

## CALIFORNIA ENERGY COMMISSION

1516 NINTH STREET  
SACRAMENTO, CA 95814-5512



April 9, 1999

Mr. Andrew Welch  
High Desert Power Project, LLC  
3501 Jamboree Road, South Tower Suite.  
Newport Beach, CA 92660

Dear Mr. Welch:

Per the High Desert Power Project Committee's March 9, 1999 order, please find enclosed staff's revisions/supplemental analysis concerning:

1. Cooling Technologies (including topics affected by use of dry cooling)<sup>1</sup>:
  - a. public health,
  - b. reliability,
  - c. efficiency,
  - d. visual resources,
  - e. noise, and
  - f. waste management,
2. Biological Resources,
3. Cultural Resources, and
4. Proposed Water Resources condition of certification to address the Lahontan Regional Water Quality Control Board requirements.

Based on our most recent conversations with the applicant and CURE, we understand these parties are attempting to reach agreement on all disputed areas by the Second Prehearing Conference on April 16, 1999. At this time, staff has no knowledge of the content or progress of the discussions between the applicant and CURE. Nor do we know whether the negotiations will resolve outstanding issues to the satisfaction of all agencies and parties involved in this proceeding. Consequently, we can not provide revised air quality, water resources or public health testimony at this time.

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<sup>1</sup> No changes to the staff's facility design testimony are required to address the possible dry cooling mitigation. The conditions of certification in staff's testimony are adequate to address the possible change in cooling technology.

If you have any questions, please call me at (916) 653-1614, or E-mail me at [rbuell@energy.state.ca.us](mailto:rbuell@energy.state.ca.us).

Sincerely,

Richard K. Buell  
Siting Project Manager

Enclosure

cc: Proof of Service, 97-AFC-1

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April 9 Submittals.doc

# COOLING TOWERS - WET, DRY, AND WET/DRY HYBRID

Testimony of Matthew S. Layton

## INTRODUCTION

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The proposed High Desert Power Project (HDPP) specifies a wet cooling tower to reject heat from the steam cycle of the combined cycle project. The wet cooling tower water supply will be the State Water Project (SWP). Water imported by the Mojave Water Agency will be used directly by HDPP at the project, or indirectly through the pumping of groundwater that is recharged with SWP water. Issues have arisen regarding the appropriateness and magnitude of inland water use by this and other power plants for cooling.

This section describes some of the commercially and technically feasible cooling technologies available to power plant developers, and some of the tradeoffs between the technologies. We believe that alternate cooling technologies are technically feasible at the High Desert Power Project site, and the multitude of design options offer a power plant designer many opportunities to balance costs, production, and environmental impacts. In particular, dry and hybrid cooling technologies are very effective in reducing water use and visible plume formation. That said, these many options also make it difficult to specify how the project would change if an alternate cooling tower technology were used. There are numerous site, design, construction and operational variables that would affect the initial, operating, and maintenance costs of the cooling technologies and project, and the production costs from the facility.

## TECHNOLOGY DESCRIPTIONS

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Historically, power plants have used once-through cooling to reject heat directly to an adjacent body of water. With increasing concerns over thermal pollution and conjunctive water uses, cooling towers have become more common, either as an intermediary step to cool the water prior to being returned to the body of water, or to reject the heat directly to the atmosphere.

Cooling towers reject heat from a power plant's steam (rankine) cycle to condense the steam exiting the steam turbine and to maintain the lowest possible condenser vacuum, and thus, improve the power plant energy efficiency. The heat rejection mechanism in wet cooling towers is primarily the evaporation of water to the atmosphere. Dry cooling towers transfer sensible heat through heat exchangers, while wet/dry hybrid cooling towers use combinations of the two mechanisms to reject heat to the atmosphere. Cooling towers use forced or induced draft to move ambient air, and pumps to move water through the tower. The ambient air temperature, humidity, and air and water mass flow rates affect the heat transfer rate and, ultimately, the efficiency of the cooling tower. The cooling tower heat rejection efficiency and pump and fan loading affect the overall power plant thermal efficiency and output.

The technology descriptions below are for the most commonly used cooling tower designs. There are variations to these designs, and many other unique and technically feasible designs that are available to power plant designers, the specifics of which are not described here.

## **WET COOLING TOWERS**

Wet cooling tower systems circulate a large volume of cooling water through the steam condenser to reject heat from the steam cycle. The circulating water passed through the condenser and then is sent to the cooling tower. In the cooling tower heat is rejected to the atmosphere through evaporation. Circulating cooling water loses are to evaporation, drift, and blow-down, which requires make-up water to be added to the system. Contaminants are concentrated in the circulating cooling water as water is evaporated. Additional contaminants are introduced into the circulating cooling water as the air and water are mixed in the cooling tower. Ancillary systems are used to control biological growth and adjust the chemical composition as water is lost and added.

Large fans are used to move air counter to the water flow to facilitate the evaporation process. However, natural draft tower designs can also be used to move the air through the tower. The air exits the tower warmer than the ambient air. The warm air rises as a plume, and can become visible if the moisture in the plume condenses into visible droplets (i.e., cloud formation). The towers are designed to uniformly distribute the hot water across the top of the tower and break the flow into small droplets or thin films. The evaporation process occurs as the water cascades down through a torturous path that maximizes air/water mixing. The cooled water is collected in a sump, augmented with make-up water, and returned to the condenser. Drift eliminators control the amount of water droplets that escape out the top of the tower. Minimizing drift is important to reduce water losses, maximize heat rejection, and reduce visible plume occurrences. Drift escaping the cooling tower is unrealized cooling and wasted water.

Wet cooling tower performance is a function of the wet bulb and the approach temperatures. Wet-bulb is the air temperature that would result if ambient air were saturated (to 100% humidity) with water; dry-bulb is the ambient temperature. Wet-bulb temperature is less than or equal to dry-bulb temperature, depending on the starting humidity of the ambient air. Wet cooling is more effective than dry cooling in dry low-humidity areas.

The approach temperature is the difference between the temperature of the cold water exiting the cooling tower and the air temperature (wet bulb for a wet cooling tower) entering the cooling tower. While it would be desirable to design to achieve an approach of zero, in reality, 6 to 10 °F is the most cost effective and common for mechanical draft wet cooling towers (Burns 1995). Lower approach temperatures can be designed for with a larger heat transfer surface area (a bigger tower to spread out water flows), a longer residence time, or higher air flows, all at higher initial or operating costs.

## ***DRY COOLING TOWERS***

### **DIRECT DRY COOLING**

In the direct dry cooling system, steam exhausts from the turbine to a manifold radiator system. The steam condenses in the radiator system as heat is conducted through the pipe walls to the atmosphere. Often the piping is finned on the airside to increase the heat transfer surface area and rate. In mechanical draft systems, fans move air through the radiator to enhance heat transfer.

Because the steam is condensed directly in the radiator system, and is returned to the boiler as feed water, direct dry cooling does not have a huge volume of circulating cooling water. The closed system does not experience water losses due to evaporation. Additionally, without evaporation, the cooling water system does not become concentrated with salts and impurities, requiring additional losses through a blow-down stream. Therefore, dry cooling does not require the large volumes of make-up water that are necessary in wet cooling systems. Nor does it require ancillary systems to control biological growths, and control water chemistry to the degree that a wet cooling tower does (the steam/boiler water chemistry would still need to be monitored).

The amount of cooling that can be achieved is related to the dry-bulb temperature of the ambient air and the approach temperature. Dry bulb temperature is the measured temperature of the air, regardless of humidity. The approach temperature is the difference between the cold water (exiting the cooling tower) temperature and the air temperature (dry bulb for a dry cooling tower) entering the cooling tower. Approach temperatures in the range of 35 to 60 °F are generally available for dry cooling towers (Ortega 1995 and Hutton 1997), with 35 to 40 °F considered a relatively small approach temperature (Bonger 1995). If a process requires an approach temperature below 30 to 40 °F, in the range of 20 °F, designers generally recommend wet cooling towers (Bukowski 1995). The lower approach temperatures can be achieved through a larger heat transfer surface area, a longer residence time, or higher air flows.

The larger volume of steam-containing piping, relative to a wet system steam condenser, and the associated seals, valves, flanges, etc., offers more opportunities for oxygen ingress due to the vacuum created during the condensing process. Increasing oxygen content in the boiler water generally leads to increasing corrosion; additional boiler water treatment/deaerators would be required to control oxygen.

### **INDIRECT DRY COOLING**

An indirect dry cooling system uses a secondary working fluid to transfer the heat from the steam cycle to the atmosphere. In the indirect cooling system, a closed cycle system extracts heat from the condenser and rejects the heat through a radiator system. The secondary working fluid can be water, ammonia, or a fluid/mixture with heat transfer and properties suited to the temperatures and heat transfer regime.

The performance of the indirect dry cooling tower is still a function of the dry bulb temperature. Pumps are required to move the working fluid through the condenser and radiator system. For those indirect dry systems using water, the initial fill of the circulating system requires treated water. Since the fluid is not evaporated or exposed to ambient air, extensive biological and water chemistry systems are not required.

### ***WET/DRY HYBRID COOLING TOWERS***

Wet/dry hybrid cooling towers use both an evaporative system and a radiator system to reject heat from the condenser. The ratio of dry to wet depends on the ambient conditions and the desired heat rejection, water savings, or visible plume reductions. Because the dry radiator system rejects heats into the air moving through the tower without adding moisture, it is often used in series or parallel with the wet portion to control visible plume formation. The key to the hybrid system is controlling the two systems to achieve the desired heat rejection (operational constraints), visible plume reduction, and/or water savings while balancing pump and fan loads.

In a series configuration, a wet/dry hybrid cooling tower evaporative section rejects heat by evaporating moisture into the air to levels approaching saturation. If this saturated, or near saturated, air were immediately rejected into the environment, the warm plume would rise, and become visible as the moisture in the plume cooled and condensed. By arranging the tower in series, the dry radiator section rejects additional heat into the saturated air stream without adding additional moisture. The air stream then exits the tower at a higher temperature and lower relative humidity, compared to a wet system, which will take longer to cool to the point of condensing. This additional time can allow the plume to dissipate before a visible plume has time to form.

In a parallel configuration, the heat rejection mode depends on the meteorological conditions. Cool ambient air temperatures, that generally promote visible plume formation, are also those conditions that improve the heat rejection effectiveness of dry cooling system. Visible plumes are less likely to form during warmer ambient air temperatures. Warmer air can hold more moisture, thereby improving the cooling potential from the evaporative wet cooling tower. The control logic balances the ambient conditions and plume control with the desired cooling system performance by rejecting heat in both towers, at some ratio, or in one tower exclusively.

## **COOLING TOWER TECHNOLOGY COMPARISONS**

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A comparison of dry, hybrid, and wet cooling towers ultimately depends on the specific needs of the proposed project. Dry and hybrid-cooling systems provide benefits in the areas of water use and plume visibility, but with some performance degradation and different costs. A quantitative discussion follows, in order to allow a reader to discern to advantages and disadvantages of the potential cooling schemes. While this testimony attempts to introduce issues that may arise in the various technical disciplines from the use of dry or hybrid cooling towers on the

HDPP, more detailed discussions regarding others issues and impacts can be found in other sections of the staff analysis.

## **ENVIRONMENTAL COMPARISON**

Cooling tower technology characteristics are compared in Table 1. These may include, for example, higher potential noise impacts for dry or hybrid cooling systems relative to a wet system due to larger fans to move more ambient air through the tower. Induced draft towers obviously will not have fan noise or loads, but the parabolic cooling towers used to induce the draft can be large, costly and visually obtrusive. More detailed discussions follow the table.

## **COSTS COMPARISON**

In general, dry cooling towers are more expensive than a wet system. For hybrid systems, which basically require the design and construction of two cooling systems, costs range from less than dry cooling systems to more than dry cooling systems, depending on the ratio of "wet to dry" cooling in the hybrid design. In general, the initial cost differences are due to:

- the dry condenser, or heat exchanger;
- the taller structures for dry and hybrid cooling systems; and
- larger fans and motors for dry and hybrid cooling systems.

Despite the cost differences, dry and hybrid cooling systems are occasionally used because, compared to wet systems, they use less water and reduce the occurrence of visible plumes. Additionally, dry and hybrid systems may experience simpler and quicker permitting since they do not use as much water and chemicals as wet systems (Kosten 1995 and Armstrong 1973). Dry and hybrid cooling systems are, however, less efficient in rejecting heat, and generally have higher parasitic (fan) electrical loads and can create a higher pressure (temperature) in the steam turbine condenser (Burns 1995). Both of these factors decrease the thermal efficiency and power output of the plant.

The High Desert Power Project estimated that the initial capital costs of a wet/dry hybrid cooling system would be two times, and a dry cooling system would be more than two and one-half times the cost of the proposed wet system (HDPP 1998). The details of what ancillary equipment are included in these estimates is unclear, but the estimates do not appear to include the groundwater banking program or water treatment equipment. However, discussions with cooling tower vendors confirm a similar overall cost trend for the basic dry and wet cooling tower equipment. For the San Francisco Energy Project, it was estimated that dry cooling towers would cost 2 to 3 times as much as the proposed hybrid cooling system (Ortega 1995). In this case, a hybrid system was proposed to provide some visible plume reduction, but the dry configuration was a small portion of the proposed hybrid system.

**Table 1 – Qualitative Comparison of Cooling Tower Environmental Characteristics**

<b>Environmental Impact</b>	<b>Wet Cooling</b>	<b>Wet/Dry Cooling</b>	<b>Dry Cooling</b>
<b>Water Supply</b>	Highest supply and treatment requirements	Intermediate supply and treatment requirements	None
<b>Water discharge</b>	Highest discharge and treatment requirements	Intermediate discharge and treatment requirements	None
<b>Plant efficiency/ Fuel supply</b>	Baseline	Lower plant efficiency or higher fuel demand	Lower plant efficiency or higher fuel demand
<b>Plant Emissions</b>	Baseline	Can be higher if additional fuel used	Can be higher if additional fuel used
<b>Auxiliary power requirements</b>	Some	More than wet	Most compared to wet
<b>Secondary emissions</b>	Salt deposition from cooling tower drift	Less salt deposition from cooling tower drift	No secondary emissions
<b>Land requirements</b>	Baseline	Similar to more	Similar to more
<b>Visual impact – Structural</b>	Least obtrusive	Taller structure compared to wet	Taller structure compared to wet
<b>Visual impacts – Plume</b>	Visible plume, function of ambient temperatures	Plume occurrence can be reduced to almost zero	No plume
<b>Noise</b>	Lowest	Can be higher than wet	Can be higher than wet

(HDPP 1998)

Calpine estimates that the proposed Sutter project costs increase by a net of \$20 to 25 million with the redesign to dry cooling/zero discharge plant. The exact ratio is uncertain, but the net increase is almost 10% of the total project cost.

Other studies have found that initial capital investment costs for dry and hybrid equipment compared to wet can be three to four times higher. Secondary facilities needed for wet systems reduce this ratio to two to three. Incorporating parasitic power for pumps and fans results in a ratio of one and one-half to two. If factors such as real costs for water and waste discharge requirements are considered for a new project, the initial costs of the various cooling systems may be very similar (Kosten 1995).

However, the site characteristics and project design, construction, and operational constraints may cause the initial and operational costs to vary considerably from

project to project, regardless of cooling tower technology. The initial costs are highly dependent on the performance requirements. A wet cooling tower designed to achieve 10 °F approach temperature can cost 1½ times as much as a wet cooling tower designed to achieve a 15 °F approach, and can cost almost twice as much as a wet cooling tower designed for a 20 °F approach (Bukowski 1995).

## **WATER USE**

The High Desert Power Project estimates water use to be more than 4,600 gallons per minute (gpm) or 4000 acre-feet per year, most of which will be consumed by the wet cooling tower system in the evaporation process and blow-down streams. Installing dry cooling could reduce project water consumption by approximately 95% (or a reduction of 4,370 gpm or 3,800 acre-feet per year).

A hybrid system would also reduce project water consumption. The water savings realized are close, but not directly proportional, to the “wet-dry” ratio. The hybrid cooling tower water savings depend on a complicated relationship of the relative sizing of the wet and dry systems, and the seasonal meteorological conditions and varying use of the wet and dry systems in those seasons. In hot, dry conditions, the wet cooling tower is most effective system for rejecting heat because of high evaporation rates. With higher evaporation rates, impurities are concentrated in the circulating water more quickly, increasing water losses through increased blow-down. In cool or humid conditions, dry cooling towers become almost as effective as wet cooling towers, increasing their use and reducing project water consumption. Project water consumption does not reach zero using most hybrid systems because the dry systems are not usually sized to reject 100% of the heat load, requiring the wet system to almost always be in use simultaneously. Calpine submitted some information for the Sutter project on dry and hybrid cooling systems, in which they estimated that a 50/50 wet dry system would use approximately 60 percent of the water that a wet system would require (Calpine 1998).

While saving water is technically feasible using alternatives to wet cooling, the breakeven water costs can be high. One study found that desalination of seawater for a wet cooling tower would still be more cost effective than dry cooling (Beck 1982).

## **PERFORMANCE EFFECTS**

### ***HEAT RATE/GENERATION OUTPUT LOSSES***

Combined cycle project performance is influenced less, compared to a steam-cycle only project, by the cooling tower technology in that it only affects the steam side of the combined cycle project and not the performance of the gas turbine, as shown in Table 2. However, dry cooling at a 600 MW combined cycle plant in Turkey resulted in a plant thermal efficiency of 47%, which is less than the 50+% most combined cycle plants expect to operate (Bartz 1998). Additional fuel can be burned to overcome some or all of the loss of output, but the fuel will be an additional operating cost and will produce additional air pollutant emissions.

**Table 2 - Thermal Power Dissipated by the Cooling tower as a Function of the Power Plant Type**

Station Type	Electrical Production (MW)	Efficiency (%)	Dissipated Power (MW)
Thermal	460	42	635
Nuclear	460	35	855
Combined Cycle	460	50 +	
- gas turbine	2 X 145	-	-
- steam turbine	1 X 170	33	345

(Source: Mirsky 1997)

Any difference between wet and dry bulb temperature, particularly those in California during the hot dry summer months, results in differences between wet and dry cooling tower performance. This is because colder water can produce a better vacuum in generating plants, decreasing turbine back pressure, which increases output for the same energy input (Burger 1995 and Cooper 1997). A wet system may provide less than two inches of mercury (< 2" Hg) or 1.0 pounds per square inch absolute (1.0 psia) versus 4" to 8" Hg (2 to 4 psia) for a dry cooling tower, during any given day (Ortega 1995). In the winter, when the ambient temperatures are lower and differences between wet and dry bulb temperatures diminish, the difference in cooling tower performances are not as marked. However, differences in approach temperatures between the cooling technologies will continue to be reflected in differences in condenser vacuum and turbine backpressure.

Additionally, the steam turbine must be designed for the expected vacuum range for the turbine to operate at its optimum to maximize output. Turbine performance degradation and output reduction will occur at higher back pressures, and will be even worse in the steam turbine is not designed (optimized) for the range of back pressures obtainable with a dry cooling tower (Burns 1995). Steam turbines that can handle widely varying outlet conditions are available. It would be cost effective select this type of turbine to match the turbine and cooling tower conditions initially, rather than retrofit a steam turbine later or operate at less than optimum conditions.

The summer design conditions at HDPP are 98 °F with a relative humidity of 28%, which is a wet bulb temperature of 72 °F. The annual average temperature is 59 °F and 60% relative humidity, i.e., an ambient dry bulb temperature of 59 °F and a wet bulb temperature of 51.5 °F. Given the differences between dry- and wet-bulb temperatures, and approach temperatures in the range of 6 to 10 °F for wet cooling towers and 30 to 60 °F for dry cooling towers, one can see that the steam turbine will see considerably different back pressures with different cooling towers.

**PARASITIC LOADS**

Wet cooling tower parasitic loads generally consume 0.75 to 1.5% of the gross rankine cycle generation (Kosten 1995). Power demand for an air-cooled condenser fan are more than the power demand of a wet cooling tower's fan and pump, while indirect dry cooling tower's fan and pump loads are almost double that

of a wet cooling tower (Kosten 1995). These do not consider ancillary power demands, for example, that are required for a complicated water production system that delivers and cleans make-up water to the site.

## **AIR POLLUTANT EMISSIONS**

### **COOLING TOWER EMISSIONS**

Particulate matter less than 10 microns (PM10) emissions from wet and wet/dry hybrid cooling towers are a function of total dissolved and suspended solids in the circulating water system, and the drift rate. The dissolved and suspended solids are emitted in the cooling drift. Limiting the number of cycles of the circulating water, using cleaner make-up water, using more dry cooling in a hybrid system, and reducing the drift rate can control the PM10 emissions from the tower. Alternatively, using dry cooling exclusively can reduce PM10 emissions from the cooling tower to zero.

Reducing PM10 emission can reduce the amount of PM10 offsets that a project will have to provide. Additionally, reducing or eliminating the PM10 emissions can reduce the estimated air quality impacts from the tower. The air dispersion modeling results indicate that PM10 impacts from cooling towers are higher than the impacts associated with the power plant stacks, notwithstanding the fact that the cooling towers actually have lower PM10 emission rates than the power plant stack. The low temperature and velocity of the cooling tower exhaust stream appear to skew the modeling results more so than the actual PM10 emission rate of the sources.

### **TURBINE/HRSG STACK EMISSIONS FROM ADDITIONAL FUEL USE**

Additional fuel can be fired to overcome some of the capacity losses due to higher condenser backpressures. However, since the low thermal efficiency of the steam cycle (see Table 1) is degraded further, firing additional fuel in the heat recovery steam is not the most efficient method to make up capacity losses. Firing additional fuel in the combustion turbine can take advantage of the high overall project efficiency (50+ %), but increased output from the combustion turbine generator comes at the expense of higher combustion turbine maintenance costs and potentially lower reliability and availability.

Regardless of how the fuel is fired, additional fuel combustion leads to additional combustion emissions. For most natural gas-fired combined cycle gas turbine projects, which are comparatively clean anyway, the increase in emission should not cause air quality impacts. However, for most project sites in California, additional offsets will be required for some of the air pollutant emission increases.

## **LAND USE**

Dry cooling towers, and to some degree hybrid cooling towers have a larger footprint than a wet cooling tower. The exact size differential depends on the desired heat rejection effectiveness of the dry cooling tower, and whether the hybrid is a parallel configuration. If the plant designer attempts to achieve wet cooling tower

condenser conditions using dry cooling towers, the land use of a dry cooling tower can be almost four times as large as a wet cooling tower footprint. However, the amount of land used does not appear to dominate the cooling tower costs. There may be land use issues associated with dry cooling towers in that the structures, which are taller and bigger than wet cooling towers, may be harder to position on a small site, or a site that has adjacent use conflicts. Additionally, land use issues can arise when the project designer attempts to locate the direct air cooled condenser as close to the turbine building to minimize steam piping runs (Mirsky 1997).

## ***VISUAL***

### **VISIBLE PLUME**

Visible plumes are a relative common occurrence for wet cooling towers like that specified for HDPP. The plumes become visible when droplets of water are entrained in the tower plume as drift, and as the warm, saturated air cools, condensing the vapor into droplets of water. Plume formation and size is highly dependent on the drift rate, heat rejection and flow rates, and meteorological conditions. Wintertime and early mornings are most conducive to visible plume formation, when the ambient air is still and cool. Modern cooling towers can limit drift loss to 0.0006%, as specified for the HDPP, thereby minimizing one mechanism that contributes to visible plume formation potential. However, the high efficient drift eliminators have a slightly higher-pressure loss, thus requiring more fan horsepower (Mirsky 1997).

Dry cooling would eliminate a visible plume altogether. Alternatively, a hybrid-cooling tower can reduce or eliminate visible plume. For those conditions conducive to visible plume formation, plant operators can preferentially use the dry cooling section to reject all the project heat, or use the wet and dry section in series. These ambient conditions are generally those in which the dry section is most efficient in rejecting heat.

### **STRUCTURAL**

Generally mechanical draft cooling towers are larger in length and breadth compared to the heat recovery steam generator structures or gas or steam turbine buildings located at a combined cycle project. Hybrid cooling towers, if designed in series, are larger yet. If the hybrid system is arranged in parallel, then there will be two cooling towers on site. When dry cooling towers are used, the radiator section is often used in a structure that is taller than all other structures on site except for the stack. A direct dry cooling tower (air cooled condenser) structure, despite its height, can be less visually imposing than an isolated cooling tower in that it is often located next to the steam turbine/building to minimize steam piping runs (Mirsky 1997). If large (400 to 500 feet tall) parabolic natural draft cooling towers are used with dry, wet, or hybrid cooling systems, the towers can become visually noticeable.

## NOISE

Most cooling tower noise emanates from the circulating water pumps, the fan blades, and the water cascade. Building enclosures or berms can attenuate pump noise. It is more difficult to attenuate fan and water noise, as the cooling tower structure generally contains large openings to permit the least restrictive airflow through the tower. Switching to dry cooling does remove the water cascade as a sound source, but at the same time, most dry applications increase the fan and motor size to move more air through the dry cooling tower. Further, the dry cooling towers are often a taller structure compared to wet cooling tower to allow the least restrictive path (from the bottom of the structure up through the fan and the radiator) for the larger volume of air. The height of the dry structure makes it more difficult to surround the structure with a berm, and increases the area surrounding the dry tower that will be affected by the noise.

Fan blade research indicates that 15 dB reductions are achievable using new blades rather than traditional fan blades (van der Spek 1995). These low noise fans appear to increase parasitic loads. The size of the tower can be increased to lower the level of noise from the water for wet cooling towers. The oversized tower can also reduce fan speed, leading to lower noise (Mirsky 1997). Additional, technically feasible, options exist for noise attenuation for cooling towers, as show in Table 3 below.

**Table 3 - Potential Cooling Tower Noise Attenuation Modifications**

Low Noise Fan	≈7dB
Extra Low Noise Fan	9 to 13 dB
Low noise gear box	5 to 10 dB
Isolated motors	negligible noise
Inclined sheets in the water basin	≈7dB on the water noise
Screens and earth banks	7 to 15 dB
Noise baffles	10 to 30 dB

(Source: Mirsky 1997)

## CONCLUSIONS

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Except for limited sites where once-through cooling is still a viable alternative, most modern power plants use cooling towers to reject heat from the power plant steam cycle. The design and construction of the cooling tower affects the initial capital, operational, and maintenance costs; and the efficiency of the cooling tower affects the project production costs. Wet cooling towers are usually the least cost option, as they are commercially available, efficient, and in most cases, water costs are low.

In situations where water is costly or unavailable, hybrid cooling tower designs can reduce the use of water and water processing chemicals. These savings depend on the configuration of the hybrid system. Alternatively, dry cooling can reduce water use by almost 95%. Dry and hybrid systems are also frequently used to

reduce visible plume occurrences, or reduce ground level fogging and icing due to plume touchdowns.

Hybrid and dry cooling towers are technically feasible, but the feasibility is not without additional costs and potential plant performance degradation. While costs and performance requirements can be balanced, it is still expected that the plant costs and performance will change if dry or hybrid-cooling towers are used versus wet cooling towers. How much they change depends on site specific ambient and operational conditions. It appears that increased initial cooling tower expenditures can reduce long-term production costs, however, the relationship is highly dependent on the project site and operational constraints of the project.

We believe that dry and hybrid cooling towers are technically feasible for the High Desert Power Project. Given the wide range of technical design options available within the scope to these cooling technologies, we do not believe it is appropriate to specify how the project might change with the incorporation of dry or hybrid cooling. However, we believe that, in general, dry and hybrid cooling technologies will cost more to build and operate than a wet system, especially if the towers are designed to compensate for their negative effect on plant thermal efficiency and output. Even then, in almost all situations, hybrid and dry cooling will result in a performance penalty at the steam turbine and from increased parasitic loads, resulting in lost megawatt hours and cycle degradation.

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# PUBLIC HEALTH

Errata to the testimony of Obed Odoemelam

1. SA Page 56, insert the following section prior to the section titled “**CONCLUSIONS AND RECOMMENDATIONS**”;

## DRY COOLING ALTERNATIVE

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The fresh water-conserving policies of the State Water Resources Control Board points to dry cooling as an appropriate alternative to wet cooling in power plants. The Commission staff has noted this fact in identifying dry cooling as appropriate for the proposed project. Any public health hazard from cooling tower operations is usually related to public or worker exposure to (1) the chemical additives used for corrosion and bacterial growth control and (2) the salts and other impurities in the make-up water.

Staff is satisfied with the safety of the additives to be used in the proposed wet cooling tower and does not consider the constituents of the make-up water as posing a significant health risk to plant workers or the general public. The use of dry cooling would reduce the volume of water involved and correspondingly reduce any operation-related health risks. Staff has not recommended any conditions of certification for the plant as proposed and would not recommend any conditions if dry cooling were to be used.



# POWER PLANT RELIABILITY

Errata to the Testimony of Steve Baker

1. SA Page 450, insert the following sections prior to the section entitled "CONCLUSION."

## DRY COOLING ALTERNATIVE

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As part of staff's analysis of Soils & Water Resources, staff identified that the project as proposed could potentially result in significant impacts on water resources. In addition, State Water Resources Control Board 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. Based on these findings, staff has identified that dry cooling or wet/dry cooling may be feasible alternatives to the use of fresh inland waters for HDPP cooling. The following analysis addresses whether the dry or wet/dry cooling alternatives will result in any significant impacts on power plant reliability.

## IMPACT ON PLANT AVAILABILITY

In the low humidity generally encountered at the HDPP site, a wet cooling system can be expected to cool the steam condenser to lower temperatures than a dry cooling system. This means that, on the exceedingly hot days when plant output is most likely to be needed to supply air conditioning loads, a temperature might be reached that would exceed the capabilities of the dry cooling system. At this point, condenser backpressure would increase to the point that the steam turbines must be shut down. With the single-shaft turbine designs likely to be used in this project, this would, in turn, require the gas turbines to also be shut down, curtailing plant output entirely until ambient temperatures drop. The extent of this reduction in plant availability depends on weather conditions and on the specific design of the dry cooling system. Such curtailments could be expected to occur several days per year.

This negative impact on plant availability, particularly on hot days when power is most likely to be needed, can be expected to negatively impact project economics by making the plant unavailable when peaking power prices are high. The dry cooling system can be designed to handle cooling loads at higher ambient temperatures, typically by increasing the size of the radiators and/or cooling fans. This reduces the impact on project availability on hot days at the expense of increased capital and operating costs. This is an economic decision that the applicant must make if dry cooling is to be employed. Impacts to the electric system should be insignificant, as the Cal-ISO can schedule power from other suppliers if the HDPP is unavailable.

## FACILITY CLOSURE

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Closure of the facility, whether planned or unplanned, cannot impact project reliability. Reliability impacts on the electric system from facility closure, should

there be any, are dealt with in that portion of this document entitled **Transmission System Engineering.**

2. SA Page 450, insert the following at the end of the section entitled “**CONCLUSION.**”

Should the project be built with a dry cooling system in place of the wet cooling towers originally proposed, plant availability on hot days would be adversely affected. While this would negatively impact project revenues, the extent of this impact can be reduced through increased capital outlay and operating expenditures in the specific design of the cooling system. Any reliability impacts on the electric system due to reduced availability on hot days should be insignificant.

# POWER PLANT EFFICIENCY

Errata to the Testimony of Steve Baker

1. SA Page 457 insert the following sections prior to the section entitled **“CONCLUSIONS AND RECOMMENDATIONS.”**

## DRY COOLING ALTERNATIVE

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As part of staff’s analysis of Soils & Water Resources, staff identified that the project as proposed could potentially result in significant impacts on water resources. In addition, State Water Resources Control Board 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. Based on these findings, staff has identified that dry cooling or wet/dry cooling may be feasible alternatives to the use of fresh inland waters for HDPP cooling. The following analysis addresses whether the dry or wet/dry cooling alternatives will result in any significant impacts on power plant efficiency.

## IMPACT ON PLANT EFFICIENCY

Utilization of dry cooling will reduce the project’s maximum power output and its efficiency by a small amount. The Sutter Power Plant Project (97-AFC-2) switched from wet cooling to dry, and the projected efficiency dropped approximately two percent on an annual basis. The degradation of efficiency may be somewhat higher for the HDPP (perhaps three percent on an annual basis), due to the dryer climate at the HDPP site. (The performance difference between wet and dry cooling varies inversely with humidity.) Nevertheless, staff deems such a relatively minor drop in efficiency as an acceptable tradeoff, reasonable in light of the vast improvement in water supply impacts to be derived from the switch to dry cooling.

## FACILITY CLOSURE

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Closure of the facility, whether planned or unplanned, will not influence, nor will it be influenced by, project efficiency. Any efficiency impacts due to closure of the project would be on the electric system as a whole. Yet the vast size of the electric system serving California, the number of generating plants offering to sell power into it, and the existence of the California Independent System Operator and Power Exchange to ensure the efficient management of the system, all lend assurance that closure of this facility will not produce significant adverse impacts on efficiency.

2. SA Page 457, insert the following before the last sentence under the section entitled **“CONCLUSIONS.”**

- 3.

While utilization of dry cooling would yield a small drop in efficiency, the benefits of dry cooling in terms of water supply outweigh any such disadvantage.



# VISUAL RESOURCES

Errata to the Testimony of Gary D. Walker

5. SA Page 196, insert the following section prior to the section intitled “FACILITY CLOSURES”:

## DRY COOLING ALTERNATIVE

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As part of staff’s analysis of Soils & Water Resources, staff identified that the project as proposed could potentially result in significant impacts on water resources. In addition, State Water Resources Control Board 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. Based these findings, staff has identified that dry cooling or wet/dry cooling may be feasible alternatives to the use of fresh inland waters for HDPP cooling. The following analysis addresses whether the dry or wet/dry cooling alternatives will result in any significant visual resource impacts.

The use of dry cooling would eliminate the potential for cooling tower plumes. Dry cooling would require a larger cooling structure than the proposed cooling tower, but the difference in size would barely be detectable from public view areas. Overall, the use of dry cooling would reduce the visual impacts of the proposed project. However, because the cooling tower plumes from the proposed project are not expected to cause a significant visual impact, the improvement would not be significant.

The use of wet/dry cooling would reduce but not eliminate the potential for cooling tower plumes. It would also require larger cooling facilities than the proposed project. Overall, the difference in visual impact compared to the proposed project would be negligible.

There are no new conditions of certification that staff proposes for visual resources to mitigate the effects of either the dry or wet/dry cooling alternatives.



# NOISE

## Errata to the Testimony of Steve Baker

1. SA Page 157, replace the second paragraph under the heading, "STATE," which begins "The California Environmental Quality Act (CEQA) requires..." with the following paragraph:

The California Environmental Quality Act (CEQA) requires that significant environmental impacts be identified, and that such impacts be eliminated or mitigated to the extent feasible. The CEQA Guidelines (Cal. Code Regs., tit. 14, Appendix G) explain that a significant effect from noise may exist if a project would result in:

"a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

"b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.

"c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.

"d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project."

2. SA Page 165, insert the following section prior to the section entitled "FACILITY CLOSURE."

### DRY COOLING ALTERNATIVE

As part of staff's analysis of Soils & Water Resources, staff identified that the project as proposed could potentially result in significant impacts on water resources. In addition, State Water Resources Control Board 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. Based on these findings, staff has identified that dry cooling or wet/dry cooling may be feasible alternatives to the use of fresh inland waters for HDPP cooling. The following analysis addresses whether the dry or wet/dry cooling alternatives will result in any significant impacts on power plant noise.

### IMPACT ON PLANT NOISE

Dry cooling systems can produce more noise than wet cooling systems. The sound of large circulating water pumps and of water cascading down the cooling tower, present in a wet cooling system, is absent from a dry cooling system. However, the fans used to move air through the dry cooling tower are typically larger, and thus noisier, in order to move larger quantities of air. Added to this is the fact that a dry cooling tower often rises higher above the ground than a wet cooling tower. The greater noise level from the fans, and the difficulty of shielding this noise with berms or terrain features, often leads to greater noise emissions. No specific figures are available, but staff believes any increase in noise due to dry cooling would be on the order of 5 to 15 dB.

The potential for increased cooling tower noise emissions, however, is inconsequential for the HDPP. Project noise levels are low enough, and the nearest sensitive receptors distant enough, that employing dry cooling will not likely present any significant increase in noise impacts.

# WASTE MANAGEMENT

Errata to the Testimony of Ellen Townsend-Smith

2. SA Page 115, insert the following section prior to the section intitled “**Facility Closures**”;

## DRY COOLING ALTERNATIVE

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The State Water Resources Control Board 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. The policy also requires the evaluation of dry and wet/dry cooling as a means of water conservation. Staff has identified that the use of dry cooling or wet/dry cooling may be a feasible alternative to the use of fresh inland waters for HDPP cooling. The following analysis addresses whether the dry or wet/dry cooling alternatives will result in a significant impact on solid waste generated by the project’s water treatment process.

The major components of the project’s waste stream (Refer to WASTE Management Table 1) will remain the same if wet/dry cooling is used. Dry cooling will reduce the volume of waste being discharged from the crystallizer because the largest source of wastewater, cooling tower blowdown, will be eliminated. For example, cooling tower makeup water for the HDPP represents 97 percent of the total water usage.

Staff is waiting for HDPP to provide additional information on the reverse osmosis process used in the project’s water treatment system. Staff does not expect to find that this reverse osmosis information will indicate that the use of dry or wet/dry cooling will create significant impacts. Therefore, as long as no additional equipment in the process changes, the use of dry or dry/wet cooling will not impact the area of waste management. No new conditions of certification will be proposed by staff for waste management to mitigate the effects of either the dry or wet/dry cooling alternatives. Therefore no changes are required on Conditions of Certification WASTE-1, WASTE-2, WASTE-3 or WASTE 4.



# BIOLOGICAL RESOURCES

Testimony of Marc Sazaki

## INTRODUCTION

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The Southern California International Airport has been selected as the site for the High Desert Power Project (HDPP). This airport was formally George Air Force Base, but as part of the federal government's base closure program, it is in the process of being converted for civilian use. In general, siting energy facilities in pre-existing urbanized areas is preferred from a biological resources perspective because potential impacts are likely to be considerably less than when these kind of facilities are sited in rural or wildland settings. However, where ancillary facilities (pipelines, transmission lines, etc.) or operational activities extend beyond the power plant footprint, project related impacts on biological resources, including threatened or endangered species, can present problems. Thus, though siting the HDPP on a former military base has some advantages, there are also disadvantages. Any biological resources located on undeveloped areas within the base boundaries that once functioned as a buffer against conflicts with nearby urban and rural land uses or along proposed linear facilities will no longer be protected to the extent that they have been.

Biological resource surveys were conducted by consultants for the applicant to provide information useful in determining the potential impacts related to the power plant and its ancillary facilities, including a thirty-two mile-long second natural gas pipeline that will parallel State Highway 395 in a northerly direction through a Bureau of Land Management designated utility corridor and interconnect with two existing natural gas supply pipelines. In addition, the applicant has prepared and submitted a Draft Biological Resources Mitigation Implementation Plan as well as a Draft Erosion Control and Revegetation Plan (HDPP 1998n, Data Response 27-29). These plans are relied on for information, and to some extent, incorporated into staff's project assessment. Based on the information developed by the applicant and other information gathered by Energy Commission staff, recommended mitigation for identified potential impacts are presented for review and comment by the California Department of Fish and Game (CDFG) as part of the Energy Commission's endangered species consideration. In the staff analysis, biological resources at the site are described, anticipated project related impacts are evaluated, and potential mitigation measures are proposed to reduce these impacts to acceptable levels.

## LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

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### FEDERAL

- The Endangered Species Act of 1973 (16 U.S.C., §1531 et seq.), and implementing regulations, (C.F.R.) §17.1 et seq.), designate and provide for protection of threatened and endangered plants and animals and their critical habitat.

- The Clean Water Act (33 U.S.C. § 404 et seq) prohibits the discharge of dredged or fill material into the waters of the United States without a permit. An individual 404 permit is required to fill more than 3 acres. Nationwide permit (NWP) 26 is required to fill 3 acres or less of wetlands and NWP 12 is required for utility line placement near waters of the U.S. causing temporary discharge of material. The statute requires water quality assessment when issuing 404 permits and for discharges into waters of the United States.

## STATE

- The California Endangered Species Act, (Fish & G. Code, §2050 et seq.), protects California's endangered and threatened species. The implementing regulations list animals of California declared to be threatened or endangered (Cal. Code Regs., tit.14, §670).
- Fish and Game Code Section 1603 requires that any person planning to substantially divert or obstruct the natural flow or substantially change the bed, channel or bank of any river, stream or lake designated by the department, or use any material from the streambeds, must notify the department prior to such activity so that the Department can carry out its mandate by proposing measures necessary to protect the fish and wildlife.
- Fish and Game Code Sections 3511, 4700, 5050 and 5515, prohibit the taking of birds, mammals, reptiles and amphibians, and fishes respectively listed as fully protected in California.
- Fish and Game Code Section 1900 et seq., gives the Department authority to designate state endangered and rare plants and provides specific protection measures for identified populations.

## LOCAL

- Title 8 of the San Bernardino County Code specifies that Joshua tree removal be by permit only. Joshua trees proposed for removal must be transplanted or stockpiled for future transplantation.
- The Victorville Municipal code, Chapter 1333, requires a permit from the Director of Parks and Recreation prior to the destruction or removal of Joshua trees.

## SETTING

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The emphasis in this analysis is on impacts to threatened or endangered species, fully protected species, species of special concern, recreational species, and areas of critical concern. Notwithstanding this adopted focus, it is understood that all habitat loss or conversion has an effect on wildlife species, particularly resident species in the vicinity of the proposed project, as well as the vegetation that comprises the affected habitat. The effect of this cumulative loss is difficult to

assess and it is likely to be species-specific in nature because of different response capabilities of the affected species.

Threatened or endangered species are those formally recognized and listed by the state or federal government. Fully protected species receive special legal protection from the state in the form of prohibition against unauthorized take or possession, while species of special concern are candidate threatened or endangered species or unique species that are protected through state and local permitting processes by requiring mitigation to minimize potential adverse effects resulting from project development. This particular category also includes, but is not limited to, those rare and endangered plant species recognized by the California Native Plant Society. Though endangered plant species recognized by the California Native Plant Society may not be formally listed by state or federal governments, they may be considered endangered under the California Environmental Quality Act (CEQA) (Cal Code Regs, tit. 14, §15380 (d)). Recreational species are generally ones that are harvested by the public for sport or utilized for nonconsumptive purposes.

Areas of critical concern are special or unique habitats or biological communities. This category includes, but is not limited to, wildlife refuges and wetlands. Both species of special concern and areas of critical concern may be identified by the California Natural Diversity Data Base (CNDDDB) and other state, federal, and local agencies with responsibility within the project area or by educational institutions, museums, biological societies and special interest groups that might have specific knowledge of resources within the project area.

## REGIONAL DESCRIPTION

The western Mojave Desert, a portion of the 25-million-acre California Desert Conservation Area (CDCA) (BLM 1980), is a relatively high elevation terrain that has edaphic characteristics reflective of being situated in the rain shadow of the Tehachapi Mountains to the west and the San Gabriel and San Bernardino Mountains to the south. As a result of the low annual average precipitation (which normally occurs in episodes of high intensity) and the relatively poorly developed water holding capacity of desert soils, vegetation communities predominantly consist of low profile shrubby perennials and diminutive, but often showy desert annuals. Over-summer evaporation usually leaves dry lake beds with varying degrees of alkali deposits on the soil surface. This also happens on a decreased scale throughout the desert resulting in small playas and alkali sinks dotting the landscape. This situation gives rise to vegetation communities around the large playas that range from salt tolerant species to less and less salt tolerant ones as the distance from the playas increases. Creosote bush (*Larrea tridentata*), ubiquitous throughout California's desert region, grows primarily upslope and away from the playas. Joshua trees (*Yucca brevifolia*) typically grow still further upslope providing a new habitat element (relatively tall structure) for wildlife species. The variety of amphibians and larger mammals in the desert environment is reduced over other habitat types because of the extremely arid and hot conditions while reptiles are comparatively abundant and diverse. Avian species, because of their mobility, are able to take advantage of small areas of suitable habitat (such as temporary lakes or year-round springs) and can be both abundant and well represented in regards to

species diversity. Suitable areas in the desert can provide birds with foraging, resting, and even breeding sites. In essence, the desert provides considerable habitat for wildlife species, but because of the extreme climatic conditions, complex life strategies have evolved for many of the resident animals as well as plants. As a result, if the desert habitat is altered by human activity, significant and lasting effects can result if they are not sufficiently mitigated.

In contrast to many parts of the CDCA that are predominantly open space, the western Mojave Desert has undergone moderate to severe land use change. Large areas have been dedicated for use as military reservations, including Edwards Air Force Base, Fort Irwin, and China Lake Naval Weapons Center. Mining activities vary in magnitude and intensity with the Borax surface mine near the town of Boron being one of the largest on-going surface mining operations. Agricultural development in the region is decentralized.

Off-highway vehicle (OHV) activities are a popular form of recreation in the desert. Both organized off-road races and individual and family riding take place in the western Mojave because of its close proximity to major metropolitan areas of Southern California and the sustained growth of local communities such as Victorville, Adelanto, Palmdale, Mojave, Ridgecrest, and Barstow. Also, access to many remote areas via transmission line and pipeline maintenance roads is another factor that likely encourages OHV recreational activity. Vegetation and wildlife habitat can be degraded and even destroyed by irresponsible users.

Solar electric generation facilities have been developed in the region. Two of the more prominent examples are the Luz Solar electric projects on the west side of Harper Lake and close to the junction of State Highways 395 and 58. By nature, solar energy development usually involves land intensive technologies. Slightly over 1,400 acres of desert habitat was used for these two projects. Continued solar development in the western Mojave will most certainly eliminate additional habitat for important species. Unmitigated encroachment of land intensive development into the desert environment can only lead to inevitable decline in the desert biome's overall quality.

## **SITE AND VICINITY DESCRIPTION**

The proposed site for the power plant consists of 25 acres of previously disturbed land on the former George Air Force Base (now the Southern California International Airport [SCIA]) that was used by the previous base operators as a spoils area for storing miscellaneous refuse and debris. Outside of the developed facilities on the SCIA, there are many areas that are either ruderal in nature, or consist of relatively undisturbed natural desert scrub habitat. As reported in the Installation Restoration Program Remedial Investigation for Operable Unit 3 - George Air Force Base (Montgomery Watson 1996), most of the more natural areas exist in the eastern side of the air base (SCIA).

Habitat traversed by appurtenant facilities of the proposed project is described in the AFC and includes an approximately seven-mile transmission line from the project south to the Victor Substation, a water supply pipeline that is about 2.5 miles

in length that will interconnect with a source line to the north of the SCIA, and a 2.75 mile long natural gas pipeline that originates south of the project (HDPP 1997b, AFC page 5.3-5 through 5.3-22). Subsequent to the AFC filing, the applicant proposed adding a field of seven ground water wells along with a water pipeline that is approximately 3.4 miles long. Habitat descriptions and plant and animal survey results of the areas where the ground water supply system is proposed are described in documentation submitted for these additional facilities (HDPP 1998n, Data Response 45).

A second natural gas pipeline was incorporated into the project somewhat later in the process. It will be approximately thirty-two miles long, thirty inches in diameter, and extend in a northerly direction to connect with existing major gas lines.

Habitat of variable quality for desert tortoise (*Gopherus agassizii*), a state and federal threatened species and Mohave ground squirrel (*Spermophilis mohavense*), a state threatened species, exists in the vicinity of the proposed project and related facilities. Other federal or state listed and plant and animal species and species of special concern that may inhabit the project area are listed in Table 5.3-1 and 5.3-2 of the AFC respectively (HDPP 1997a, AFC page 5.3-10 and 5.3-11). In addition to desert tortoise and Mohave ground squirrel, they include small-flowered androstephium (*Androstephium breviflorum*), Alkali mariposa lily (*Calochortus striatus*), pygmy poppy (*Canbya candida*), Mojave Indian paintbrush (*Castilleja plagiotoma*), Mojave spineflower (*Chorizanthe spinosa*), desert cymopterus (*Cymopterus deserticola*), Reveal's buckwheat (*Eriogonum contiguum*), Barstow woolly sunflower (*Eriophyllum mohavense*), sand linanthus (*Linanthus arenicola*), Mojave monkey flower (*Mimulus mohavensis*), short-joint beavertail (*Opuntia basilaris* var. *brachyclada*), Mojave indigo bush (*Psorothamnus arborescens* var. *arborescens*), salt spring checkerbloom (*Sidalcea neomexicana*), Lemmon's syntrichopappus (*Syntrichopappus lemmonii*), southwestern pond turtle (*Clemmys marmorata pallida*), San Diego coast horned lizard (*Phrynosoma coronatum blainvillei*), short-eared owl (*Asio flammeus*), golden eagle (*Aquila chrysaetos*), Swainson's hawk (*Buteo swainsoni*), prairie falcon (*Falco mexicanus*), loggerhead shrike (*Lanius ludovicianus*), summer tanager (*Piranga rubra*), burrowing owl (*Athene cunicularia*), and Le Conte's thrasher (*Toxostoma lecontei*). Other species that could be affected by project construction and operation are listed in Table 2.3-1 of the High Desert Power Project LLC "Analysis of Proposed Natural Gas Pipeline" and include southern skullcap (*Scutellaria blanderi* spp.), Victorville shoulderband (*Helminthaglypta mohaveana*), California red-legged frog (*Rana aurora draytonii*), Cooper's hawk (*Accipiter cooperii*), long eared owl (*Asio otus*), western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), yellow warbler (*Dendroica petechia brewsteri*), willow flycatcher (*Empidonax traillii*), yellow-breasted chat (*Icteria virens*), gray vireo (*Vireo vincinior*), and Mojave River vole (*Microtus californicus mohavensis*) (SWGAs 1998). Biological surveys were conducted in areas expected to be impacted by the project and results are reported in the AFC and subsequent informational submittals. Of the species of concern listed above, Mojave spineflower, Mojave indigo bush, loggerhead shrike, Le Conte's thrasher, desert tortoise, and Mohave ground squirrel were observed during the surveys (RMI 1998a).

Mojave River riparian habitat and associated wildlife occur in the Mojave River channel to the east of the project within about a mile and some of the new wells that will provide backup water for the project lie within approximately two miles of the river. Important species that likely inhabit this riparian zone include the state listed endangered western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), arroyo toad (*Bufo microscaphus californicus*), southwestern willow flycatcher (*Empidonax traillii extimus*) which are federal endangered species, and the least Bell's vireo (*Vireo bellii pusillus*) which is both state and federal listed as endangered (Jones 1997).

Where project related facilities, particularly linear ones such as transmission lines and pipelines, cross desert washes, important habitat for desert wildlife can be affected. A jurisdictional determination for waters of the United States was performed by the applicant and verified by the Corps of Engineers (RMI 1998b and RMI 1998c). As part of this jurisdictional determination, it was concluded that no wetlands existed. The Corps of Engineers will be "...reviewing the permit application once the final design plans have been completed..." and issue the required permit under Section 404 of the Clean Water Act. This permit authorizes disposing of fill into areas considered waters or tributaries to waters of the United States. Staff is unfamiliar with the terms and conditions that might be associated with such a permit, but as part of National Environmental Policy Act compliance, an Environmental Impact Statement will be prepared which will disclose terms of the Corps of Engineers permit.

## IMPACTS

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### PROJECT SPECIFIC IMPACTS

The project location itself raises few biological resource issues. However, certain aspects of the appurtenant facilities (including the water supply pipeline that connects to the State Water Project service line to the north, and the transmission line where it crosses less urbanized areas to the east and south of the project, as well as the second natural gas supply pipeline) cause concern because they will be developed in areas that still provide useful habitat for wildlife.

Tortoises, Mohave ground squirrels, and other animals could be killed during construction and operation by being run over by vehicles. Animals could fall into trenches dug for pipelines and killed by being crushed under foot, or buried alive. Habitat necessary for fulfilling life sustaining needs of plants and animals, such as nutrient rich top soil, food, cover, and nesting structure, will be temporarily and permanently lost due to trenching and other surface disturbing site preparation activities. In addition, these activities subject species such as desert tortoise and Mohave ground squirrel to potentially life threatening stress.

Loggerhead shrikes and Le Conte's thrashers could lose nesting opportunities with the removal of shrubs which may occur during pipeline construction, although no nest sites were identified during biological surveys.

An additional concern arises from the proposed backup water supply wells and associated water lines that will be installed to the south of the project. Withdrawal of ground water in the amount proposed could indirectly reduce available ground water in the Mojave River riparian area, exacerbating the losses of willows and cottonwoods that have occurred in recent years (Lines and Bilhorn 1996). This area supports ~~arroyo toad~~, southwestern willow flycatcher, and least Bell's vireo. [Historically, arroyo toad also inhabited portions of the Mojave River \(McLaughlin 1999\). Reductions in ground water levels could further reduce riparian vegetation resulting in the elimination of potential nest sites for the two bird species. In addition, the availability of shallow water along the river's edge where eggs could be laid by arroyo toads and undergo larval development could be reduced.](#) The applicant has submitted an addendum to their "Evaluation of Alternative Water Supplies for the High Desert Power Project" in which they estimate that water levels in the riparian area of concern will likely rise by a foot (RMI 1998e). The validity of this modeling result has been questioned by the California Department of Fish and Game and the U.S. Fish and Wildlife Service (Jones and Washick 1999). Field testing may have to be done in order to convince these two agencies that the potential for impacts on riparian vegetation along the Mojave River near the project will be minimal and likely positive. It is expected that meetings between the agencies and applicant will be conducted to resolve this issue.

Where pipelines cross desert washes, ground disturbing activities can cause impacts because washes provide refugia for many plant and animal species and often remain undeveloped because of flood risks to manmade structures. Unless special precautions are taken to minimize habitat destruction and to schedule activities during times of the year when flooding is not likely, significant impacts could occur by degrading habitat of important species such as desert tortoise. Wheeled vehicles cause greater levels of disturbance to desert soils that are saturated with water. Consequently, more vegetation is disturbed.

The second natural gas pipeline, which will be approximately thirty-two miles long and connect the power plant to major gas supply lines near Kramer Junction at State Highway 58 to the north, is of considerable concern from a biological resource perspective. Habitat for listed species will be lost for a period of time during construction and until restoration efforts have succeeded. The applicant suggests that by restoring the construction and permanent right-of-way, vehicle use will be restricted to existing dirt and paved roads (HDPP 1998z). Based on Energy Commission staff observations of the proposed gas pipe line route that parallels State Highway 395, it appears that the existing dirt and paved roads that parallel the route are approximately one hundred fifty to two hundred feet away. This would not lend itself to effective use for purposes of inspecting and maintaining the gas line at ground level. Eventually, whether intended or not, an access road virtually contiguous to the centerline of the pipeline will likely develop. This will probably be within the fifty foot permanent right-of-way identified by the applicant (HDPP 1998aa). This potential habitat loss is considered by Energy Commission staff to be permanent and significant because slightly more than fifty percent of the loss will be of desert tortoise habitat designated as "critical" in the desert tortoise recovery plan (FWS 1994). [1994\). In a February 3, 1999 workshop, a Southwest Gas Corporation representative gave assurances that existing maintenance roads would be used for](#)

pipeline maintenance. Notwithstanding this assurance, Energy Commission staff, believes that over the life of the project, a small access road closely paralleling the pipeline will develop, as discussed above. However, the CEC would have no compliance jurisdiction over the pipeline or its owner/operator, Southwest Gas Corporation, to require habitat restoration when such an occurrence takes place, to whatever degree it happens. Travel routes along linear facilities are not always created by project related operational activities, but by recreationists or other non-project activities outside the control of the project owners. This concern could be alleviated if the applicant is able to devise measures that can be implemented along the pipeline to prevent such an outcome, but until such measures are developed and incorporated into the Biological Resources Mitigation Implementation and Monitoring Plan the concern remains. For purposes of establishing habitat compensation for listed species, Energy Commission staff assumes that long term loss of habitat attributable to the development of a parallel travel route will occur.

Although the desert habitat impacted by the project and related facilities will be of varying quality, desert tortoise and Mohave ground squirrel are of key concern. Energy Commission Staff believes that state and federal endangered species “incidental take” authorizations issued by the California Department of Fish and Game and the U.S. Fish and Wildlife Service respectively, including associated terms and conditions imposed as part of the resulting biological opinions, if rendered, will be based on findings of no significant impacts. Energy Commission staff further believes these findings can be reached if adequate mitigation is committed to by the applicant prior to CEC certification. Aside from protecting individual organisms from direct construction and operational impacts which will be addressed through implementation of specific measures incorporated into action plans such as the Biological Resources Mitigation Implementation and Monitoring Plan and the U.S. Fish and Wildlife Service Habitat Conservation Plan Implementing Agreement, habitat loss will be mitigated by acquiring and preserving off-site habitat for these species.

~~Short-term and permanent~~Long-term and short-term habitat loss will occur for the desert tortoise and Mohave ground squirrel. The applicant has estimated land disturbance for the project and appurtenant facilities, except for the second natural gas pipeline, to be 104.2 acres long-term and 112.7 acres short-term (<10 yrs) for a total of 216.9 (RMI 1998d [Table 2-1]). Energy Commission staff considers this a reasonable estimate. However, where the applicant estimates 281.9 acres of long-term and 131.5 acres of short-term disturbance for the second natural gas pipeline (RMI 1998d [Table 6-2]) equaling a total of 413.4 acres, Energy Commission staff’s estimate is 45.9 acres of long-term and ~~336.7~~331.65 acres of short-term habitat disturbance for a total of ~~382.6~~377.55 acres. Energy Commission staff’s estimate is based on its expectation that for the pipeline segment paralleling State Highway 395, a fifteen foot access road will result for a distance of 25.25 miles adjacent to the gas pipeline over time resulting in the 45.9 acre estimate, while the remaining ninety-five foot width of the construction right-of-way will be revegetated and restored to suitable habitat for desert tortoise, and possibly Mohave ground squirrel, in ten years or less. The short-term habitat disturbance along this 25.25 mile segment is derived by multiplying the 25.25 miles by 5,280 feet and multiplying their product by the 95 foot width of temporary disturbance within the construction right-

[of-way. The resulting product \(square feet\) of the three factors is then divided by 43,560 to get 290.75 acres.](#) For the approximately six [and three quarter](#) miles of gas pipeline that crosses State Highway 395 to the east and then south to the power plant, Energy Commission staff assumes that construction work will be done from existing roads and a fifty foot right-of-way would be disturbed for construction and subsequently rehabilitated to useful habitat. [Computing the short-term loss for this 6.75 mile portion as done above, but for a fifty foot wide disturbance zone, results in an additional 40.9 acres.](#) It is reasonable to assume that necessary inspection patrols can use existing roads along this segment, thus minimizing any intrusion onto the actual right-of-way except for emergency purposes.

## **CUMULATIVE IMPACTS**

The project is in an urbanized area, the city of Victorville, and thus adds to the impacts associated with heavy growth and development desired by the local jurisdictions. Because the project is on a highly disturbed site, the cumulative impacts on biological resources will be insignificant. However, the extension of some of the linear facilities into surrounding undeveloped desert habitat contributes to the expanding loss of important wildlands on a cumulative basis. In the case of this project, the cumulative habitat losses can likely be effectively mitigated through acquiring off-site habitat for desert tortoise and Mohave ground squirrel and protecting it in perpetuity. The acquired habitat should be given in fee to a land management entity for the purpose of managing and protecting the acquired habitat.

## **FACILITY CLOSURE**

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Except for revegetation of any area where structures are removed at the power plant site, there is no anticipated need for other measures to address biological resource needs because by the time the facility is closed after 30 plus year operational period, the surrounding community will be probably be highly developed and densely populated if local desires of civil authorities are realized. If linear facilities remain in areas with little or no human habitation and they serve no secondary purpose to the power plant, consideration should be given to their removal. This will be addressed in a required facility closure plan in accordance with standard conditions of certification. Under certain circumstances, it would conceivably be advisable to leave such facilities in place from a biological resource perspective. Such considerations will be addressed in the closure plan.

## **COMPLIANCE WITH LORS**

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The applicant can comply with biological resource LORS if Energy Commission staff proposed mitigation is required and implemented.

## **MITIGATION**

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The applicant proposes to avoid impacting biological resources through avoidance measures based on preconstruction surveys. An on-call biological monitor will notify

construction crews of steps to minimize disturbance. Project engineers will adjust project features to avoid impacting denning sites, Joshua trees, Mojave indigo bush, and desert washes (HDPP 1997b, AFC page 5.3-31 and 5.3-32). The applicant has submitted a draft Biological Resources Mitigation Implementation Plan (HDPP 1998n, Data Response 27) and an Erosion Control and Revegetation Plan (HDPP 1998n, Data Response 29) that provide details of measures proposed for mitigating anticipated biological resource impacts. Submittal of the final plans for review and approval should be required as a condition of certification. No site disturbance should be allowed before the plans are approved by Energy Commission staff in consultation with appropriate resource agencies.

Endangered species mitigation often takes the form of habitat compensation in situations in which habitat that the species rely on for life sustaining requisites is permanently eliminated by project structures or temporarily obliterated through construction practices such as trenching and clearing areas for work crews and mobile equipment marshalling yards. The level of habitat compensation, is dependent on factors such as quality of the habitat for endangered species, permanence of the habitat loss, proximity to other development, and potential growth inducing effects of the project. A ratio of habitat compensation is determined through consultation with the regulatory agencies along with input from interested public.

Habitat compensation is proposed by the applicant for desert tortoise and Mohave ground squirrels by establishing compensation ratios ranging from 0 to 2:1 for the project and appurtenant facilities, except for the second natural gas pipeline (RMI 1998d Table 5.2). Energy Commission staff considers this level of compensation ratio as applied, satisfactory, and concurs with the 269.8 acres proposed by the applicant (RMI 1998d [Table 7-1](#)). It is uncertain at this time if this will be acceptable to the California Department of Fish and Game and the U.S. Fish and Wildlife Service. Before the start of any ground disturbance prior to the start of construction at the site or any appurtenant project related facilities, the applicant should provide the habitat along with written concurrence from these two agencies that this level of compensation, at a minimum, for the aspects of the project as specified above, is acceptable.

With respect to the second natural gas pipeline, habitat compensation proposed by the applicant for desert tortoises and Mohave ground squirrels is based on ratios ranging from 1:1 to 4:1 (RMI 1998d Table 6-1). For habitat compensation associated with the second natural gas pipeline, the applicant is proposing 1,188.7 acres (RMI 1998d Table 6-2). Energy Commission staff adjusted ratios in [critical habitat](#) [Critical Habitat](#) to 4:1 for long-term habitat loss and 2.5:1 for short-term losses. For habitat in BLM Category III zones, ratios are adjusted to 2.0:1 for long-term losses and 1.5:1 for short term losses. This is due to the growth inducing nature of the oversized pipeline. [Because there will be excess capacity associated with the second natural gas pipeline, and there is no assurance that all the gas needed for the project will be solely dedicated to the project, other users could be serviced anywhere between the power plant site and where the line interconnects to the major gas line to the north near Kramer Junction. It is unlikely that excess gas in the pipeline will not be marketed. If the power plant is served totally by the](#)

second pipeline, then the gas available from the first gas pipeline could be diverted for other growth inducing purposes. Approximately 17.25 miles (68.3%) of the pipeline that parallels State Highway 395 is in ~~critical habitat~~Critical Habitat. Eight miles is in Category III. The remaining length of pipeline, approximately six and three quarter miles, is also in Category III desert tortoise habitat.

For long-term habitat loss in Critical Habitat (45.9 acres x 68.3%=31.3 acres at 4:1) compensation equals 125.2 acres. For the remainder of long-term habitat loss, which occurs in Category III desert tortoise habitat along the second natural gas pipe line (45.9-31.3=14.6 acres at 2:1) compensation equals 29.2 acres. For short-term habitat loss in Critical Habitat (290.75 acres x 68.3%=198.58 acres at 2.5:1) compensation equals 496.45 acres. For the remainder of the gas line running parallel and west of State Highway 395 in Category III desert tortoise habitat (290.75-198.58=92.17 acres at 1.5:1) including the remaining 6.75 (40.9 acres at 1.5:1) mile segment that goes east and then south to the power plant, also in Category III desert tortoise habitat, the compensation for short-term habitat loss is (138.26+61.35) 199.61. Based on Energy Commission staff calculations, habitat compensation for the second natural gas pipeline should be ~~4,132.48~~50.46 acres.

Total habitat compensation for desert tortoise and Mohave ground squirrel should be ~~4,402.2 acres~~1,120.26 acres. This is the sum of 269.8 acres for the power plant and appurtenant linear facilities plus 850.46 acres for the second natural gas pipeline.

Assuming present cost for suitable desert tortoise and Mojave ground squirrel habitat is approximately \$700.00 an acre, the cost of purchasing 1,120.26 acres would be \$784,182.00 including closing costs. An equivalent amount should be provided to establish an endowment for long-term management of the acquired land. At five per cent annual interest, approximately \$39,209.00 would be generated, a portion of which would be retained for maintenance and growth of the endowment over the long-term. In addition, \$9,881.00 should be provided for protective fencing. This estimate is based on \$1.30 per lineal foot including four gates at \$200.00 each. Overall habitat compensation cost would equal \$1,578,245.00.

The applicant suggests that habitat acquired to satisfy the mitigation requirements for the desert tortoise will also satisfy the habitat compensation needs of the Mohave ground squirrel. While this might be possible, and has been recommended in the past, the efficacy of this is uncertain. Although life history information has been developed for the Mohave ground squirrel in the northern extent of its range (Leitner and Leitner 1998), this information may not be applicable to southern extremes of the animals range, where the proposed project is located. Because of this uncertainty, the applicant should contribute \$50,000.00 to research that will address this question. Dr. Leitner has estimated that comparable costs to develop habitat suitability information in the southern portion of the squirrel's range will be 1 to 1.2 million dollars. The Desert Tortoise Preserve Committee, in cooperation with state and federal land management agencies working in the region where the High Desert Power Project will be constructed, is planning on conducting research to address this question in portions of the ground squirrel's range that have not been

investigated previously. With respect to the High Desert Power Project, Energy Commission staff believes a contribution to research, as proposed above, will be sufficiently beneficial to compensate for any loss that occurs because the habitats are not identically suited to both species.

Mojave River riparian habitat impacts will be mitigated by banking water in the area of withdrawal. The applicant agrees to bank 12,000 acre feet prior to any pumping. Energy Commission staff, in consultation with the applicant, have agreed to a modeling protocol which will be used to identify specifics of this mitigation action will be discussed in detail in the Water Resources Section of this or the final Staff Assessment. To verify if any impacts occur the additional water that will need to be provided annually to account for natural depletion of the banked water. This mitigation is expected to prevent impacts in the riparian zone that otherwise could lead to reduced habitat for important species there, a monitoring program must include sampling that will demonstrate whether or not these effects occur. The applicant has submitted a draft plan for review and approval which should take place before the start of project construction. inhabiting this area. For further discussion of this issue, see the **Soil & Water Resources** section of this Staff Assessment. If ground water levels decline in the Mojave River riparian area and further exacerbate an already existing problem (loss of riparian vegetation and wetted stream channel important to listed species) the applicant should meet with the CEC CPM, the California Department of Fish and Game, and the U.S. Fish and Wildlife Service to determine what action should be taken to stop and/or reverse the losses.

Staff proposes that the HDPP have an environmental awareness program to inform construction workers and operations personnel about sensitive biological resources that must be protected in accordance with existing laws and Energy Commission decision requirements<sup>2</sup>.

## CONCLUSIONS AND RECOMMENDATIONS

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### CONCLUSIONS

The final power plant configuration will not create impacts on biological resources because the footprint will remain within the 25 acre highly disturbed area dedicated as the power plant site. Biological resource impacts associated with the project's linear facilities and back-up water supply well field can be adequately mitigated. However, even though the impacts associated with the second natural gas pipeline can be mitigated, allowing this action may not be considered desirable by the U.S. Fish and Wildlife Service because of the loss of desert tortoise **critical habitat**. Critical Habitat. This, coupled with the fact that the second natural gas pipeline is not necessary for the project to operate might preclude approval of an endangered species "incidental take" permit by the U.S. Fish and Wildlife Service

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<sup>2</sup> The CPM has Worker Environmental Awareness Program materials (handouts and videotapes) developed for other power plant siting cases. These materials are available for inspection by the project owner at any time in the preparation of the current project's specific program.

for this feature of the project. [The U.S. Bureau of Land Management is likely to propose issuing a right-of-way permit for the second natural gas pipeline with mitigation it considers sufficient to allow the U.S. Fish and Wildlife Service to issue an incidental take permit and a “no jeopardy” opinion.](#) This issue remains to be resolved among the U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, and the Applicant.

The applicant has submitted a draft Biological Resources Mitigation Implementation Plan and a draft Erosion Control and Revegetation Plan. [These are anticipated that before the start of rough grading of the project, these plans will be finalized and deemed finalized, reviewed by CEC staff, and determined](#) acceptable by staff and other appropriate agencies. Potential biological impacts related to the proposed project such as killing wildlife and destroying habitat are mitigable, but final mitigation details sufficient to meet state and federal endangered species requirements remain to be resolved. [Energy Commission staff believes its proposed mitigation measures are sufficient to satisfy both state and federal concerns.](#)

The applicant has received draft Streambed Alteration Agreements for the project and appurtenant facilities as well as the second natural gas pipeline. These agreements are required respectively under Section 1603 and Section 1601 of the State Fish and Game Code.

In spite of [the issue concerns](#) regarding the issuance of [a federal and state](#) endangered species “incidental take” permits for the second natural gas pipeline, Energy Commission staff [considers believes that with adoption of its proposed conditions of certification,](#) the likelihood of the applicant complying with the federal Endangered Species Act “incidental take” requirements or the California Fish and Game [incidental](#) “incidental take” permit and streambed alteration agreement process is high.

## RECOMMENDATIONS

If the committee approves the project, it should also adopt the proposed conditions of certification.

## CONDITIONS OF CERTIFICATION

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Staff proposes the following conditions of certification. Subsequent to further meetings with the applicant and the outcome of their meetings with appropriate federal agencies, additional conditions of certification may be recommended.

BIO-1 Construction-site and/or ancillary facilities preparation (described as any ground disturbing activity other than allowed geotechnical work) shall not begin until a CPM approved designated biologist is available to be on site.

Protocol: The designated biologist must meet the following minimum qualifications:

1. a bachelor's degree in biological sciences, zoology, botany, ecology, or a closely related field,
- ~~1.2.~~ three years of experience in field biology or current certification of a nationally recognized biological society, such as the Ecological Society of America or The Wildlife Society,
- ~~2.3.~~ one year of field experience with resources found in or near the project area, and
4. ability to demonstrate to the satisfaction of the CPM the appropriate education and experience for the biological resource tasks that must be addressed during project construction and operation.

If the CPM determines the proposed designated biologist to be unacceptable, the project owner shall submit another individual's name and qualifications for consideration.

If the approved designated biologist needs to be replaced, the project owner shall obtain approval of a new designated biologist by submitting to the CPM the name, qualifications, address, and telephone number of the proposed replacement, within ten working days ~~prior to the~~after termination or release of the preceding designated biologist.

No disturbance will be allowed in any designated sensitive area(s) until the CPM approves a new designated biologist and that designated biologist is on-site.

**Verification:** At least 90 days prior to the start of rough grading, the project owner shall submit to the CPM for approval, the name, qualifications, address, and telephone number of the individual selected by the project owner as the designated biologist. The CPM will notify the project owner of approval or disapproval of the designated biologist. Oral approval may be given by the CPM, and will be followed up in writing no later than 15 days after oral approval is granted.

BIO-2 The CPM approved designated biologist shall perform the following duties:

- ~~2.~~
  - advise the project owner's supervising construction or operations engineer on the implementation of the biological resource conditions of certification,
  - supervise or conduct mitigation, monitoring, and other biological resource compliance efforts, particularly in areas requiring avoidance or containing sensitive biological resources, such as wetlands and special status species, and

- notify the project owner and the CPM of any non-compliance with any condition.

**Verification:** The designated biologist shall maintain written records of the tasks described above, and summaries of these records shall be submitted with the Monthly Compliance Reports to the CPM.

BIO-3 The project owner's supervising construction and operating engineer shall comply with the recommendation of the designated biologist to ensure conformance with the biological resource conditions of certification.

**Protocol:** The project owner's supervising construction and operating engineer shall halt, if needed, all construction activities in areas specifically identified by the designated biologist as sensitive to assure that potential significant biological resource impacts are avoided.

The designated biologist shall:

- 3-1. tell the project owner and the supervising construction and operating engineer when to resume construction, and
2. advise the CPM if any corrective actions are needed or have been instituted.

**Verification:** Within 2 working days of a designated biologist notification of non-compliance with a Biological Resources condition or a halt of construction, the project owner shall notify the CPM by telephone of the circumstances and actions being taken to resolve the problem or the non-compliance with a condition.

For any necessary corrective action taken by the project owner, a determination of success or failure will be made by the CPM within 5 working days after receipt of notice that corrective action is completed, or the project owner will be notified by the CPM that coordination with other agencies will require additional time before a determination can be made.

BIO-4 The project owner shall develop and implement a CPM approved program in which each of its own employees, as well as employees of contractors and subcontractors who work on the project site or related facilities (including any access roads, storage areas, transmission lines, water and gas lines) during construction and operation, are informed about biological resource sensitivities associated with the project.

**Protocol:** The Worker Environmental Awareness Program:

~~4.1.~~ shall be administered by the designated biologist and consist of an on-site or classroom presentation in which supporting written material is made available to all ~~participants.~~participants.

~~7.2.~~ must discuss the locations and types of sensitive biological resources on the project site and adjacent areas,

~~8.3.~~ the reasons for protecting these resources,

4. the meaning of various temporary and permanent habitat protection measures, and

~~10.5.~~ who to contact if there are further comments and questions about the material discussed in the program.

The specific program can be administered by a competent individual(s) acceptable to the designated biologist.

Each participant in the on-site Worker Environmental Awareness Program shall sign a statement declaring that the individual understands and shall abide by the guidelines set forth in the program material. Each statement shall also be signed by the person administering the Worker Environmental Awareness Program.

The signed statements for the construction phase shall be kept on file by the project owner and made available for examination by the CPM for a period of at least six (6) months after the start of commercial operation. Signed statements for active operational personnel shall be kept on file by the project owner for the duration of their employment and for six months after their termination.

**Verification:** At least 30 days prior to the start of rough grading, the project owner shall provide copies of the Worker Environmental Awareness Program and all supporting written materials prepared by the designated biologist and the name and qualifications of the person(s) administering the program to the CPM for approval. The project owner shall state in the Monthly Compliance Report the number of persons who have completed the training in the prior month and a running total of all persons who have completed the training to date.

BIO-5 The project owner shall acquire a Streambed/Lake Alteration Agreement from the California Department of Fish and Game for project impacts to drainages, and implement the terms of the agreement.

**Verification:** At least 90 days prior to the start of rough grading, the project owner shall provide the CPM with a copy of the California Department of Fish and Game Streambed Alteration Agreement for this project.

BIO-6 The project owner shall submit to the CPM for review and approval a copy of the Biological Resources Mitigation Implementation and Monitoring Plan for this project.

The Biological Resources Mitigation Implementation and Monitoring Plan shall identify:

- all sensitive biological resources potentially impacted by project construction and operation;
- all mitigation, monitoring and compliance conditions included in the Commission's Final Decision;
- all mitigation measures specified in the Habitat Conservation Plan developed for issuance of an "Incidental Take Permit" from the U.S. Fish and Wildlife Service;
- all conditions agreed to in the CDFG Streambed/Lake Alteration Agreement;
- required mitigation measures for each sensitive biological ~~resource;~~ [resource;](#)
- required compensation for any loss of sensitive biological resources;
- all locations, on a map of suitable scale, requiring temporary protection/signs during construction;
- aerial photographs (direct overhead) of all areas to be disturbed during project construction activities (at a scale of 1"=100') - one set prior to site disturbance and one set subsequent to completion of mitigation [measures if a one-time mitigation level is required, or periodic monitoring for the measures.](#) ~~life of the project if mitigation for disturbance during operation is required.~~ Include planned timing of aerial photography and a description of why times were chosen;
- monitoring duration for each type of monitoring and a description of monitoring methodologies and frequency;
- performance standards to be used to help decide if/when proposed mitigation is or is not successful;
- all remedial measures to be implemented if performance standards are not met and,
- a process for proposing plan modifications to the CPM and appropriate agencies for review and approval.

**Verification:** At least 60 days prior to rough grading, the project owner shall provide the CPM with the final version of the Biological Resources Mitigation Implementation and Monitoring Plan for this project, and the CPM will determine the plans acceptability within 15 days of receipt of the final plan. The project owner shall notify the CPM five working days before implementing any modifications to the Biological Resource Mitigation Implementation and Monitoring Plan.

Within 30 days after completion of construction, the project owner shall provide to the CPM for review and approval, a written report identifying which items of the Biological Resource Mitigation Implementation and Monitoring Plan have been completed, a summary of all modifications to mitigation measures made during the project's construction phase, and which condition items are still outstanding.

BIO-7 Prior to the start of rough grading of the project or any related facilities, the project owner shall provide a letter of credit in the amount of \$1,578,245.00 to a willing party acceptable to the CPM or acquire and transfer title in fee simple to a third party nonprofit habitat conservation organization with experience in acquiring and protecting desert tortoise and/or Mohave ground squirrel habitat, or to the California Department of Fish and Game, or to the U.S. Bureau of Land Management, one thousand ~~four~~one hundred twenty and twenty-six one hundredths ~~two~~(1,120.26) acres of suitable habitat for desert tortoise and Mohave ground squirrel. Funds equivalent to the cost of the land on a per acre basis shall be provided to the recipient of the land for establishing a long-term management endowment. Additionally, ~~funds equal to one fourth of the cost of the land on a per acre basis will~~\$9,881.00 shall be provided to the recipient of the land for fencing the acquired land.

**Verification:** At least 90 days prior to the start of rough grading of the project or any related facilities, the project owner shall provide the CPM with a copy of the ~~all~~letter of credit or the land transfer documents including verification of recording of title in the County Assessor's Office of the county in which the property transfer took place. Copies of receipts for all funds provided the recipient of mitigation land for long-term management funds and fencing funds, shall be provided the CPM.

BIO-8 Prior to the start of rough grading of the project or any related facilities, the project owner shall provide the Desert Tortoise Preserve Committee \$50,000.00 to support Mohave ground squirrel research that will aid in determining habitat characteristics indicative of suitability within various parts of its range. Once transferred, the money shall be nonrefundable.

**Verification:** At least 90 days prior to the start of rough grading of the project or any related facilities, the project owner shall provide the CPM with a copy of receipts for all funds provided the Desert Tortoise Preserve Committee.

BIO-9 Should ground water monitoring show that ground water levels in the Lower Narrows of the Mojave River riparian area are declining due to

project related withdrawals or other project related actions associated with the well field established for the High Desert Power Project, the project owner shall meet with the California Department of Fish and Game, the U.S. Fish and Wildlife Service, and the CPM to determine appropriate mitigation actions.

**Verification:** The CPM will review the ground water monitoring reports filed as required in **Soil & Water Resources #?** condition of certification and initiate action to address ground water level declines as they occur.

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# CULTURAL RESOURCES

Testimony of Kathryn M. Matthews

## INTRODUCTION

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This testimony discusses cultural resources, which are the structural and cultural evidence of the history of human development and life on earth. Archaeological evidence indicates that California has been occupied by humans for many thousands of years. Evidence of California's early occupation is becoming increasingly vulnerable to the ongoing development and urbanization of the state. Cultural resources are considered non-renewable resources, because those who made them lived long before the present.

Cultural resource materials may be found nearly anywhere in California: along the ocean coastline and on coastal islands; along rivers and streams; in coastal and inland valleys and lowlands; throughout the coastal and inland mountain ranges; and throughout the interior deserts. Cultural resources may be found on the ground or may be found at varying depths beneath the surface. In some areas of the state, a sequence of settlements on the same site may cover multiple layers of cultural resources. In other areas, the distribution of cultural materials may be much more dispersed.

Cultural resources are significant to our understanding of our culture, our history and heritage. Critical to the analysis of cultural resources are the spatial relationships between an undisturbed cultural resource site and the surface environmental resources and features, and the analysis of the locational context of the resource materials within the site and beneath the surface. These relationships provide information that can be used to piece together the sequence of human occupation and use of an area and they begin to create a picture of the former inhabitants and their environment. Analysis of cultural resources can also provide insight into the broader patterns of human adaptation to environmental change.

Staff's primary concerns in its cultural resource analysis are to ensure that all potential impacts are identified and that conditions are set forth which ensure no significant adverse impacts will occur. The determination of potential impacts to cultural resources from the proposed High Desert Power Project (HDPP) is required by the Siting Regulations of the California Energy Commission (Energy Commission) and by the California Environmental Quality Act (CEQA). Three aspects of cultural resources are addressed in staff's analysis: prehistoric archaeological resources, historic archaeological resources and ethnographic resources.

## PREHISTORIC RESOURCES

Prehistoric archaeological resources are those materials relating to prehistoric human occupation and use of an area; these resources may include sites and deposits, structures, artifacts, rock art, trails, and other traces of prehistoric human behavior. In California the prehistoric period began over 10,000 years ago and

extended through the 18th century when the first Euro-American explorers settled in California.

## **HISTORIC RESOURCES**

Historic archaeological resources are those materials usually associated with Euro-American exploration and settlement of an area and the beginning of a written historical record; they may include archaeological deposits, sites, structures, traveled ways, artifacts, documents, or other evidence of human activity. Under state requirements cultural resources must be greater than 100 years old, while under federal requirements such materials are considered if they are greater than 50 years old.

## **ETHNOGRAPHIC RESOURCES**

Ethnographic resources are those materials important to the heritage of a particular ethnic or cultural group, such as Native Americans, African, European, or Asian immigrants. They may include traditional resource collecting areas, ceremonial sites, topographic features, cemeteries, shrines, or ethnic neighborhoods and structures.

## **LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)**

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The following laws, ordinances, regulations, standards, and policies apply to the protection of cultural resources in California. Projects licensed by the Energy Commission are reviewed for compliance with these laws. In addition, federal, state and local guidelines for the assessment of cultural resources are included in Appendix A of this analysis.

### **FEDERAL**

- Antiquities Act of 1906, Title 16, United States Code, Sections 431, 432, and 433, and subsequent related legislation, policies, and enacting responsibilities.
- National Historic Preservation Act (NHPA), Title 16, United States Code, Section 470, establishes a national policy to preserve for public use historic sites, buildings, and objects of national significance for the inspiration and benefit of the people of the United States.
- Executive Order 11593, "Protection of the Cultural Environment," May 13, 1971, 36 Federal Register, 8921: orders the protection and enhancement of the cultural environment through providing leadership, establishing state offices of historic preservation, and developing criteria for assessing resource values.
- National Environmental Policy Act (NEPA): Title 42 United States Code, Sections 4321-4327; requires federal agencies to consider potential environmental impacts of projects with federal involvement and requires application of appropriate mitigation measures.

- Federal Land Policy and Management Act (FLPMA): Title 43 United States Code, Section 1701-1784: requires the Secretary of Interior to retain and maintain public lands in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric water resource, and archeological values; the Secretary, with respect to the public lands, shall promulgate rules and regulations to carry out the purposes of this Act and of other laws applicable to public lands.
- Historic and Archaeological Data Preservation Act, Title 16, United States Code, Section 469, provides for the protection of archaeological resources as a result of construction of a dam or alteration of terrain caused by the federal government or a federally-licensed project.
- American Indian Religious Freedom Act; Title 42 United States Code, Section 1996: protects Native American religious practices, ethnic heritage sites, and land uses.
- Native American Graves Protection and Repatriation Act (1990); Title 25, United States Code Section 3001, *et seq.*: defines “cultural items”, “sacred objects”, and “objects of cultural patrimony”; establishes an ownership hierarchy; provides for review; allows excavation of human remains, but stipulates return of the remains according to ownership; sets penalties; calls for inventories; and provides for return of specified cultural items.

## STATE

- [Title 14](#), Public Resources Code, Section 5020.1 -- defines several terms, including the following:
  - (j) “Historical resource” includes, but is not limited to, any object, building, structure, site, area, place, record, or manuscript which is historically or archaeologically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California.
  - (k) “Substantial adverse change” means demolition, destruction, relocation, or alteration such that the significance of an historical resource would be impaired.
- [Title 14](#), Public Resources Code, Section 5024.1 -- establishes a California Register of Historic Places; sets forth criteria to determine significance; defines eligible properties; lists nomination procedures.
- [Title 14](#), Public Resources Code, Section 5097.5 -- any unauthorized removal or destruction of archaeological or paleontological resources on sites located on public land is a misdemeanor.

[Public Resources Code, section 5097.98, defines procedures for notification of discovery of Native American artifacts or remains and the disposition of such](#)

materials. This section also prohibits obtaining or possessing Native American artifacts or remains taken from a grave or cairn, and sets penalties.

~~Title 14, Public Resources Code, section 5097.98 -- defines procedures for notification of discovery of Native American artifacts or remains; disposition of such materials.~~

~~Title 14, Public Resources Code 5097.98 -- prohibits obtaining or possessing Native American artifacts or human remains taken from a grave or cairn; sets penalties.~~

- ~~Title 14, Public Resources Code, Section 21083.2 -- The lead agency determines whether a project may have a significant effect on unique archaeological resources; if so, an EIR shall address these resources. If a potential for damage to unique archaeological resources can be demonstrated, such resources must be avoided; if they can't be avoided, mitigation measures shall be required. The law also discusses excavation as mitigation; discusses the cost of mitigation for several types of projects; sets time frame for excavation; defines "unique and non-unique archaeological resources"; provides for mitigation of unexpected resources; sets limitations for this section.~~
- ~~Title 14, Public Resources Code, Section 21084.1 -- indicates that a project may have a significant effect on the environment if it causes a substantial change in the significance of a historic resource; the section further describes what constitutes a historic resource and a significant historic resource.~~
- ~~Guidelines for the Implementation of the California Environmental Quality Act -- Appendix K specifically addresses effects on historic and prehistoric archaeological resources, in response to problems that have arisen in the application of CEQA to these resources. CEQA Guidelines, section 15126.4 "Consideration and Discussion of Mitigation Measures Proposed to Minimize Significant Effects", sub-section (b) "Mitigation Measures Related to Impacts on Historical Resources". Sub-section (1) discusses impacts of maintenance, repair, stabilization, restoration, conservation, or reconstruction of a historical resource. Sub-section (2) discusses documentation as a mitigation measure. Sub-section (3) discusses mitigation through avoidance of damaging effects on any historical resource of an archaeological nature, preferably by preservation in place, or by data recovery through excavation if avoidance or preservation in place is not feasible. Data recovery must be conducted in accordance with an adopted data recovery plan.~~
- ~~CEQA Guidelines, section 15064.5 "Determining the Significance of Impacts to Archaeological and Historical Resources". Sub-section (a) section defines the term "historical resources". Subsection (b) explains when a project may be deemed to have a significant effect on historic resources and defines terms used in describing those situations. Subsection (c) describes CEQA's applicability to archaeological sites and provides a bridge between the application of the terms "historic resources" and a "unique archaeological resources".~~

- ~~Title 14~~, Penal Code, Section 622.5 -- Anyone who damages an object or thing of archaeological or historic interest is guilty of a misdemeanor.
  - California Environmental Quality Act (CEQA): Public Resources Code Sections 5020.1, 5024.1, 21083.2, 21084.1, *et seq.* requires analysis of potential environmental impacts of proposed projects and requires application of feasible mitigation measures.
  - California Environmental Quality Act (CEQA) Guidelines: ["ISSUE V: CULTURAL RESOURCES"](#). [There are four questions to be answered in determining the potential for a project to impact archaeological, historic, and paleontologic resources.](#) ~~California Code of Regulations, Sections 15000, et seq, Appendix G (j), specifically defines a potentially significant environmental effect as occurring when the proposed project will "...disrupt or adversely affect...an archaeological site, except as part of a scientific study."~~
- ~~—~~
- ~~Public Resources Code, Section 5097.5. Any unauthorized removal of archaeological resources or sites located on public lands is a misdemeanor. As used in this section, a public land means lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority or public corporation, or any agency thereof.~~

## LOCAL

Although the Energy Commission has pre-emptive authority over local laws, it typically requires compliance with local laws, ordinances, regulations, standards, plans, and policies.

### **SAN BERNARDINO COUNTY, GENERAL PLAN**

The county's General Plan recognizes the importance of cultural resources on lands over which it has jurisdiction and several goals; policies and actions have been established to address management of these resources. General Plan Goals C-10, C-11, and C-12 address the identification of resources; preservation or data recovery; and avoidance of potential conflicts with Native American beliefs and concerns. Policies / Actions CP-1, CP-2, CP-3, CP-4, and CP-5 set forth procedures to be followed to implement the county's goals. The county has developed specific requirements for the protection of cultural resources and mitigation of potential impacts to such resources. The county requirements are usually effected by placement of conditions on a project during the environmental review process. Refer to AFC section 5.10.2 for the discussion of the county's General Plan requirements.

### **CITY OF VICTORVILLE, GENERAL PLAN**

The General Plan recognizes the "existence of rich ... archaeological resources" in the HDPP project area. City policies 1.3 and 1.4 address cultural resources and they set forth corresponding implementation measures and programs to effect these policies.

## SETTING

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### REGIONAL DESCRIPTION

The project region is located near the southern edge of the Mojave Desert Physiographic Province, in the northwestern portion of San Bernardino County. At the time of Euro-American contact, most of the Mojave had been traditionally occupied by the Serrano peoples, with an interfingering of tribal territories and boundaries at the edges of the Mojave, nearer to the mountain ranges and the Colorado River Basin. These early occupants had well established patterns of seasonal hunting and resource collection throughout the Mojave. As the weather patterns shifted away from the wetter cycles in the late Pleistocene, the climate became more arid, with corresponding changes in vegetation and animal resources. The native Californians had to adapt to a sparser distribution of water, food and other necessary resources. The presence of the Mojave River became an important factor in the ability of the early peoples to survive the changing environmental conditions.

The early peoples of California had well-established trade routes that often followed the river and other sources of water across the desert. The trade routes extended from the ocean coastal areas, northeastward across the Mojave Desert toward the tribes along the Colorado River and in northern Mexico. They also traveled northward and traded with the tribes along the eastern slopes of the Sierras. Many of the trade routes established by the native peoples of California were used by the Euro-American explorers and settlers as they spread into California. Eventually these same routes provided the foundation for the railroads and for modern-day highways. Due to topographic constraints and the presence of transportation access, these routes also were used for utility transmission facilities.

### SITE AND VICINITY DESCRIPTION

Prior to Euro-American contact, the power plant site and immediate project vicinity were occupied by the Vanyume sub-group of the Serrano. The Vanyume were not a large group and by the time of Euro-American contact, they had generally disappeared. However, numerous archaeological sites found throughout the project area provide evidence of prehistoric occupation and use by the native peoples of California.

After contact, the area attracted settlers seeking open land and the opportunity to develop homesteads and small farms. Discovery of gold, silver, and borax (among many minerals found in the Mojave) drew other waves of settlers. Portions of the routes for project-related linear facilities cross remnants of early trails and wagon roads across the Mojave. The construction of the railroad brought another wave of settlers who spread out along the route to provide water and other services for the trains. Eventually, the military was drawn to the vast, unoccupied spaces in the Mojave and several military installations were developed.

The city of Victorville is located just over the crest of a ridge from the greater Los Angeles basin and on the edge of the desert. The Mojave River provided a

consistent supply of good water for travelers preparing to cross or arriving from crossing the desert. Victorville and the surrounding cities of Adelanto, Apple Valley, and Hesperia became the focus of all major transportation routes between the coast and other western states. Numerous archaeological sites found throughout the project area provide evidence of these waves of historic occupation and development.

### ***PRE-AFC LITERATURE AND RECORDS SEARCH-AFC LITERATURE AND RECORDS SEARCH***

Prior to preparation of the AFC, consultants to the applicant conducted a literature and records search at the San Bernardino Archaeological Information Center at the San Bernardino County Museum in Redlands, California. Pertinent topographic maps, archaeological resource survey maps and notes, site records, and pertinent research and literature were reviewed to establish the location of previously conducted cultural resource surveys and known resources within one-[quarter to one-half](#) mile of all project components. Records on file at the information center denote each known cultural resource site [of or](#) isolate with a three-part identification number. If a site has a historic, as well as a prehistoric component to it, the trinomial designation is followed by an "H".

The background record search provides a basis from which to predict the archaeological potential of the area. Literature on the history, prehistory, and ethnography of the area was also consulted as an aid in developing the archaeological potential of the area and to prepare a context to be used in evaluating the significance of known or predicted resources (HDPP 1997a, [p.5-10-5](#)). Results of the literature and records reviews were summarized in the AFC and site-specific information was filed with the Energy Commission under separate cover to maintain confidentiality of sensitive resource locations ([AFC-1997b](#)[HDPP 1997a](#)).

#### **POWER PLANT SITE AND THE STAGING AND PARKING AREAS**

Records at the San Bernardino County Museum indicated that there were no known, recorded sites within one-half mile of the project site.

#### **ELECTRIC TRANSMISSION LINE CORRIDOR**

The record search indicated that there are 10 known cultural resources within the transmission line survey corridor; [. These resources are](#) described as follows:

- Prehistoric site CA-SBR-182 is described as a large village and burial site. This significant site was relocated by the applicant's consultant and was found to be intact and in fair to good condition. Its overall size was found to be more than four times that shown on the original site record.
- Historic site CA-SBR-6784H is described as a refuse disposal site. A visual search for this site yielded no cultural material. The site record states that the site is located in an intermittent drainage that periodically moves historical

materials downstream. It is also next to Air Base Road which has been recently widened through this area, and this appears to have destroyed the site.

- Prehistoric site CA-SBR-8391: [is](#) described as a lithic debitage and fire-cracked rock scatter. Both a visual search and use of a Global Positioning System (GPS) survey receiver were used to try to relocate this site. No evidence of the site was observed. The site record states that the site was at the toe of a dirt berm that supported Air Base Road. Air Base Road appeared to have been recently widened in this area, so the site was probably destroyed.
- Site CA-SBR-8389H: [is](#) described as a historic period fire hearth and a modern dog burial. A visual and GPS search failed to relocate the site and it may have been destroyed during a road-widening project.
- Site CA-SBR-8393: [is](#) described as a prehistoric campsite and lithic scatter. A visual and GPS search failed to relocate the site and it may have been destroyed by a road-widening project.
- Site PSBR-38H: is a three-cable, 115 kV transmission line originally built to provide energy for the Hoover Dam project. The line is 225 miles long and travels within the HDPP transmission line survey corridor for approximately four miles. This transmission line appears to be in good condition and it was found eligible for the NRHP in 1993.
- Site PSBR-62H: [is](#) the second historic electrical transmission line that travels within the HDPP transmission line survey. Built in 1918, this line runs for 39 miles and appears to be in good condition.
- Site CA-SBR-7043: [is](#) described as containing lithic tool manufacturing debris and milling stones. A visual and GPS search failed to relocate this site and it appears that the site could have been destroyed during road construction.
- Historic site CA-SBR-8392H: is a railroad spur from the Santa Fe main line to the SCIA that crosses the transmission line corridor. Constructed some time after 1941, the rails and wooden ties have been removed and the integrity of the resource has been greatly diminished.
- Sites CA-SBR-4272H and 4411H: [are](#) these reportedly are remnants of the Mormon Trail and the Salt Lake - Santa Fe Trail respectively through this area. The integrity of these portions of the trails is very low and a previous researcher has indicated that the location is only speculation based on interpretation of early maps.

#### SWP WATER PIPELINE CORRIDOR

The records search revealed no previously recorded sites along the proposed 7.2-mile water pipeline route.

## CORRIDOR FOR NATURAL GAS, POTABLE WATER, AND SEWAGE PIPELINES

No known sites have been recorded along the proposed gas pipeline route. Note: as the corridors for water and sewage are within the gas pipeline corridor and any impacts are likely to be similar in nature, all of these will be addressed under the gas pipeline corridor.

### POST-AFC LITERATURE AND RECORDS SEARCH

After the AFC was filed in June 1997, the applicant provided supplemental filings that withdrew the second water supply pipeline presented in the AFC and replaced it with a proposed well field and 6.5-mile pipeline ([Self-1998a](#)[HDPP 1997b](#)). In April 1998, the applicant filed a supplemental filing that proposed an additional 26-mile natural gas pipeline to connect the project with an alternative supplier ([HDPP 1998](#)). In June 1998, the applicant provided another supplement to the AFC in which the 26-mile natural gas pipeline route was withdrawn and a different, 32-mile route was proposed ([Self-1998b](#)[HDPP 1998](#)).

### POST-AFC WELL FIELD AND PIPELINE-(SELF 1998A)

Records at the San Bernardino County Museum indicated that there were four known, cultural resource sites recorded within one half mile of the well field and pipeline route. Two of the four recorded resources (PSBR-38H and PSBR-62H) are historic electric transmission facilities that would be crossed by the proposed pipeline route. The remaining two resource sites are CA-SBR-8861H (a pre-1900 historic dump) and CA-SBR-8862H (a historic scatter of artifacts). These four resource sites were previously described in the cultural resource report provided with the AFC.

### POST-AFC, 26-MILE NATURAL GAS PIPELINE (GREYSTONE 1998A)

Literature and record searches were apparently conducted for the proposed 26-mile gas pipeline project and the cultural resource survey work was begun. After discussions with federal agency staff about sensitive species and habitat, this proposed pipeline project was withdrawn and no report on the cultural resource findings was filed with the Commission.

### POST-AFC, 32-MILE NATURAL GAS PIPELINE (SELF 1998B)

The records search indicated that there are at least 54 known cultural resource sites and 73 historic and prehistoric isolates recorded within one quarter mile of the natural gas pipeline survey corridor. Recorded resources located within or adjacent to the 500-foot survey corridor were described as follows:

- Isolate A1841-281: described as a single rock core that was recorded in 1992 that was not relocated during the survey.
- Site CA-SBR-7431H: described as a remnant of one of several old wagon roads that emanating from the Randsburg mining district, that extended south toward Red Buttes and the Kramer Hills. The road currently is only faintly visible as a dirt track. The site was considered potentially significant.

- Site CA-SBR-7545H: is an abandoned section of historic Highway 395. The asphalt road segment is double lane, 26 feet wide and approximately 4 miles long. When originally recorded in 1993, the road still retained its white centerline striping and still appears as it did when first recorded. The age of this segment is not known from existing information. The site was considered potentially significant.
- Site CA-SBR-7670H: recorded as a scatter of historic debris. When recorded in 1993, the site consisted of a fence and posts, a well, three trash pits, a scatter of historic refuse, and a scatter of cinder block fragments. When inspected as part of this survey, the site was found to be mostly intact and as described on the record. The site was considered potentially significant.
- Site CA-SBR-7687H: first recorded in 1993, the site is a historic building foundation, a conical pit, a debris-filled shaft with adjacent piles of dirt, portions of a dirt road, two can concentrations, and a scatter of other historic debris. When inspected during the field survey, this site was still intact and appeared to be in the same condition as when first recorded. The site was considered potentially significant.
- Site PSBR-039H: is a portion of the Southern California Edison Company's Kramer-Victor 115kV Transmission Line. During the survey, it was not apparent how much of the existing transmission line may be original (unaltered) and of potential historic significance. The site was considered potentially significant.
- Site CA-SBR-7085: described as a large lithic quarry with associated lithic scatter situated on several ridgelines. The site contained both core reduction and biface reduction remnants were found. The site was considered potentially significant.
- Site CA-SBR-7202: described as a sparse lithic scatter containing less than 30 chert and rhyolite cores and flakes. The site was relocated during the survey and was found to extend an additional 450 meters north/south of the recorded site boundary. The existing site record will be updated to reflect the extension of the boundaries. The site was considered potentially significant.
- Site CA-SBR-7281: described as a sparse lithic flake scatter. Some, but not all, of the lithic flakes were relocated during this field survey. Fragments of colored glass were also relocated, confirming a historic dimension for this site. The original site record will be amended to include a description of the historic component. The site was considered potentially significant.
- Site CA-SBR-7282: described as a sparse lithic scatter exposed on the surface in and around areas of deflated soil. The site appears to be intact and was considered potentially significant.
- Site CA-SBR-7551: recorded as a light to moderate-density lithic scatter with two loci, situated on an alluvial plain. Although this site was not relocated during survey, it was considered potentially significant.

- Site CA-SBR-7672: recorded as a prehistoric quarry with associated lithic scatter situated on a series of low-lying ridgelines. This site was inspected during the field survey and appears to be intact. The site was considered potentially significant.
- Site CA-SBR-7674: recorded as a small lithic scatter. Although the site was not located during the field survey, it is considered potentially significant.
- Site PSBR-1582-2: recorded as a (presumably prehistoric) campsite but the site record is illegible and no further information on the resources present is available. If this was relocated, it would be considered potentially significant.
- Site CA-SBR-2257/H: recorded as a dual component site. The prehistoric component consists of a very large (1,387,880 square meters) scatter of flaked stone tools and debitage, with three loci separated by a sparse, discontinuous scatter of debitage. Two loci are lithic concentrations; the third is a historic can scatter with lavender glass shards. Investigations, including a limited testing program, have occurred on five separate occasions at this site (Smith 1971; Hampson et al. 1989; Macko 1989; Taylor and Tambunga 1990; and McKenna, *et al* (no date). The site was relocated during the field survey. The site boundary is estimated to extend south an additional 2000 feet and east an additional 700 feet. The site was considered potentially significant.
- Site CA-SBR-7544/H: described as a multi-component site consisting of a lithic quarry, a historic shaft, and a can scatter. Relocated during field survey, the site appears to be intact and the dimensions correctly rendered. The site was considered potentially significant.

#### PRE-AFC FIELD SURVEYS-

Following the literature and records search, an intensive on-the-ground surveys of the proposed power plant site and the proposed routes or corridors for the associated linear facilities were conducted by qualified professional archaeologists. The cultural resource consultants to the applicant conducted these pedestrian surveys between April 21 and 29, 1997. Survey crew members walked in a zig-zag pattern, in transect intervals varying from 15 to 30 meters (50 to 100 feet) or less. The width the corridors surveyed for the linear facilities ranged between 100 and 4,000 feet. Natural and manmade exposures were examined for lithic and cultural artifacts and isolates, for signs of possible midden deposits, for evidence of prehistoric and historic use, and to ground-proof the mapped topography and developments in the project area ([HDPP 1997a](#)[AFC 1997b](#)).

If a previously unknown site or an isolated artifact were found during these pre-project surveys, a map and a record form were completed and filed with the regional archaeological information center. The information center reviews the maps and survey forms and then assigns a three-part identification number to each recorded site or isolate.

#### PROJECT SITE AND THE STAGING AND PARKING AREAS [\(HDPP 1997A\)](#)

The survey of the project site included the 25-acre site and the 24-acre staging and parking areas. No surface evidence of cultural resources was found during these surveys.

#### ELECTRIC TRANSMISSION LINE CORRIDOR [\(HDPP 1997A\)](#)

The surveys for the electric transmission route varied from 2,000 to 4,000 feet in width, depending upon the need to pass under or over other existing transmission facilities. Three archaeological sites that had not been previously recorded were discovered and recorded during the survey of the transmission line corridor and consist of the following:

- Site CA-SBR-8861H is a pre-1900 historic dump with possible foundation remnants. Observed artifacts included glass and ceramic fragments and metal remains. The site measures about 15 meters (50 feet) in diameter and there is evidence of recent digging and/or possible bottle hunting.
- Site CA-SBR-8862H is a very dense historic artifact scatter (estimated at 3000+ artifacts) consisting primarily cans with a smaller quantity of bottle glass and ceramics. The site, about 30 meters (100 feet) in diameter, appears to date from about 1920 to 1930.
- Site CA-SBR-8863, is a prehistoric site consisting of a sparse lithic tool scatter and fire cracked rock. The site measures 30 meters x 25 meters (100 feet x 80 feet), but could be larger as sand deposits appear to have settled over cultural materials.

#### SWP WATER PIPELINE CORRIDOR [\(HDPP 1997A\)](#)

The width of the survey of the 7.2-mile water pipeline corridor ranged between 250 and 500 feet. Although no sites had been previously recorded along this corridor, two new sites were discovered during the survey. The newly discovered sites consist of the following:

- Site CA-SBR-8859H: described as a pre-1890 historic can and bottle scatter, measuring about 15 meters x 15 meters (50 feet x 50 feet).
- Site CA-SBR-8860H: described as a historic can scatter with over 30 cans and bottle glass fragments. This site appears to date later than CA-SBR-8859H, to about 1920 to 1930.

#### CORRIDOR FOR NATURAL GAS, POTABLE WATER, AND SEWAGE PIPELINES [\(HDPP 1997A\)](#)

The surveys of the routes for these facilities were between 100 and 500 feet in width. No sites were previously recorded along the corridor and no new sites were encountered during the pre-AFC surveys.

## **POST-AFC FIELD SURVEYS**

As noted above, the applicant filed supplements to the AFC that described additional facilities and identified additional linear routes that were subjected to the required record searches and surveys. The results of the surveys for the supplemental filings are summarized here.

### **SURVEYS OF THE WELL FIELD AND PIPELINE (SELF 1998A)**

Portions of the route proposed for the new water supply pipeline run parallel the route for the natural gas supply pipeline that was surveyed for the AFC. Additional surveys were conducted on April 6 and 7, 1998 for the well field and for that portion of the water pipeline corridor that extends southward from the gas pipeline route. The archaeologist walked in a zig-zag pattern within a 100-foot wide corridor on either side of the center line for the pipeline and within a circle 300 feet in diameter around each of the seven proposed extraction well sites. No new archaeological sites were discovered and recorded during these surveys.

### **SURVEY OF THE 26-MILE NATURAL GAS PIPELINE (GREYSTONE 1998A)-**

Surveys for this pipeline corridor were conducted in February or March 1998. However, since this supplementary pipeline proposal was withdrawn, no report on the survey results was filed with the Commission.

### **SURVEY OF THE 32-MILE NATURAL GAS PIPELINE (SELF 1998B)-**

Cultural resource consultants to the applicant conducted a intensive pedestrian survey of the 32-mile proposed natural gas pipeline corridor between May 26 and June 3, 1998. Survey crew members walked in a zig-zag pattern across a 500-foot wide corridor, using transect intervals of approximately 85 feet or less. One steep slope (over 50 degrees) in the Kramer Hills was excluded from the survey for safety reasons but it was visually scanned for evidence of either historic mining debris or other historic remains, or rock outcroppings that might have served as shelters, or that might contain petroglyphs or incipient mortars. Ground visibility during the survey varied from good to very good depending on the vegetation. Twelve of the sixteen previously recorded archaeological sites were relocated during the surveys and six previously unknown cultural resource sites were discovered within the pipeline survey corridor.

The newly discovered and recorded sites encountered during the surveys are described as follows:

- Site CA-SBR-9390H: described as a metal-lined ventilation shaft located approximately 1500 feet southeast of a known mine shaft. The shaft drops to an unknown depth and there are several concrete, wood, and metal foundation components on the surface near the opening and in the general vicinity. This site was considered potentially significant.
- Site CA-SBR-9391H: described as an historic trash scatter, composed mostly of cans. It measures 15 feet north/south x 30 feet east/west. There are approximately 180 cans with an additional 20 or more outside the principal

concentration. Can construction indicated they were manufactured after 1900. This site was considered potentially significant.

- Site CA-S BR-9392: described as a small lithic scatter consisting of approximately 20 flakes and three cores. The approximate size of the site is 15 meters x 15 meters. This site was considered potentially significant.
- Site CA-SBR-9393H: consists of three small stone circles with upright wood stakes and remnants of coffee cans embedded in the center and four wood stakes that form a square. The function of the circles and the associated staked square is not readily apparent. The site was considered potentially significant.
- Site CA-SBR-9394H: described as a small trash scatter measuring approximately 100 feet x 35 feet. Artifacts observed included glass fragments (likely pre 1917 manufacture), post-1900 type tin cans, thick, clear glass fragments, square aspirin tin, ceramic fragments, pieces of barbed wire, and some milled lumber. The site was considered potentially significant.
- Site CA-SBR-9395H: described as a large mine shaft or pit excavated in an outcrop of white, chalky rock; the excavation has been filled with modern debris. The site was considered potentially significant.

#### **REFINED SURVEY OF 32-MILE GAS PIPELINE CORRIDOR (SELF 1998C)**

Approximately eight miles of the proposed 32-mile gas pipeline route are located on lands administered by the US Bureau of Land Management (BLM). BLM has determined that the pipeline project constitutes an “undertaking”, and has indicated that the entire 32-mile route is subject to federal historic preservation laws and regulations, regardless of ownership.

For its review of a project, the BLM typically requires an applicant to provide a specific project design and a clearly defined Area of Potential Effect (APE). The APE is defined as “that area within which all direct, physical impacts of construction, operation, and maintenance will be confined. For a pipeline project, the APE is described in relation to the staked centerline, as an area 20 feet west of the staking and an area 90 feet east of the staking. These offset areas stay on the same side of the pipeline regardless of the direction of travel; thus, the 20-foot wide area continues along on the south side of the center line if the alignment shifts to an east/west heading, while the 90-foot wide area continues along the north side of the staking.

The initial surveys of the pipeline route were based on a 500-foot wide corridor. After the center lines and right-of-way boundaries were staked and the APE was identified, the findings of the May and June 1998 surveys were re-evaluated by the archaeological consultants and an additional survey was conducted on August 17 and 18, 1998. The narrowing the right-of-way to 110 feet within the 500 feet meant that 10 of the 21 known sites would now be avoided by pipeline construction; eleven known sites remained within or adjacent to, the APE. The eleven remaining sites of concern include:

- CA-SBR-7202, a large lithic scatter, with new, extended boundaries;
- CA-SBR-7545H, a lithic scatter, a historic shaft, and a can scatter;
- CA-SBR-9395H, a mine shaft or pit filled with debris;
- CA-SBR-7544/H, lithic quarry, historic shaft, and can scatter;
- CA-SBR-2257/H, a very large quarry site with a scatter of flaked stone tools and debitage, historic can and glass scatter, with newly extended boundaries
- CA-SBR-9390H, a metal-lined ventilation shaft and associated historic artifacts;
- CA-SBR-7282, a sparse lithic scatter;
- CA-SBR-7431H, remnant of early Randsburg wagon road;
- CA-SBR-7670H, historic debris associated with a well, a fenceline and trash pits;
- CA-SBR-7672, a prehistoric quarry; and
- PSBR-1582-2, recorded as a (probably prehistoric) camp site but not relocated;

### **SUMMARY OF RESOURCES ASSOCIATED WITH THE HDPP PROJECT, EXCEPT THE 32-MILE GAS LINE**

As described in the AFC, and in subsequent filings describing amendments to the proposed HDPP project, the project may directly and/or indirectly affect numerous known and recently recorded cultural resources. The AFC discuss a total of fifteen such resources, all but two of which were found within the corridor evaluated for the proposed electric transmission line. Ten of the fifteen sites had been previously recorded and five new sites were discovered during surveys for the HDPP project. Three additional sites were discovered during pre-AFC surveys of the transmission route and two new sites were discovered during surveys of the route for the proposed pipeline to connect with the State Water Project.

Five of the ten previously recorded sites could not be re-located during pre-AFC field surveys and were presumed destroyed by road construction. One previously recorded linear resource was described as being altered to the extent that its integrity was greatly diminished, and another linear resource was described as having low integrity in the project area and the resource location itself was described as somewhat speculative.

Of the remaining three previously recorded resources, one is a relatively intact prehistoric village site that contained burials. This site was relocated during pre-AFC surveys and the overall size was found to be nearly four times larger than originally recorded and it is still in relatively good condition. The other two previously recorded resources described in the AFC are electrical transmission facilities that are in use and relatively unchanged since original installation. One of the transmission lines was declared eligible for listing in the National Register of Historic Places in 1993. The second transmission line appears to be in good condition and its eligibility status is undetermined. Of the five newly recorded sites discovered during pre-AFC surveys, only one is described as being prehistoric in age and no additional evaluations have been conducted to determine their potential eligibility for listing in the National or State registers.

## **SUMMARY OF RESOURCES ASSOCIATED WITH THE 32-MILE GAS PIPELINE**

As described in a filing subsequent to the AFC, the applicant has proposed to connect the HDPP project with an, as yet unbuilt, natural gas pipeline. A series of cultural resource surveys have been conducted along the 32-mile corridor identified for this project. During the record search prior to the surveys, consultants to the applicant identified sixteen known cultural resource sites within or immediately adjacent to the pipeline corridor. The initial surveys covered an area about 500-foot wide, on either side of a preliminary centerline. Twelve of the sixteen previously recorded sites were re-located during the surveys and an additional six sites were discovered.

Portions of the new gas pipeline corridor cross lands managed by the US BLM and they requested further refinement of the pipeline route to specifically identify the centerline and the boundaries of a one hundred and ten (110) foot right of way. The applicant was requested to conduct additional surveys to identify which resource sites remained within the project's Area of Potential Effect (APE) and to make a determination of potential eligibility for the National Register. Eleven sites remained within the APE after the second survey and the archaeological consultant determined that five of these sites were potentially eligible for listing on the National Register. Follow-up evaluations were done for these five sites. One was already deemed eligible for the Register; two that are adjacent to the right-of-way boundaries could be fenced to avoid impacts during construction; and two sites were recommended for surface collection and sub-surface sampling to determine their potential eligibility. The results of these final evaluations have not yet been filed with the Energy Commission but staff visited the sites during the field testing and learned that one of the two was deemed potentially eligible and the other was not.

## **CATEGORIZATION OF IDENTIFIED RESOURCES**

Various laws apply to the treatment of cultural resources. These laws require the Energy Commission to categorize resources by determining whether they meet several sets of specified criteria. These categories then in turn influence the analysis of impacts to the resources and the mitigation that may be required to ameliorate any such impacts.

Only historic or prehistoric sites, objects or features, or architectural resources which are assessed by a qualified researcher as "important" or "significant" in accordance with federal guidelines need to be considered during the planning process. The significance of historic and prehistoric cultural resources is judged in accordance with the criteria for eligibility for nomination to the National Register of Historic Places as defined in 36 CFR 60.4. If such resources are determined to be significant, and therefore eligible for listing in the National Register [or the California Register, under CEQA], they are afforded certain protection under the National Historic Preservation Act and/or CEQA. The Advisory Council on Historic Preservation, for example, must be given an opportunity to comment on any federally-funded or permitted undertaking that could adversely affect such resources.

The National Register criteria state that “eligible historic properties” are: districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that (a) are associated with events that have made a significant contribution to the broad patterns of our history,; or (b) that are associated with the lives of persons significant in our past; or (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or (c) that represent a significant distinguishable entity whose components may lack individual distinction; or (d) that have yielded or may be likely to yield, information important to history or prehistory.

Resources determined not to be significant, that is, not eligible for National Register listing, are subject to recording and documentation only, and are afforded no further protection under federal law. However, occasionally certain resources, although they may not be assessed as “significant”, may nonetheless be of local or regional importance such that mitigation may be warranted regardless of their assessed significance (HDPP 1998\*). Staff’s evaluation only considers those resources that meet these criteria.

The record and literature search and intensive field survey of the proposed pipeline corridor was conducted to identify any cultural resources already listed on or potentially eligible for listing on either the National Register of Historic Places (National Register) [36 CFR 800] or the California Register of Historic Resources. The determination of eligibility is made in compliance with the applicable provisions of the National Historic Preservation Act.

In addition, in the time that has elapsed since the first draft of this testimony was prepared, the state Resources Agency has adopted considerable revisions to the regulations implementing California Environmental Quality Act (CEQA). These changes affected the language applicable to the analysis of cultural resources. Previously, the bulk of the information on how to assess resource and impact significance and on the types of mitigation measures available was contained in Appendix K of the CEQA Guidelines. Much of the language of that appendix has now been incorporated into Title 14 Code of California Regulations (CCR), sections 15126.4 and 15064.5.

The CEQA guidelines now explicitly require the lead agency (in this case, the Energy Commission), to make a determination of whether a proposed project will affect “historic resources” and sets forth a listing of criteria for making this determination. As used in the law, the term “historic resources” includes any resource, regardless of age, as long as it meets these criteria. If the criteria are met, the Energy Commission must evaluate whether the project will cause a substantial adverse change in the significance of that historic resource, which the regulations state is a significant effect on the environment. The CEQA changes also indicate that the mitigation for impacts to historic resources meeting these criteria shall not be subject to the limitations provided in PRC section 21083.2.

Using the above criteria, staff has determined that all of the cultural resource sites described in the AFC and in subsequent filings for the HDPP project meet one or more of the criteria for being an historical resource. Isolated finds, by definition do not meet these criteria.

Finally, CEQA contains a statute addressing archeological resources. It establishes limitations on analysis and prohibits imposition of mitigation measures for impacts to archeological resources that are not unique. (PRC section 21083.2) The statute also provides a definition of unique archeological resources. However, the CEQA Guidelines state that this prohibition does not apply when an archeological resource also meets the definition of a historical resource. (Cal. Code Regs., tit 14, section 15064.5) Because staff determined that the impacts for which it is recommending mitigation do meet the definition of historical resources, the prohibition does not apply to the mitigation discussed in this Staff Assessment.

## IMPACTS

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Impacts to cultural resources may result either directly or indirectly during the pre-construction, construction, and operation of the project. Direct impacts are those which may result from the immediate disturbance of resources, whether from vegetation removal, vehicle travel over the surface, earth-moving activities, or excavation. Placement of an industrial project such as a power plant, within the setting of an historic neighborhood or within an ethnically significant or sacred landscape may also have an adverse effect on these sensitive resources. Indirect impacts are those which may result from increased erosion due to site clearance and preparation, or from inadvertent damage or outright vandalism to exposed resource materials due to improved accessibility. Cumulative impacts to cultural resources may occur if increasing amounts of land are cleared and disturbed for the development of multiple projects in the same vicinity as the proposed project. In most instances, researchers prefer to avoid disturbance of known cultural resource sites and artifacts.

As described in the AFC, the potential for the project to impact cultural resources is directly related to likelihood that such resources are present and whether they are actually encountered during project development and construction activities. Since numerous cultural resource sites have been discovered in the vicinity of the project site and linear facility routes, there is a strong likelihood that cultural resources may be encountered during project-related site clearance and excavation. (AFC 1997b).

Often the potential for cultural materials to be found during project construction activities remains uncertain until the ground surface has been broken and excavation of sub-surface soils takes place. When a potential for discovery of cultural resources has been identified through literature search and reconnaissance surveys, there is a potential that project-related impacts may affect any cultural resources actually present. The potential for discovery does not measure the full significance of individual artifacts or other cultural resources present, since it is impossible to accurately predict what specific materials could be encountered.

Often the full significance of recovered cultural resource materials can only be determined after they have been collected, prepared, and studied by professional archaeologists

Not all cultural resources are the same, nor do they offer the same degree of information or insight into past human activities and adaptations to their environment. Professional experience, the literature, and the records of previously discovered cultural resources all provide a means of assessing the relative value of a newly discovered site or a recently unearthed resource. Significant cultural resources are those that meet established scientific criteria that are generally accepted by professional archaeologists. Staff's objective is to ensure that there will be no adverse impacts to cultural resources during site development and project construction

## **SIGNIFICANCE CRITERIA FOR CULTURAL RESOURCES**

~~The record and literature search and intensive field survey of the proposed pipeline corridor was conducted to identify any cultural resources already listed on or potentially eligible for listing on either the National Register of Historic Places (National Register) [36 CFR 800] or the California Register of Historic Resources. The determination of eligibility is made in compliance with the applicable provisions of the National Historic Preservation Act and the California Environmental Quality Act (CEQA) Guidelines contained in CEQA Appendix K.~~

~~Only historic or prehistoric sites, objects or features, or architectural resources which are assessed by a qualified researcher as "important" or "significant" in accordance with state and federal guidelines need to be considered during the planning process. The significance of historic and prehistoric cultural resources is judged in accordance with the criteria for eligibility for nomination to the National Register of Historic Places as defined in 36 CFR 60.4. If such resources are determined to be significant, and therefore eligible for listing in the National Register [or the California Register, under CEQA], they are afforded certain protection under the National Historic Preservation Act and/or CEQA. The Advisory Council on Historic Preservation, for example, must be given an opportunity to comment on any federally-funded or permitted undertaking that could adversely affect such resources.~~

~~The National Register criteria state that "eligible historic properties" are:~~

~~.districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that (a) are associated with events that have made a significant contribution to the broad patterns of our history;; or (b) that are associated with the lives of persons significant in our past; or (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or (c) that represent a significant distinguishable entity whose components may lack individual distinction; or (d) that have yielded or may be likely to yield, information important to history or prehistory.~~

~~Resources determined not to be significant, that is, not eligible for National Register listing, are subject to recording and documentation only, and are afforded no further protection under state or federal law. However, occasionally certain resources, although they may not be assessed as “significant”, may nonetheless be of local or regional importance such that mitigation may be warranted regardless of their assessed significance (HDPP 1998\*).~~

## **PROJECT-RELATED IMPACTS**

More than 70 archaeological sites, features, or objects are known to be located on the Adelanto and Victorville topographic quadrangles, within one-half mile of the proposed project site. An additional 29 prehistoric, 16 historic, 9 historic/prehistoric, and 73 isolates had previously been recorded within one quarter mile of the 32-mile gas pipeline route and an additional six sites were identified during project-related surveys. The density of sites recorded in the project vicinity indicates a high potential for historic and prehistoric resources to be encountered in the immediate project area.

For the HDPP project, the majority of potential impacts to cultural resources will be associated with the construction phase of the project. Since project development and construction usually entail surface and sub-surface disturbance of the ground, the proposed HDPP has the potential to adversely affect known, as well as previously unknown cultural resources. The day to day operation of the HDPP power plant is not expected to have any significant impacts on the region’s cultural resources. However, the presence of major known archaeological sites within the right-of-way for the 32-mile natural gas pipeline would generate the potential for on-going impacts to those resources throughout the lifetime of the HDPP project. [As a result, staff has proposed mitigation that addresses impacts for both known and unknown resources.](#)

### **POWER PLANT SITE AND THE STAGING AND PARKING AREAS**

Site clearance and grading associated with the power plant site preparation and the excavations and foundation development associated with power plant construction is not expected to impact any known cultural resources materials. The potential for impact to cultural resources will depend on the extent of surface area to be disturbed during site preparation and the depth of excavation into previously undisturbed ground to build project foundations (AFC 1997b).

However, information provided in the AFC on project construction methods was generalized and the plans and site layouts for project structures were identified as “typical” or “conceptual”. The project AFC and subsequent information responses do not indicate the depth of excavation or ground disturbance needed for construction of the power plant foundations. No geotechnical reports and borings were conducted for this project AFC and there is no information on whether fill materials are present at the proposed power plant site. While the AFC indicates considerable disturbance of the site, there is no information on the depth of this previous disturbance.

While no surface evidence of cultural resources was found during the initial surveys of exposed soil surfaces at the proposed power plant site, the high potential for discovery of cultural resource materials in the project study area suggests that previously unknown cultural resources may be encountered during excavations into the underlying soils for structural foundations. The varying extent and depth of excavations will result in different degrees of impacts on the cultural resources. The potential for impacts is directly related to the amount of excavation -- the more excavation there is, the greater the potential for impacts (AFC 1997b). Staff has proposed conditions of certification that will reduce the potential for significant impacts to cultural resources if they occur.

#### ELECTRIC TRANSMISSION LINE

Information provided on project construction methods was generalized and transmission structures were drawn as "typical" or "conceptual". The AFC description of the ground surface along the transmission corridor indicates it is variable - some areas have been previously disturbed and some areas are covered to varying degrees with vegetation. Portions of the proposed corridor are crossed by existing high voltage transmission facilities and access roads; other portions of the corridor run parallel to existing high voltage transmission facilities and access roads (AFC 1997b).

The final center lines for transmission line segments have not yet been identified. The width of the ultimate right of way for the proposed transmission line is expected to vary from 100 to 120 feet, depending upon the type of transmission structures used and the span length between them (AFC 1997b). As discussed in the AFC, the applicant will likely use lattice towers in those areas where the new line parallels existing lines using lattice towers and then use tubular poles elsewhere along the proposed route. The AFC indicates that the specific location of each transmission structure is to be delineated in engineering studies that are to take place after project certification.

Construction of either lattice towers or tubular poles will require drilling of the soil to variable depths for foundation footings, placement of rebar and anchors, pouring of concrete, and assembly and erection of the transmission structures. Depth and width of soil disturbance will depend on the height and diameter of the transmission structure designed for that portion of the route (AFC 1997b). Pending detailed design studies, the applicant has assumed an average span length of 700 to 800 feet between transmission structures which would indicate approximately 50 transmission structures would be required for the proposed 7.25 mile route (AFC 1997b).

Regardless of the actual location of transmission facilities, the high potential for discovery of cultural resource materials in the project study area suggests that previously unknown cultural resources may be encountered during excavations into the underlying soils for the foundations for transmission line poles or towers. The varying extent and depth of excavations will result in different degrees of impacts on the cultural resources. The potential for impacts is directly related to the amount of excavation -- the more excavation there is, the greater the potential for impacts

(AFC 1997b). Staff has proposed conditions of certification that will ensure no significant impact to cultural resources

#### **SWP WATER PIPELINE CORRIDOR**

Although no cultural resource sites had been previously recorded within the proposed pipeline corridor, two new sites were discovered during the pre-AFC surveys. Both were historic trash dumps. The high potential for discovery of additional cultural resources in this area, there is a potential that trenching for the pipeline could encounter previously unknown cultural resources. Staff has proposed conditions of certification that will ensure no significant impact to cultural resources.

#### **CORRIDOR FOR NATURAL GAS, POTABLE WATER, AND SEWAGE PIPELINES**

The AFC describes the largest diameter pipeline needed to supply natural gas to the HDPP, as 16 inches. The ground surface along the gas pipeline route is described as considerably disturbed and much of the alignment is now paved or otherwise covered by development. Portions of the proposed pipeline corridor are crossed by existing high voltage transmission facilities and access roads. Information provided on pipeline construction methods was generalized but did indicate that the new gas pipeline will be buried in trenches approximately two feet wide and seven feet deep (AFC 1997b).

As described in the AFC, the project's proposed potable water connection line will be about six inches in diameter and will run for about 500 feet along local streets. Information provided on pipeline construction methods was generalized but the AFC indicated the pipeline would be buried in a trench that was approximately 2.5 feet wide and 8 feet deep (AFC 1997b). As described in the AFC, the proposed HDPP sanitary sewer line will be connected to the existing sewer facility located just to the east of the project site AFC 1997b).

The final centerlines for these pipeline routes have not yet been identified. Regardless of the actual location of the connections and pipelines, the high potential for discovery of cultural resource materials in the project study area suggests that previously unknown cultural resources may be encountered during excavations into the underlying soils for pipeline trenching. The varying extent and depth of excavations will result in different degrees of impacts on the cultural resources. The potential for impacts is directly related to the amount of excavation - the more excavation there is, the greater the potential for impacts (AFC 1997b). Staff has proposed conditions of certification which should ensure that no significant impact to cultural resources would occur.

#### **POST-AFC WELL FIELD AND WATER SUPPLY PIPELINE**

Most of the new water supply pipeline will parallel that of the gas pipeline route that was described in the AFC as considerably disturbed with much of the alignment paved or otherwise covered by development. Four cultural resource sites were identified in the record search for the gas pipeline and no new sites were encountered during the surveys. Two of the known sites are electric transmission lines that would not be affected by trenching for pipeline construction. The other

two known sites are located outside the APE and would not be affected by trenching for the pipeline.

The high potential for discovery of cultural resource materials in the project study area suggests that previously unknown cultural resources could be encountered during excavations into the underlying soils for pipeline trenching or well field development. The varying extent and depth of excavations will result in different degrees of impacts on the cultural resources. The potential for impacts is directly related to the amount of excavation -- the more excavation there is, the greater the potential for impacts (AFC 1997b). Staff has proposed conditions of certification which should ensure that no significant impact to cultural resources would occur.

#### POST-AFC, 32-MILE NATURAL GAS PIPELINE

During the initial survey of the 32-mile natural gas pipeline survey corridor, 21 cultural resource sites were identified. Following flagging of the centerline and the right-of-way boundaries and the second survey of the pipeline route, ~~ten~~ ~~eleven~~ sites still remained within the APE. For these ~~eleven~~ ~~ten~~ sites, BLM required the archaeologist to make a determination whether any were potentially eligible for nomination to the National Register. Five were determined to be eligible and they are undergoing, or are scheduled for, testing and further evaluation. These five sites are CA-SBR-7202, CA-SBR-7544H, CA-SBR-2257/H, CA-SBR-7282, and PSBR-1582-2.

Each of these sites clearly will be significantly impacted by clearance of the ground surface and the construction of trenches seven feet deep and six to ten feet wide. Two of the sites extend over such a large surface area on either side of the centerline, that there is no room within, or outside of, the proposed pipeline right-of-way to avoid crossing through them. BLM staff has indicated that the presence of cultural resource sites that meet the federal eligibility criteria would not preclude BLM from granting a permit for construction of the gas pipeline project. They would require completion of the testing program and evaluation, preparation of a detailed "Historic Resources Treatment Plan", pre-construction testing and data recovery, as well as full-time monitoring and extensive mitigation during construction activities. Where trenching for the pipeline would impact cultural resource sites determined not to be eligible for the National Register, the BLM requirements are more limited (~~Kunkleman~~ ~~Cunkelman~~ 1998c). The only way not to impact the five resource sites already determined to be eligible for the National Register is to not construct the gas pipeline in this route.

## CUMULATIVE IMPACTS

Based upon previous cultural resource surveys and research, the desert areas of California have been inhabited by prehistoric and historic peoples for thousands of years. Proposed developments reaching wider and deeper into the Mojave Desert can contribute to the potential for loss of significant cultural resources. Usually, with proper planning and appropriate mitigation, such developments can help to preserve these resources and can also provide opportunities for increasing our understanding of the past environmental conditions and cultures. However, construction of the proposed 32-mile natural gas pipeline will add to cumulative

impacts that have already occurred at two or more of the [eligible sites already determined to be eligible for listing in the National Register](#).

## FACILITY CLOSURE

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The anticipated lifetime of the HDPP power plant is expected to be in excess of thirty years. At the time of closure all then-applicable LORS will be identified and the closure plan will address how these LORS will be complied with. Generally, if no additional ground disturbance occurs during closure activities and all conditions of certification placed on the original project have been met, then no impacts to cultural resources would be expected.

The potential for actual impacts to cultural resources depends, to some degree, upon final design and location of project structures, in relation to existing cultural resources. Likewise, the potential for project closure and structure removal to impact cultural resources will depend upon the spatial relationship between the project facilities and any known cultural resources. Since these spatial relationships will not be known until completion of final project design and site layout, staff can make no final conclusion this time with respect to potential impacts of facility closure on known cultural resources.

For the 32-mile natural gas pipeline, staff can conclude that any surface or sub-surface maintenance and repair or removal of the pipeline upon abandonment or closure, will have potentially adverse impacts on those known cultural resource sites located directly within the APE of this pipeline. Prior to any surface or sub-surface disturbance or pipeline removal, the project owner / operator must complete an archaeological resource treatment plan that meets BLM permit requirements and Commission conditions of certification.

## MITIGATION

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The literature and the records of known cultural resource sites and isolates indicate there is a high potential for discovery of cultural resources throughout the project area. The records also suggest that cultural resources may be found on the surface or may be uncovered during excavations into the underlying soils. The potential for impacts is directly related to the amount of project-related surface and or sub-surface disturbance -- the greater the disturbance, the greater the potential for impacts. For cultural resources, the preferred mitigation measure is for project-related construction to avoid areas where cultural resources are known to be present.

No project-specific geotechnical studies or project site lay-outs have been presented for the power plant site. The applicant does not propose to conduct these studies until after the project has been certified, prior to determining final project design. Except for the 32-mile natural gas pipeline route, the final center lines and right-of-way boundaries for the linear facility routes have not been identified within the wider corridors described in the AFC. The applicant does not propose to delineate the final center lines and right-of way limits for linear routes not

on BLM-administered lands until after certification of the project (HDPP 1997b; 1998\*).

The discussion of proposed mitigation measures is presented in two parts: the power plant site and associated facilities as described in the AFC, and the 32-mile natural gas pipeline project which was added to the project to provide a second, alternative gas supply. The proposed 32-mile gas pipeline project is presented separately because it is not needed for the HDPP project as proposed in the AFC and because the pipeline project is subject to review and concurrence by the US Bureau of Land Management.

Staff believes it can be reasonably inferred from the literature and the archaeological records that excavations for project structural foundations, trenching for pipelines, and augering the foundations for transmission line towers are likely encounter cultural resource materials. The varying surface extent and depth of project-related excavations will result in different degrees of impacts on cultural resources (HDPP 1997b). Absent more specific project information, Staff recommends that the designated cultural resource specialist conduct a pre-construction survey of the linear routes after the project owner has identified the final centerlines and right-of-way boundaries. Staff also recommends monitoring for cultural resources throughout the pre-construction and construction periods and the implementation of full mitigation measures wherever cultural resource materials are encountered. Monitoring and mitigation by a qualified cultural resource specialist are essential to reduce the potential for project impacts to cultural resources to a less than significant level.

## **APPLICANT'S PROPOSED MITIGATION MEASURES<sup>4</sup>**

The applicant's proposed mitigation measures for the power plant and related facilities are listed on pages 5.10-1 through 5.10-22 of the AFC. As stated in the AFC, the proposed measures were based on the guidelines and requirements of the City of Victorville, the County of San Bernardino, and upon the archaeological consultant's professional experience and judgement.

### ***MEASURES PRESENTED IN THE AFC FOR THE POWER PLANT SITE AND RELATED FACILITIES***

#### **RESOURCE AVOIDANCE**

The ten significant archaeological sites and historic properties described in the AFC will be avoided during construction in accordance with the provisions of CEQA Appendix K. Further, a buffer of 50 feet will be established around each archaeological site to avoid impacts from ground disturbance resulting from pipeline trenching, transmission tower construction, electrical line installation, or construction traffic. Archaeological sites will be fenced to preclude inadvertent damage.

Construction will avoid sites PSBR-38H and 62H (the significant transmission lines and towers) by providing a buffer of a sufficient distance to mitigate potential visual impacts to the setting and integrity of the two properties.

In accordance with the San Bernardino County General Plan Policy CP-4, a program will be developed to address long-term avoidance or preservation of archaeological sites when avoidance is used as a mitigation measure. The plan will state how avoidance will be achieved, both during construction (e.g., through redesign of the project, fencing, flagging, or monitoring) and during operation (e.g., through an employee awareness program and/or monitoring).

Sites SBR-4272H and 4411H, the Mormon Trail / Salt Lake to Santa Fe Trail, should be avoided by allowing a buffer of 500 feet between the placement of transmission tower footings and the boundaries of the historic property.

Construction monitoring will occur when ground-disturbing activities take place within 100 feet of identified historic resources. A qualified archaeologist will be retained to coordinate monitoring needs with construction management to preclude unnecessary delays. The frequency of monitoring will be determined by the archaeological Principal Investigator in charge of the work based on the particular property in the construction and the type of disturbance anticipated.

A mitigation monitoring report will be prepared, describing the results of monitoring, artifacts or features discovered, a reference to subsequent data recovery reports (if any) and recommendations for post-construction preservation if necessary. The frequency of reports will be dependent upon the duration of monitoring and construction and could range from monthly to semi-annually to a single post-construction report. In addition to the CEC, the report will be submitted to the San Bernardino County Museum.

Any artifacts recovered during monitoring or data recovery will be prepared for curation and submitted to the San Bernardino County Museum for curation unless a satisfactory (certified) local repository is found.

#### STATE HISTORIC PRESERVATION OFFICE

The State Historic Preservation Office (SHPO) will be consulted and given opportunity to comment regarding potential impacts and mitigation measures associated with sites eligible for listing on the California Register of Historic Resources. The lead agency must define the nature and location of the proposed undertaking, describe the resources identified within the project area that may be impacted by the proposed undertaking, and define measures to be used to mitigate impacts to significant resources. The SHPO has 30 days within which to respond.

#### DATA RECOVERY

Should avoidance not prove feasible, it will be necessary to conduct data recovery on archaeological sites. Data recovery is the process whereby the inherently important data within an archaeological site are removed by a qualified archaeologist (meeting the Secretary of Interior's Standards as Archaeologist under CFR 61) using generally accepted archaeological excavation techniques and other methods. Data recovery can be used to reduce impacts to non-avoidable sites to a less than significant level. For archaeological sites, an Excavation Plan will be prepared prior to conducting data recovery to address topical research questions,

techniques, and reporting requirements for each impacted site. The results of the work will be presented in a final technical report prepared in accordance with applicable California Department of Parks and Recreation, SHPO, guidelines. The report will be submitted to the San Bernardino County Museum and all recovered artifacts prepared and curated in accordance with recognized professional standards.

#### **NATIVE AMERICAN CONSULTATION**

In mid-April 1997, the Native American Heritage Commission (NAHC) was contacted in writing to request information on known Native American traditional or cultural properties within the project area, and to request a listing of individuals or groups with cultural affiliation to the project area. No one from the NAHC responded. Continued Native American consultation shall be conducted to ensure that concerns of the Native American community are addressed during the construction and operational phases of the project. Individuals or groups identified by the NAHC as having traditional or cultural affiliation in the project area shall be contacted for comment prior to construction.

#### **EMPLOYEE CULTURAL RESOURCE AWARENESS TRAINING**

One or more construction employee briefing sessions will be conducted by a qualified archaeologist before work commences to aid in reducing inadvertent or intentional damage to archaeological sites, features, and objects. The training will describe the types of archaeological sites and historic properties in the area, mitigation measures on the project, avoidance techniques, and regulatory requirements, including statutes prohibiting damage or vandalism to historic properties.

#### **DISCOVERIES DURING CONSTRUCTION**

Potentially significant sites, features, and objects may be obscured by vegetation or buried by sediments within the project area and may not have been observed during the pedestrian survey. If cultural resources are encountered during project construction activities, work shall be halted or diverted to allow an archaeologist an opportunity to assess the resource in accordance with the provisions of CEQA Appendix K. In the case of the discovery of human remains, the County Coroner, and if necessary, the NAHC will be contacted.

#### **POST-AFC 32-MILE NATURAL GAS PIPELINE PROJECT, PROPOSED BY SOUTHWEST GAS**

##### ***Avoidance***

Avoidance of a known cultural resource is the preferred mitigation and the cultural resource consultant to the applicant recommends that all known sites should be avoided by the proposed project if possible. ~~Avoidance could ultimately lead to a finding of "No Effect" for some of the known resources. However, since the final design of the proposed pipeline has not yet been defined and the Area of Potential Effect (APE) was not yet delineated, a significance determination on properties in the survey corridor has not yet been completed. Once the APE has been determined, final recommendations will be made relative to the significance of each~~

site, or the additional data needed to make such a recommendation. Where known significant historical resource sites cannot be avoided by pipeline construction, full data recovery would be required.

### **Spanning**

Certain linear resources, such as the historic transmission line (PSBR-039H), the Randsburg wagon road (SBR-7431H) and early Highway 395 (SBR-7545H), cross the pipeline corridor and will be contained within any APE for the gas pipeline. However, if the tower footings for the overhead transmission line avoid the surface traces of these linear resources, there should be no adverse effect on the resource.

### **Tunneling**

Similarly, if the surface manifestations of the two roadways are avoided (through tunneling, which is the proposed method, or bore-and-jack of the pipeline), or the roadway is returned to its pre-construction state after the work, there should be no adverse effect on these linear historic resources.

### **Buffers**

Once the final design and APE have been defined, should the gas pipeline right-of-way be designed to pass within 150 feet of a known archaeological site boundary, a 50-foot buffer around the site should be established through the installation of flagging and/or fencing as necessary to preclude direct and indirect impacts to the resource. A qualified archaeologist should relocate the site and place the flagging or fencing as necessary.

### **If Resource Cannot Be Avoided**

If avoidance of a site is not possible, as may be the case with CA-SBR-2257/H (because of its existence on both sides of the proposed route), a focused pre-construction subsurface testing program should be implemented within the staked centerline of the proposed gas pipeline trench and within intuitively selected areas of the APE or construction right-of-way, to assess the significance of the resource in the area of direct impact.

A pre-construction testing plan should be prepared which describes the methodology to be used during testing and artifact analysis, research questions to be addressed during testing, and the threshold of significance for data recovery should National Register-eligible resources be located within the area of direct impact.

The testing program for each site may differ depending upon the known and observed characteristics of the particular site. Large concentrations of prehistoric lithic artifacts occupying a widespread site area may require a more intensive testing effort than a small, diffuse scatter of artifacts over a small area. Similarly, small historic sites with limited visible resources may demand additional archival research and limited subsurface testing, while larger, more complex sites may require a more intensive effort.

Should any of the sites subject to direct impacts be located on Bureau of Land Management-administered lands, co-ordination with the appropriate District or Resource Area archaeologist will be necessary in the formulation of a testing or treatment plan and implementation of the work. Special Use or Archaeological Resource Protection Act (ARPA) permits may be required for archaeological excavation on BLM lands; Native American consultation will also be required as part of ARPA.

Several of the known cultural resource sites in the project area could not be relocated during the survey either because of their sparse nature, changes in the physical landscape over the intervening years since they were recorded, previous collection of the resource, or other reasons. Without the benefit of a visual assessment, these sites should also be considered potentially significant and avoided or treated as described above.

### ***NATIVE AMERICAN CONSULTATION***

In April 1997, the Native American Heritage Commission was contacted in writing to request information on known Native American traditional or cultural properties within the project area, and to request a listing of individuals or groups with cultural affiliation to the project area. Continued Native American consultation should be conducted to ensure that concerns of the Native American community are addressed during the construction and operational phase of the project. Individuals or groups identified by the Native American Heritage Commission as having traditional or cultural affiliation in the project area should be contacted for comment prior to construction.

### ***EMPLOYEE CULTURAL RESOURCE AWARENESS TRAINING***

One or more construction employee briefing sessions should be conducted by a qualified archaeologist before work commences to aid in reducing inadvertent or intentional damage to archaeological sites, features and objects. The training should describe the types of archaeological sites and historic properties in the area, mitigation measures on the project, avoidance techniques, and regulatory requirements, including statutes prohibiting damage or vandalism to historic properties.

### ***DISCOVERIES DURING CONSTRUCTION***

Potentially significant sites, features and objects may be obscured by vegetation or buried by sediments within the project area, and may not have been observed during the pedestrian survey. If cultural resources are encountered during project construction activities, work should be halted or diverted to allow an archaeologist an opportunity to assess the resource in accordance with the provisions of 36 CFR 800.11 and CEQA Appendix K (Item IX).

### ***DISCOVERY OF HUMAN REMAINS***

In addition to the requirements of NAGPRA, section 7050.5(b) of the California Health and Safety Code should be implemented in the event that human remains, or possible human remains, are located. It states:

—”In the event of discovery, or recognition of any human remains in any location other than a dedicated cemetery, there shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent remains until the coroner of the county in which the human remains are discovered has determined, in accordance with Chapter 10 (commencing with Section 27460) of Part 3 of Division 2 of Title 3 of the Government Code, that the remains are not subject to the provisions of Section 27492 of the Government Code or any other related provisions of law concerning investigation of the circumstances, manner and cause of death, and the recommendations concerning treatment and disposition of the human remains have been made to the person responsible for the excavation, or to his or her authorized representative, in the manner provided in Section 5097.98 of the Public Resources Code.

If the County Coroner recognizes the remains as being of Native American origin, he or she must contact the Native American Heritage Commission within 24 hours. The NAHC has various powers and duties to provide for the ultimate disposition of any Native American remains, as does the assigned Most Likely Descendant.—“

Sections 5097.98 and 5097.99 of the Public Resources Code also call for the protection to Native American human burials. These code sections include recommendations that construction personnel on the project be instructed as to the potential for skeletal remains to be encountered, the need to protect them from vandalism and inadvertent destruction, and the consequences of failure to notify the coroner of such a discovery in a timely manner.

### ***CITY OF VICTORVILLE MITIGATION REQUIREMENTS***

The majority of the power plant project and associated linear facilities are located within the boundaries of the City of Victorville. The City of Victorville has adopted the requirements of San Bernardino County as guidelines for the mitigation of potential project impacts to cultural resources (Victorville 1997).

### ***US BUREAU OF LAND MANAGEMENT PROPOSED MITIGATION MEASURES***

The US Bureau of Land Management manages approximately eight miles of the 32-mile route proposed for the second natural gas pipeline project and considers the project an undertaking, under federal definitions. While Staff have evaluated this natural gas pipeline project as part of the Commission’s certification process, the US Bureau of Land Management, through the area office in Barstow, will have jurisdiction over cultural and paleontologic resource mitigation for the entire 32-mile route of this pipeline. The BLM, under a recent programmatic agreement with the state, now has the authority to act on behalf of the SHPO in making determinations of eligibility and effect for archaeological sites, once the final project design has been completed. The five cultural resource sites that are located within the APE of the proposed 32-mile natural gas pipeline are currently being evaluated for eligibility which will be reviewed by BLM, and possibly the SHPO.

The eligibility criterion that most often applies to archaeological (non-architectural) sites or objects (criterion d) states that they must "...have yielded or may be likely to yield, information important to prehistory or history". To evaluate a site against such a broad criterion requires consideration of the regional culture history, the types, ages; and distribution of other sites in the region, and the nature of questions that researchers are attempting to address regarding the history or prehistory of the region, among other factors. Often information about potential sub-surface resources and the potential for project impacts can not be easily gleaned from the surface evidence at a given cultural resource site. In such an instance, additional archival research (in the case of historic properties) or subsurface probing or testing (within archaeological properties) may be required to gather sufficient information to make a determination as to the significance of the resource site or its potential eligibility for the National Register.

The archaeological consultant to the applicant is currently developing a specific mitigation plan designed to meet BLM requirements. The applicant's mitigation measures presented above, for the 32-mile natural gas pipeline project are based upon BLM requirements and will be supplemented by the archaeological resource treatment plan now in preparation. Staff have requested that BLM include them in any site visits during testing and field work, review and oversight of the cultural resource monitoring and mitigation plan preparation, approval, and implementation.

[In late 1998, the US Fish and Wildlife Service \(F&WS\) determined that the entire HDPP project constituted a federal "undertaking" subject to NEPA requirements for environmental analysis. Although the BLM has jurisdiction only over the 32-mile gas pipeline, it is also a responding agency in the preparation of the Environmental Impact Statement \(EIS\) and will assess paleontologic and archaeological resources for the entire project. Energy Commission staff is involved in portions of the federal EIS preparation process and anticipates that proposed federal permit conditions will be compatible with Commission conditions of certification for the HDPP project. The federal environmental assessment process of the HDPP project is scheduled to be completed in late 1999.](#)

## **STAFF'S PROPOSED MITIGATION MEASURES**

Commission Staff concur with the mitigation measures proposed in the AFC for the power plant site and related facilities. Staff has suggested additional language to clarify the measures presented by the applicant and other participating agencies. The changes would extend the mitigation contingency planning to address the following aspects in greater detail, including: 1) Energy Commission staff review and approve the qualifications of professional archaeologists proposed for project monitoring and mitigation efforts; 2) recovery of any sensitive cultural resources prior to impact by project activities; 3) recordation and analysis of all pertinent data and scientific information from the site(s) and any recovered cultural resources; 4) curation in a qualified repository, of the data and materials recovered; 5) preparation of recovered materials to the point of identification and completion of an inventory of materials prepared for curation; 6) preparation of a final report on data recovery efforts associated with project mitigation; and 7) filing of pertinent maps, photos,

and other information with the curated materials. These measures are incorporated into the conditions of certification specified below.

Whether BLM's interest in the protection of paleontologic resources and participation as a permitting agency applies only the 32-mile natural gas pipeline or to the entire HDPP project, staff have included the US BLM in its proposed conditions of certification. Staff is recommending that BLM staff join them in reviewing and approving the selection of the designated cultural resource specialist; in reviewing and approving the Cultural Resource Monitoring and Mitigation Plan (Archaeological Resource Treatment Plan); in reviewing and approving any contingency mitigation measures that must be implemented during construction if previously undiscovered cultural resources are encountered; in the review and approval of the Preliminary and Final Cultural Resource Reports to be prepared after data and cultural resource recovery; and in the delivery for curation of any data and cultural resource materials recovered during project monitoring and mitigation efforts.

### ***PROJECT-SPECIFIC MITIGATION MEASURES***

Rather than setting forth project-specific measures here, staff's recommended mitigation requirements and guidelines have been incorporated into the proposed conditions of certification which follow the text of this staff analysis.

## **COMPLIANCE WITH APPLICABLE LAWS, ORDINANCES, REGULATIONS, AND STANDARDS**

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If the cultural resources mitigation measures proposed by the applicant, by San Bernardino County, City of Victorville, Energy Commission staff, and by the BLM are implemented in a timely and proper manner, the project would be in compliance with the applicable laws, ordinances, regulations, and standards.

## **CONCLUSIONS AND RECOMMENDATIONS**

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### **CONCLUSIONS**

The project region is located near the southern edge of the Mojave Desert, in the northwestern portion of San Bernardino County. Archaeological evidence indicates that California has been occupied by humans for many thousands of years. These early occupants had well established patterns of seasonal hunting and resource collection throughout the Mojave. The early peoples of California had well-established trade routes that extended from the ocean coastal areas, northeastward across the Mojave Desert toward the tribes along the Colorado River and in northern Mexico. They also traveled northward and traded with the tribes along the eastern slopes of the Sierras. Numerous archaeological sites found throughout the project area provide evidence of prehistoric occupation and use by the native peoples of California.

Many of the trade routes established by the native peoples of California were used by the Euro-American explorers and settlers as they spread into California. Portions of the routes for project-related linear facilities cross remnants of early trails and wagon roads across the Mojave. Eventually these early trade routes provided the foundation for the railroads and for modern-day highways. And due to topographic constraints and the presence of transportation access, these routes also were used for utility transmission facilities.

The location of the City of Victorville at the crest of a pass at the edge of the desert, plus the water available in the Mojave River made the area a focal point for all major transportation routes between the coast and other western states. The numerous archaeological sites found throughout the project area provide evidence of the succession of historic occupation and development.

Cultural resources are significant to our understanding of our culture, our history and heritage and they can also provide insight into the broader patterns of human adaptation to environmental change. Evidence of California's early occupation is becoming increasingly vulnerable to the ongoing development and urbanization of the state. Staff's primary concern is to ensure that all potential impacts are identified and that conditions are set forth to ensure that no significant adverse impacts will occur.

No project-specific geotechnical studies or site layout plan have been completed for the project site and the centerlines and right-of-way boundaries for project-related linear facilities not be identified. This project and site specific information is not expected to become available until after the Commission has certified the HDPP project. After the centerlines and rights-of-way have been identified, additional, pre-construction surveys should be completed by qualified professionals and a detailed monitoring and mitigation plan should be prepared, describing the measures proposed to mitigate potential project impacts to cultural resources. This plan would incorporate the measures and requirements set forth in discussion above and in the Conditions of Certification.

The applicant has also proposed construction of a second, 32-mile natural gas supply pipeline to serve the proposed HDPP project. Portions of the pipeline route crosses lands administered by the US Bureau of Land Management which has taken the lead over the evaluation and protection of cultural resources known to exist or yet to be discovered within the pipeline right-of-way. Surveys of a 500-foot corridor for the pipeline identified over twenty known cultural resource sites; refinement of the surveys to a specific 110-foot wide right-of-way still would impact eleven sites. Five of the eleven known sites were determined potentially eligible for the National Register of Historic Places and BLM will require special treatment and mitigation of construction impacts for these sites. Since pipeline construction requires excavation of a continuous trench along the entire route, the only way to avoid impacts to these eligible (significant) cultural resources would be to avoid construction of the pipeline.

[Staff encourages US BLM representatives to participate throughout the Energy Commission permitting process and in the implementation of any Commission conditions adopted for protection of cultural resources that could be affected by](#)

construction and operation of the HDPP project. If the BLM chooses not to participate in the Energy Commission permitting process or prefers to adopt separate permit conditions, the staff expects to continue to co-ordinate with BLM staff in the implementation of Energy Commission-approved conditions of certification.

The federal agencies are beginning preparation of an Environmental Impact Statement for this gas pipeline and their review process is not expected to be complete until late in 1999. BLM staff has indicated that they do not believe the presence of unavoidable cultural resource sites would preclude construction of the pipeline. Commission staff has requested that BLM staff keep them apprised of the schedule and activities of the federal review and permit process.

## RECOMMENDATIONS

If the cultural resource mitigation measures proposed by the applicant, by San Bernardino County, by the City of Victorville, by the Bureau of Land Management, and by Staff are implemented in a timely and proper manner, the project is expected to be in compliance with the applicable LORS.

Staff recommends designation of a qualified professional cultural resource specialist to conduct a pre-construction survey of the linear routes after the project owner has identified the final centerlines and rights-of-way. Staff also recommends monitoring for cultural resources throughout the pre-construction and construction periods and the implementation of full mitigation wherever cultural resources are encountered. Monitoring and mitigation by a qualified cultural resource specialist are essential to reduce the potential for project impacts to cultural resources to a less than significant level.

Staff recommends that the Commission adopt the mitigation measures described above, and which are included in the following proposed conditions of certification to ensure adequate mitigation of potential impacts to cultural resources during the construction of the High Desert Power Project.

## PROPOSED CONDITIONS OF CERTIFICATION

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CUL-1 Project construction (defined as any construction-related vegetation clearance, ground disturbance and preparation, and site excavation activities), shall not begin until the designated cultural resources specialist approved by the California Energy Commission (Commission) Compliance Project Manager (CPM), is available to be on site.

The designated cultural resources specialist shall be responsible for implementing all the Conditions of Certification and for using qualified personnel to assist him or her in project-related activities. The designated specialist, with professional assistance from team members as needed, shall conduct final pre-construction surveys, flag areas to be avoided, and identify areas where shovel testing, test pits, or backhoe trenching needs to be done; prepare the Cultural Resources Monitoring and Mitigation Plan; prepare and

present the pre-construction employee awareness training program; keep a daily log of monitoring and mitigation activities and prepare a summary of these activities to be included in the weekly construction status report filed with the CPM; direct and implement monitoring and mitigation procedures, as needed in sensitive resource areas, during any construction activities associated with all aspects of the project; conduct the mapping, recording, sampling, and collection of sensitive and diagnostic cultural resources; conduct the preparation and analyses of all data and cultural materials recovered during project monitoring and mitigation; identify and inventory recovered cultural resources; prepare recovered cultural resources for delivery and curation to a qualified public repository; and prepare the preliminary and final cultural resources reports to be filed with the receiving curation repository, appropriate regional information center(s), SHPO, and the Commission.

After CPM approval of the Cultural Resources Monitoring and Mitigation Plan, described below in Condition CUL-4, the designated cultural resource specialist and team shall be available to implement the mitigation plan prior to, and throughout construction of the project.

Protocol: 1) The resume shall include all information needed to demonstrate that the designated cultural resource specialist meets the minimum qualifications specified in the US Secretary of Interior Guidelines, as published by the State Office of Historic Preservation (199\*). The Commission staff expects that these minimum qualifications would include the following: a graduate degree in anthropology, archaeology, California history, cultural resource management, or other comparable fields; at least three years of archaeological resource mitigation and field experience in California; and at least one year's experience in each of the following areas: leading archaeological resource field surveys; leading site and artifact mapping, recording, and recovery operations; marshalling and use of equipment necessary for cultural resource recovery and testing; preparing recovered materials for analysis and identification; recognizing the need for appropriate sampling and/or testing in the field and in the lab; directing the analyses of mapped and recovered artifacts; completing the identification and inventory of recovered cultural resource materials; and the preparation of appropriate reports to be filed with the receiving curation repository, the SHPO, all appropriate regional archaeological information center(s), and the CPM.

2) The resume for the designated cultural resource specialist shall include a list of specific projects the specialist has previously worked on; the role and responsibilities of the specialist for each project listed; and the names and phone numbers of contacts familiar with the specialist's work on these referenced projects.

3) If additional personnel will be assisting the designated cultural resource specialist in project-related field surveys, monitoring, data and artifact recovery, mapping, mitigation, cultural resource analysis, or report

preparation, the project owner shall also provide names, addresses, and resumes for these cultural resource team members.

4) If the CPM determines that the qualifications of the proposed cultural resource specialist are not in concert with the above requirements, the project owner shall submit another individual's name and qualifications for consideration.

5) If the previously approved, designated cultural resources specialist is replaced prior to completion of project mitigation, the project owner shall obtain CPM approval of the new designated cultural resource specialist by submitting the name and qualifications of the proposed replacement to the CPM, at least ten (10) days prior to the termination or release of the preceding designated cultural resource specialist. Should emergency replacement of the designated specialist become necessary, the project owner shall immediately notify the CPM to discuss the qualifications of its proposed replacement specialist?

**Verification:** At least one hundred twenty (120) days prior to the start of construction on the project, the project owner shall submit the names and resumes for its designated cultural resource specialist and the specialist's team members, to the CPM for review and written approval. The CPM shall provide approval or disapproval of the proposed cultural resource specialist. The submittal from the project owner shall also include an estimated schedule and the approximate number of hours needed to implement the monitoring and mitigation plan.

Thirty (30) days prior to start of construction, the project owner shall confirm in writing to the CPM that the previously approved designated cultural resources specialist and the team of assistants are prepared to implement the monitoring and mitigation measures for cultural resources, as described in the CPM-approved Cultural Resources Monitoring and Mitigation Plan, prepared per Condition CUL-4, below.

At least ten (10) days prior to the termination or release of a designated cultural resource specialist, the project owner shall obtain CPM approval of the replacement specialist by submitting to the CPM the name and resume of the proposed new designated cultural resource specialist. Should emergency replacement of the designated specialist become necessary, the project owner shall immediately notify the CPM to discuss the qualifications of its proposed replacement specialist?

CUL-2 Prior to the start of project construction, the project owner shall survey and stake all areas expected to be affected by construction and operation of the proposed project and its associated linear facilities. The surveys and staking shall reflect the final project design and site layout and the final post miles, centerlines, and right-of-way boundaries for the linear facilities.

**Verification:** At least ninety (90) days prior to the start of construction, the project owner shall stake and flag the boundaries of all areas expected to be affected by construction and operation of the proposed project and its associated linear facilities. The staking of linear routes shall define the mile-posts, centerlines,

and right-of-way boundaries. The project owner shall notify the CPM when the surveys and staking have been completed.

CUL-3 Prior to the start of project construction, the project owner shall provide the designated cultural resource specialist and the CPM with maps and drawings showing the final project design and site layout, and the final alignment of all linear facilities, as surveyed and staked per Condition CUL-2, above. The routes for the linear facilities shall be provided on 7.5 minute quad maps, showing post mile markers, final center lines and right-of-way boundaries, and the location of all the various areas where surface disturbance may be associated with project-related access roads, storage yards, laydown sites, pull sites, pump or pressure stations, switchyards, electrical tower or pole footings, etc.

After reconnaissance surveys by the designated cultural resource specialist, the specialist may request, and the project owner shall provide, enlargements of portions of the 7.5 minute maps presented as a sequence of strip maps for the linear facility routes. The strip maps would show post mile markers and the detailed locations of proposed access roads, storage or laydown sites, tower or pole footings, and any other areas of disturbance associated with the construction and maintenance of linear facilities.

**Verification:** At least one hundred twenty (120) days prior to the start of construction on the project, the project owner shall provide the designated cultural resource specialist and the CPM with final drawings and site layouts for all project facilities and maps at appropriate scale(s) for all areas potentially affected by project construction.

CUL-4 After the final center lines have been determined and prior to the start of construction, the designated cultural resource specialist shall determine, in consultation with the CPM and the BLM (as appropriate), where and whether reconnaissance surveys need to be conducted for the rights of way for linear facility routes, and any other areas expected to be affected by construction and operation of the proposed project ~~Prior to the start of project construction, the designated cultural resources specialist shall conduct a reconnaissance survey of the final project site and the final center lines and rights-of-way for the project linear facilities, and all other areas expected to be affected by construction and operation of the proposed project.~~ Surveys of the linear facilities shall use the centerlines and rights-of-way delineated by the survey stakes placed under Condition CUL-2, above. During the surveys, potentially sensitive cultural resource areas that must be protected during construction and operation shall be mapped and listed for specific monitoring and / or mitigation measures to be described in the Cultural Resources Monitoring and Mitigation Plan to be prepared per Condition CUL-5, below.

**Verification:** A least one hundred five (105) days prior to the start of construction, the designated cultural resources specialist shall conduct a reconnaissance survey of all areas expected to be affected by construction and operation of the proposed project and its associated linear facilities.

CUL-5 Prior to the start of project construction, the designated cultural resources specialist shall prepare a draft Cultural Resources Monitoring and Mitigation Plan to identify general and specific measures to minimize potential impacts to sensitive cultural resources. The Cultural Resources Monitoring and Mitigation Plan prepared for the Energy Commission per this condition, may also become part of the Archaeological Resources Treatment Plan required by the US Bureau of Land Management permit process. The BLM permit usually applies to archaeological resource surveys, testing, monitoring and mitigation, and data and resource recovery that takes place on lands managed by the US Bureau of Land Management and / or other federal agencies. The CPM will review and must approve in writing, the Cultural Resources Monitoring and Mitigation Plan. After CPM approval, the project owner's designated cultural resource specialist and designated cultural resource team shall be available to implement the Monitoring and Mitigation Plan, as needed throughout project construction.

Protocol: The Cultural Resources Monitoring and Mitigation Plan shall include, but not be limited to, the following elements and measures:

a. A proposed research design that includes a discussion of questions that may be answered by the mapping, data and artifact recovery conducted during pre-construction and construction activities, and by the post-construction analysis of recovered data and materials.

a-b. A discussion of the sequence and time frame for project-related tasks, such as any final pre-construction surveys, fieldwork, flagging or staking; construction monitoring; mapping and data recovery; preparation of a research design; cultural resource preparation and recovery; preparation of data and recovered materials for analysis, identification, and inventory; preparation of preliminary and final reports; and preparation of materials for curation.

b-c. An identification of the person(s) expected to assist with each of the tasks identified in (a), above, and a discussion of the mitigation team leadership and organizational structure, and the inter-relationship of tasks and responsibilities.

e-d. A discussion of the need for Native American observers or monitors, the procedures to be used to select them, the areas or post-mile sections where they will be needed, and their role and responsibilities.

~~d. A proposed research design that includes a discussion of questions that may be answered by the mapping, data and artifact recovery conducted during monitoring and mitigation activities, and by the post-mitigation analyses.~~

d. Where sensitive areas are to be avoided during construction and/or operation, the designated cultural resources specialist shall identify measures such as flagging or fencing, to prohibit or otherwise restrict

access to sensitive resource areas. The discussion shall address how these measures will be implemented prior to the start of construction and how long they will be needed to protect the resources from project-related effects.

- e. Where monitoring of project construction activities is deemed necessary by the designated cultural resource specialist, the specialist will determine the size or extent of the areas where monitoring is to occur and will establish a schedule for the monitor(s) to be present. If the designated specialist determines that the likelihood of encountering cultural resources in certain areas is slight, monitoring may be discontinued in that location;

~~(g)~~f. The designated cultural resource specialist shall have the authority to halt or redirect construction if previously unknown midden deposits or cultural resource materials are encountered during project-related grading, augering, excavation and/or trenching. The halting or redirection of construction shall remain in effect until the designated cultural resources specialist has notified the CPM of the find and the work stoppage, and until the necessary data recovery and mitigation has been completed. After construction is halted or redirected, the designated cultural resources specialist shall act in accordance with the following procedures:

- The designated cultural resources specialist, representatives of the project owner, and the CPM shall confer within five working days of the notification of the CPM, if necessary, to discuss any mitigation measure(s) already implemented or proposed to mitigate potential impacts to these resources.
- If previously unknown cultural resources are encountered, the designated cultural resource specialist and team members shall monitor construction activities and implement data recovery and mitigation measures, as needed
- If midden deposits are exposed during ground clearance or excavation, then construction activities are to be halted and the construction area is to be spot-checked or monitored by the designated cultural resources specialist to determine whether cultural resources are present in the deposit
- All necessary and required data recovery and mitigation shall be completed as expeditiously as possible after discovery of any previously unknown cultural resources, unless additional time is agreed to by all parties.

- g. A discussion of the availability and the designated specialist's access to equipment and supplies necessary for site mapping and recovery of cultural resource materials.
- h. All cultural resources encountered will be recorded and mapped (may include photos) and all significant or diagnostic resources will be collected for analysis and eventual curation into a retrievable storage collection in a public repository or museum that meets the US Secretary of Interior standards and requirements for the curation of cultural resources
- i. Identification of the public institution that has agreed to receive any data and cultural resources recovered during project-related monitoring and mitigation work. Discussion of any requirements, specifications, or funding needed for the materials to be delivered for curation and how they will be met. Also include the name and phone number of the contact person at the institution.

**Verification:** At least ninety (90) days prior to the start of construction on the project, the project owner shall provide the CPM with a copy of the draft Cultural Resources Monitoring and Mitigation Plan prepared by the designated cultural resource specialist. If the draft plan is not approved, the project owner, the designated cultural resources specialist, and the CPM shall meet to discuss comments and work out necessary changes.

CUL-6 Prior to the start of project construction, the designated cultural resources specialist shall prepare an employee training program. The project owner shall submit the cultural resources training program to the CPM for review and written approval.

**Protocol:** The training program will discuss the potential to encounter cultural resources in the field, the sensitivity and importance of these resources, and the legal obligations to preserve and protect such resources.

The training program shall also include the set of reporting procedures that workers are to follow if previously unknown cultural resources are encountered during project activities. The training program will be presented by the designated cultural resource specialist and may be combined with other training programs prepared for biological resources, hazardous materials, or any other areas of interest or concern.

**Verification:** At least sixty (60) days prior to the start of construction on the project, the project owner shall submit to the CPM (or designee) for review, comment, and written approval, the proposed employee training program and set of reporting procedures the workers are to follow if previously unknown cultural resources are encountered during construction.

The CPM shall provide the project owner with written approval or disapproval of the employee training program and set of reporting procedures. If the draft employee

training program is not approved, the project owner, the designated cultural resources specialist, and the CPM shall meet to discuss comments and work out necessary changes.

CUL-7 Prior to the start of construction and throughout the project construction period as needed for all new employees, the project owner and the designated cultural resource specialist shall provide the CPM-approved training to all project managers, construction supervisors, and workers who operate ground disturbing equipment. The project owner and construction manager shall provide the workers with the CPM-approved set of procedures for reporting any sensitive resources that may be discovered during project-related ground disturbance.

**Verification:** Prior to the start of construction and throughout the project construction period as needed for all new employees, the project owner and the designated cultural resources specialist shall present the CPM-approved training program on the potential for project impacts to sensitive cultural resources. The training shall include a set of reporting procedures for cultural resources encountered during project activities. The project owner shall provide documentation to the CPM that the employee training and the set of procedures have been provided to all project managers, construction supervisors, and all workers.

CUL-8 Throughout the project construction period, the project owner shall provide the designated cultural resource specialist with a current schedule of anticipated weekly project activity and a map indicating the area(s) where construction activities will occur. The designated cultural resources specialist shall consult daily with the project superintendent or construction field manager to confirm the area(s) to be worked on the next day(s).

Throughout the pre-construction reconnaissance surveys and the construction monitoring and mitigation phases of the project, the designated cultural resources specialist shall keep a daily log of any resource finds and the progress or status of the resource monitoring, mitigation, preparation, identification, and analytical work being conducted for the project. The designated resource specialist may informally discuss the cultural resource monitoring and mitigation activities with Commission technical staff.

The project owner shall include copies of the cultural resources weekly progress or status summaries in the project owner's weekly Construction Status Report to the CPM.

**Verification:** Throughout the project construction period, the project owner shall include in the Monthly Compliance Reports to the CPM, a summary of the daily logs prepared by the designated cultural resource specialist on the progress or status of cultural resource monitoring and mitigation activities.

CUL-9 The designated cultural resource specialist shall be present at all times to monitor construction-related grading, excavation, trenching, and/or augering

in the vicinity of previously recorded archaeological sites and in areas where midden deposits have been identified during project construction.

If the designated cultural resource specialist determines that full-time monitoring is not necessary in certain portions of the project area or along portions of the linear facility routes, the designated specialist shall notify the project owner of the changes. Mile post markers and boundary stakes placed by the project owner will be used to identify areas where monitoring is being reduced or is no longer deemed necessary.

The daily logs prepared by the designated cultural resource specialist shall indicate by post mile, where and when monitoring has taken place and where monitoring has been deemed unnecessary.

**Verification:** The project owner shall include in the Monthly Compliance Reports to the CPM, a summary of the daily logs prepared by the designated cultural resource specialist.

CUL-10 The project owner shall ensure that the designated cultural resource specialist obtains and maintains a current BLM Archaeological Resource Use Permit to gain access to lands managed by the US BLM or other federal agencies, to conduct any surveys, monitoring, data and/or artifact recovery activities on these lands. This use permit is to be obtained from the area office of the BLM in Barstow, California, no less than ten (10) days prior to the start of cultural resource activities governed by the permit.

**Verification:** The project owner shall provide the CPM and the designated BLM representative(s) with a copy of the BLM archaeological resource use permit received by the designated cultural resource specialist, in the next Monthly Compliance Report following its receipt or renewal.

CUL-11 The project owner shall ensure that the designated cultural resource specialist meets the professional qualifications specified by the BLM; that the Cultural Resources Monitoring and Mitigation Plan prepared per Energy Commission Condition CUL-5, also reflects BLM requirements for a Archaeological Resource Treatment Plan; and that all surveys, monitoring, and data and/or artifact recovery activities implemented during the construction and operation of the HDPP project, meet the requirements of the BLM and the Energy Commission.

**Verification:** The project owner shall concurrently provide the designated BLM representative(s) with copies of all information submitted to the CPM in response to Energy Commission conditions of certification. The project owner shall provide the CPM with current copies of BLM permit conditions and requirements; the criteria and requirements for the designation of a cultural resource specialist; the contents of its Archaeological Resource Treatment Plan; and any other requirements pertinent to the protection of cultural resources potentially affected by the HDPP project. In each Monthly Compliance Report, the project owner shall provide the

[CPM with a summary outlining the measures it has taken to ensure that it has met both BLM and Energy Commission requirements.](#)

[CUL-12](#) [The project owner shall ensure](#) the recovery, preparation for analysis, analysis, and preparation for curation of all cultural resource materials encountered and collected during pre-construction surveys and during the monitoring, data recovery, mapping, and mitigation activities related to the project.

**Verification:** The project owner shall maintain in its compliance files, copies of signed contracts or agreements with the museum(s), university(ies), or other appropriate research specialists which will ensure the necessary recovery, preparation for analysis, and analysis of cultural resource materials collected during data recovery and mitigation for the project. The project owner shall keep these files available for periodic audit by the CPM.

~~CUL-11~~[CUL-13](#) The project owner shall ensure preparation of a Preliminary Cultural Resource Report following completion of data recovery and site mitigation work. The preliminary report is to be prepared by the designated cultural resource specialist and the project owner shall submit the preliminary report to the CPM for review, comment, and written approval.

**Protocol:** The preliminary report shall include (but not be limited to) preliminary information on the survey report(s), methodology, and recommendations; site records and maps; determinations of sensitivity and significance; data recovery and other mitigation activities; discussion of possible results and findings of any analysis to be conducted on recovered cultural resource materials and data; proposed research questions which may be answered or raised by the data recovered from the project; and an estimate of the time needed to complete the analysis of recovered cultural resource materials and prepare a final report.

If no cultural resources were recovered during project construction, the CPM-approved preliminary report shall also serve as the final report and shall be filed with appropriate entities, as described in conditions CUL-12 and CUL-13.

**Verification:** The designated cultural resources specialist shall prepare a preliminary report on the cultural resource monitoring and mitigation activities conducted for the project. The report shall be prepared within ninety (90) days following completion of the data recovery and site mitigation work. The project owner shall submit a copy of the Preliminary Cultural Resources Report to the CPM for review, comment, and written approval.

~~CUL-12~~[CUL-14](#) The project owner shall ensure preparation of a Final Cultural Resources Report by the designated cultural resources specialist, if significant or diagnostic cultural resources are found. The Final Cultural Resource Report shall be completed within ninety (90) days following completion of the analysis of the recovered cultural materials and related

information. The project owner shall submit the final cultural resources report to the CPM for review, comment, and written approval.

**Protocol:** The Final Cultural Resource Report shall include (but not be limited to) the survey report(s), methodology, and recommendations; site records and maps; description and inventory list of recovered cultural materials; determinations of significance and potential eligibility; data recovery and other mitigation activities; results and findings of any special analyses conducted on recovered cultural resource materials and data; research questions answered or raised by the data from the project; and the name and location of the public institution receiving the recovered cultural resources for curation.

**Verification:** The Final Cultural Resource Report shall be prepared by the designated cultural resources specialist for the project, within ninety (90) days following completion of the analysis of the recovered cultural materials and preparation of related text, maps, tables, charts, photos, etc. The project owner shall submit a copy of the final cultural resources report to the CPM for review and approval.

**CUL-13CUL-15** The project owner shall submit an original, or an original-quality, copy of the CPM-approved Final Cultural Resource Report to the public institution receiving the recovered data and materials for curation, to the SHPO, and to the appropriate archaeological information center(s). A legible copy of the final report shall be filed with the Commission CPM, with a request for confidentiality, if needed to protect any sensitive resources or sites.

**Protocol:** The copies of the Final Cultural Resource Report sent to the curating institution, the SHPO, and the information center(s) shall include the following (as applicable to the project findings set forth in the final report): clean and reproducible original copies of all text; originals of any topographic maps showing site and resource locations; original or clear copies of drawings of significant or diagnostic cultural resource materials found during pre-construction surveys, during project-related monitoring, data recovery, and mitigation; and photographs (including a set of negatives, if possible) of the site(s) and the various cultural resource materials recovered during project monitoring and mitigation and subjected to post-recovery analysis and evaluation.

**Verification:** The project owner shall maintain in its compliance files, copies of all documentation related to the filing of the original materials and the Commission-approved Final Cultural Resources Report with the public institution receiving the recovered data and materials for curation, the SHPO, and the appropriate archaeological information center(s). If no significant cultural resources were recovered, then the preliminary report shall serve as the final report and copies of the preliminary report shall be filed with these same agencies.

**CUL-14CUL-16** Following the filing of the CPM-approved Final Cultural Resource Report with the appropriate entities, the project owner shall deliver for

curation all cultural resource materials, maps and data collected during data recovery and mitigation for the project. The materials shall be delivered for curation into a public repository that meets the US Secretary of Interior requirements for the curation of cultural resources.

**Verification:** All recovered cultural resource materials shall be delivered for curation within thirty (30) days following the filing of the CPM-approved Final Cultural Resource Report. The project owner shall maintain in its project history or compliance files, copies of signed contracts or agreements with the museum(s), university(ies), or other appropriate public repository(ies) to which the project owner has delivered for curation all cultural resource materials collected during data recovery and mitigation for the project.

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# SOILS & WATER RESOURCES

Supplemental Testimony of Joe O'Hagan

## INTRODUCTION

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HDPP (Bookman-Edmonston 1998d) has proposed groundwater banking in the Regional Aquifer to provide water for the project when State Water Project water is not available. The Regional Aquifer is the major drinking water source for the Mojave River Groundwater Basin. The water to be stored in the aquifer will be State Water Project (SWP) water.

The Porter-Cologne Water Quality Control Act requires a waste discharge requirement (WDR) for injection of surface water into a groundwater aquifer to ensure the protection of groundwater quality. The state allows the Lahontan Regional Water Quality Control Board (RWQCB) to waive this requirement (Baqai 1999).

State Water Resources Control Board (SWRCB) Policy 68-16, Statement of Policy with Respect to Maintaining High Quality of Waters in California (anti-degradation policy), requires any discharge to existing high quality waters to meet waste discharge requirements to ensure the highest water quality.

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 (Maxwell 1999) 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 mg/l. 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 the applicant's (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 and the Victor Valley Water District approve the proposed plan.

## CONDITIONS OF CERTIFICATION

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**Soil&Water 1:** The project owner shall submit a Report of Waste Discharge as an application to the Lahontan Regional Water Quality Control Board for a waste discharge requirement. An approved waste discharge requirement must be received prior to any groundwater banking unless the Regional Water Quality Control Board decides to waive the need to issue a waste discharge requirement or waives the need for the project owner to file a Report of Waste Discharge.

**Verification:** The project owner shall submit to the CEC CPM a copy of the Report of Waste Discharge submitted to the Lahontan Regional Water Quality Control Board as an application for a waste discharge requirement. 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 the Regional Water Quality Control Board requires a waste discharge requirement, the project owner shall submit to the CEC CPM a copy of the approved permit.

**Soil&Water 2:** The project owner shall prepare 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 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 for the last five years and shall identify the proposed treatment level for each constituent. These levels shall be the arithmetic mean based upon the five year monitoring results for all constituents detected in the local groundwater as long as this value meets primary drinking water standards. For constituents that are not detected in the local groundwater, the treatment level for the SWP water shall also be to the non-detect level. The plan submitted for approval shall 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:** The project owner shall submit the State Water Project water treatment and monitoring plan to the CEC CPM for review and approval. The CEC CPM's review will be conducted in consultation with the Mojave Water Agency, the Victor Valley Water District and the City of Victorville.

**Soil&Water-3:** The project owner shall implement the CEC CPM's approved water treatment and monitoring plan. All banked SWP water shall be treated to meet local groundwater conditions as identified in Soil&Water-2 above. Revised treatment levels may be provided based upon changes in local groundwater quality identified in the monitoring program not attributable to the groundwater-banking program. Monitoring results shall be submitted to the Regional Water Quality Control Board and the CEC CPM.

**Verification:** The project owner shall submit monitoring results as specified in the approved plan to the CEC CPM. The project owner shall identify to the CEC CPM for approval any proposed changes to SWP water treatment levels. The project owner shall notify the Regional Water Quality Control Board 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 and the Regional Water Quality Control Board.

