the entire amount of groundwater used during the last pumping period (Tom Berringer, HDPP Workshop, June 15, 1999);
- ~~9.~~ project wells would be installed, owned and operated by VVWD (HDPP 1998o; HDPP 1997b); and
- ~~10.~~ (6) conditions of operation would be imposed by VVWD (Bookman-Edmonston, 1998c,d).

General Evaluation of Effectiveness of Proposed Mitigation

Groundwater banking through the well injection of SWP water into the regional aquifer is the primary method proposed for mitigation of potential groundwater use impacts. The goal of groundwater banking is to provide a reserve of groundwater that can be subsequently pumped (1) without drawing on the existing groundwater supply and (2) without decreasing groundwater levels below that which would have occurred in the absence of the project

Effect of Applicant's Proposed Mitigation on the Mojave River System

When water is injected into an aquifer, groundwater levels rise and create~~ing~~ a mound of groundwater beneath the injection site. However, the groundwater mound is not a static feature. Groundwater levels flow outward from the source location, just as surface water does, only more slowly. Without continuous injection, the groundwater mound will dissipate with time and will be distributed evenly within the aquifer system. With a sufficient delay between injection and withdrawal, the groundwater will return near to pre-injection levels at the injection site by the time withdrawal occurs.

In a closed groundwater basin, which has no outlet for flow, the injected water would stay within the basin. Most of the injected water may dissipate away from the well field, but when subsequent project pumping occurs, the project does not cause a net change in the amount of water in the system. In other words, if the full amount of water previously banked were withdrawn, groundwater levels would temporarily decline in the area of the well field but would eventually return to pre-injection levels with time. ~~could be pumped without causing any effects on the local environment.~~

However, the HDPP project is not located in a closed basin. The Alto Subarea is an open basin in which the Mojave River system provides both an inlet and outlet for flow. In an open basin, groundwater can exit the system, causing losses to the groundwater bank, which depletes the balance of groundwater available for later withdrawal. SWP water injected by the applicant will flow outward from the point of injection, just as surface water does, only more slowly. Without supplemental injection, the groundwater mound will dissipate with time and will cause an increase in groundwater discharge to the Mojave River system.~~and will be distributed evenly within the regional system.~~ With a sufficient delay between injection and withdrawal, the groundwater will return near to pre-injection levels at the injection site by the time withdrawal occurs.

Groundwater discharges caused by~~losses from~~ the HDPP bank would benefit the Mojave River system. During and following the period of injection, losses from HDPP groundwater bank would increase groundwater levels in the Regional Aquifer and the Alluvial Aquifer, local base flow to Mojave River, and support river flow to downstream users. However, once losses from HDPP were distributed downstream to the larger Mojave River Basin, this water could not be recovered later for project use.~~. without reducing groundwater levels to below where they would have been absent the project.~~ Prior benefits caused by HDPP operations would not mitigate later negative impacts caused by the project. Staff believes that these later negative impacts are significant, and the mitigation measures we recommend are designed to avoid their occurrence.

HDPP has proposed to inject a three-year supply of water, 12,000 ~~af~~ acre-feet, at the beginning of the project. As described previously, HDPP has calculated that 12,000 ~~af~~ acre-feet of groundwater would be more than sufficient to meet project water needs under worst-case drought conditions. Most of this water would be available for withdrawal without causing negative impacts if it were pumped immediately following injection. However, with a delay in groundwater use, there would be continuous decrease in the amount of groundwater that could be withdrawn without causing negative impacts. This means that the risk of negative impacts from pumping would increase with the length of the time delay following injection.

HDPP has concurred that supplemental injection may be needed in addition to the initial 12,000 ~~af~~ acre-feet and replacement injection for pumped water (BE 4/1999). In recognition of the problem of declining balance and through an agreement with CURE, HDPP will inject an additional 1,000 ~~af~~ acre-feet at the beginning of the project to supplement the initial bank of groundwater. However, HDPP and staff analyses indicate that even this additional 1000 ~~af~~ acre-feet would not be sufficient to fully mitigate the impacts that would occur if the 12,000 ~~af~~ acre-feet were withdrawn toward the end of project operation (BE, Lefkoff Memo, 6/21/99).

This residual negative impact would tend to be buffered and postponed if pumping were followed immediately by re-injection. However, even if the groundwater pumped were replaced after pumping, negative impacts could still occur. Therefore, although HDPP has proposed to inject additional water at the end of the project that would be equal to half of the amount of water used during the last groundwater-pumping period (HDPP Workshop, Victorville, 6/15/99), staff does not believe this action would necessarily prevent significant adverse impacts.

Effect of Applicant's Proposed Mitigation on Well Interference

With respect to well interference, although HDPP and staff have concluded that nearby production wells will be affected during HDPP pumping periods, VVWD has indicated that the likely declines in groundwater levels are acceptable if HDPP compensates the district monetarily for the increased cost of pumping lifts. In light of VVWD's conditional approval ~~to provide the wells and review of the evaluations of likely project impacts~~, staff assumes that the district is confident that the issue of well interference can be resolved.

Quantitative Analysis of Proposed Mitigation~~Project Impacts~~

Selected Method of Analysis

In the early stages of the application process, project impacts and proposed mitigation were analyzed by the applicant and other interested parties through a variety of methods. In March 1999, HDPP, staff, CURE and DFG developed a consensus approach to evaluate project impacts. The participating parties agreed to the following method and parameters for analysis, as previously outlined by HDPP (BE, 4/1999):

- **Groundwater Model** - The primary tool for analysis would be a modified version of the project area model developed by HDPP, which uses the numerical groundwater-modeling program **FEMFLOW3D** (Durbin and Bond, 1997).
- **Incremental Impact Analysis** - The analysis would identify the incremental impact of the project on groundwater and surface water conditions, based on the method of superposition. This approach would analyze the project impact independently of ongoing impacts by other groundwater users.
- **Project Operations** - The analysis would evaluate the worst case conditions for project operations. The worse case conditions would provide an estimate of the maximum negative impacts, given the maximum delay between initial injection and groundwater withdrawal that would occur for a 30-year project. In addition, the analysis would assume that project wells would be screened in the lower portion of the aquifer, which is also a conservative assumption (Figure 1).
- **Groundwater System Parameters** - The analysis would be based on the best information available regarding physical parameters of the groundwater system and would be generally consistent with the present configuration of the USGS regional groundwater model currently under development (Table 3~~1~~).
- **Sensitivity Testing** - Sensitivity testing of model parameters would be used (1) to identify the primary parameters that control project impacts, (2) to evaluate the effectiveness of ~~additional~~ information that should be added to improve the reliability of the model, and (3) to estimate the accuracy of the analysis.

This analytic approach has provided a common framework from which to analyze the impacts of the project and the effectiveness of proposed mitigation actions. In general, analyses conducted by HDPP and staff produced similar results once initial problems with the setup were identified and resolved; the primary differences between the evaluations performed by the applicant and staff were in the interpretation of the results.

Base Case Analysis

A base case analysis, using **FEMFLOW3D** model and the consensus parameters, was developed to evaluate the effectiveness proposed mitigation. Three of the six mitigation measures proposed by the applicant were incorporated into the model. (~~t~~The others ~~are not~~ measures were not relevant to model results). These mitigation measures include the following:

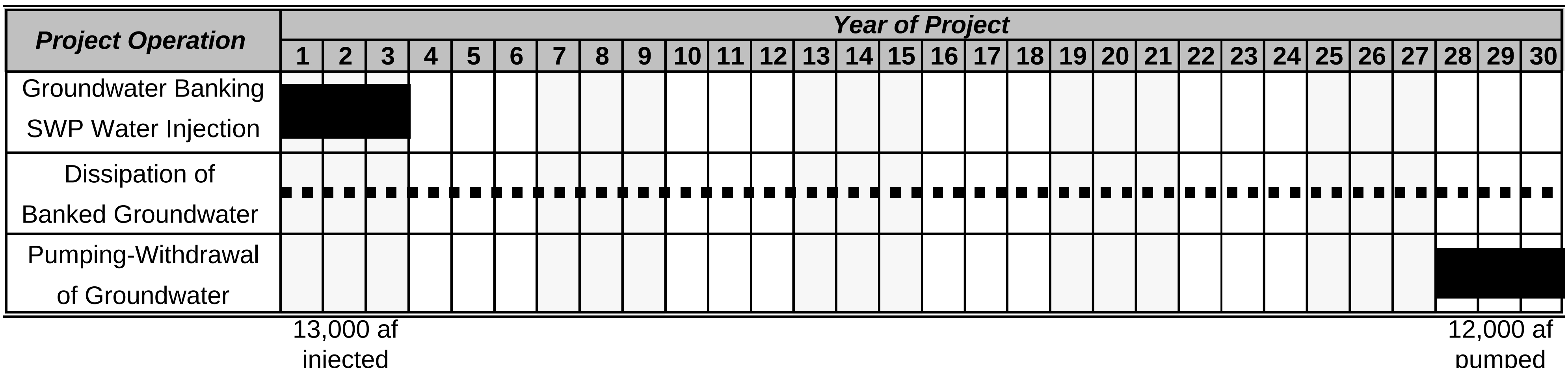
~~11.~~ • twelve thousand (12,000) ~~af~~ acre-feet of water would be banked by the initial injection of SWP water into the aquifer to meet subsequent groundwater project demands (Bookman-Edmonston, 1998c,d);

~~12.~~ • a supplement of 1000 ~~af~~ acre-feet of SWP water would be added to the groundwater bank at the onset of the project and maintained through the life of the project (CURE agreement); and

~~13.~~• after any groundwater withdrawal, SWP water would be injected to replenish the banked reserve (Bookman-Edmonston, 1998c,d), not including replenishment of final withdrawal.

The Staff analyzed effectiveness of these proposed mitigation actions ~~was evaluated~~ in terms of the significance criteria described previously. These three~~Each of the~~ proposed actions provided an additional increment towards the mitigation of negative impacts, but would not mitigate for the negative impacts related to the dissipation of the banked groundwater.

Figure 1
Worst Case Conditions for Project Operations
Analyzed to Estimate Potential for Maximum Negative Impacts



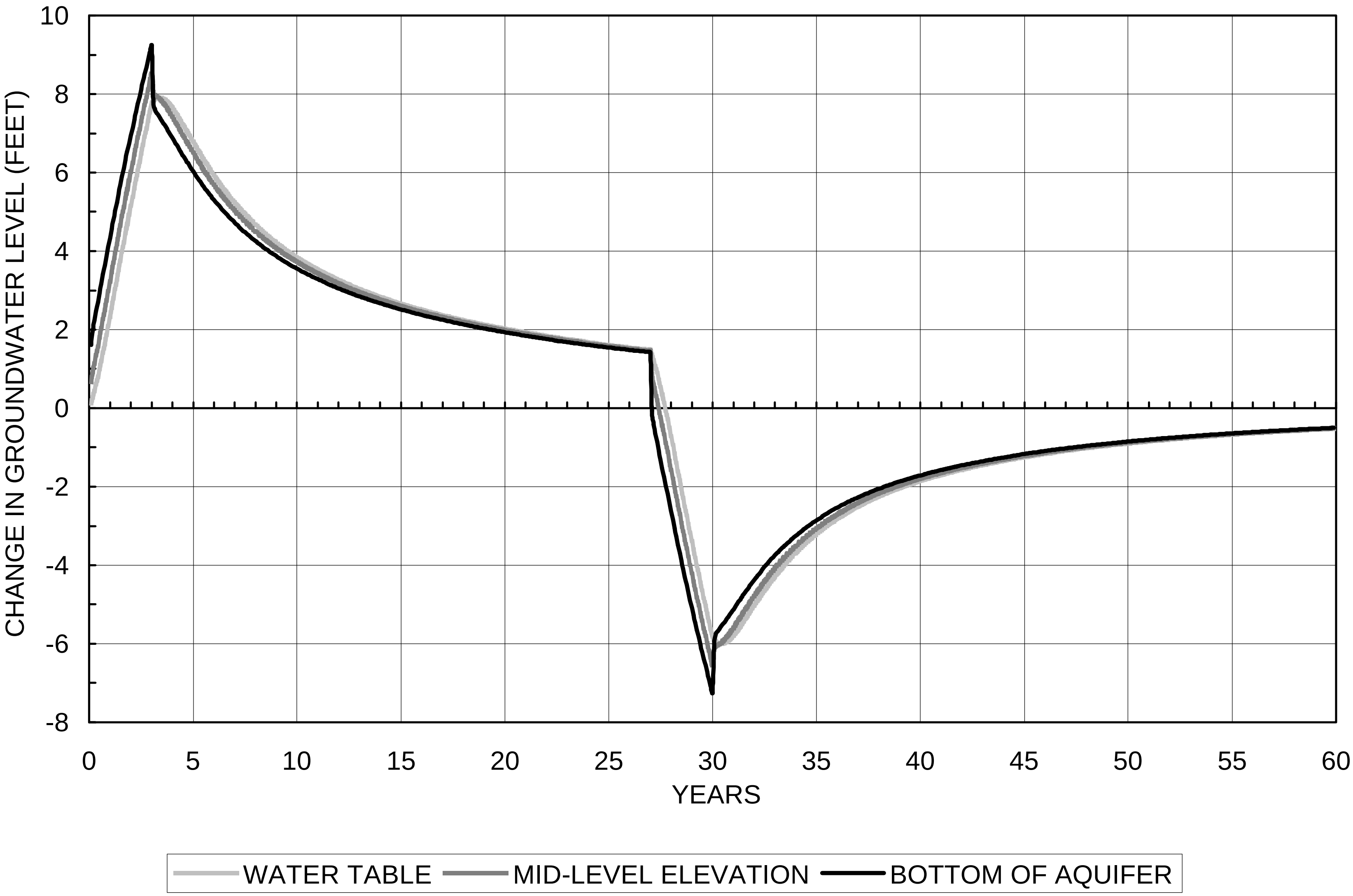
Note that dissipation of banked groundwater occurs as soon as injection begins.

SOIL&WATER RESOURCES Table 13:

Groundwater Model Parameters for Primary Analysis
Used in CEC Staff Model

Parameter	*Primary Analysis Values*
Regional Aquifer	
Horizontal Hydraulic Conductivity	8 feet/day
Vertical Hydraulic Conductivity	0.08 feet/day
Specific Yield	0.12
Specific Storage	3.3E-06/feet
Turner Springs Fault	
Horizontal Hydraulic Conductivity	0.08 feet/day
Vertical Hydraulic Conductivity	0.08 feet/day
Specific Yield	0.12
Specific Storage	3.3E-06/feet
Mojave River Alluvial Aquifer	
Horizontal Hydraulic Conductivity	200 feet/day
Vertical Hydraulic Conductivity	2 feet/day
Specific Yield	0.25
Specific Storage	3.3E-06/feet
Hydraulic Connection of Aquifers	
(1) Upper Reach of Mojave River (no barrier to flow)	Regional Aquifer Connected to Mojave River Alluvial Aquifer Within Upper Reach
(2) Mojave River Narrows (partial barrier to flow)	Upper Layer of Regional Aquifer Connected to Mojave River Alluvial Aquifer Within the Narrows
	Lower Layer of Regional Aquifer Not Connected to Mojave River Alluvial Aquifer Within the Narrows
(3) Lower Reach of Mojave River (significant barrier to flow)	Regional Aquifer Between Turner Springs Fault and HDPP Well Field Not Connected to Mojave River Alluvial Aquifer Within Upper Reach
	(Regional Aquifer North of Turner Springs Fault Connected to Mojave River Alluvial Aquifer Within Upper Reach)
Operational Parameters	
Surface Water Injection	During First 3 Years of Project, Injection = 12,000 acre-feet over 3 years + 1,000 acre-feet
Groundwater Pumping	During Final 3 Years of Project, Pumping = 12,000 acre-feet over 3 years
Screened Interval of Project Wells	Lower Layer of Regional Aquifer Only

FIGURE 2. BASE CASE ANALYSIS OF WELL INTERFERENCE AT VVWD WELL 27
CALCULATED CHANGES IN GROUNDWATER LEVELS WITH TIME



Model Results of Well Interference Analysis

Well interference was evaluated for VVWD Well 27, because ~~the well~~ Well 27 is the nearest water supply well to the HDPP well field and ~~, which~~ would therefore experience the largest fluctuations in groundwater levels owing to project operations. Figure 2 is a plot of the calculated changes in groundwater levels with time under the condition represented in the base case. The maximum decrease in groundwater levels in Well 27 caused by the project would be about 7 feet in the lowest portion of the aquifer. Well interference with other nearby water supply wells would smaller than the impact that would occur in Well 27. As discussed above, staff is recommending that criteria for evaluating the significance of these impacts be the acceptability of the proposal to VVWD.

Model Results of Mojave River System Analysis

In contrast, under base case conditions, unmitigated impacts on~~would affect~~ the Alluvial Aquifer, Mojave River base flows, and downstream users would require a physical solution. The initial groundwater banking of 13,000 acre-feet would not be sufficient to prevent impacts in the situation in which all the injected water was withdrawn at the end of project operation.

Specifically, under~~the~~ base case conditions, Staff analysis indicates that in this situation, a small negative impact to groundwater levels the Alluvial Aquifer, primarily in the Upper Reach, would occur (Figure 3). Groundwater levels in ~~flow from the Regional Aquifer to~~ the Alluvial Aquifer would increase ~~by 370 acre-feet over~~during the 30 years as a result of project injection. However, following project closure, a similar decrease in groundwater levels ~~flow~~ would be caused by groundwater withdrawal at the end of the project. This decrease would continue for more than 30 years. ~~The maximum rate of increase would be about 18 acre-feet/year, and the maximum rate of decrease would be about 14 acre-feet/year.~~

In addition, there would be much greater impacts to the overall base flow to the Mojave River system. Base flows to the live stream plus groundwater discharge to the Alluvial Aquifer would increase to over 200~~a maximum rate of 240~~ acre-feet/year, and the maximum rate of decreased flow would about 130 acre-feet/year as shown in Figure 4. A total increase of 4,400 acre-feet of groundwater would discharge to the Mojave River Alluvial Aquifer in response to the project injection in the base case analysis. However, subsequent groundwater pumping for the project would not recover this water. As a result, following project closure, a total decrease in groundwater discharge of 2,100 acre-foot would occur over the next 30 years. ~~Neither base flow nor groundwater levels would fully recover during this period.~~

The analysis clearly shows that although groundwater banking will create significant increases in discharge to the Mojave River system, this water cannot be recovered. Withdrawal of the total amount of water that has been injected will cause ~~without causing~~ significant long-term negative effects. ~~The~~If the dissipation of banked groundwater is not considered, these negative effects would occur even if the withdrawn water ~~is~~ were subsequently replaced after pumping. The potential for negative impacts increases concomitantly with the time lag between injection and pumping.

To address the question of whether the negative impacts would only occur under worst-case operational conditions, staff also evaluated two ~~reasonable~~ operational scenarios that represent likely operating conditions. Staff felt this was necessary given the uncertainty about how the project will operate. Figure 5 provides a diagram of the two operational schedules that were analyzed. The first s~~S~~cenario ~~5A~~ evaluated conditions under which both pumping and replacement occurred on a frequent, periodic schedule (Figure 5A). The second s~~S~~cenario ~~5B~~ evaluated occasional use and replenishment of groundwater (Figure 5B).

These modeling analyses indicated that negative impacts are likely to occur even under operational conditions that are much less extreme than assumed in the base case (Figures 6 and 7). Model analyses~~is did~~ demonstrated that if groundwater was pumped frequently and

FIGURE 3. BASE CASE ANALYSIS OF CHANGE IN GROUNDWATER LEVELS IN THE MOJAVE RIVER ALLUVIAL AQUIFER WITH TIME

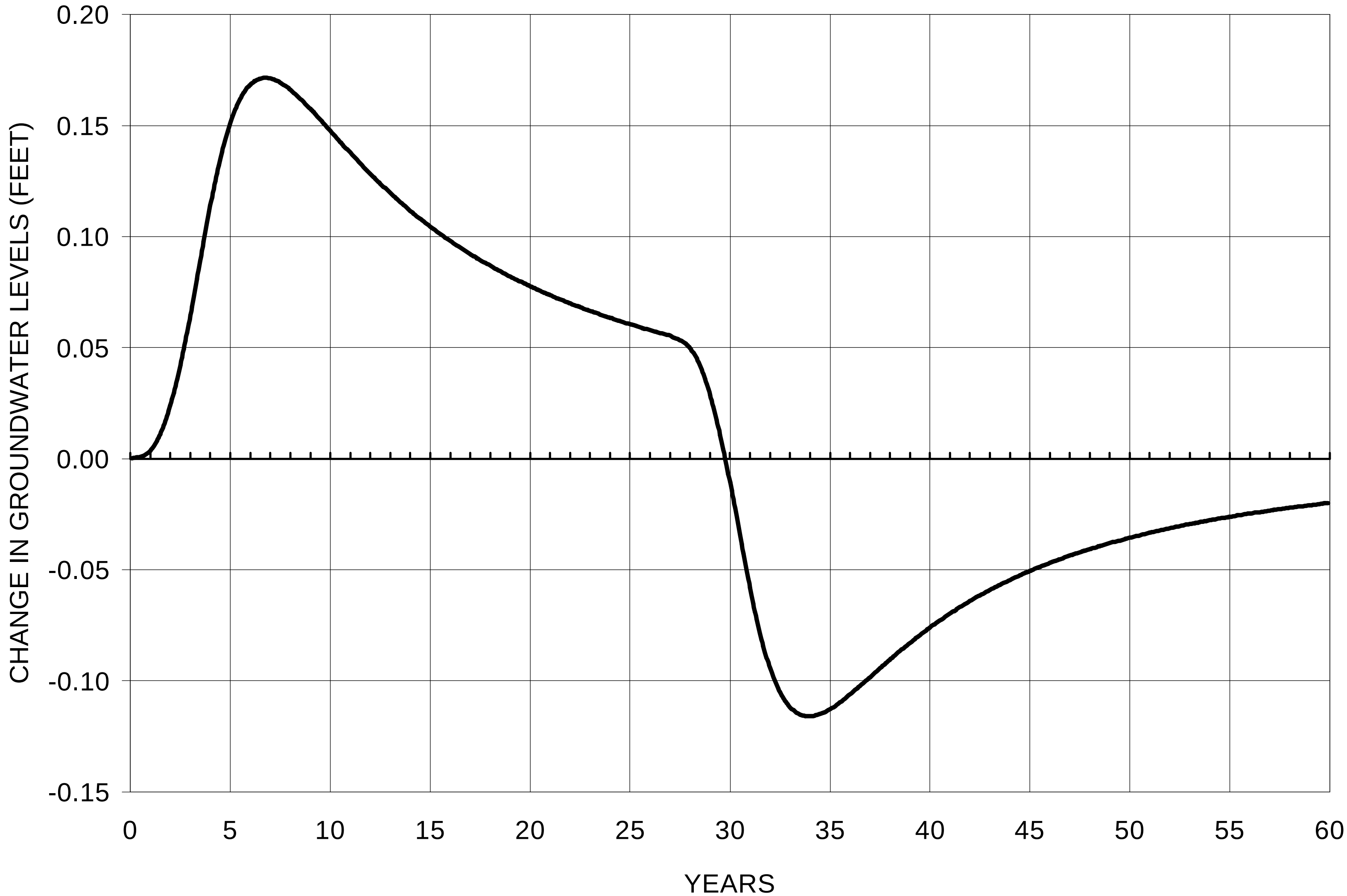


FIGURE 4. BASE CASE ANALYSIS
IMPACT TO BASE FLOW OF THE MOJAVE RIVER SYSTEM

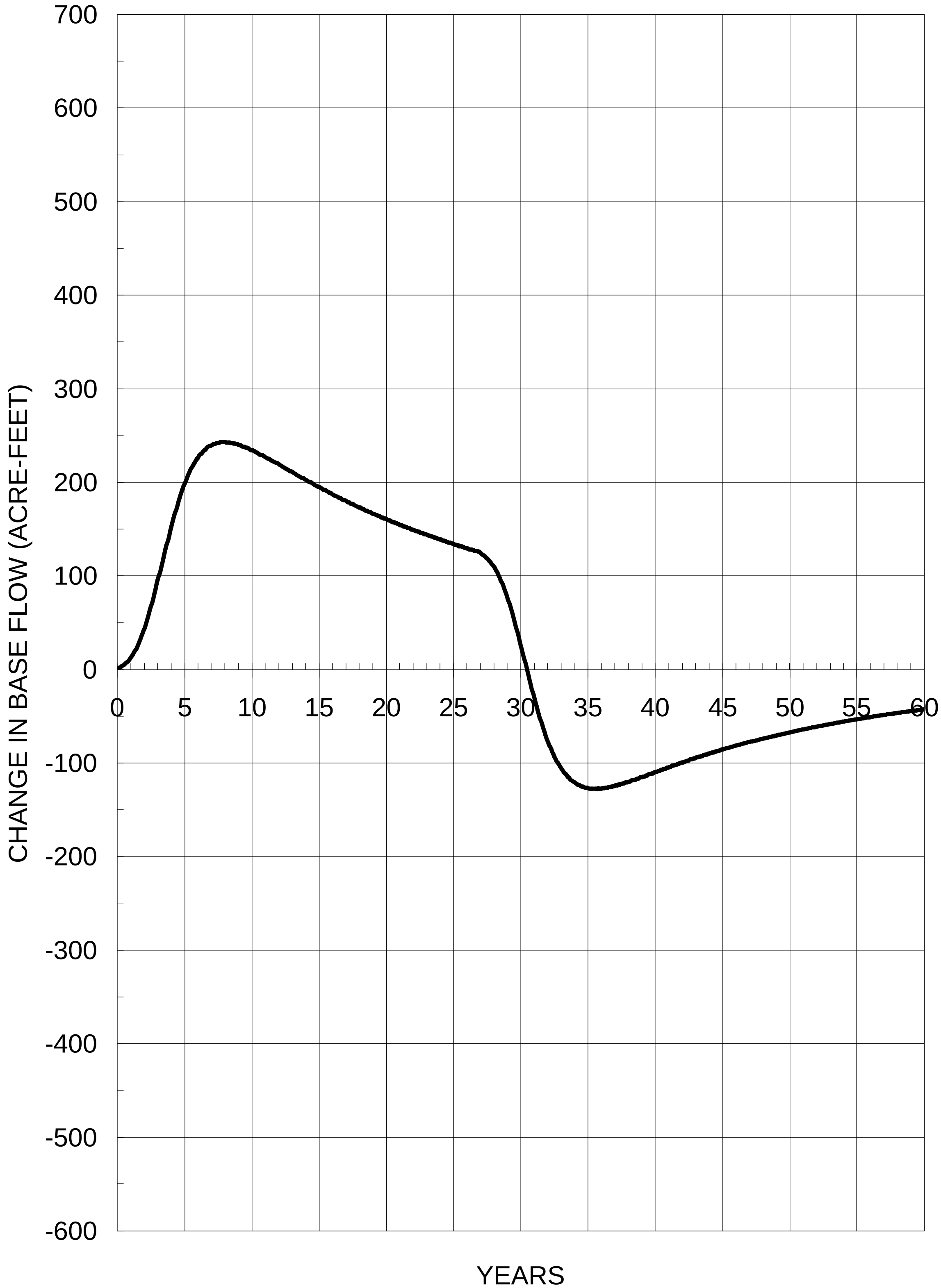


Figure 5A. Representative Project Operations - Regular Periodic Injection and Pumping

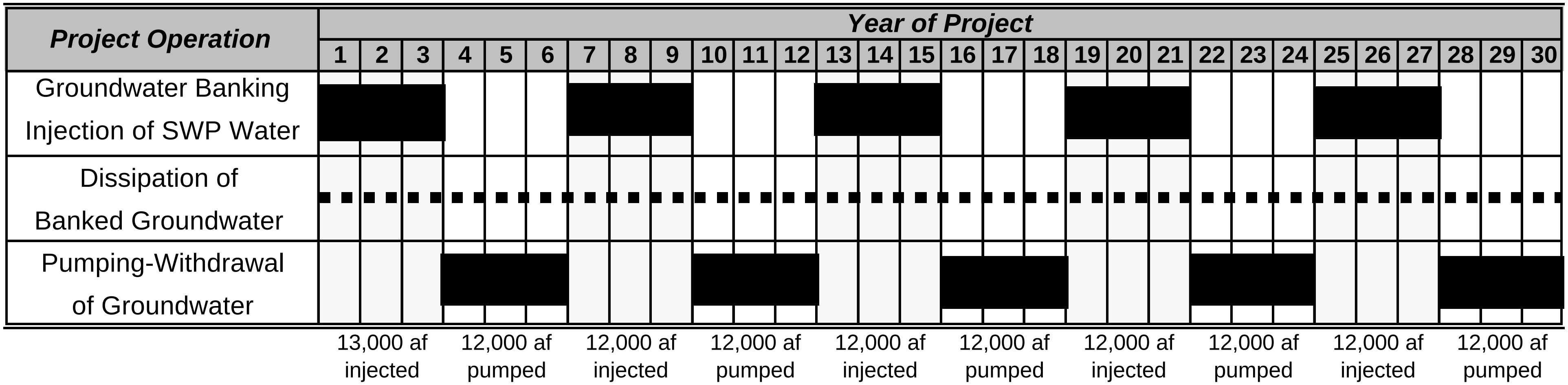
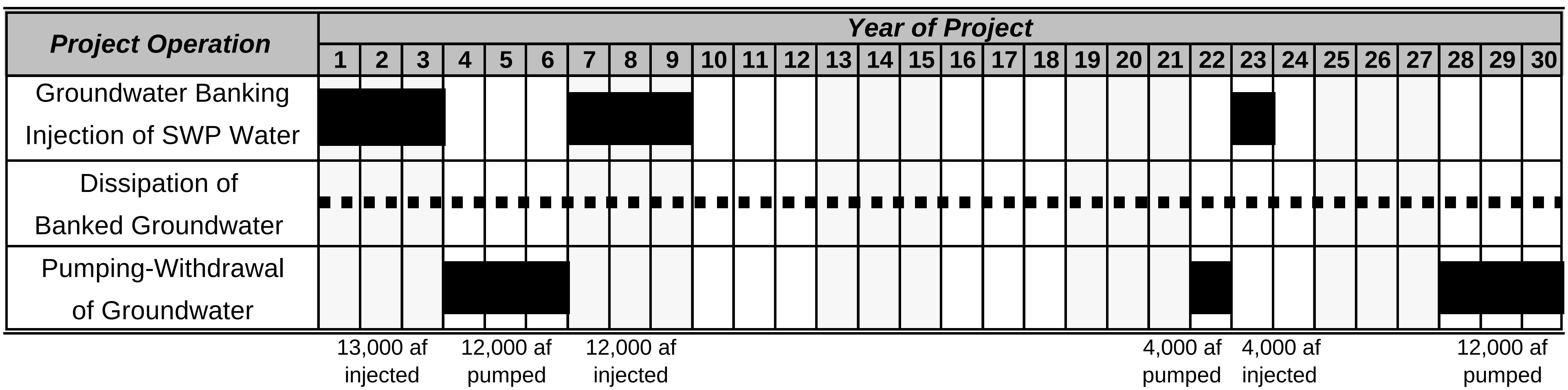


Figure 5B. Representative Project Operations - Occasional Injection and Pumping



Note that dissipation of banked groundwater occurs as soon as injection begins and continues during periods of groundwater pumping.

replenished immediately, negative post-closure impacts could be reduced, although not entirely eliminated (~~. See~~ Figure 6). Key to decreasing the negative post-closure impacts would be the frequent injection. Figure 7 shows that ~~with~~ sporadic use and replenishment of groundwater with ~~that includes~~ multiple-year delays between injection and withdrawal~~,~~ would cause negative post-closure impacts that would be similar to impacts with the worst-case operational schedule.

Based on the staff's analysis of the likelihood of negative impacts, the applicant proposed an additional fourth mitigation action: post-closure injection with SWP water equal to 100 percent of the final groundwater withdrawal used at the end of the project (HDPP Workshop, Victorville, June 15, 1999).

Model evaluation of this fourth mitigation measure indicated that it would eliminate most, but not all, of the potential negative impacts. More importantly, the effectiveness of this action would be contingent on the availability and immediate injection of SWP water and funds reserved specifically for this purpose. Staff has concluded that the availability of SWP water for the HDPP is likely to become increasingly~~will be highly~~ uncertain~~ long before the planned closure date of the facility~~. The feasibility of purchasing such replacement water is even more speculative, given the likely response of prices to projected water shortages for California. Staff does not believe it is prudent to adopt a mitigation proposal whose effectiveness is dependent upon the availability of a very uncertain water supply. Rather, we believe that the mitigation sufficient to prevent impacts should be in place before the pumping occurs, thereby eliminating any likelihood that unforeseen circumstances could result in the project causing a significant adverse impact.

In response to the fact that the applicant's proposal does not eliminate the potential for negative impacts to the Mojave River system, staff believes a different approach is warranted. Specifically, Staff urges the Commission to adopt a mitigation mechanism adopted that takes into account the fact that the amount of groundwater injected dissipates, and the amount that thus can be pumped without impacting the riparian habitat declines over time. Staff believes that a declining balance approach must be used to ensure the effectiveness of mitigation for the HDPP project. It puts the risk of water unavailability where it belongs: on the applicant rather than on the riparian habitat. Staff evaluated three alternative mitigation options that considered the decline in banked groundwater and assumed that pumping would not exceed the available balance. The three alternatives evaluated were:

- ~~14.~~ No supplemental injection (continuous decline in groundwater reserves for project operation),
- ~~15.~~ Periodic supplemental injection to restore balance of banked water, and
- ~~16.~~ Ongoing supplemental injection needed to maintain sufficient groundwater reserves to meet project needs during worst-case drought conditions.

Any one of these three mitigation actions would eliminate ~~all but a very small post-~~ negative project impacts on groundwater levels in the Mojave River Alluvial Aquifer and base flows to the Mojave River.~~ that in turn~~

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FIGURE 6. REPRESENTATIVE PROJECT OPERATIONS FREQUENT PERIODIC INJECTION AND PUMPING IMPACT TO BASE FLOW OF THE MOJAVE RIVER SYSTEM

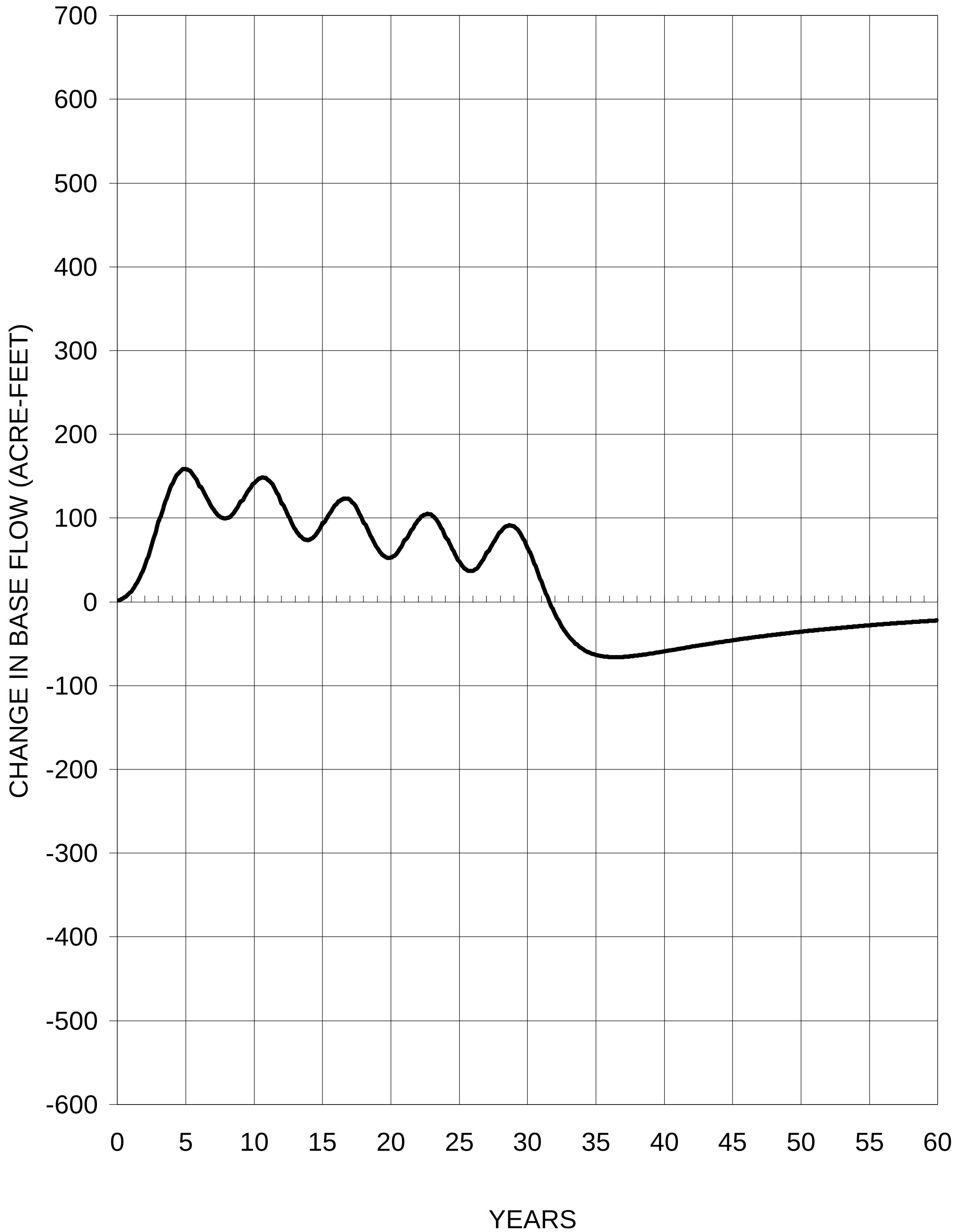

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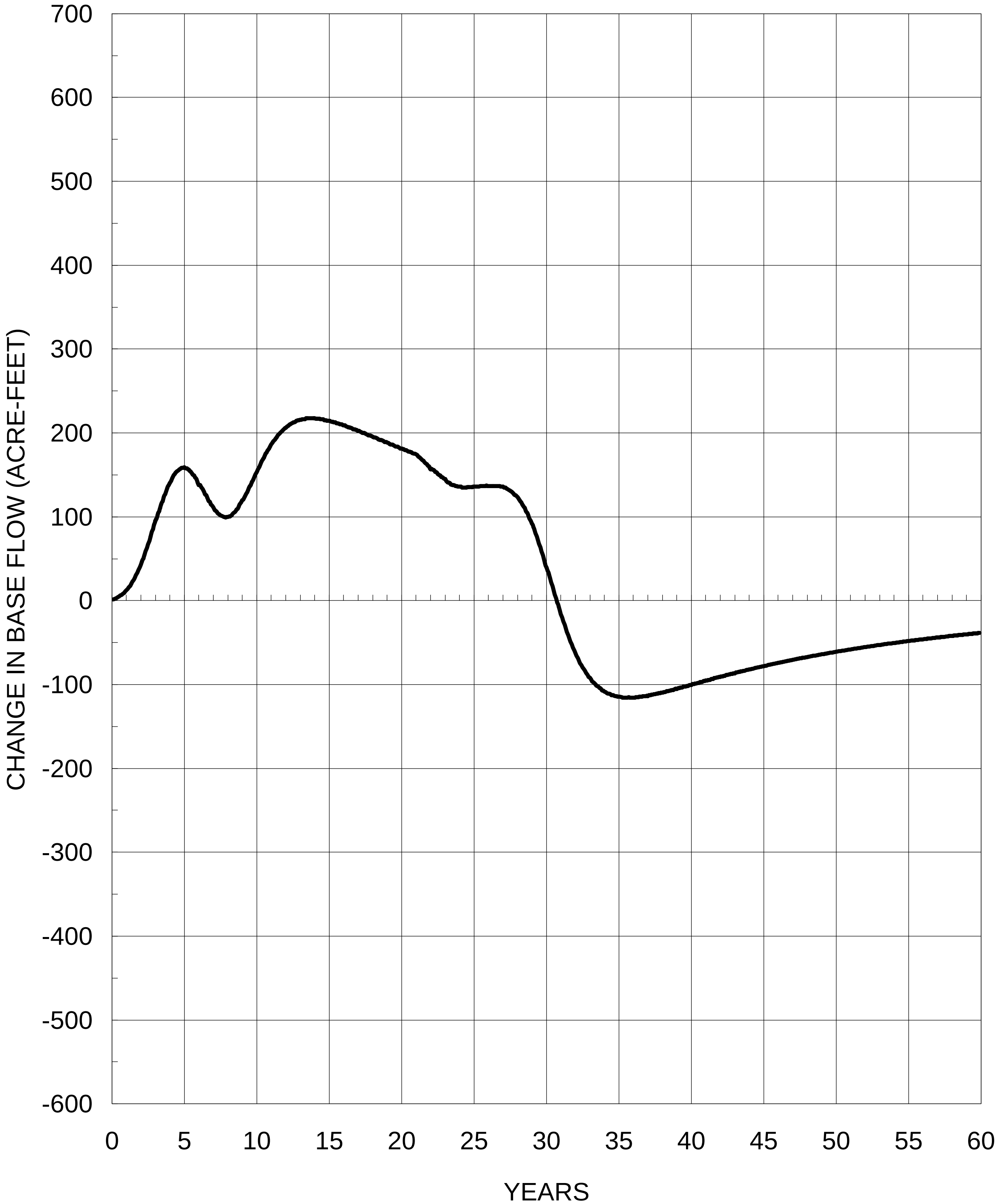
FIGURE 7. REPRESENTATIVE PROJECT OPERATIONS
OCCASIONAL INJECTION AND PUMPING
IMPACT TO BASE FLOW OF THE MOJAVE RIVER SYSTEM



~~could most effectively be mitigated with in-stream river recharge (less than 5 acre-feet/year).~~

Results of Sensitivity Testing Analysis

Sensitivity testing was conducted to estimate the accuracy of the model analysis with respect to the simplifying assumptions used in the model and the uncertainty in the operational and groundwater system parameters. The groundwater model is a simplified representation of the major features of the groundwater system. For the base case, parameter values were selected to represent best estimates of average groundwater system conditions. However, the actual system does have complex, variable conditions, and the actual conditions are not entirely understood.

Sensitivity tests were performed individually on parameter variables and used the worst-case operational conditions that did not include post-closure mitigation. Sensitivity test values were selected to represent the range of end values that would reasonably be expected in the depositional environment of the project area groundwater system. Table ~~2~~4 compares the parameters for the base case to the sensitivity test parameters. These tests provide an indicator of the sensitivity of the model results to each tested parameter and not a precise quantification of model uncertainty. The sensitivity tests can be used to identify the parameters that are most important in determining project impacts. With this information, the accuracy of the model results can be estimated and the reliability of the model can be improved by obtaining better information on the most important parameters.

Sensitivity Testing with respect to Well Interference

Evaluation of well interference to water supply production wells was included in sensitivity testing. Well interference was evaluated in terms of the maximum drawdown to the VVWD Well 27, the well nearest to the HDPP well field, which represent the worst case. Table ~~3~~5 summaries the maximum drawdown for each of the sensitivity tests. Well interference would be greater if either vertical hydraulic conductivity or specific yield of the Regional Aquifer were lower in the vicinity of the HDPP well field. Well interference would double if the vertical hydraulic conductivity were one order of magnitude lower (0.008 ft/day) than estimated in the base case (0.08 ft/day). More drawdown would occur in the deeper portion of the groundwater system if vertical conductivity were lower. Well interference would almost double if the specific yield was as low as 6 percent, rather than 12 percent as assumed in the base case.

Neither of these parameters has been measured in the vicinity of the project. Pumping tests for the HDPP wells, if conducted properly, would provide information site-specific values for vertical hydraulic conductivity and specific yield that would improve the accuracy of the model. Staff assumes that VVWD will evaluate the results of these analyses and develop a satisfactory mitigation agreement with HDPP.

SOIL&WATER RESOURCES Table ~~2~~4~~:~~

Groundwater Model Sensitivity Testing Used in CEC Staff Analysis

Parameter	***Primary Analysis Values***	***Range of Parameter Values Tested***
Regional Aquifer		
Horizontal Hydraulic Conductivity	8 feet/day	4 to 25 feet/day Bizonal: west of site 4 feet/day; from site to river 8 feet/day
Vertical Hydraulic Conductivity	0.08 feet/day	0.008 to 0.8 feet/day
Specific Yield	0.12	0.06 to 0.20
Specific Storage	3.3E-06/feet	3.3E-05 to 3.3E-07/feet
Turner Springs Fault		
Horizontal Hydraulic Conductivity	0.08 feet/day	0.008 to 0.8
Vertical Hydraulic Conductivity	0.08 feet/day	no test
Specific Yield	0.12	no test
Specific Storage	3.3E-06/feet	no test
Mojave River Alluvial Aquifer		
Horizontal Hydraulic Conductivity	200 feet/day	60 to 600 feet/day
Vertical Hydraulic Conductivity (1) Upper Reach (2) Narrows (3) Lower Reach	 2 feet/day 2 feet/day 2 feet/day	 0.2 to 20 feet/day 20 feet/day 0.2 to 20 feet/day
Specific Yield	0.25	0.15 to 0.35
Specific Storage	3.3E-06/feet	3.3E-05 to 3.3E-07/feet
Hydraulic Connection of Aquifers		
(1) Upper Reach	No Barrier To Flow	no test
(2) Narrows	Partial barrier to flow	Significant barrier to flow
(3) Lower Reach	Significant Barrier To Flow	no test
Operational Parameters		
Screened Interval of Project Wells	Lower Layer of Regional Aquifer Only	Both Layers of Regional Aquifer

SOIL&WATER RESOURCES Table ~~35:~~
Sensitivity Test Results Maximum Drawdown in VVWD Well 27 (feet)

Sensitivity Test Description~~*Test results are listed in order of magnitude of drawdown.*~~	*Water Table*	*Mid-Level*	*Aquifer Bottom*
BASE CASE	***-6.0***	***-6.5***	***-7.2***
Regional Aquifer Kv 0.008 ft/day	**-3.8**	**-10.4**	**-15.2**
Regional Aquifer Sy=0.06	**-11.3**	**-11.8**	**-12.1**
Regional Aquifer Kh=4 ft/day	-5.4	-6.1	-8.1
Turner Springs Fault Kh = 0.8 ft/day	-6.2	-6.7	-7.4
Regional Aquifer Ss=3.33e-07/feet	-6.1	-6.6	-7.3
Mojave River Alluvial Aquifer Kh=600 ft/day	-6.0	-6.6	-7.3
Mojave River Alluvial Aquifer Kv=20 ft/day	-6.0	-6.5	-7.2
Mojave River Alluvial Aquifer Sy=0.35	-6.0	-6.5	-7.2
Mojave River Alluvial Aquifer Ss=3.33e-05/feet	-6.0	-6.5	-7.2
Mojave River Alluvial Aquifer Ss=3.33e-07/feet	-6.0	-6.5	-7.2
Mojave River Alluvial Aquifer Sy=0.15	-6.0	-6.5	-7.2
Mojave River Alluvial Aquifer (excluding Narrows) Kv=0.2 ft/day	-6.0	-6.5	-7.2
Test 5a: Mojave River Alluvial Aquifer Kh=60 ft/day	-5.9	-6.5	-7.2
Turner Springs Fault Kh = 0.008	-5.9	-6.5	-7.2
Wells Fully Screened In Regional Aquifer	-6.1	-6.5	-7.1
Regional Aquifer Kv=0.8 ft/day	-6.8	-6.8	-6.7
Aquifers Not Connected Between Narrows	-5.4	-6.0	-6.7
Regional Aquifer Ss=3.33e-05 /feet	-5.5	-5.9	-6.5
Regional Aquifer Kh=25 ft/day	-5.0	-5.1	-5.2
Regional Aquifer Sy=0.20	**-3.4**	**-3.8**	**-4.8**

Note: The base case and the most sensitive parameters are shown in bold typeface. *Test results are listed in order of magnitude of drawdown.*

Abbreviations: Kh = horizontal hydraulic conductivity (ft/day)
Kv = vertical hydraulic conductivity (ft/day)
Sy = specific yield (percent)
Ss = specific storage (1/feet)
ft/day = feet per day

Sensitivity Testing with respect to Mojave River System

Sensitivity testing identified one simplifying assumption and two groundwater-system parameters that would be determining factors in the magnitude of potential significant impacts to the Mojave River system (Table ~~4~~6). The simplifying assumption is ~~the assumption~~ regarding the connection of the Regional Aquifer to the Mojave River Alluvial Aquifer between the Narrows. The two groundwater-system parameters are the horizontal hydraulic conductivity and the specific yield of the Regional Aquifer.

The base case assumes that the Regional Aquifer is hydraulically connected to the Mojave River Alluvial Aquifer between the Narrows. The magnitude of project impacts to the Mojave River system would be about half of the base case impact if the aquifers are not connected within the Narrows (Figure 8). Current modeling by the USGS does indicate that flow between the aquifer is probably limited. However, the USGS is still evaluating the extent of hydraulic connection between the two aquifers through the development of the regional groundwater model (Stamos and Martin, verbal communications, April 1999). Given the uncertainty of this connection, both staff and the applicant have treated the assumption of no connection between the Narrows as a secondary analysis. Staff recommends that until a definitive study resolves this uncertainty, mitigation conditions should be based on the conservative assumption that the aquifers are connected. If such a study is performed and indicates that the conservative assumption is unwarranted, HDPP should be permitted to present it to the Commission in a post-certification amendment proceeding.

Sensitivity tests indicated that horizontal hydraulic conductivity and specific yield in the Regional Aquifer are the most sensitive groundwater system parameters. In a sensitivity test of conductivity, staff evaluated a value of 25 feet/day compared to the 8 feet/day used in the base case. The test indicated that negative impacts to base flows of the Mojave River would be almost four times larger than indicated in the base case if the horizontal hydraulic conductivity were 25 feet/day (Figure 9). Given the sensitivity of this parameter, a hydraulic conductivity of 9.3 to 13.6 feet/day, which was calculated~~has been observed~~ by HDPP in pumping tests in nearby wells (BE, 4/1999), would probably double the estimated impacts. Conversely, sensitivity tests showed that if the horizontal hydraulic conductivity were 4 feet/day, the negative impacts to the Mojave River would be one/third the impact calculated for the base case (Table 6). The test for the second sensitive parameter, specific yield, considered a value of six percent compared to twelve percent used in the base case. This test indicated that a specific yield in the range of six percent would indicate more than double the estimated impacts to base flows of the Mojave River (Figure 10).

Given the importance of the horizontal hydraulic conductivity and specific yield in calculating probable impacts, pumping tests in the HDPP wells would provide valuable information for improving the accuracy of the model. Staff has drafted a proposed condition of certification requiring such tests and the incorporation of the results into the model used to determine the amount of pumping that will be allowed.

Table 4: Sensitivity Test Results

Maximum Negative Impact on Mojave River System Base Flows (acre-ft/year)

Test results are listed in order of outflow from Aquifer and River combined	***Alluvial Aquifer***	***Mojave River***	***Combined***
BASE CASE	*-14*	*-116*	*-128*
Regional Aquifer Kh=25 ft/day	-64	-441	-503
Regional Aquifer Sy=0.06	-48	-295	-341
Regional Aquifer Kv=0.008	-42	-136	-174
Regional Aquifer Kv=0.8	-29	-146	-173
Turner Springs Fault Kh=0.8	-28	-125	-152
Mojave River Alluvial Aquifer Kh=600 ft/day	-14	-121	-133
Regional Aquifer Ss=3.33E-07/feet	-14	-117	-130
Mojave River Alluvial Aquifer Sy=0.35	-16	-116	-130
Wells Fully Screened In Regional Aquifer	-14	-117	-129
Bizonal Values for Regional Aquifer Kh(west of site)=4 ft/day and Kh(site to river)=8 ft/day	-15	-128	-114
Mojave River Alluvial Aquifer Ss=3.33E-07/feet	-14	-116	-128
Mojave River Alluvial Aquifer Ss=3.33E-05/feet	-14	-116	-128
Mojave River Alluvial Aquifer 20 feet/day	-12	-117	-127
Mojave River Alluvial Aquifer Sy=0.15	-11	-116	-125
Mojave River Alluvial Aquifer (excluding Narrows) Kv=0.2	-15	-111	-124
Turner Springs Fault Kh = 0.008	-11	-112	-121
Mojave River Alluvial Aquifer Kh=60 ft/day	-14	-101	-114
Regional Aquifer Ss=3.33E-05/feet	-11	-101	-110
Regional Aquifer Sy=0.20	-5	-50	-54
Aquifers Not Connected Between Narrows	-15	-35	-49
Regional Aquifer Kh=4 ft/day	-4	-37	-40

Note: The base case and the most sensitive parameters are shown in bold typeface.

Abbreviations: Kh = horizontal hydraulic conductivity (ft/day)
Kv = vertical hydraulic conductivity (ft/day)
Sy = specific yield (percent)
Ss = specific storage (1/feet)
ft/day = feet per day

SOIL&WATER RESOURCES Table 6
Sensitivity Test Results: Maximum Negative Impact on Mojave River System

Sensitivity Test Description	***Groundwater Levels in Alluvial Aquifer (feet)***	***Base Flows to Mojave River (acre-ft/year)***
BASE CASE	*-0.1*	*-116*
Regional Aquifer Kh=25 ft/day	**-0.3**	**-441**
Regional Aquifer Kh=4 ft/day	**-0.04**	**-37**
Bizonal Values for Regional Aquifer Kh(west of site)=4 ft/day and Kh(site to river)=8 ft/day	**-0.3**	-128
Regional Aquifer Kv=0.008	-0.1	-136
Regional Aquifer Kv=0.8	-0.1	-146
Regional Aquifer Sy=0.06	**-0.3**	**-295**
Regional Aquifer Sy=0.20	-0.1	**-50**
Regional Aquifer Ss=3.33E-05/feet	-0.1	-101
Regional Aquifer Ss=3.33E-07/feet	-0.1	-117
Turner Springs Fault Kh = 0.008	-0.1	-112
Turner Springs Fault Kh=0.8	-0.1	-125
Mojave River Alluvial Aquifer Kh=60 ft/day	**-0.3**	-101
Mojave River Alluvial Aquifer Kh=600 ft/day	**-0.04**	-121
Mojave River Alluvial Aquifer (excluding Narrows) Kv=0.2	-0.1	-111
Mojave River Alluvial Aquifer Kv=20 feet/day	-0.1	-117
Mojave River Alluvial Aquifer Sy=0.15	-0.1	-116
Mojave River Alluvial Aquifer Sy=0.35	-0.1	-116
Mojave River Alluvial Aquifer Ss=3.33E-05/feet	-0.1	-116
Mojave River Alluvial Aquifer Ss=3.33E-07/feet	-0.1	-116
Aquifers Not Connected Between Narrows	**-0.04**	**-35**
Wells Fully Screened In Regional Aquifer	-0.1	-117

Note: The base case and the most sensitive parameters are shown in bold typeface.

Abbreviations: Kh = horizontal hydraulic conductivity (ft/day)
Kv = vertical hydraulic conductivity (ft/day)
Sy = specific yield (percent)
Ss = specific storage (1/feet)
ft/day = feet per day

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FIGURE 8. SENSITIVITY TEST: REGIONAL AND ALLUVIAL AQUIFERS NOT CONNECTED WITHIN THE NARROWS - IMPACT TO BASE FLOW OF THE MOJAVE RIVER SYSTEM

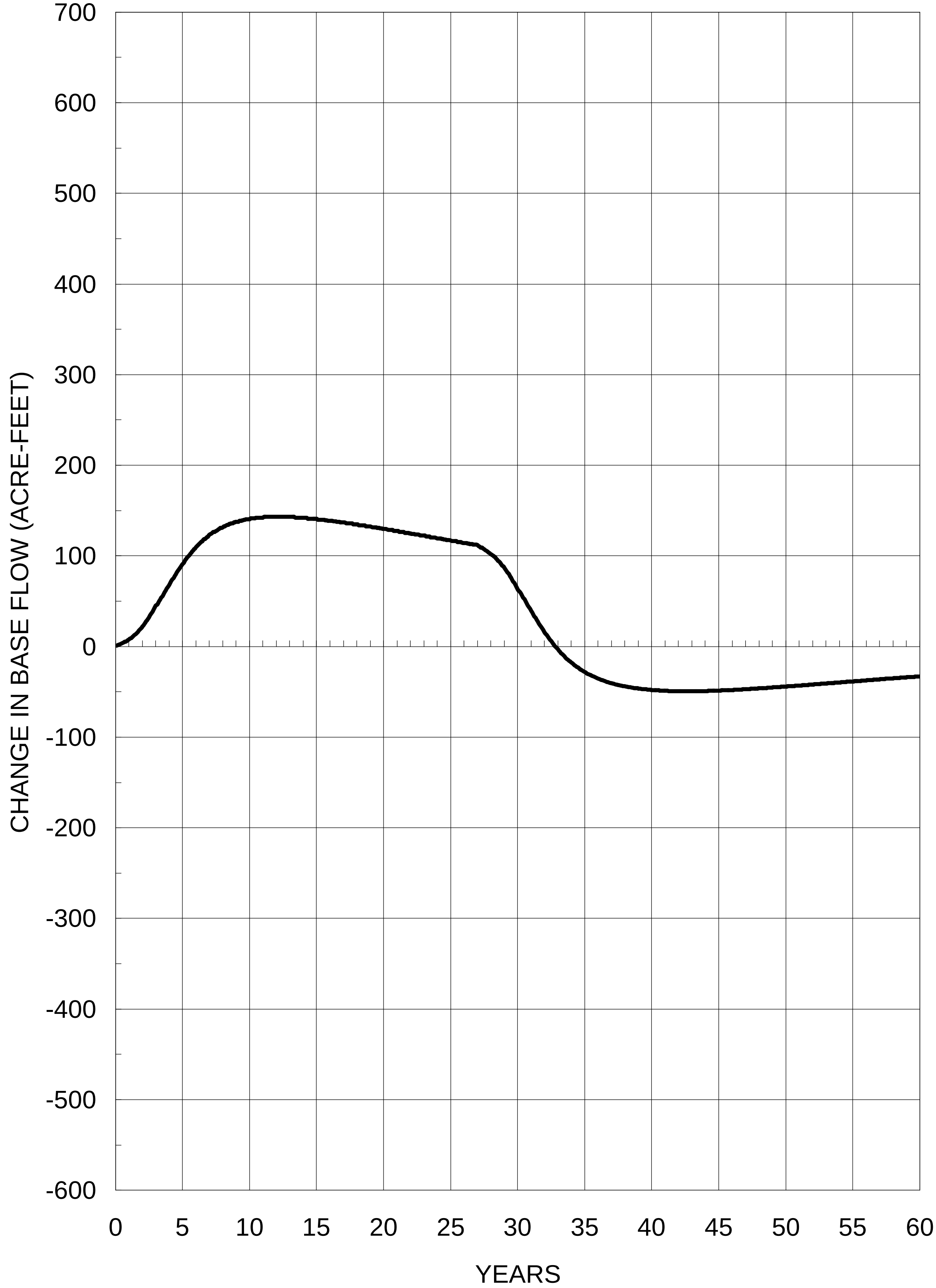


FIGURE 9. SENSITIVITY TEST: REGIONAL AQUIFER HORIZONTAL HYDRAULIC CONDUCTIVITY(Kh)=25 FT/DAY IMPACT TO BASE FLOW OF THE MOJAVE RIVER SYSTEM

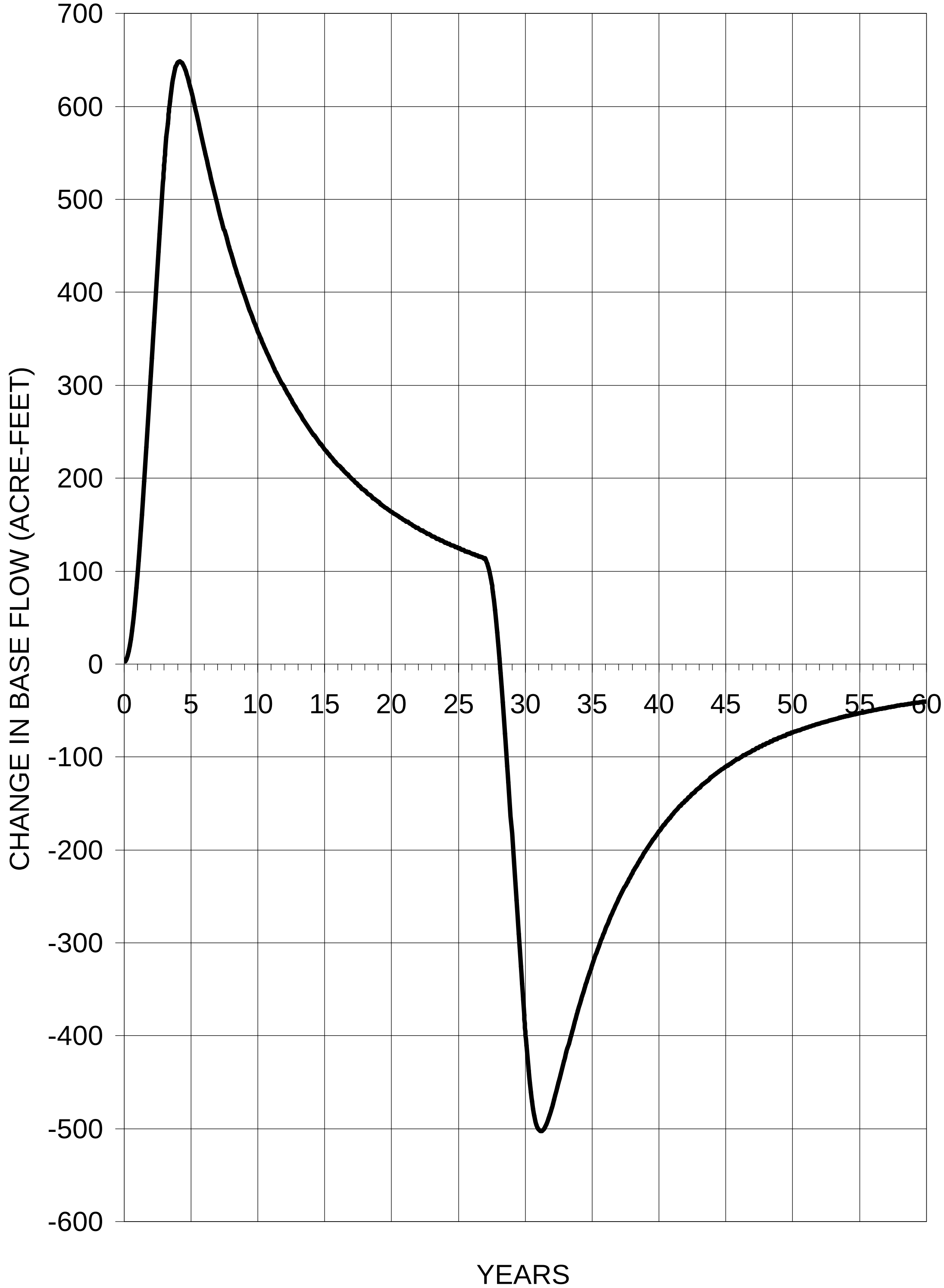
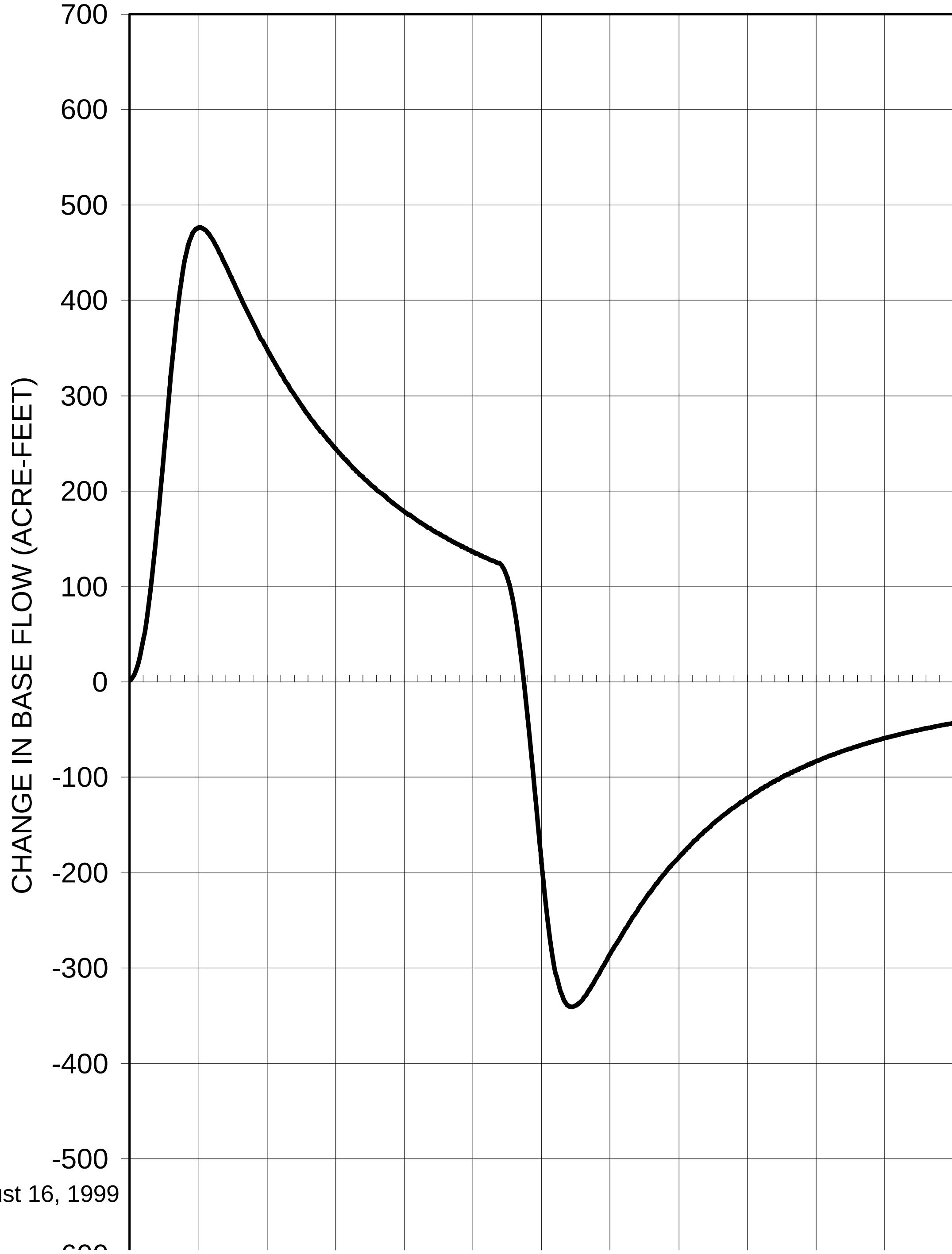


FIGURE 10. SENSITIVITY TEST: REGIONAL AQUIFER SPECIFIC YIELD (Sy) = 6 PERCENT - IMPACT TO BASE FLOW OF THE MOJAVE RIVER SYSTEM



Certainty of Modeling Results

Although the exact magnitude of project impacts and hence the amount of mitigation needed is uncertain, the modeling analysis clearly demonstrates that negative impacts will occur if the dissipation of banked groundwater is not incorporated into the mitigation plan. In all of the simulations, including sensitivity tests, the dissipation of banked water can be demonstrated, as can its negative effects on the Mojave River system. In other words, all the simulations, including sensitivity tests, indicated some level of negative impact to the Mojave River system.

~~***CALCULATION OF DECAY RATE OF AVAILABLE BALANCE FOR GROUNDWATER PUMPING WITHDRAWAL***~~

Calculation of Decay Rate of Available Balance for Groundwater Pumping Withdrawal

An empirical formula to calculate the decay rate of the banked groundwater was developed using the groundwater model.

The decay rate of banked groundwater by HDPP was evaluated in terms of project impacts to the Mojave River ~~system~~. As discussed previously, the injection of water at the HDPP site causes an increase in base flow to the Mojave River system. The rate of dissipation of the banked groundwater at the project site declines exponentially. This means that the highest rate of dissipation occurs when water is first injected and that dissipation becomes progressively slower with time. The change in the rate of decay of the groundwater mound at the site is reflected in the change in the rate of base flow to the Mojave River system, following injection.

Figure 11 shows the calculated change in the rate of base flow to the Mojave River ~~system~~ that would occur if HDPP injected 13,000 acre-feet of water during the first 3 years of the project, followed by no further pumping or injection. If this figure is redrawn on a semi-log graph, the data plots roughly as straight line (Figure 12). The average slope of this line can be redrawn with a y-intercept equal to the log of the initial amount of injected water (Figure 13). The approximate balance of groundwater available for pumping over the life of the project can be read from the resulting graph. The data can be plotted in either in a semi-log format, as shown in Figure 13, or an arithmetic format (Figure 14).

Alternatively, the following linear equation of the groundwater balance graphs (Figures 13 and 14) can be used to calculate the approximate balance of banked groundwater available for HDPP pumping:

Log (available balance) = Log (initial injection) +
[-0.016 x (time since start of injection)]

The available balance and the initial injection are expressed in acre-feet, and time is expressed in terms of years.

Both the graphs and the formula provide a good estimate of the available balance, plus or minus 500 acre-feet. However, actual balance should be calculated with model simulations. To evaluate the impact of a planned withdrawal, the actual

FIGURE 11. CALCULATED CHANGE IN RATE OF BASE FLOW TO MOJAVE RIVER SYSTEM

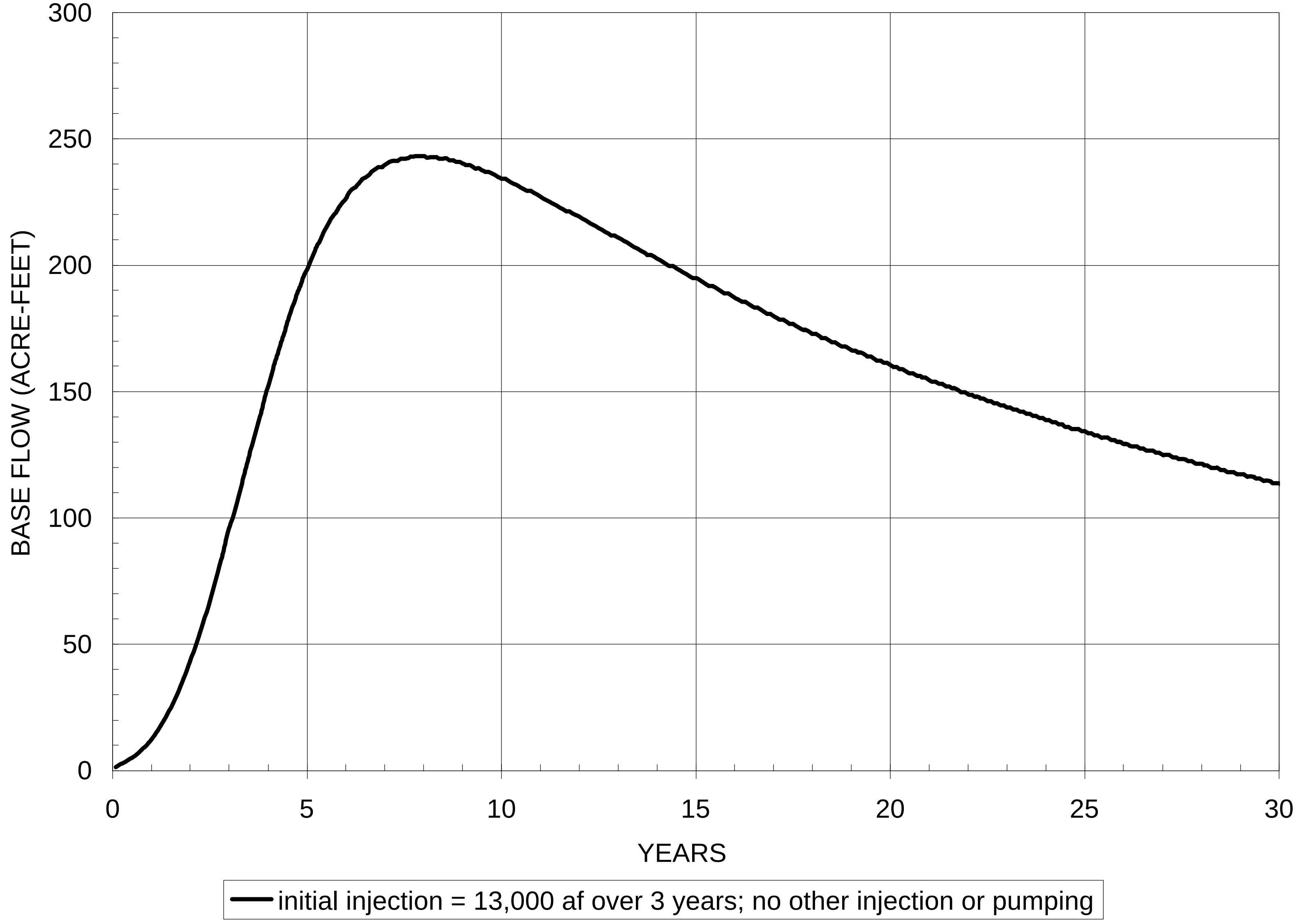


FIGURE 12. CALCULATED CHANGE IN THE RATE OF BASE FLOW TO MOJAVE RIVER SYSTEM

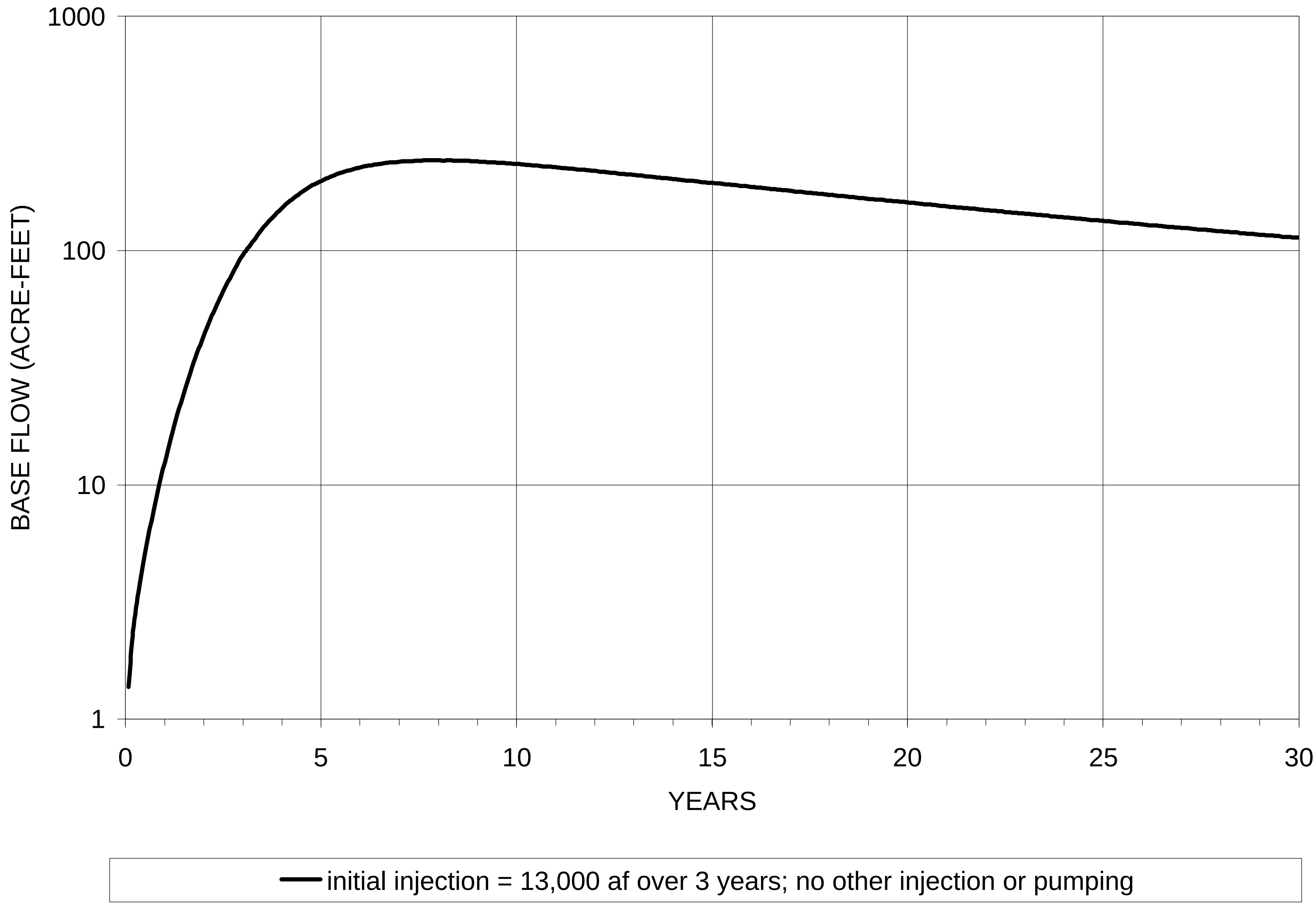


FIGURE 13. CALCULATED DECLINE IN AVAILABLE BALANCE OF BANKED GROUNDWATER

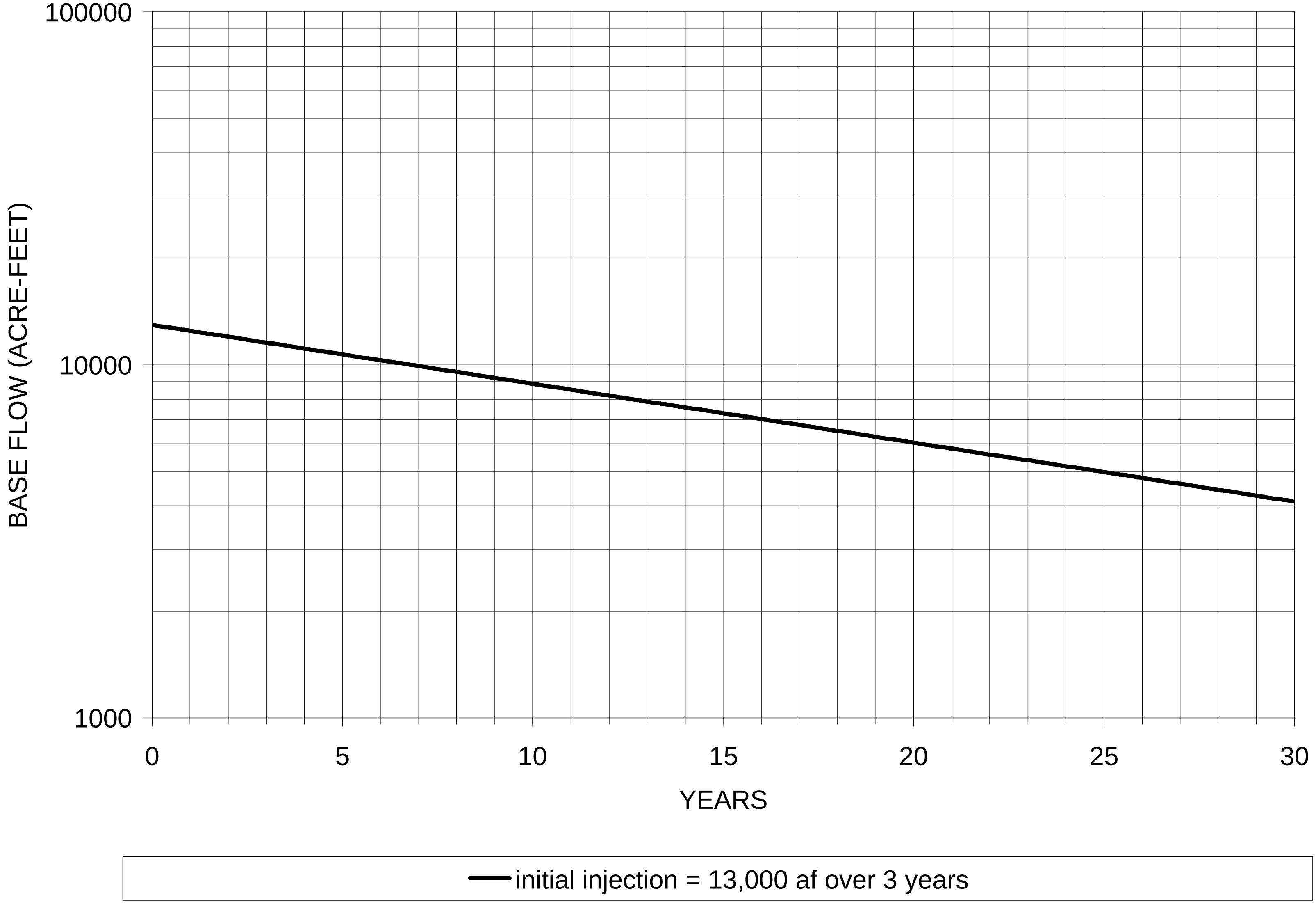


FIGURE 14. CALCULATED DECLINE IN AVAILABLE BALANCE OF BANKED GROUNDWATER

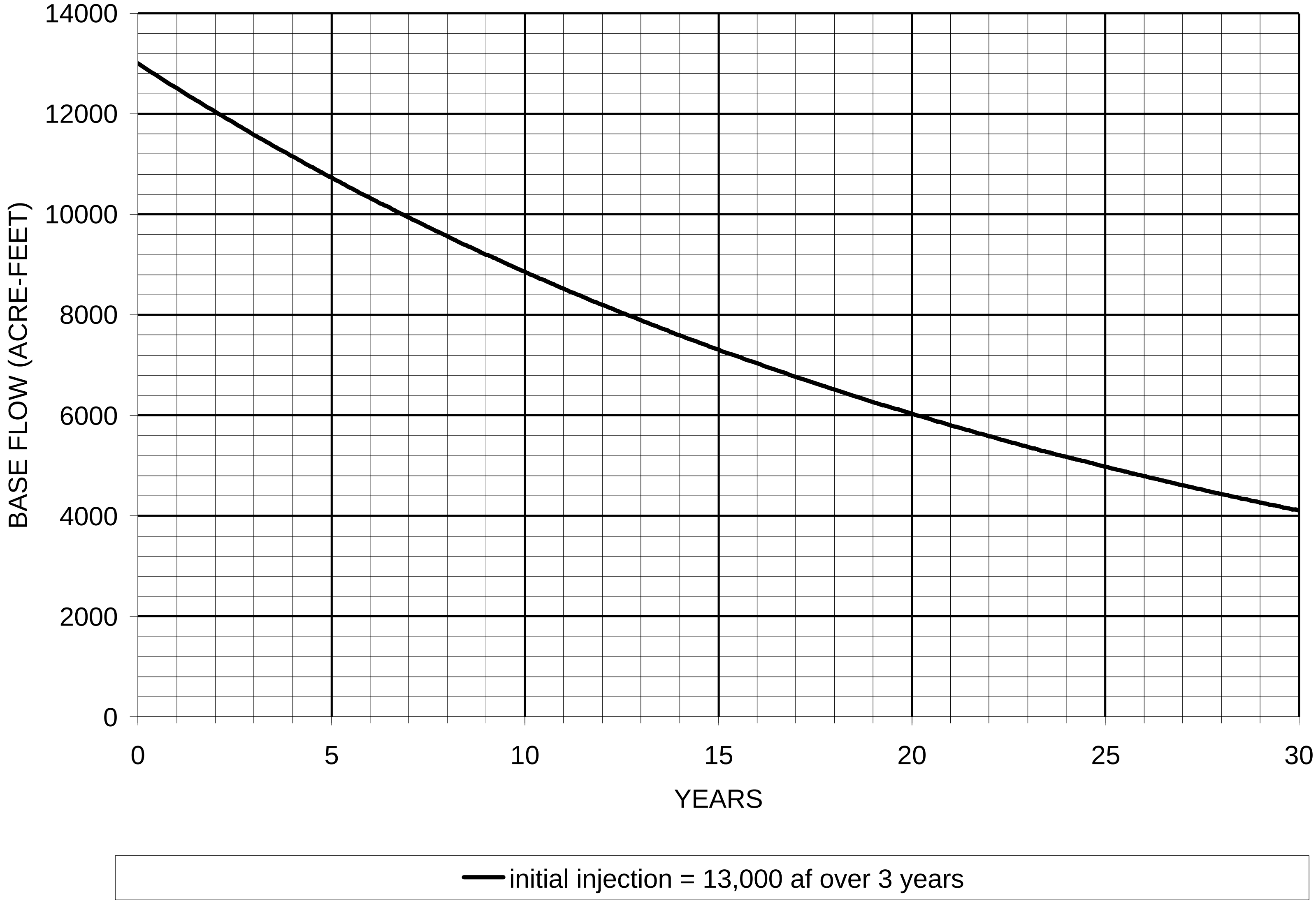
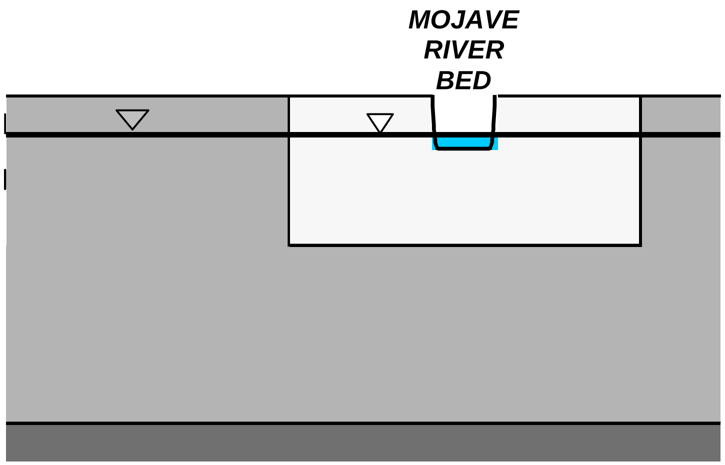
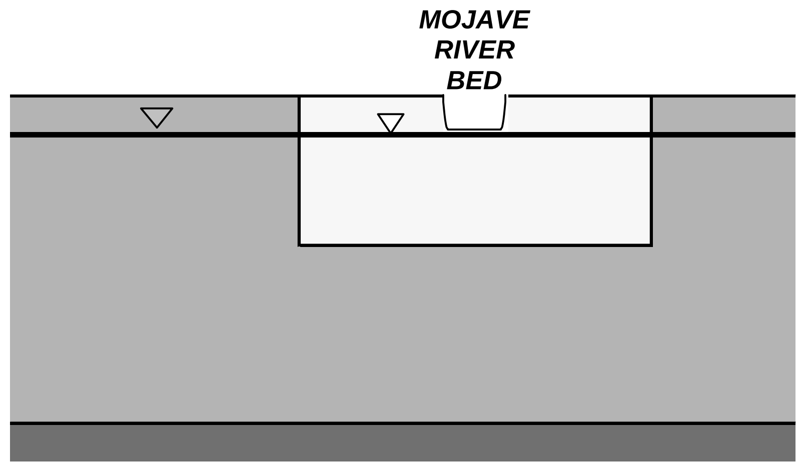


Figure 15. Reach 1: Diagrammatic Cross Section of the Groundwater System above the Narrows
(Vertically exaggerated. Figure is not to scale.)

a. Downstream portion of the Reach 1.



b. Upstream portion of the Reach 1.



NOTE: In Reach 1, the Mojave River is usually a live stream in the downstream portion of the reach and is a dry stream bed in the upstream portion of the reach during most years.

Legend:

groundwater table

fault

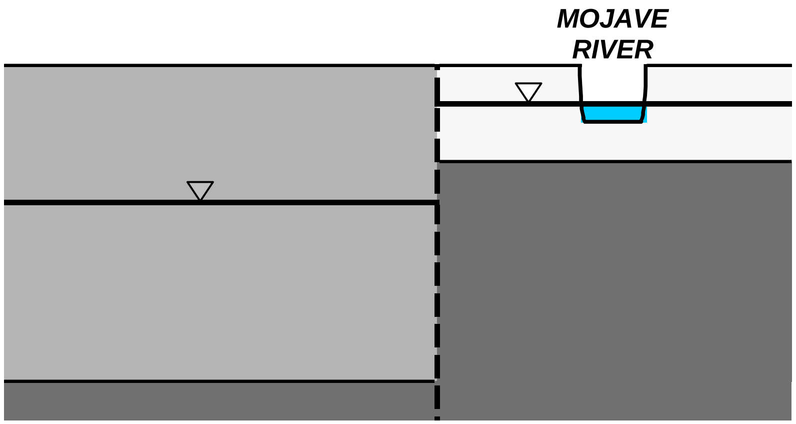
Mojave River Alluvial Aquifer

Regional Aquifer

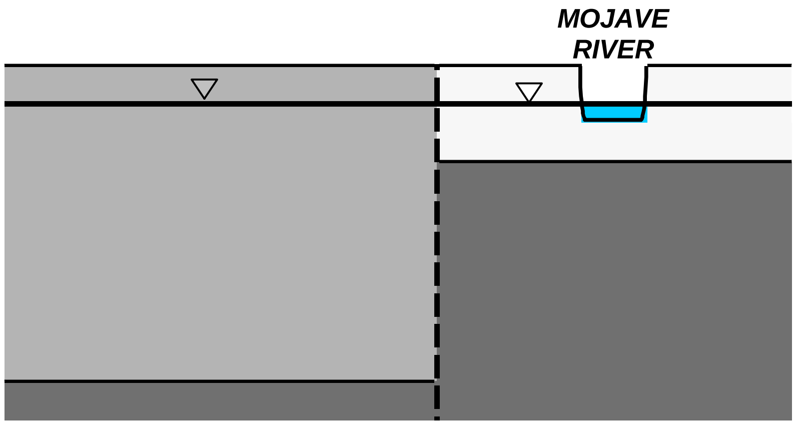
Bedrock

Figure 16. Reach 2: Diagrammatic Cross Section of the Groundwater System between the Narrows
(Vertically exaggerated. Figure is not to scale.)

a. Aquifers are not hydraulically connected.



b. Aquifers are hydraulically connected.



NOTE: Mojave River is usually a live stream in this reach of the river.

Legend:

groundwater table

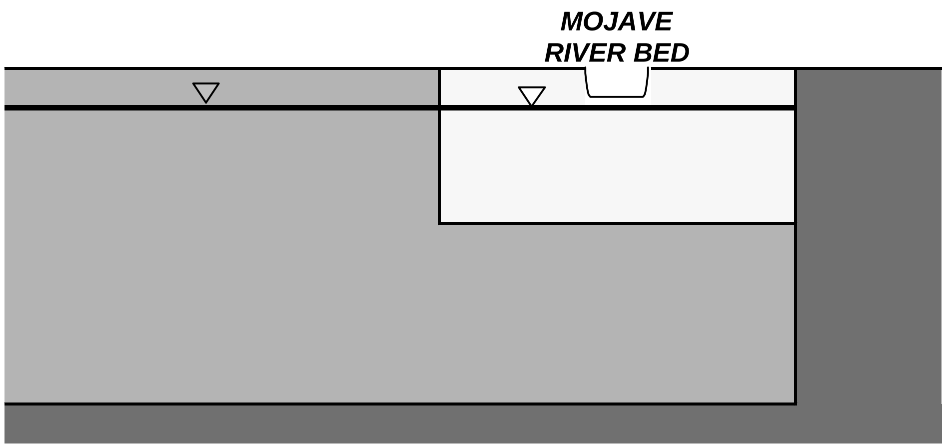
fault

Mojave River Alluvial Aquifer

Regional Aquifer

Bedrock

Figure 17. Reach 3: Diagrammatic Cross Section of the Groundwater System below the Narrows
(Vertically exaggerated. Figure is not to scale.)



NOTE: Mojave River bed is dry in this reach of the river during most of the year.

Legend:

- groundwater table
- fault
- Mojave River Alluvial Aquifer
- Regional Aquifer
- Bedrock

sequence of previous pumping and injection with the planned withdrawal should be simulated with the model and evaluated with respect to impact to the Mojave River system.

As discussed in the previous section, sensitivity tests have indicated that horizontal hydraulic conductivity and specific yield in the Regional Aquifer significantly control project impacts. Following the update of the model with HDPP well field pumping tests and USGS model data, if available, these figures and the formula above shall be reformulated with new model output. (A new slope value for the equation of the line could also~~would~~ be calculated from a semi-log plot of the base flow using the updated model.)

~~This model also evaluated the effects of three years of water injection and three years of water extraction. Bookman-Edmonston reports that the model indicates the direction and velocity of movement for a particle is dominated by the regional gradient; Close to the injection wells, the model shows the particles traveling slightly faster than the regional gradient, with distance the velocity drops until it matches the gradient velocity. Thus in three years a particle would move about 1,370 feet from the injection well. The model indicates that it is unlikely that any particles would reach VVWD or City of Adelanto production wells. The model also shows that groundwater pumping would retard particle pumping, but complete recapture would not occur.~~

~~A problem with this analysis is that the effect of drawdown from the local municipal production wells was not included in the model. The drawdown of these production wells is likely to be a primary factor in the groundwater gradients that determine solute transport. The actual velocities and direction of particle movement and the potential for capture by municipal production wells would be significantly effected by the pumping of local municipal productions wells. It should be noted that water treatment is sufficient that this is not a concern unless there is an upset in the water treatment plant. See the water treatment discussion below. However, if the movement of the injected water is an issue of concern, this analysis should be corrected.~~

~~Concerns raised by the RWQCB staff (Bookman-Edmonston 1998d; Maxwell 1999) about the proposed injection of SWP water into the groundwater aquifer are:~~

- ~~To ensure injected TDS, chloride and sulfate approach background (groundwater) levels;~~
- ~~Trihalomethanes (THM) not be introduced into the groundwater. THMs include such compounds as chloroform and bromoform. These compunds form when naturally occurring organic matters is combined with oxidizing compounds such as chlorine and other disinfectants commonly used in water treatment; and~~
- ~~Surface water parasites, such as *giardia* are not introduced into the groundwater aquifer.~~

~~HDPP (1998d) proposes that a water treatment plant be built at the power plant site to address these water quality concerns. Water treatment will include rapid mixing,~~

~~adsorption clarifier with granulated activated carbon, mixed media filtration and reverse osmossis. Specific water treatment requirement will be set forth in the draft WDR.~~

~~HDPP (Bookman-Edmonston 1998 c,d) has proposed a water quality monitoring and reporting program. Pre-injection raw and treated SWP water would be monitored for general physical parameters, minerals and THM potential. In additon, HDPP would monitor water quality at City of Adelanto Well Nos. 4 and 8a and VVWD Well Nos. 21, 27, 32 and 37 (Bookman-Edmonston 1998c,d). Water quality parameters would be reported semi-annually.~~

GROUNDWATER LEVEL MONITORING

~~The monitoring plan for HDPP, with the inclusion of one of the proposed prison wells, appears to be adequate for water quality purposes. However, a plan for groundwater level monitoring has not been included in HDPP's report prepared by Bookman-Edmonston Engineering, Inc. (BE). Although BE reports that the water districts will be performing groundwater level measurements, no specific information on groundwater level monitoring has been provided.~~

To evaluate the effectiveness of HDPP mitigation operations in the area of the well field, at a minimum, static (non-pumping) groundwater levels should be measured and reported on a semi-monthly basis for both the HDPP wells and the area's production wells. In addition, monthly rates for surface water injection and groundwater production should be measured and reported. (This information should be required by CEC.)

To evaluate the effectiveness of the actual mitigation operations to offset any negative project impacts on groundwater levels for riparian vegetation, the use of a comprehensive, 3-dimensional, numerical model would be ~~a~~ recommended. At a minimum, field measurement of the aquifer parameters for both the Regional and Mojave River Alluvial Aquifers would be needed. (Aquifer testing of the Mojave River Alluvial Aquifer could be performed if this evaluation would be required by Fish and Wildlife now or at anytime in the future if a problem or issue arises.)

In the case that more complex concerns or problems arise during the operation of the project that relate to groundwater levels, a larger set data would be needed to evaluate the relation of the project's water use to the groundwater issue. Water deliveries and wastewater disposal, as well as well construction data should be recorded for the area, including HDPP. The other data needed for groundwater level analysis would include precipitation, stream flow for the Mojave River, the water service population and land use, which are usually compiled by various local, state and federal agencies. (Because long-term records are needed for this kind of analysis, we could request that HDPP survey if these data are being collected and reported. These data would also be needed for a subsidence study.)

If regional groundwater consumption continues to increase in the area without the mitigation of increased groundwater recharge or other methods, land subsidence might occur. If subsidence were to occur, a monitoring record of changes in land surface elevation would be needed to quantify the magnitude of subsidence and to determine if there were any contributing impact of the project.

~~Water Treatment~~

WATER QUALITY TREATMENT AND MONITORING

Concerns raised by the RWQCB staff (Bookman-Edmonston 1998d; Maxwell 1999) about the proposed injection of SWP water into the groundwater aquifer are:

- To ensure injected TDS, chloride and sulfate approach background (groundwater) levels;
- Trihalomethanes (THM) not be introduced into the groundwater. THMs include such compounds as chloroform and bromoform. These compounds form when naturally occurring organic matters is combined with oxidizing compounds such as chlorine and other disinfectants commonly used in water treatment; and
- Surface water parasites, such as *giardia* are not introduced into the groundwater aquifer.

HDPP (Bookman-Edmonston 1998d) has proposed treatment of the SWP water prior to groundwater injection to ensure there is no degradation of the Regional Aquifer. SWRCB Policy 68-16, Statement of Policy with Respect to Maintaining High Quality of Waters in California (Anti-degradation policy) is a part of the Water Quality Control Plan for the Lahontan Region (Basin Plan). The Anti-degradation Policy requires the Regional Board to ensure that all projects are conducted in a manner that will maintain the highest quality water that is feasible in consideration of technical, economic and social factors. Any degradation of water quality must be quantified and must be in the best interest of the people of California. To effectively implement the Anti-degradation Policy, the Regional Board may issue Waste Discharge Requirements, may issue a Waiver of Discharge Requirements or may waive the need ~~fo~~for a responsible ~~partyt~~party to file a report of waste discharge for a specific project (Maxwell 1999c),

In discussions with RWQCB staff, HDPP was given the choice to do an anti-degradation study to evaluate the potential impacts to the Regional Aquifer from banking untreated SWP water or to treat the water (Maxwell 1999b). HDPP (Bookman-Edmonston 1998d) decided to treat the SWP water prior to injection and submitted a Report of Waste Discharge (ROWD) to the RWQCB as part of an application for a WDR. The RWQCB (Maxwell1999) deemed this application incomplete because the Commission's certification process is not complete. The RWQCB requires compliance with the California Environmental Quality Act (CEQA) as a necessary element of a ROWD. Therefore, HDPP will have to apply for a WDR following Commission certification of the proposed project, unless, at that time the RWQCB staff waives this requirement.

A comparison of SWP water quality and local groundwater quality shows that for certain constituents, SWP water exceeds the levels found in the local groundwater. Specific water quality concerns raised by the RWQCB staff (Bookman-Edmonston 1998d; Maxwell 1999) about the proposed injection of SWP water into the groundwater aquifer are:

- To ensure that injected total dissolved solids (TDS), chloride and sulfate approach background (groundwater) levels;
- That trihalomethanes (THM) not be introduced into the groundwater. THMs include such compounds as chloroform and bromoform. These compounds form when naturally occurring organic matter found in water is combined with oxidizing compounds such as chlorine and other disinfectants commonly used in water treatment; and
- That surface water parasites, such as *Giardia,* are not introduced into the groundwater aquifer.

As shown in Table 6 of the ROWD (Bookman-Edmonston 1998 d), SWP water quality and local groundwater quality varies. For example, TDS levels from Victor Valley Water District wells between 1984 and 1998 ranged from 116 mg/l to 314 mg/l with an average of 174. SWP water at Rock Springs between 1994 and 1998 varied from 160 to 351 mg/l of TDS with an average of 233 mg/l. To ensure the groundwater banking program does not lead to groundwater degradation and to comply with the SWRCB anti-degradation policy, HDPP (1998d) proposes that a water treatment plant be built at the power plant site to treat SWP water to approach background levels. Water treatment will include rapid mixing, adsorption clarifier with granulated activated carbon, mixed media filtration and reverse osmosis. Actual treatment will vary as necessary with the quality of the SWP source water.

HDPP (Bookman-Edmonston 1998 c, d) has proposed a program to monitor the water treatment process. Pre-injection raw and treated SWP water would be monitored for general physical parameters, minerals and THM potential. Treated water that did not meet desired water quality levels would be retreated. In addition, HDPP would monitor water quality at City of Adelanto Well Nos. 4 and 8a and VVWD Well Nos. 21, 27, 32 and 37 (Bookman-Edmonston 1998c, d) to establish background levels. Water quality parameters would be reported semi-annually.

Staff concludes that HDPP (Bookman-Edmonston 1998 c, d) proposed water treatment and monitoring program is sufficient to ensure groundwater quality protection.

The staff proposed conditions of certification below are intended to ensure implementation of the proposed treatment and monitoring program. Since SWP water quality and local groundwater quality varies, it is proposed that HDPP's treatment process achieve the average concentration indicated by monitoring at the wells identified above, as long as this average is within primary drinking water standards. For those constituents that are not detected within the local groundwater, such as THM potential, treatment of SWP water would also be to the non-detect level. To ensure local input into the treatment and monitoring plan, staff is recommending that the Mojave Water Agency, the City of Victorville and the Victor Valley Water District approve the proposed plan.

CONCLUSIONS AND RECOMMENDATIONS

~~CALIFORNIA DEPARTMENT OF FISH & GAME~~

CALIFORNIA DEPARTMENT OF FISH & GAME

As part of the draft Streambed Alternation Permit (No. 5-313-98) issued ~~Septmeber~~September 17, 1998, the California Department of Fish & Game has identified conditions to reduce erosion, sedimentation and other water quality impacts from project related activities in desert washes and streams. These conditions include: revegetation with native species ; replacement of topsoil, avoidance of wet areas, vehicle maintenance to avoid leaks and the use of clean fill. To reduce impacts on the Mojave River and associated riparian vegetation, the draft agreement requires the project to only pump groundwater from previously banked water sufficient to meet groundwater demand when State Water Project Water is not available. Any groundwater pumped from the banked supply will not exceed this supply and shall not cause a decline in bank and base flow of the Mojave River. The draft permit requires that prior to project approval, the Applicant shall submit a report that demonstrates by studies and field tests that the above condition can be met. An annual compliance and monitoring report that provides data on the banked water sufficient in time and place to take corrective action to assure the above conditions shall be met is also required.

~~CEC STAFF~~

CEC STAFF

Staff recommended conditions of certification are to ensure project compliance with applicable laws, ordinances, regulations and standards as well as to ensure that potentially significant environmental impacts are mitigated to a less than significant level. Staff recommends that, contingent on the following conditions, HDPP shall be certified to use State Water Project (SWP) water and groundwater pumped on-site to meet the proposed project water requirements. Because the Mojave River Groundwater Basin is in overdraft, the use of groundwater shall be limited. This is consistent with HDPP's proposal

To minimize groundwater impacts, during periods in which SWP water is available, surface water will pre-injected into the groundwater system for later withdrawal. The withdrawal of groundwater would be limited by two conditions. Groundwater withdrawal (1) shall only occur when SWP water was not available and (2) shall not exceed the amount of banked water that can be recovered. Water injected into the groundwater system continually dissipates from the well field with time and cannot be recovered without adversely affecting base flow within the Mojave River.

The value of limiting HDPP's groundwater withdrawal to the recoverable balance of banked groundwater is that it shifts the risk of a shortfall in water supply, owing to the operation of the project, from the overdrafted groundwater basin to HDPP.

Staff, with the concurrence of the applicant, has analyzed the impacts of the proposed project with a 3-dimensional groundwater model, developed by HDPP. This approach was selected over other methods of analysis for 3 reasons. The first reason was that simpler methods, such as the Theis equation, were rejected because they could not represent the complexity of the HDPP site. The HDPP model was designed to represent the primary factors in the vicinity of the project that determine the effects of the project. The second consideration was the use of a comprehensive model, such as the Mojave River Groundwater Basin model (USGS), which could represent complex factors. However, the USGS model was not selected because (a) it is not yet publicly available, (b) it has not been designed at a appropriate scale for evaluation this project's impacts, and (c) it would be much more difficult to use. Furthermore, the development of a new, comprehensive model would have taken years to develop. The third reason the staff selected the HDPP was because it could be used to quantify project impacts independently of ongoing impacts by other groundwater users. Although the measurement and contouring of groundwater levels was proposed to evaluate project impacts, conclusions drawn from this method are largely interpretive and are not quantitative. In addition, the use of measured groundwater levels would not be useful in projecting or calculating changes in base flow to the Mojave River system.

The Model is currently based on best data available. Prior to start of project operations, the Model shall be revised with site-specific groundwater system parameters, calculated from HDPP pumping-test data, and calibrated regional parameters, based on the USGS Mojave River Groundwater Basin model, if available. These revisions will improve the accuracy and reliability of groundwater use requirements based on Model results.

The current model analyses indicate that proposed groundwater-use conditions should mitigate most negative impacts to the groundwater system and the Mojave River system. However, modeling does indicate that there may be a small, unavoidable negative impact to first reach of river, above the Upper Narrow

Staff has recommended conditions regarding SWP water treatment prior to injection as part of the ~~groundwater banking~~groundwater-banking program. Although Waste Discharge Requirements for the injection program may not be required from the Lahontan RWQCB, these conditions have been coordinated with Board staff.

Another recommended ~~condition provide~~condition provides the Air Force access to the site to conduct contaminated soil and/or groundwater characterization and remediation. The remaining recommended conditions are standard measures to ensure project compliance with applicable ~~ordinace~~ordinance and permits and to ensure proper erosion and stormwater runoff control.

~~CONCLUSIONS AND RECOMMENDATIONS~~

In summary,~~The~~ HDPP is not likely to cause significant impacts to soil resources through erosion and sedimentation. HDPP has proposed an ambitious program of treating and banking State Water Project water in the aquifer to offset potential project specific and cumulative adverse environmental impacts on groundwater. The success of the proposed project's water supply is contingent on SWP water being available. Staff concludes that allocation of this imported water supply to the project will not cause a significant environmental impact given the recommended mitigation measures. It is also necessary to acknowledge that there is no mechanism to secure a long-term commitment of SWP water to the project. Given increased demand for this water, prolonged drought or court decisions regarding the adjudication, the project may not always be able to secure SWP water. Given that the project will rely on groundwater for unknown periods of time, implementation of staff's recommended mitigation measures will ensure that the project does not contribute to project specific and/or cumulative impacts to local groundwater resources and the base flow of the Mojave River and the associated riparian habitat and endangered species.

PROPOSED CONDITIONS OF CERTIFICATION

SOIL&WATER-1 The project shall not operate unless the following criteria is strictly observed:

1)State Water Project water is used whenever it is available to be purchased from the Mojave Water Agency.

2) Whenever State Water Project water is not available, banked groundwater pumped from the proposed seven HDPP wells that does not exceed the amount of available water determined under Soil&Water-3 below may be used.

Alternative sources of water, including groundwater acquired through the temporary or permanent transfer of free production allowance(s) shall not be used, except for domestic purposes. At the project owner's discretion, dry cooling may be used.

Verification: The project owner shall submit to the CEC CPM a copy of the annual application to the Mojave Water Agency for State Water Project water when it is filed with the agency. The project owner shall submit to the CEC CPM a copy of the Mojave Water Agency's annual approved application for State Water Project. The project owner shall submit to the CEC CPM a copy of the finalized agreement with the Victor Valley Water District.

SOIL&WATER 2 The project owner shall bank 13,000 acre-feet as soon as feasible. If State Water Project water is available, banking should start within six months of the start of rough grading for the project. If prior to the completion of banking of the 13,000 acre-feet, the project starts commercial operation and State Water Project water is not available, banked groundwater may be pumped and used for the project operation. At no time, however, will the amount of pumped water used for the project operation exceed the amount of banked water allowance as determined in condition 3 below. The project owner shall apply for and receive a storage agreement from the Mojave River Basin Watermaster (Mojave Water Agency) prior to the initiation of any groundwater banking.

Verification: The project owner shall submit to the CEC CPM a copy of the application for a storage agreement with the Mojave Water Agency when the application is filed. The project owner shall submit to the CEC CPM a copy of the approved storage agreement from the Mojave Water Agency within 15 days of receipt of the agreement with the anticipated amount of water that will be banked and treated on a monthly basis for the coming year. The project owner shall notify the CEC CPM in writing on a quarterly basis the amount of SWP water that has been treated and injected.

SOIL&WATER 3 The amount of banked groundwater available to the project is based upon the amount of State Water Project water injected by the project owner into the HDPP wells, minus the amount of groundwater pumped by the project owner, minus the amount of dissipated groundwater. The Project Owner shall report by January 15 of each year to the CEC CPM, the amount of groundwater pumped by the project and the amount of groundwater injected into the project. When the amount of banked water

~~available to the project is less than one year's supply (4,000 acre-feet plus what is necessary to compensate for the decay factor), the Project Owner shall report to the CEC CPM these amounts on a quarterly basis. Dissipated groundwater is the amount of banked groundwater that cannot be recaptured through pumping. The annual amount of dissipation is referred to as the decay rate. The amount of banked groundwater water available to the project shall be calculated by staff using the HDPP model, based upon the United States Geologic Service model, FEMFLOW3D. The amount of banked groundwater available will be updated on a calendar year basis by staff taking into account the amount of groundwater pumped by the project during the preceding year and the amount of water banked by the project during the preceding year. Each annual model run will simulate the actual sequence of historic pumping and injection since the injection program began. From the model runs, staff will calculate the decay factor and determine the amount of groundwater available for the new calendar year.~~

~~**Verification**: The project owner shall submit to the CEC CPM in writing each January 15, a monthly accounting for all groundwater pumped and all State Water Project water treated and injected for the preceding year. This information will be used by the CEC staff to update the HDPP model. Staff will run the model, calculate the decay factor and notify the project owner in 30 days of the amount of banked groundwater available to be pumped in the new calendar year.~~

~~**SOIL&WATER 4**: The project owner shall conduct pumping tests in all project wells to establish site-specific hydraulic conductivity and storage parameters of the aquifer system. In addition, the project owner shall modify the HDPP model grid to accommodate the representation of gradational changes in the hydraulic conductivity of the Regional Aquifer, in conformance with the USGS Mojave River Groundwater Basin model. Prior to conducting the pump test, the Project Owner shall submit a plan to the CEC for review and approval detailing the proposed pumping tests.~~

~~All modeling runs referred to in SOIL&WATER 3 shall incorporate the parameters approved by the CEC determined pursuant to this condition.~~

~~Protocol: A pump test allows *in situ* measurement of these parameters by measuring the flow at a pumping well and the resulting lowering of water levels at non-pumping wells in the area.~~

~~The pumping test for each of the HDPP wells shall include the measurement of drawdown in observation wells.~~

~~Observation well(s) for each pumping test must be sufficiently close to the pumping well that pumping produces measurable drawdown of sufficient duration in the observation well(s) to analyze the site-specific hydraulic conductivity and storage factors for the Regional Aquifer.~~

~~In addition, if the observation well data indicates a slow release of groundwater from storage, the pumping test shall be extended until the release from storage can be observed to stabilize in the observation well(s). Single well pumping tests and pumping~~

~~tests that do not produce enough measurable drawdown in observation wells to conclusively calculate aquifer parameters will not meet the conditions of certification.~~

~~At least one of the pumping tests shall include the measurement of drawdown in (1) one shallow observation well that is screened at the water table and (2) one deep observation well that is screened at the same depth as the pumping well.~~

~~The data produced by this pumping test will be used to evaluate the vertical permeability of the groundwater system and the timing of release of groundwater from the water table compared to release from the deep portion of the groundwater system.~~

~~The rest of the pumping tests for all of the other HDPP wells will include the measurement of drawdown in at least one observation well that is screened at the same depth as the pumping well.~~

~~The Model shall be revised to reflect analysis of aquifer parameters from these pumping tests. Based on results of the revised Model, model parameters shall be finalized before project operation begins, including the calculation of the decay-rate formula and graphs of the available balance of banked groundwater over time.~~

~~Verification: The project owner shall submit a plan to the CEC CPM for review and approval a plan detailing the proposed pumping tests on the seven HDPP wells. The project owner shall perform the pumping tests following the CEC approved protocol. The project owner then shall submit a plan detailing how the tests were conducted and the results of the tests. Based upon the information generated by the pumping tests, staff will modify the aquifer parameters used int HDPP model. The project owner shall modify and submit to the CEC CPM the HDPP model grid files to equal those used in the United States Geologic Survey Groundwater Model for the Mojave River Basin. Staff will use this information to correlate the HDPP model with information obtained from the United States Geologic Survey modeling efforts.~~

~~**SOIL&WATER 5**: The project owner must post a bond for post-closure recharge The current model analyses indicate that there may be small, unavoidable negative impacts to the first reach of river, above the Upper Narrows. The model projects a post-closure decline in base flow to the first reach of less than 5 acre-feet/year that will extend for over 25 years. Based on the revised Model results, the amount of the bond will, if necessary, be detemined.~~

~~Verification: : To be determined.~~

~~**SOIL&WATER 6:.** The Project Owners will monitor groundwater levels in all project wells, and all wells within a 1-mile radius of the project on a quarterly basis starting within six months after the start of rough grading. Additional monitoring wells specified by VVWD for the evaluation of well interference within Pressure Zone 2 should also be included.~~

~~Verification: The project owner shall annually submit a copy of the monitoring report to the CEC CPM and the Mojave Water Agency and the Victor Valley Water District.~~

SOIL&WATER 7: The project owner shall submit an approved Waste Discharge Requirement prior to the start of any groundwater banking unless the Regional Water Quality Control Board decides to waive the need to issue a waste discharge requirement or waive the need for the project owner to file a Report of Waste Discharge.

Verification: The project owner shall submit a copy of the approved Waste Discharge Requirement from the Lahontan Regional Water Quality Control Board to the CEC CPM within 60 days of the start of rough grading. The project owner shall also submit a copy of any additional information requested by the Regional Water Quality Control Board as part of their evaluation of the application to the CEC CPM. If the Regional Water Quality Control Board decides to waive the need to file a Report of Waste Discharge or the need for a waste discharge requirement, the project owner shall submit a copy of the letter from the Regional Water Quality Control Board to the CEC CPM. If a waste discharge requirement is required by the Regional Water Quality Control Board, the project owner shall provide a copy of the approved permit to the CEC CPM.

SOIL&WATER 8: The project owner shall prepare and submit to the California Energy Commission and, if applicable, to the Lahontan Regional Water Quality Control Board for review and approval, a water treatment and monitoring plan that specifies the type and characteristics of the treatment processes and identify any waste streams and their disposal methods. The plan shall provide water quality values for all constituents monitored under requirements specified under California Code of Regulations, Title 22 Drinking Water Requirements from all production wells within two miles of the injection wellfield for the last five years.

The plan shall also provide SWP water quality sampling results from Rock Springs, Silverwood Lake or other portions of the East Branch of the California Aqueduct in this area for the last five years. Also identified in the plan will be the proposed treatment level for each constituent based upon a statistical analysis of the collected water information. The statistical approach used for water quality analysis shall be approved prior to report submittal by the California Energy Commission and, if applicable, the Regional Water Quality Control Board. Treatment of State Water Project water prior to injection shall be to levels approaching background water quality levels of the receiving aquifer or shall meet drinking water standards, whichever is more protective. The plan will also identify contingency measures to be implemented in case of treatment plant upset.

The plan submitted for approval should include the proposed monitoring and reporting requirements identified in the Report of Waste Discharge (Bookman-Edmonston 1998d) with any modifications required by the Regional Water Quality Control Board.

Verification: Ninety (90) days prior to banking of State Water Project water within the Regional Aquifer, the project owner shall submit to the Lahontan Regional Water Quality Control Board and the California Energy Commission a proposed statistical approach to analyzing water quality monitoring data and determining water treatment levels. The project owner shall submit the State Water Project water treatment and monitoring plan to the CEC and, if appropriate, the Lahontan Regional Water Quality Control Board for review and approval. The California Energy Commission's review will be conducted in consultation with the Mojave Water Agency, the Victor Valley Water District and the City

~~of Victorville. The plan submitted for review and approval shall reflect any requirements imposed by the Regional Water Quality Control Board through a waste Discharge Requirement.~~

~~**SOIL&WATER 9**: The project owner shall implement the approved water treatment and monitoring plan. All banked SWP water shall be treated to meet local groundwater conditions as identified in condition number 2. Treatment levels may be revised by the California Energy Commission and, if applicable, by the Regional Water Quality Control Board, based upon changes in local groundwater quality identified in the monitoring program not attributable to the groundwater-banking program. Monitoring results shall be submitted annually to the California Energy Commission and, if applicable, to the Regional Water Quality Control Board.~~

~~Verification: :The project owner shall annually submit monitoring results as specified in the approved plan to the CEC CPM. The project owner shall identify any proposed changes to SWP water treatment levels for review and approval by the California Energy Commission and, if appropriate, the Lahontan Regional Water Quality Control Board. The project owner shall notify the Regional Water Quality Control Board and the California Energy Commission of the injection of any inadequately treated SWP water into the aquifer due to an upset in the treatment process or for other reasons. Monitoring results shall be submitted to the CEC CPM~~

~~**SOIL&WATER 10:** The Project Owner shall provide access to the United States Air Force for all efforts to characterize and remediate all soil and groundwater contamination at the power plant site.~~

~~Verification: : The project owner shall submit in writing a copy within two week of receipt of any request from the Air Force for site access to characterize or remediate contaminated soil and/or groundwater.~~

~~**SOIL&WATER 11** Prior to beginning any clearing, grading or excavation activities associated with closure activities, the project owner must submit a notice of intent to the State Water Resources Control Board to indicate that the project will operate under provisions of the General Construction Activity Storm Water Permit. As required by the general permit, the project owner will develop and implement a Storm Water Pollution Prevention Plan (SWPPP).~~

~~Verification: :Two weeks prior to the start of construction, the project owner will submit to the CPM a copy of the Storm Water Pollution Prevention Plan (SWPPP).~~

~~**SOILS&WATER 12** Prior to the initiation of any earth moving acitivites, the project owner shall submit a erosion control and revegetation plan for staff approval. The final plan shall contain all the elements of the draft plan with changes made to address the final design of the project.~~

~~Verification: :The final erosion control and revegetation plan shall be submitted to the CPM for approval 30 days prior to the initiation of any earth moving activities~~

PROPOSED CONDITIONS OF CERTIFICATION

SOIL&WATER 1 The only water used for project operation (except for domestic purposes) shall be State Water Project (SWP) water obtained by the project owner consistent with the provisions of the Mojave Water Agency's (MWA) Ordinance 9.

a. Whenever SWP water is available to be purchased from MWA, the project owner shall use direct delivery of such water for project operation.

b. Whenever water is not available to be purchased from the MWA, the project owner may use SWP water banked in the seven HDPP wells as identified in Figure Number 1 of the Addendum Number 1 to the "Evaluation of Alternative Water Supplies for the High Desert Power Project" (Bookman-Edmonston 1998) as long as the amount of water used does not exceed the amount of water determined to be available pursuant to SOIL&WATER 5.

c. If there is no water available to be purchased from the MWA and there is no water available to be pumped, as determined pursuant to SOIL&WATER 5, no groundwater may be pumped, and the project may not operate. At the project owner's discretion, dry cooling may be used instead, if an amendment to the Commission's is decision is approved.

Verification: The project owner shall submit to the California Energy Commission (CEC) Compliance Project Manager (CPM) a copy of the annual application to the MWA for SWP water when it is filed with the agency. The project owner shall submit to the CEC CPM a copy of the MWA's annual approved application for SWP water. The project owner shall submit to the CEC CPM a copy of the finalized agreement with the Victor Valley Water District (VVWD).

SOIL&WATER 2 The project owner shall provide evidence of a storage agreement between the Mojave Basin Area Watermaster (Mojave Water Agency) and VVWD prior to the initiation of any groundwater banking.

Verification: The project owner shall submit to the CEC CPM a copy of the application for a storage agreement with the Mojave Basin Area Watermaster when the application is filed. The project owner shall submit to the CEC CPM a copy of the approved storage agreement from the Mojave Basin Area Watermaster within 15 days of receipt of the agreement.

SOIL&WATER 3 The project owner shall provide a copy of a "Will Serve Letter" from VVWD to the CEC CPM prior to the start of commercial operation.

Verification: The project owner shall provide a copy of a "Will Serve Letter" from VVWD to the CEC CPM within 30 days of its receipt by the project owner.

SOIL&WATER 4 The project owner shall inject 1000 acre-feet of SWP water within 12 months of the commencement of the commercial operation. During this period, the project owner may pump banked groundwater that is available to the project as determined by SOIL&WATER 5.

Verification: The project owner shall provide a monthly report to the CEC CPM and to the CDFG on the progress of construction of the project wells, the amount of SWP water injected and the amount of groundwater pumped during the period beginning 18 months from the start of rough grading to the end of the first 12 months of commercial operation. The project owner shall provide the CEC CPM and the CDFG with verification that 1,000 acre-feet of SWP water has been injected within one month of the start of the second year of commercial operation.

SOIL&WATER 5 The amount of banked groundwater available to the project during the first 12 months of commercial operation is the amount of SWP water injected by the project owner into the High Desert Power Project (HDPP) wells minus the amount of groundwater pumped by the project owner, minus the amount of dissipated groundwater. The amount of banked groundwater available to the project after the first 12 months of commercial operation is the amount of SWP water injected by the project owner into the HDPP wells, minus the amount of groundwater pumped by the project owner, minus the amount of dissipated groundwater, minus 1,000 acre feet.

The amount of banked groundwater water available to the project shall be calculated by the CEC Staff using the HDPP model, based upon the United States Geological Survey (USGS) model, FEMFLOW3D. The amount of banked groundwater available shall be updated on a calendar year basis by the CEC Staff, taking into account the amount of groundwater pumped by the project during the preceding year and the amount of water banked by the project during the preceding year. Each annual model run shall simulate the actual sequence of historic pumping and injection since the injection program began. From the model runs, the CEC Staff shall determine the amount of groundwater available for each new calendar year. If the amount of banked groundwater available to the project is less than one year's supply plus 1,000 acre-feet, the CEC Staff shall determine the amount of groundwater available to the project on a quarterly basis.

Verification: The project owner shall submit to the CEC CPM and to the CDFG in writing on a quarterly basis, a monthly accounting of all groundwater pumped and all SWP water treated and injected for the preceding quarter. Within 30 days of receipt of the approved storage agreement, pursuant to SOIL&WATER 2, the project owner shall submit to the CEC CPM and to the CDFG an annual written estimate of the anticipated amount of SWP water that will be banked and the anticipated amount of groundwater that will be pumped in the coming year. If the amount of banked groundwater available to the project is less than one year's supply plus 1,000 acre-feet, quarterly estimates of anticipated injection and withdrawal will be required; under these conditions, the project owner shall submit to the CEC CPM and to the CDFG a quarterly written estimate of the anticipated amount of SWP water that will be banked and the anticipated amount of groundwater that will be pumped in the coming quarter.

CEC Staff shall use this information in the HDPP model to evaluate the amount of banked groundwater available and to calculate the approximate rate of decay. CEC Staff shall notify the project owner within 30 days of the amount of banked groundwater available to be pumped in the new calendar year or in the next quarter, if applicable.

SOIL&WATER 6 By the end of the fifth year of commercial operation, the amount of water injected minus the amount of banked groundwater used for project operation shall meet or exceed 13,000 acre-feet.

Verification: The project owner shall submit verification to the CEC CPM and the CDFG that the amount of injected groundwater minus the amount of banked groundwater pumped equals or exceeds 13,000 acre feet of water within one month of the start of the sixth year of commercial operation.

SOIL&WATER 7: After the fifth year of commercial operation and until three 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 1,000 acre-feet. Once the limit of 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

During the three years prior to project closure, the project owner may withdraw the balance of banked groundwater determined to be available to the project, except for 1,000 acre-feet, pursuant to SOIL&WATER 5. The project owner is not required to replace this final withdrawal of groundwater. However, during the three years prior to project closure, at no time may the balance of banked groundwater decline below 1,000 acre-feet. Furthermore, there must be a remaining balance of 1,000 acre-feet banked in the groundwater system at closure, as determined to be available to the project pursuant to SOIL&WATER 5.

Verification: The project may use the verification for SOIL&WATER 6 for SOIL&WATER 7; however, in addition, the facility closure plan submitted three years prior to closure to the CEC CPM and the CDFG shall specify any plans for the pumping of any banked groundwater available to the project.

SOIL&WATER 8 The project owner shall conduct pumping tests in all project wells to establish in situ hydraulic parameters including transmissivity and storativity in the Regional Aquifer. From these parameters and the project well-log data, the project owner shall calculate the following site-specific values:

- effective horizontal hydraulic conductivity'
- effective vertical hydraulic conductivity
- specific yield, if pumping tests indicate the aquifer is unconfined, or
- specific storage, if aquifer is confined.

Prior to conducting the pumping test, the project owner shall submit a work plan detailing the methodology to be used to conduct the proposed pumping tests and to calculate the specified parameters and values to the CEC CPM and to the CDFG for review and approval.

Based upon the information generated by the pumping tests, CEC Staff shall revise the HDPP model to reflect the results of the pumping tests. All modeling runs referred to in SOIL&WATER 5 shall incorporate the results of these pumping tests, following approval by the CEC CPM determined pursuant to this condition.

Protocol: The pumping tests shall provide data to calculate the *in situ* hydraulic parameters of the Regional Aquifer.

- At a minimum the pumping tests for all HDPP wells shall include the measurement of drawdown in at least one non-pumping (observation) well that is screened at the same depth as the pumping well.
- Observation well(s) for each pumping test must be sufficiently close to the pumping well that pumping produces measurable drawdown of sufficient duration in the observation well(s) to analyze the site-specific hydraulic parameters including transmissivity and storativity in the Regional Aquifer.
- In addition, if the observation well data indicates a slow release of groundwater from storage, the pumping test shall be extended until the release from storage can be observed to stabilize in a plot of the data from the observation well(s). (For a description of the evaluation of storativity under slow release conditions, see Driscoll, F.G., 1986, Groundwater and Wells, H.M. Smyth, Inc., p. 229-230).
- Single well pumping tests and pumping tests that do not produce enough measurable drawdown in observation wells to conclusively calculate hydraulic parameters will not meet the conditions of certification.

Verification: The project owner shall submit to the CEC CPM and to the CDFG six month prior to the start of pumping tests, the work plan that details the methodology for conducting the proposed pumping tests on the seven HDPP wells and for calculating the specified parameters and values. With the approval of the work plan by the CEC CPM, in consultation with the CDFG, the project owner shall perform the pumping tests following the CEC protocol.

Within two months after the completion of pumping tests, the project owner shall submit to the CEC CPM and to the CDFG a report detailing how the pumping tests were conducted and the results of the tests, including the calculation of (1) the *in situ* hydraulic parameters of transmissivity and storativity for the Regional Aquifer and (2) the site-specific values of effective horizontal hydraulic conductivity, effective vertical hydraulic conductivity, and specific yield and/or specific storage.

SOIL&WATER 9 The project owner shall modify the HDPP model grid to accommodate the representation of gradational changes in the hydraulic conductivity of the Regional Aquifer, in conformance with the USGS Mojave River Groundwater Basin model.

The CEC Staff shall revise the HDPP model, using the modified grid, to incorporate the gradational changes in the hydraulic conductivity of the Regional Aquifer represented in the USGS Mojave River Groundwater Basin model.

All modeling runs referred to in SOIL&WATER 5 shall incorporate the modifications of the model along with the model information obtained from the USGS following approval by the CEC CPM determined pursuant to this condition.

Verification: The project owner shall submit the modified model grid input files (including updated versions of any other input files that are effected by the modification of the grid) within two months after the construction of the HDPP wells to the CEC Staff for review and approval, in consultation with the CDFG.

SOIL&WATER 10 The project owner shall prepare an annual report of describing groundwater level monitoring performed as follows. The project owner shall monitor groundwater levels in all project wells, in VVWD wells 21, 27, 32, and 37, in Adelanto wells 4 and 8a, and in all other wells within a 1-mile radius of the project wells. Groundwater monitoring shall also be conducted within the Mojave River Aquifer Alluvium. Additional monitoring wells specified by VVWD for the evaluation of well interference within Pressure Zone 2 should also be included. Monitoring shall be performed on a quarterly basis starting within six months after the start of rough grading.

Verification: The project owner shall annually submit a copy of the groundwater level monitoring report to the CEC CPM, the CDFG, the MWA and the VVWD.

SOIL&WATER 11 The project owner shall submit an approved Waste Discharge Requirement prior to the start of any groundwater banking unless the Regional Water Quality Control Board (RWQCB) decides to waive the need to issue a waste discharge requirement or waive the need for the project owner to file a Report of Waste Discharge.

Verification: The project owner shall submit a copy of the approved Waste Discharge Requirement from the Lahontan RWQCB to the CEC CPM within 60 days of the start of rough grading. The project owner shall also submit to the CEC

CPM a copy of any additional information requested by the RWQCB as part of their evaluation of the application. If the RWQCB decides to waive the need to file a Report of Waste Discharge or the need for a waste discharge requirement, the project owner shall submit a copy of the letter from the RWQCB to the CEC CPM. If a waste discharge requirement is required by the RWQCB, the project owner shall provide a copy of the approved permit to the CEC CPM.

SOIL&WATER 12 The project owner shall prepare and submit to the CEC CPM and, if applicable, to the Lahontan RWQCB for review and approval, a water treatment and monitoring plan that specifies the type and characteristics of the treatment processes and identify any waste streams and their disposal methods. The plan shall provide water quality values for all constituents monitored under requirements specified under California Code of Regulations, Title 22 Drinking Water Requirements from all production wells within two miles of the injection wellfield for the last five years.

The plan shall also provide SWP water quality sampling results from Rock Springs, Silverwood Lake or other portions of the East Branch of the California Aqueduct in this area for the last five years. Also identified in the plan will be the proposed treatment level for each constituent based upon a statistical analysis of the collected water information. The statistical approach used for water quality analysis shall be approved prior to report submittal by the CEC CPM and, if applicable, the RWQCB. Treatment of SWP water prior to injection shall be to levels approaching background water quality levels of the receiving aquifer or shall meet drinking water standards, whichever is more protective. The plan will also identify contingency measures to be implemented in case of treatment plant upset.

The plan submitted for approval should include the proposed monitoring and reporting requirements identified in the Report of Waste Discharge (Bookman-Edmonston 1998d) with any modifications required by the RWQCB.

Verification: Ninety (90) days prior to banking of SWP water within the Regional Aquifer, the project owner shall submit to the Lahontan RWQCB and the CEC CPM a proposed statistical approach to analyzing water quality monitoring data and determining water treatment levels. The project owner shall submit the SWP water treatment and monitoring plan to the CEC CPM and, if appropriate, to the Lahontan RWQCB for review and approval. The CEC CPM's review will be conducted in consultation with the MWA, the VVWD and the City of Victorville. The plan submitted for review and approval shall reflect any requirements imposed by the RWQCB through a waste Discharge Requirement.

SOIL&WATER 13 The project owner shall implement the approved water treatment and monitoring plan. All banked SWP water shall be treated to meet local groundwater conditions as identified in condition number 2. Treatment levels may be revised by the CEC and, if applicable, by the RWQCB, based upon changes in local groundwater quality identified in the monitoring program not attributable to the groundwater-banking program. Monitoring results shall be submitted annually to the CEC CPM and, if applicable, to the RWQCB.

Verification: The project owner shall annually submit monitoring results as specified in the approved plan to the CEC CPM. The project owner shall identify any proposed changes to SWP water treatment levels for review and approval by the CEC and, if appropriate, the Lahontan RWQCB. The project owner shall notify the RWQCB, the VVWD and the CEC CPM of the injection of any inadequately treated SWP water into the aquifer due to an upset in the treatment process or for other reasons. Monitoring results shall be submitted to the CEC CPM

SOIL&WATER 14 The project owner shall provide access to the United States Air Force for all efforts to characterize and remediate all soil and groundwater contamination at the power plant site.

Verification: The project owner shall submit in writing a copy within two weeks of receipt of any request from the Air Force for site access to characterize or remediate contaminated soil and/or groundwater to the CEC CPM.

SOIL&WATER 15 Prior to beginning any clearing, grading or excavation activities associated with closure activities, the project owner must submit a notice of intent to the State Water Resources Control Board to indicate that the project will operate under provisions of the General Construction Activity Storm Water Permit. As required by the general permit, the project owner will develop and implement a Storm Water Pollution Prevention Plan.

Verification: Two weeks prior to the start of construction, the project owner will submit to the CEC CPM a copy of the Storm Water Pollution Prevention Plan.

SOIL&WATER 16 Prior to the initiation of any earth moving activities, the project owner shall submit an erosion control and revegetation plan for CEC Staff approval. The final plan shall contain all the elements of the draft plan with changes made to address the final design of the project.

Verification: Thirty days prior to the initiation of any earth moving activities, the final erosion control and revegetation plan shall be submitted to the CPM for approval, in consultation with the CDFG.