Final Staff Assessment
(Part 3)

MOSS LANDING POWER PLANT PROJECT

Application For Certification (99-AFC-4)
Moss Landing - Monterey County

CALIFORNIA ENERGY COMMISSION

STAFF REPORT

JUNE 2000
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Gray Davis, *Governor*

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EXECUTIVE SUMMARY

On May 7, 1999, Duke Energy Moss Landing LLC filed an Application for Certification (AFC) seeking approval from the California Energy Commission (Energy Commission) to construct and operate the proposed Moss Landing Power Plant Project (MLPPP). The AFC was determined to be data adequate by the Energy Commission at the August 11, 1999 business meeting. This finding began staff's review and analysis of the project.

On May 15, 2000 staff filed Part 1 of its Final Staff Assessment (FSA). Part 1 included staff analysis of 17 technical areas[1]. Part 2 of the FSA was filed on June 1, 2000, and included staff's **Air Quality** and **Land Use** analysis. Part 2 also includes errata for **Cultural Resources**, **Public Health**, **Hazardous Material Management**, **Waste Management**, **Socioeconomics** and **Visual Resources.** This Part 3 of the FSA includes **Soil & Water Resources, Biological Resources** and **Alternatives**. Also include in this Part 3 of the FSA is staff supplemental Transmission System Engineering testimony. The following provides a brief summary of the project.

PROJECT SUMMARY

The existing Moss Landing Power Plant is an extensive industrial complex of 7 electric generation units, 8 225-foot exhaust stacks, 19 fuel storage tanks, 2 seawater inlet and out fall structures, various warehouse and office buildings, and other related equipment on a 239-acre site. The power plant has been generating electricity since 1950. Units 1-5 (613 MWs), originally built in the 1950's were shut down in 1995. Units 6 and 7 (1,500 MWs) are currently in operation. On July 1, 1998, Duke Energy purchased the 239-acre site from PG&E. PG&E retained the adjacent 500/230/115-kV substation.

The project is proposed to be located at the existing Moss Landing Power Plant site. This site is located about 12 miles northwest of Salinas, California in Monterey County at the intersection of Highway 1 and Dolan Road, east of the community of Moss Landing. The plant is situated near the Moss Landing Harbor in an area that includes industrial facilities, agricultural lands, residences, recreational beaches and tidal wetlands.

The Moss Landing Power Plant Project consists of replacing the existing electric power generation Units 1-5 with two 530 MW, natural gas-fired, combined cycle, units. Each combined cycle unit consists of two natural gas fired combustion turbine generators (CTGs), two unfired heat recovery steam generators (HRSGs) and a reheat, condensing steam turbine generator (STG). Each combined cycle

[1] Need Conformance, Waste Management, Public Health, Geology and Paleontology, Hazardous Materials Handling, Facility Design, Transmission Line Safety & Nuisance, Reliability, Traffic and Transportation, Efficiency, Noise, Transmission System Engineering, Cultural Resources, Worker Safety and Fire Protection, Visual Resources, General Conditions/Compliance, and Socioeconomics.

unit will use seawater for once through cooling. In addition, they plan to dismantle 8 of the existing 225-foot stacks that were previously used for Units 1-5.

There are no linear facilities outside the property owned by Duke Energy and the adjacent PG&E substation. The natural gas pipeline connection, interconnection to the PG&E substation, and ocean water intake are all contained on these two adjacent properties.

In addition, Duke will be removing the large fuel storage tanks on site and adding Selective Catalytic Reduction (SCR; an air emission control technology) to existing Units 6 and 7. Monterey County is the lead agency for the environmental review of these projects, but the analysis in this document includes a discussion and analysis of any potential cumulative impacts from these projects.

If the project were to be approved by the Energy Commission, construction is expected to begin immediately after the decision and will take about 29 months. Full-scale commercial operation is expected by mid 2002. Duke Energy expects a peak work force of approximately 732 craft laborers, supervisory, support and construction management personnel on the site during construction. The capital cost of the project is estimated to be about $475 million.

ENERGY COMMISSION JURISDICTION

The Moss Landing Power Plant Project and related facilities are under the Energy Commission's jurisdiction (Pub. Resources Code (PRC) §§ 25500 et seq.). When issuing a license, the Energy Commission acts as lead state agency (PRC § 25519(c)) under the California Environmental Quality Act (PRC §§ 21000 et seq.), and its process is functionally equivalent to the preparation of an environmental impact report (PRC § 21080.5).

Staff's primary responsibility is to provide an independent assessment of the project's potentially significant effects on the environment, the public's health and safety, conformance with all applicable laws, ordinances, regulations and standards (LORS), and measures to mitigate any identified potential effects. The analyses contained in this document were prepared in accordance with PRC Sections 25500 et seq.; the California Code of Regulations (CCR) Title 20, Sections 1201 et seq.; and the California Environmental Quality Act (PRC §§ 21000 et seq.) and its guidelines (CCR title 14 §§ 15000 et seq.).

The Final Staff Assessment (FSA) presents Energy Commission staff's conclusions and recommended conditions of certification for the design, construction, operation and closure of the facility. The analyses contained in this document are based upon information from the AFC and subsequent revisions; responses to data requests; supplemental information from local, state and federal agencies, local citizens and interested parties; existing documents and publications; independent field study; and information gained from two days of publicly noticed workshops on the Preliminary Staff Assessment.

Each technical area section of the FSA contains a discussion of impacts, mitigation measures and conditions of certification. The FSA includes staff's assessments of:

- the environmental setting of the proposal;
- environmental impacts, and measures proposed to mitigate these impacts;
- impacts on public health and safety. the engineering design of the proposed facility, and measures proposed to ensure the project can be constructed and operated safely and reliably;
- compliance of the project with all applicable laws, ordinances, regulations and standards (LORS) during construction and operation;
- proposed conditions of certification;
- project closure; and
- project alternatives.

STAFF RECOMMENDATION

If all of staff's recommendations and conditions of certification are adopted, we believe the project complies with applicable regulations and will not result in any significant unavoidable environmental or public safety impacts. Therefore, we recommend that the project be certified.

SUPPLEMENTAL TESTIMONY

Testimony of C. Vartanian

CUMULATIVE TRANSMISSION SYSTEM ENGINEERING IMPACTS

Transmission System Engineering's Final Staff Assessment (FSA) for Moss Land Power Plant Project (MLPPP) gave an opinion of low expectation of cumulative impacts. Our FSA also identified several specific power flow scenarios to be performed in Pacific Gas and Electric Company's (PG&E) then pending MLPPP Detailed Facilities Study (DFS) which would model MLPPP on-line in conjunction with several other potential projects. Subsequent to the FSA, PG&E completed its DFS analysis (April 21, 2000 Draft). Staff has reviewed PG&E's DFS analysis, as well as the California System Operator's (Cal-ISO) review comments on this particular aspect of the DFS analysis. The PG&E quantitative analysis and related Cal-ISO review comments are consistent with staff's earlier qualitative finding, i.e. no significant cumulative impacts expected.

Future generation projects included in PG&E's MLPPP DFS power flow 'sensitivity' cases were:

Sutter Power Project (SPP)	500 MW,	approved AFC
Los Medanos Energy Center (LMEC)	500 MW,	approved AFC
Delta Energy Center (DEC)	880 MW,	approved AFC
Metcalf Energy Center (MEC)	500 MW,	active AFC

Three projects from the above list, LMEC, DEC and MEC, are electrically proximate enough to potentially show effect of combined operation, and for which PG&E performed 'sensitivity studies'[1]. SPP was modeled by PG&E as operating in all cases, but is electrically remote from MLPPP and does not have any significant 'compounding' effect with MLPPP. The table below shows the general impact to the bulk transmission system as indicated by the changing number (reduction) of facility overloads on the bulk PG&E transmission system as these plants were cumulatively added to PG&E's power flow case.

[1] Market Generator sensitivity cases were performed in PG&E's Detailed Facility Study for MLPPP per Cal-ISO comments (11/3/99 ltr) on PG&E's Preliminary Facilities Study (5/14/99) for MLPPP.

Table 1
Number of Facility Overloads (OL's) in Power Flow,
PG&E 2002 Heavy Summer Peak Case

	Basecase w/ MLPP	Basecase w/ MLPP, LMEC	Basecase w/ MLPP, LMEC, DEC	Basecase w/ MLPP, LMEC, DEC, MEC
N-0[2] OL's due to MLPPP	2	**0**	**0**	**0**
N-1 OL's due MLPPP	2[3]	2	2	**0**
N-1 OL's, inclusive	17	15	13	9
N-2 OL's due to MLPPP[4]	16	18	17	18
N-2 OL's, inclusive	24	23	21	21

The data in Table 1 above indicate that the modeled electrical interaction between MLPPP and the particular projects studied reduced the number of line overloads.

There are additional projects for which staff posits additional quantitative analysis is not required for making a determination on MLPPP cumulative impacts. In all cases, the following projects are too remote electrically to have significant interaction with MLPPP; Contra Costa Power Plant Project, Potrero, La Paloma, Midway-Sunset Cogen West, Elk Hills Power Project, Sunrise Cogen and Power Project, and Three Mountain Power Project. All projects considered for cumulative impacts with MLPPP passed two screening criteria, 1) they are within or adjacent to PG&E's transmission control area, and 2), they have successfully completed, or are in the AFC process.

In conclusion, the post-FSA technical studies that staff has reviewed indicate no significant cumulative impacts due to MLPPP when considered in conjunction with the additional projects analyzed.

[2] N-0 indicates all transmission elements were modeled in service, N-1 indicates one transmission element was modeled out of service, N-2 indicates two transmission elements were modeled out-of-service.

[3] There is an additional N-1 overload for the 'partial peak' case. This overload is alleviated with addition of next generator/LMEC.

[4] All of these overloads can be mitigated by reducing the output of the MLPPP.

ALTERNATIVES

Testimony of Richard K. Buell

INTRODUCTION

Energy Commission staff is required by Title 20, California Code of Regulations Section 1765 of the Energy Commission's siting regulations to examine the "feasibility of available site and facility alternatives to the applicant's proposal which substantially lessen the significant adverse impacts of the proposal on the environment". The "Guidelines for Implementation of the California Environmental Quality Act" (CEQA), Title 14, California Code of Regulations, Section 15112(d), provides further direction by requiring an evaluation of the comparative merits of "a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the project objectives."

The purpose of staff's alternatives analysis is to provide the Energy Commission with an analysis of a reasonable range of feasible alternatives which would attain most of the basic objectives of the project, but substantially reduce or avoid any potentially significant adverse impacts of the proposed project. (Cal. Code Regs., tit. 14, § 15126.6(a); tit. 20, § 1765). This analysis identifies the potentially significant impacts of the proposed project, and those project alternatives that are capable of reducing or avoiding significant impacts.

Staff has analyzed four alternative sites in order to better inform the Committee about possible alternatives. CEQA requires an analysis of alternative sites only if "the significant effects of the project would be avoided or substantially lessened by putting the project in another location." Staff has concluded that with mitigation the project will not have any significant adverse impacts. Therefore staff believes it is not required under CEQA to look at alternative sites in this case, but is doing so to ensure a thorough analysis.

METHODOLOGY

To prepare this alternatives analysis, staff used the methodology summarized below:

- Identified the basic objectives of the project;
- Provided an overview of the project and potentially significant adverse impacts;
- Evaluated the "no project" alternative;
- Identified and evaluated feasible alternative electricity generation technologies;
- Identified screening criteria;
- Conducted a screening analysis to assess the feasibility of the alternative sites mentioned by the applicant and staff;
- Determined whether the alternative technologies and sites reduced or avoided any significant impacts of the proposed project;

- Determined whether the alternative technologies and sites would cause one or more impacts that could be significant;

BASIC PROJECT OBJECTIVES

After studying the Moss Landing Power Plant Project (MLPPP) Application for Certification (AFC), Energy Commission staff has determined the project's objectives to be:

- The construction and operation of a merchant power plant in the Monterey County region that supplies economic, reliable and environmentally sound electrical energy and capacity in the newly deregulated power market;
- The generation of approximately 1060 MW of electricity;
- The utilization of an existing power generation site and existing ancillary facilities;
- The location of the site near key infrastructure, such as transmission line interconnections (230-kv or greater), and supplies of process water and natural gas;
- The improvement of local electric reliability while reducing electric system losses.

DETERMINING THE SCOPE OF THE ALTERNATIVES ANALYSIS

In considering locational alternatives, the staff had to determine a reasonable geographical area. Since alternatives must consider the underlying objectives of the proposed project, staff confined the geographic area of locational alternatives to the Monterey County region. Locational alternatives beyond this region would be inconsistent with the project objectives.

These siting alternatives assume that the proposed MLPPP is unmitigated. The alternative sites presented here were compared with the MLPPP before the proposed mitigation. None of these alternative sites has been subjected to an in-depth analysis similar to that conducted for the MLPPP site. Each alternative site, however, provides adequate information for the decision-makers consistent with CEQA and Energy Commission regulations.

SETTING

SITE AND VICINITY

The proposed project is located within the existing Moss Landing Power Plant. The power plant site encompasses 239 acres and is situated adjacent to the PG&E Moss Landing Switchyard. The project site is zoned Heavy Industrial with electric power plants being an allowable use. The project site consists of 7 generating units (2 of which are currently in operation), 10 exhaust stacks, 19 fuel storage tanks, 2 seawater inlet and outfall structures, various warehouse and office buildings, and other related equipment. Duke Energy purchased the site from PG&E on July 1, 1998 and currently operates units 6&7, producing 1,500 MW of electricity.

The applicant chose the proposed site for the following reasons:

- Infrastructure for the power plant is already in place;
- The site is close to the PG&E Moss Landing Switchyard where the applicant will connect to the transmission system;
- The site contains existing once-through seawater cooling water intake and discharge structures;
- The site would result in a lower level of environmental impact when compared to other site possibilities within Monterey County;

The applicant has requested certification to add 1060 MW to the MLPPP. This would bring the total output of the site to 2590 MW. The applicant proposes to replace existing generating Units 1 through 5 (613 MW) with two 530-MW combined-cycle generation units. In addition, Duke will dismantle the eight 225-foot tall stacks that were previously used for the retired Units 1 through 5 and install four 145-foot exhaust stacks. Duke plans to place the two new generation units on land that is currently occupied by several fuel oil storage tanks. Duke will also redesign the cooling system so that outflow is diverted into the bay instead of into the more sensitive Elkhorn Slough. The project will not require installation of new high-voltage transmission lines. Electrical connections will be constructed within the power plant site to connect the new units to the adjacent switchyard.

RELATED FACILITIES

Electricity generated by the MLPPP would be transmitted to Pacific Gas & Electric's (PG&E) Moss Landing Switchyard immediately north of the plant. The project does not require any additional transmission line construction, except for short onsite line segments necessary to convey power to the PG&E switchyards. The existing switchyards and power grid are adequately sized and maintained for the additional power generated by the project.

The project will use existing seawater intake structures for retired Units 1 through 5 and the existing seawater discharge structure for Units 6 and 7. New traveling screens will be installed 350 feet west of their current location in order to minimize entrapment and impingement of biota.

Most of the nonhazardous wastewater generated will be discharged through existing cooling water outfalls. New pipelines will not be needed.

The project will use existing natural gas pipelines for fuel delivery. However, short segments of natural gas distribution lines will be extended to the Project from the existing onsite metering station, which will be modified to meet pressure requirements. The Project will provide a gas compressor to adequately support the combined-cycle units, but no change in pipeline capacity will be required.

POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACTS

The environmental impacts of the proposed project are discussed in detail in the individual sections of the FSA. Staff has identified environmental impacts in a number of technical areas. However, it is staff's opinion that the mitigation measures proposed will reduce any potential significant environmental impacts to less than significant levels.

ANALYSIS

THE "NO PROJECT" ALTERNATIVE

The CEQA Guidelines state, "The purpose of describing and analyzing a no-project alternative is to allow decision makers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project." (Cal. Code Regs., tit. §15126.6(e).) Toward that end, the no-project analysis considers "existing conditions" and "what would be reasonably expected to occur in the foreseeable future if the project were not approved…" (Ibid.)

The "no project" alternative assumes that the proposed project is not constructed. In this case, the "no project" alternative would be leaving the plant "as is". Units 1-5 would remain non-operational, units 6 & 7 would remain in operation, and the eight existing smokestacks would remain in place. No new combined-cycle units would be added.

In the MLPPP Application for Certification (AFC), Duke presented the "no project" alternative as not consistent with their objectives and provided two supporting arguments for their conclusion (MLPPP 1999, AFC page 5-6). First, Duke argues that the "no project" alternative would result in less efficient local, state, and regional transmission and distribution of electricity because electricity needed in the area would have to be routed from the Los Banos substation. Second, Duke argues that the "no project" alternative would result in greater environmental impacts because high demand for electricity would continue to be placed on older, less efficient power generating facilities.

With respect to local, state, and regional transmission and distribution of electricity, the current system transmits power used in the region from the Los Banos substation to the MLPPP switchyard. The "no project" alternative would maintain this current system. The proposed project would result in the increased power generated by the MLPPP tying directly into the MLPPP switchyard and being dispersed to local loads, thereby reducing the quantity of electricity imported from Los Banos.

As for the visual impacts, under the "no project" alternative eight 225-foot smokestacks and the fuel storage tanks would not be removed, thereby maintaining the visual impact that exists today. Duke proposes to remove these large exhaust stacks and replace them with four 145-foot exhaust stacks, thus slightly reducing the visual impact of the power plant. Duke also proposes to remove the large fuel

storage tanks on the property, thus further reducing the visual impact of the power plant. In this regard, the proposed project would be superior to the "no project" alternative.

The "no project" alternative would have less of an impact on traffic than would the proposed project. Since there would be no construction there would be no construction-related traffic and therefore no adverse impact.

Staff has determined that the "no project" alternative is environmentally superior to the proposed project in an unmitigated condition. This is because the MLPPP would, in an unmitigated condition, have significant environmental impacts on traffic, water resources and biological resources. Not constructing and operating an unmitigated power plant would avoid these impacts. However, as stated above, staff believes mitigation measures proposed by the applicant will reduce any impacts to less than significant levels. Staff also believes that the "no project" alternative would result in visual impacts because the smokestacks and fuel storage tanks would be left standing. Therefore, staff believes that, overall, the "no project" alternative is not superior to the proposed project.

GENERATION TECHNOLOGY ALTERNATIVES

Public Resources Code section 25305(c) states that conservation, load management, or other demand reducing measures reasonably expected to occur shall be explicitly examined in the Energy Commission's energy forecasts and shall not be considered as alternatives to a proposed facility during the siting process. The forecast that will address this issue is the Commission's California Energy Outlook. Thus, such alternatives are not included in this analysis.

Staff compared various alternative technologies with the proposed project. We examined the principal electricity generation technologies that do not burn fossil fuels such as natural gas. These are geothermal, solar, hydroelectricity, wind, biomass, waste-to-energy. Staff also looked at coal and nuclear power generation to provide a thorough analysis of alternative generation technologies.

There are no viable geothermal resources in the Monterey County region. Solar, wind and hydroelectricity resources would require large land areas in order to generate 1,060 megawatts of electricity. Specifically, centralized solar projects using the parabolic trough technology require approximately 5 acres per megawatt; 1,060 megawatts would require approximately 5,300 acres, more than 22 times the amount of space taken by the current plant site and linear facilities. Photovoltaic arrays require similar acreage per megawatt. Centralized wind generation areas generally require 40-50 acres per megawatt, with 1,060 megawatts requiring 42,400-53,000 acres, more than 182 times the amount of space taken by the current plant site and linear facilities. Wind generation also has environmental effects. Large wind farms can have significant visual impacts and in some areas these have resulted in a large number of raptor deaths. The noise generated by the wind turbines might also be of concern. Large hydroelectric facilities generating

1,060 megawatts would inundate more than 70,000 acres with water, resulting in extensive biological and environmental impacts.

Biomass facilities do not require the extensive amount of land of the above alternatives. However, most biomass facilities are only in the range of 5-25 MW, insufficient for Duke's objectives. They also generate significant air emissions and require numerous truck deliveries to supply the plant with the waste. Also, in waste-to-energy facilities there is some concern regarding the emission of toxic chemicals, such as dioxin, and the disposal of the resultant toxic ash.

Potential significant effects also arise in constructing transmission line interconnections to connect a renewable power facility to a nearby transmission line.

The alternative technologies discussed above have the potential for significant land use, biological and visual impacts. Consequently, staff does not believe that these technologies present any feasible alternatives to the proposed project.

Staff also considered the option of building a coal-fired power plant. Conventional boiler steam turbine technology using coal as a fuel would be feasible for commercial scale generation. However, coal would have to be imported from outside California, resulting in increased truck and/or train traffic, and coal storage issues. Furthermore, coal combustion results in a higher level of emissions than that for natural gas burning facilities. Also, the Monterey County Coastal Implementation Plan allows the use of coal only if other cleaner fuels become unavailable. For these reasons staff concluded that this alternative technology option is not superior to the proposed project.

Staff did not consider the possibility of a nuclear power plant alternative. California law prohibits new nuclear plants until the scientific and engineering feasibility of disposal of high-level radioactive waste has been demonstrated. Consequently, staff concluded that this alternative technology is not feasible.

Staff also considered the possibility of a smaller sized alternative, such as a 240 MW gas fired combined cycle project located at the MLPPP site. This is less electricity than the applicant proposes to add, but is considered here as an alternative in order to facilitate a thorough analysis of project options. This smaller project would significantly reduce the amount of cooling water required for the project thereby reducing the quantity of biota impinged or entrained and reducing the size of the thermal plume; however, this would also result in a higher thermal discharge temperature than the proposed project. This alternative would not reduce the impact from increased traffic and would not eliminate the potentially significant impact in biological and water resources.

ALTERNATIVE SITE SCREENING ANALYSIS

Alternative sites were identified through a review of the applicant's AFC and an analysis of site availability within Monterey County. The AFC did not contain any

alternative sites. No alternative sites were proposed by the public. Therefore staff selected four alternative sites that satisfied the preliminary site requirements within Monterey County.

In the MLPPP AFC, Duke listed several key criteria required for reasonable selection of an offsite alternative. (MLPPP AFC 5-4). The site would have to be large enough to support a 1060 MW power plant. We estimate this to be approximately 15-20 acres. The site would have to have sufficient infrastructure or access thereto within a reasonable outlying distance to support a 1060 MW power plant. This would include: (1) Natural gas pipelines (24 inch or larger); (2) Major roads to support deliveries and operations; (3) Water for utilities and cooling (e.g. ground water, reclaimed water); and (4) reasonably close proximity to an existing transmission line system to facilitate connecting transmission lines and switching facilities (230-kv or higher and with the capacity for the new plant).

Staff found no alternative coastal site that could support a facility of this size. This is due to the lack of "Heavy Industry" zoning (which would be required for construction of a power plant) in coastal areas. Staff was therefore required to search for inland site alternatives for this project. The use of an inland site would require a change in the cooling system from once-through ocean water cooling to an air-cooled condenser or to cooling tower technologies. This would entail a significant change in facility design, but is contemplated here in order to conduct a thorough analysis of site alternatives.

ALTERNATIVE SITES

SAN LUCAS SITE ALTERNATIVE

PROJECT AND SITE DESCRIPTION

- The San Lucas site is located in the city of San Lucas. It is bordered by Monterey Street to the east and Main street to the south. It lies approximately 2,700 feet west of State Highway 198.
- The surrounding land uses are residential, industrial and agricultural.
- The natural gas supply interconnection line would be approximately 2 miles long.
- The transmission system interconnection line would be approximately 14 miles long.

ADVANTAGES

- This site is zoned industrial.
- The site is near Highway 198 and adjacent to Highway 101 and a railroad line thus facilitating material transport for deliveries and operations.

DISADVANTAGES

- The surrounding land is zoned for residential use.
- The site lies near a potentially active fault.
- There is a groundwater overdraft in the Greater Salinas area, thereby creating potential water supply problems for the coolant system. Use of reclaimed water is not feasible.
- There are no existing transmission lines nearby that are capable of supporting a 1090 MW power plant.
- The site is near a riparian creek corridor, which is considered an area of special biological importance by the California Department of Fish and Game. There is a potential for significant adverse biological impacts to protected species including kit foxes. There is also a potential for significant adverse biological impacts to raptors including protected southern bald eagles from transmission lines.
- Traffic and noise may be a potential significant adverse impact because the site is close to a school and residential area.

SAN ARDO SITE ALTERNATIVE

PROJECT AND SITE DESCRIPTION

- Staff looked at the San Ardo oil fields as a possible alternative site.
- The site is located approximately 3 miles south of the city of San Ardo and immediately east of Highway 101 and the Salinas River.
- The natural gas supply pipeline would be approximately 3 miles long.
- The transmission system interconnection line would be approximately 16 miles long.

ADVANTAGES

- Surrounding area is not zoned for residential use
- The land is not being cultivated
- Existing industrial-type uses (oil fields) reduce visual resource impacts that would otherwise exist at this site
- The site is adjacent to Highway 101, thus facilitating material transport for deliveries and operations. However there is no direct access from 101. Traffic would have to go through the town or the applicant would have to build a temporary road.

DISADVANTAGES

- The south county section of Monterey County suffers from groundwater overdraft conditions, thereby creating potential water supply problems for the coolant system. Use of reclaimed water is not feasible.
- The groundwater in the San Ardo mineral oil fields is high in sulfur, thereby making it unsuitable for use in a utility cooling system.
- The site lies within a 100-year floodplain.
- The specific plan states that the industrial designation in the San Ardo area is intended exclusively for activities related to oil extraction.
- There are no existing transmission lines nearby capable of supporting a 1090 MW power plant.
- The site is near a riparian creek corridor, which is considered an area of special biological importance by the California Department of Fish and Game.
- The site is near an environmentally sensitive heron rookery.
- There is a potential for significant adverse biological impacts to protected species including bald and golden eagles from the transmission lines.

RANCHO SAN JUAN SITE ALTERNATIVE

PROJECT AND SITE DESCRIPTION

- This site lies immediately north of the city of Salinas. It is bordered by Harrison road to the west and San Juan road to the east.
- The natural gas supply interconnection line would be approximately 1 mile long.
- The transmission system interconnection line would be approximately 1 mile long.

ADVANTAGES

- The site is zoned industrial.
- The site is near Highway 101 and major roads, thus facilitating material transport for deliveries and operations.
- Does not appear to be any adverse biological issues.
- The site does not require construction of lengthy auxiliary lines.
- Use of reclaimed water or irrigation return flow for cooling may be feasible.

DISADVANTAGES

- The site lies along a proposed scenic highway.

- Industrial uses that need large quantities of water for production, that could cause groundwater contamination or significant point source air pollution emissions, are not permitted within this area.
- There is a potential for significant adverse biological impacts to protected species including the brown pelican and least tern.

OLD STAGE ROAD ALTERNATIVE

PROJECT AND SITE DESCRIPTION

- This site lies 2 ½ miles east of the Rancho San Juan alternative; immediately east of Old Stage Road. San Juan Road is the nearest road to the north and Natividad Road lies immediately southwest of the site.
- The transmission system interconnection line would be approximately 2 miles long.
- The natural gas interconnection line would be approximately 2 miles away.

ADVANTAGES

- This site is not encumbered by the same industrial use restrictions as the Rancho San Juan alternative.
- The use of reclaimed water or irrigation return flows for cooling may be feasible.
- There does not appear to be any adverse biological issues.
- There is adequate access to the site with many options for transportation routes.
- Nearby land is not zoned for residential use.
- The site is zoned industrial.
- The site does not require construction of lengthy auxiliary lines.

DISADVANTAGES

- The site lies along a scenic highway.
- There is a potential for significant adverse biological impacts to protected species including the brown pelican and least tern.

CONCLUSION

CEQA requires the project alternatives analysis to focus on measures that would mitigate a project's potential impacts to less than significant levels. In the MLPPP these potential significant adverse impacts were in land use, traffic, biological resources and water resources. However, staff believes the measures it proposed to address the impacts in these areas will mitigated the effects to less than significant.

Staff does not believe that energy efficiency measures and alternative technologies (geothermal, solar, wind, and hydroelectric) present any feasible alternatives to the proposed project.

The option of a smaller project, such as a 240 MW combined cycle unit would still have traffic, biological resources and water resource impacts similar to the proposed project. Therefore, the smaller option is not better than the proposed project.

Of the four alternative sites considered, three did nothing to reduce the potential for traffic, biological resources and water resources impacts to a level lower than that of the proposed project without mitigation.

Other than the proposed Moss Landing site, the single remaining alternative site that staff would consider potentially feasible, with mitigation measures, is the Old Stage Road alternative. This alternative site has the potential for use of reclaimed water which would have less impact than the proposed project on water resources. Mitigation measures identified at this time would include visual screening and other mitigation measures identified for the proposed site to lessen biological resources impacts. However, since the significant adverse impacts resulting from MLPPP can fully mitigated, this alternative is not superior to the proposed project.

After analyzing various alternatives for the Moss Landing Project, staff concludes that the proposed project, with mitigation proposed by the applicant and additional mitigation as recommended by staff, is preferred.

REFERENCES

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Monterey County Planning Department. 1987Central Salinas Valley Area Plan. As amended December 5, 1995.

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Monterey County Planning Department. 1988 South County Area Plan. As amended December 5, 1995.

WITNESS QUALIFICATIONS

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Education: B.S. Mechanical Engineering, University of California Berkeley, 1975

Work Experience: California Energy Commission, Energy Facility Siting And Environmental Protection Division (EFS&EPD).

5/07/97 to Present — ***Compelling Management Needs Assignment*** to manage Commission review of power plant certification proposals. Responsibilities included project scheduling, budgeting, developing and making staff presentations to project committees, coordination of both environmental and engineering staff review, issues identification and resolution, staff product quality review, and siting policy implications. Project proposals include the High Desert Power Project, which is the first power plant proposal under electricity restructuring.

4/20/95 to 4/20/97 — ***Training and Development Assignment*** as Energy Commission Supervisor I responsible for supervising five staff with diverse backgrounds in economics, engineering and other disciplines. Unit responsibilities include forecasting and analyzing energy use in the industrial sector and assessing the implications of air quality control measures in all sectors, except transportation. Responsibilities include program review and development, budget and workplan development and implementation, management of staff resources, review and approval of staff products, review and development of office personnel policies and procedures, preparing performance evaluations, hiring and recruitment.

4/1990 to 4/20/90 — ***Senior Mechanical Engineer*** responsible for coordinating EFS&EPD's air quality policies related to energy planning and power plant siting for California. Duties include coordination of EFS&EPD's air quality policy work including review and evaluation of local air district attainment plans and proposed rules, residual air emission reduction "values", air emission offset availability and costs, air pollutant emission controls for electric generating technologies, long-term air quality implications of energy resource plans, and energy implications of air quality regulations. Also lead air quality staff on power plant certification proposals.

BIOLOGICAL RESOURCES

Testimony of Richard Anderson and Michael Foster

INTRODUCTION

This section provides the California Energy Commission staff's analysis of potential impacts to biological resources from Duke Energy Moss Landing LLC's proposal to construct and operate the Moss Landing Power Plant Project (MLPPP). The focus of this analysis is directed toward impacts to state- and federally-listed species, fully protected species, species of special concern, wetlands, and other areas of critical biological concern. It describes the biological resources of the project site and ancillary facilities; determines the need for mitigation; determines the adequacy of mitigation proposed by the applicant and, where necessary, specifies additional mitigation measures to reduce identified impacts to less than significant levels; determines compliance with applicable laws, ordinances, regulations, and standards; and recommends conditions of certification.

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 take or unauthorized collecting and possession. 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, the same species 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 (CNDDB) 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.

Terrestrial biological resource surveys conducted by consultants for the applicant provide information useful in determining the potential impacts related to the power plant and its ancillary facilities (Duke Energy 1999a and b). Surveys of the estuarine and marine environment that supports animal species subject to entrainment, impingement, and thermal discharge effects of the once-through cooling water system provides information useful in determining potential impacts to those systems and the Elkhorn Slough ecosystem (Elkhorn Slough National Estuarine Research Reserve). These surveys are required as part of the NPDES permitting

process required under Section 402 of the Clean Water Act, which is administered by the Central Coast Regional Water Quality Control Board. The applicant is required to utilize best technology available to minimize potential once-through cooling water system impacts on biological resources. The 316(b) study results will assist in the determination of the best technology available for the proposed project, regarding entrainment and impingement losses, as well as the 316(a) thermal discharge studies to determine if the proposed project uses best technology available, and can meet the thermal discharge requirements. A complete assessment of the potential impacts, a determination of necessary mitigation, and/or best technology available alternatives will be considered for the once-through cooling water system. This assessment will be conducted in close coordination with the Central Coast Regional Water Quality Control Board.

Impacts to terrestrial biological resources are expected to be minimal because of the highly industrialized nature of the project site, and the location where impacts might occur. General mitigation approaches proposed by the applicant in combination with mitigation measures proposed by Energy Commission staff in consultation with the California Department of Fish and Game and the California Coastal Commission are expected to adequately mitigate any impacts to plants and animals that could utilize the project site and immediate vicinity.

The loss of biological resources resulting from the proposed once-through cooling water system is determined to be a significant biological resources impact. This significant impact can be mitigated to an acceptable level with sufficient enhancement and improvement (wetlands and other habitat restoration) in the Elkhorn Slough biological resources productivity to replace lost productivity due to the once-through cooling water system. The mitigation/compensation package being developed by the Energy Commission staff in cooperation with the California Central Coast Regional Water Quality Control Board, California Department of Fish and Game, and the California Coastal Commission, are expected to mitigate the significant impacts. Without agreement on an acceptable mitigation/compensation package, Energy Commission staff is unable to conclude that there are not likely to be significant biological resources impacts.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

FEDERAL

- The Endangered Species Act of 1973 (16 U.S.C., §1531 et seq.), and implementing regulations, (50 C.F.R. §17.1 et seq.), designate and provide for protection of threatened and endangered plants and animals and their critical habitat.
- Migratory Bird Treaty Act (16 U.S.C. §701-718) and implementing regulations (50 C.F.R.) Subchapter B (§10.1-24.12) provides protection for migratory birds.
- Marine Mammal Protection Act (16 U.S.C. Chapter 31 §1361-1375) provides protection for marine mammals.

STATE

- California Native Species Conservation and Enhancement Act, (Fish & Game Code, §1750 et seq.), mandates as state policy, maintenance of sufficient populations of all species of wildlife and native plants and the habitat necessary to ensure their continued existence at optimum levels.
- California Endangered Species Act, (Fish & Game Code, §2050 et seq.), protects California's endangered and threatened species. The implementing regulations, (Cal. Code Regs., tit.14, §670.5), lists animals of California declared to be threatened or endangered.
- Native Plant Protection Act (Fish & Game Code, §1900 et seq.), establishes criteria for determining if a species, subspecies, or variety of native plant is endangered or rare and regulates the taking, possession, propagation, transportation, exportation, importation, or sale of endangered or rare native plants.
- Fish and Game Code, section1603 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 fish, respectively, listed as fully protected in California.
- Fish and Game Code, section 1900 et seq., gives CDFG authority to designate state endangered and rare plants and provides specific protection measures for identified populations.
- Fish and Game Code, section 3513 makes it unlawful to take or possess any migratory nongame bird as designated in the Migratory Bird Treaty Act except as provided for under federal rules and regulations.

LOCAL

Monterey County Coastal Implementation Plan, Part 2, Regulations for Development in the North County Land Use Plan Area, Chapter 20.144.040 – Environmentally Sensitive Habitat (ESH) Development Standards.

A. Biological Survey Requirement
   1. A biological survey (BS) shall be required for all proposed development that:
      c. is or may be located within 100 feet of an ESH;

B. General Development Standards
   1. All development shall be prohibited in the following ESHs: riparian corridors, wetlands, dunes, sites of known rare and endangered species of plants and animals, rookeries, major roosting and haul-out sites, and

other wildlife breeding or nursery areas identified as environmentally sensitive.

2. Development containing or within 100 feet of ESH shall be modified to reduce adverse impacts to an insignificant level. Mitigation measures of the BS will be considered and incorporated into the conditions of approval.
3. New land uses within 100 feet of ESH cannot adversely affect the habitat either on a project or cumulative basis. Projects will only be approved where the decision will not set a precedent for development which, on a cumulative basis, could degrade the habitat.
6. Deed restrictions or conservation easement dedications over ESH areas shall be required as a condition of approval, even on previously developed parcels of land. Where the proposed project is to occur on an already-developed parcel, restrictions or easement dedications over the habitat area shall still be required.
8. Removal of vegetation and land disturbance on parcels containing or adjacent to ESH areas must be limited to the extent necessary for structural improvements and driveway access. Modifications will be made to reduce habitat impacts.
9. Use of native species found in the project area shall be required in the landscaping as a condition of approval.
10. Construction activities and industrial uses affecting rare, threatened, and endangered birds must protect these birds during breeding and nesting seasons as a condition of approval. These regulations shall not prohibit emergency operation of public utilities.

C. Specific Development Standards

2. Riparian, Wetland, and Aquatic Habitats
   d. All development must be set back a minimum of 100 feet from the landward edge of vegetation associated with coastal wetlands (including Elkhorn Slough and Moro Cojo Slough).
   e. Development with the potential to impact riparian, wetland, or aquatic habitat must be conducted to avoid breeding seasons and other critical phases in the life cycles of commercial fish and shellfish and rare, threatened or endangered indigenous species. Mitigation measures shall be made conditions of approval.
   f. Development near harbor seal haul-out areas cannot adversely impact the viability or long-term maintenance of this habitat.
3. Marine habitats
   a. Development proposing wastewater discharge into Monterey Bay and coastal waters of Monterey County will be reviewed by the Health Department. Submission of these studies is a requirement of application completion.

SETTING

REGIONAL DESCRIPTION

The regional landscape includes a variety of habitats including broad beaches, dunes, mildly sloping dune terraces and hilly uplands. The uplands are composed of grasslands, oak woodlands, Monterey pine groves, and coastal scrub. There are also salt marshes, mudflats, and rocky intertidal substrates providing complex habitats for innumerable living organisms. The range in temperature extremes is somewhat moderated by offshore westerly breezes. These habitats are described in greater detail in the AFC (Duke Energy 1999a) and Supplemental Information filing (Duke Energy 1999j). Much of the land has been converted to agriculture – row crops and livestock grazing. Specific areas of critical biological concern are the Elkhorn Slough National Estuarine Research Reserve, which adjoins the much larger (5,300 square mile) Monterey Bay National Marine Sanctuary near Moss Landing Harbor about midway between the cities of Santa Cruz and Monterey.

The ocean shore, dunes, and undeveloped upland areas as well as wetlands in the region support many amphibians, reptiles, passerines, raptors, shore birds, waterfowl, and small to medium sized mammals. A list of plant and animal species recognized as being of special concern or protected under state and federal regulations are listed in Table 1. The following three informational items are notable: 1) On October 17, 1999 at least twenty tidewater gobies (*Eucyclogobius newberryi*) were collected in the upper reaches of Bennett Slough about one mile north of the proposed power plant (Swift 1999). Other investigators also collected them here in June of 1976 (Nybakken et al. 1977). Water from this slough can eventually make its way to the north arm of Moss Landing Harbor. 2) Mud flat and salt pond areas in Elkhorn Slough have recently been designated as Critical habitat for the Pacific coast population of the western snowy plover (*Charadrius alexandrinus nivosus*) because of its nesting value (USFWS 1999). 3) Leatherback turtles frequent waters of the western coast of the United States including Monterey Bay. They are the most common sea turtle in Californian waters. Surface feeding on jellyfish by the leatherback turtle has been reported in these U.S. waters, but no systematic studies have been done to determine the relative importance of various foraging habitats (NMFS 1998).

SITE AND VICINITY DESCRIPTION

Site-specific field surveys for biological resources were conducted at the project site and laydown area by the applicant's biologists in January, March, April and May of 1999 (DEML 1999c). Energy Commission staff visited the power plant site on May 20, 1999 in the company of the applicant's terrestrial biologists, a biologist from the California Department of Fish and Game, and a representative from the U.S. Army Corps of Engineers.

BIOLOGICAL RESOURCES Table 1
Sensitive Species

Sensitive Plants	Status*
Coastal dunes milk-vetch (*Astragalus tener* var. *titi*)	CNPS List 1B/SCE /FE
Monterey spineflower (*Chorizanthe pungens* var. *pungens*)	CNPS List 1B/FT
Robust spineflower (*Chorizanthe pungens* var. *robusta*)	CNPS List 1B/FE
Coast wallflower (*Erysimum ammophilum*)	CNPS List 1B/SC
Sand gilia (*Gilia tenuiflora* ssp. *arenaris*)	CNPS List 1B/ST/FE
Santa Cruz tarplant (*Holocarpha macradenia*)	CNPS List 1B/SCE/FPT
Beach layia (*Layia carnosa*)	CNPS List 1B/SE/FE
Tidestrom's lupine (*Lupinus tidestromii*)	CNPS List 1B/SE/FE
Yadon's rein orchid (*Piperia yadonii*)	CNPS List 1B/FE
Hickman's potentilla (*Potentilla hickmanii*)	CNPS List 1B/SE/FE

Sensitive Wildlife	Status
Black legless lizard (*Anniella pulchra nigra*)	CSC/SC
San Francisco garter snake (*Thamnophis sirtalis tetrataenia*)	CSC/FT
Western burrowing owl (*Athene cunicularia*)	CSC/SC
Tricolored blackbird (*Agelaius tricolor*)	CSC/SC
Bank swallow (*Riparia riparia*)	ST
Short-eared owl (*Asio flammeus*)	CSC
Western snowy plover (*Charadrius alexandrinus nivosus*)	CSC/FT
Southwestern pond turtle (*Clemmys marmorata pallida*)	CSC/SC
California tiger salamander (*Ambystoma californiense*)	CSC/C
California red-legged frog (*Rana aurora draytonii*)	CSC/FT
Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*)	SE/FE
Clafiornia brackishwater snail (*Mimic tryonia*)	SC
Tidewater goby (*Eucyclogobius newberryi*)	CSC/FE
Southern sea otter (*Enhydra lutris nereis*)	FP/FT
California brown pelican (*Pelecanus occidentalis californicus*)	SE/FE
California least tern (*Sterna antillarum browni*)	FE
Leatherback turtle (*Dermochelys coriacea*)	FE

Status legend:
CNPS List 1B = Plants rare or endangered in California and elsewhere (California Native Plant Society 1994),
FE = Federally listed Endangered, FT = Federally listed Threatened, SC = Federal species of concern,
FPT = Federally Proposed (Threatened), C = Federal Candidate, CSC = CDFG species of special concern, FP = CDFG fully protected, ST = State listed Threatened, SCE = State Candidate (Endangered) SE = State listed Endangered.

Many common species of plants and animals were observed during surveys in the vicinity of the proposed power plant within the Duke property (Duke Energy 1999c). Sixty-five per cent of the plant species were non-native; indicating in general that disturbance and land modification at the site over time has not favored natives. Examples of common animals include Pacific chorus frog (*Pseudacris regilla*), Pacific slender salamander (*Batrachoseps* pacificus), American kestrel (*Falco sparverius*), European starling (*Sturnus vulgaris*), mourning dove (*Zenaida macroura*), Brewer's blackbird (*Euphagus cyanonecephalus*), house finch

(*Carpodacus mexicanus*), California ground squirrel (*Spermophilus beecheyi*), and mule deer (*Ococoileus hemionus*).

In contrast to the many common species observed during the surveys, tricolored blackbirds (*Agelaius tricolor*) were seen foraging over a wetland within an oil spill retention area on the extreme east side of the Duke property near oil tank 14 (Duke Energy 1999c). This is a species of special concern for the California Department of Fish and Game and is the only sensitive species listed in Table 1 observed during the terrestrial surveys of the site.

Marine and estuarine fauna inhabiting the waters and benthic habitats in close proximity to the proposed project, including Elkhorn Slough intertidal and Moss Landing Harbor and offshore subtidal has been described in considerable detail based on investigations done in July 1974 to June 1976 (Nybakken et al. 1977), and recently by Tenera Environmental Services for Duke Energy Moss Landing LLC (Duke 2000a). Additional studies done to meet previous NPDES permitting requirements or Central Coast Regional Water Quality Control Board information needs associated with the Moss Landing Power Plant identify a myriad of species that have potentially been subject to impacts associated with the once-through cooling water system that has operated at various levels since the first unit was brought on line in 1950 (PG&E 1973, 1978 and 1983).

Major modifications to the Salinas River mouth and its geophysical association with Elkhorn Slough in the early 20th century and the excavation of Moss Landing Harbor during the mid-20th century have significantly changed the hydrodynamics of the slough (Lindquist 1998). Further modifications in the watershed in the mid 1980's that were done to increase marsh acreage magnified the tidal currents and rates of channel scour and erosion in the slough. Lindquist (1998) has found that reduced trophic diversity has resulted from the increased erosion and that a shift in the diet of fish using the slough as a nursery is evident. There is concern about whether Elkhorn Slough and its associated tidal creeks will continue to function as a viable fish nursery. Due to this concern and the exceptional value of the Elkhorn Slough ecosystem, much attention has been focused on the slough and associated plans for improvements.

Elkhorn Slough is one of the few relatively large coastal wetlands remaining in California. The main channel of the slough, which winds inland seven miles, is flanked by a broad salt marsh second in size only to that which occurs around San Francisco Bay. Elkhorn Slough is a biological gem located on the edge of Monterey Bay. It supports one of California's most threatened ecosystems, the coastal estuary. Although not pristine, Elkhorn Slough is a biologically rich wetland system, providing habitat for hundreds of resident and migratory bird species. A great diversity of rare plants and animals are found in its natural communities. Elkhorn Slough serves as an important nursery and source of nutrients for Monterey Bay. Over 400 species of invertebrates, 80 species of fish, and 260 species of birds have been identified from Elkhorn Slough. Researchers and students from the Moss Landing Marine Laboratories, the University of California Santa Cruz, Stanford University, California State University Monterey Bay and others have conducted studies on biology, ecology, geology, hydrology, restoration and landscape change.

The State of California has designated Elkhorn Slough an ecological preserve, and the National Oceanic and Atmospheric Administration has included its tidal waters as part of the Monterey Bay National Marine Sanctuary, and established a National Estuarine Research Reserve on its shores (Elkhorn Slough National Estuarine Research Reserve). The California Department of Fish and Game, the Elkhorn Slough Foundation and The Nature Conservancy own land in the slough and the Elkhorn Slough Foundation in cooperation with the California Department of Fish and Game manage the property. They have extensive plans for the conservation of additional property on the slough and throughout the watershed and for improving and enhancing the quality and productivity of the slough ecosystem. The Elkhorn Slough is considered a significant biological resource.

Marine mammals such as harbor seals (*Phoca vitulina richardsi*), southern sea otters (*Enhydra lutris nereis*), and sea lions (*Zalophus californianus*) inhabit Elkhorn Slough, Moss Landing Harbor and nearby off shore waters (Duke Energy 1999i). Counts of harbor seals at a monitoring station 1.6 km east of the Highway 1 Bridge have steadily increased from 17 to 297 animals during the period from 1982 to 1995 (Fluharty 1999). Sea otter counts by the California Department of Fish and Game and the U. S. Fish and Wildlife Service in the Monterey Bay between the Capitola Pier and Seaside (north and south of Moss Landing respectively) indicate that observed numbers of sea otters here have shown a increasing trend from the mid-1980's to the mid-1990's. Declines in the sea otter population in the southern part of its range do not appear to be occurring in Capitola/Seaside area (Duke Energy 1999i). Southern sea otters are common inhabitants of Elkhorn Slough. Relative counts of sea lions in the Elkhorn Slough area have not been reviewed for this assessment.

Brown pelicans (*Pelecanus occidentalis californicus*) generally forage in offshore waters near Moss Landing and other parts of Monterey Bay but are also seen in Elkhorn Slough. A noteworthy incidental observation has been reported (Williams 1999) in which a pelican used a transmission line connected to the Moss Landing Power Plant as a perch to dive from while trying to catch fish. Western snowy plovers (*Charadrius alexandrinus nivosus)* are known to inhabit the Elkhorn Slough. The U.S. Fish and Wildlife Service has designated the Elkhorn Slough as critical habitat because of its nesting value for the western snowy plover (USFWS 1999).

PROJECT SPECIFIC IMPACTS

The site and laydown areas are in a highly disturbed industrialized area that, over time, has experienced the unassisted establishment of very small seasonal wetlands in the oil spill containment areas of some of the retired oil tanks (Duke Energy 1999c). Surveys were conducted for the Santa Cruz long-toed salamander (SCLTS) in one of the small seasonal wetlands that may be affected by the project, but no salamanders or larvae were observed. The field investigator, Mr. Bryan Mori, suggested that the habitat was marginal and relatively disconnected from known subpopulations nearby which could act as dispersal sites from which breeding salamanders could emigrate to the location examined at the proposed

project (Duke Energy 1999c). Although no salamanders were found, if actually present, he expected there would only be a few.

Soil erosion related to construction activities can impact aquatic biological resources if allowed to enter local waterways, but applying appropriate site-specific measures can mitigate potential erosion. A draft erosion control plan should be submitted to the Energy Commission for review and approval. Through implementation of an approved erosion control plan, that will be required in the Soil and Water Conditions of Certification for this project, it is anticipated that aquatic biological resources will not be significantly impacted by erosion impacts from the power plant site.

Low numbers of bird collisions with the project's new 145-foot tall turbine/HRSG stacks are estimated, because bird collision fatalities are more associated with relatively tall stacks ranging from 500 to 650 feet high (Goodwin 1975; Maehr et al. 1983; Weir 1974; Zimmerman 1975). The new stacks will be located close to the 500-foot stacks for Units 6&7 and the 180-foot tall boiler building suggesting that these existing tall and large structures would shield the smaller stacks to some degree. The new stacks are not expected to cause significant bird collisions.

In order to assess the affects of impingement, entrainment, and thermal discharge, and to determine best technology available (BTA) for the NPDES permit, the California Central Coast Regional Water Quality Control Board relies on the results of 316(a) and 316(b) studies. This information is also crucial for Energy Commission staff to estimate impacts to the marine and harbor/estuarine ecosystems. The data acquired by the 316(b) studies are critical in estimating impacts on species' populations and ecosystems that result from entrainment and impingement of organisms due to the once-through cooling water system. California Energy Commission staff and staff of the Central Coast Regional Water Quality Control Board work together and coordinate their review and impact determination and subsequent mitigation/compensation requirements. Generally a year of data is required to cover seasonal periods when distribution and abundance of marine and estuarine life forms can be significantly different. Important differences can occur between years also. In order to estimate the proportions of organisms that are being entrained in the power plant cooling system relative to the population from which they come; source water sampling must be done. This is usually done on a volumetric basis of organisms per cubic meter. Source water sampling was done only (a small number of nighttime samples was attempted but stopped due to safety reasons) during the day while the highest number of organisms have been entrained at night. To provide data for a valid comparison of the proportion of organisms entrained in relation to those in the source water, nighttime sampling is important. Therefore, due to the uncertainty of the 316(b) fractional loss analysis, the following impact estimates should be considered a minimum. Two impact assessment methods are utilized below for entrainment losses. Both of these methods are very similar in concept and result in somewhat similar levels of mitigation/compensation. Staff of the agencies with permitting authority for this project are in agreement on this impact assessment approach as a reasonable way to determine mitigation/compensation levels. These agencies are the California Central Coast Regional Water Quality Control Board, California Department of Fish and Game, California Coastal Commission, and the California Energy Commission.

Estimates of proportional entrainment (fractional losses) of fish larvae to the source water of the harbor and slough, and the percent volume of cooling water entrained (contains biological resources that will be entrained) relative to the volume of source water in the harbor and slough are considered as a percentage of the slough's productivity and used to estimate equivalent habitat productivity losses. Fractional losses from the Elkhorn Slough are equivalent to a loss of habitat (wetland habitat for instance). Determining reasonable and satisfactory mitigation amounts and costs for restoring wetland acres and other Elkhorn Slough enhancements is difficult, since there are a wide range of costs associated with these types of activities (see Table 5). Additionally, BTA alternatives will be considered, and balanced with environmental benefits and costs.

Impacts associated with the thermal discharge, impingement, and entrainment losses of marine and estuarine species due to the once-through cooling water system are considered to be significant. The new combined cycle power plant will suck through its cooling water intake system a minimum of six percent (6 percent to 28 percent with units 6&7 also operating) (see Table 2) of the water volume of the harbor and Elkhorn Slough on a daily, annual, and life-of-the-facility basis. Essentially all living material in this water volume will be lost. Additional losses of marine and estuarine biological resources will result from impingement and from thermal impacts due to the cooling water discharge influence. Impingement and thermal discharge losses are difficult to quantify, but will contribute to overall ecosystem losses. Impingement will add to the harbor and Elkhorn Slough ecosystem losses, and the thermal discharge will result in some effects to the near-shore, soft benthos, sandy beach, and jetty (rocky substrate) biological resources. The thermal discharge by itself is not considered to be a significant impact at this time. The true extent of the thermal effects of the new combined cycle power plant is unknown since the extent of the resulting thermal plume has not been determined adequately, and won't be until the new power plant operation begins. Monitoring of these thermally affected systems in order to determine effects with any level of confidence is considered difficult due to the many confounding factors. Therefore, the unquantified impacts that will result due to the thermal discharge, will be considered along with other cumulative effects and mitigated/compensated by an additional increment of Elkhorn Slough wetland replacement acres, or associated enhancements.

Table 2 below shows the replacement wetland acres required to replace harbor and Elkhorn Slough ecosystem (biological resources values) losses. There are approximately 4000 wetted acres of surface water in Elkhorn slough. The percent of water volume and associated productivity losses are considered to require an acre-for-acre of wetlands restored to replace the productivity lost due to the cooling water system. In this case six percent of Elkhorn Slough surface volume (4000 acres) equals 240 acres of wetland needed to be restored in order to replace the lost productivity.

BIOLOGICAL RESOURCES Table 2
Daily Cooling Water Intake Volume as a Percent of Harbor and Elkhorn Slough Water Volume and Equivalent Replacement Wetland Acres.

	% of Volume[1]	Equivalent Wetland Ac.[2]
Combined Cycle Units 1&2	**6%**	**240 Acres**
Units 1&2 and Units 6&7	**28%**	**1135 Acres**

1. Volume of daily maximum cooling water intake and the volume of the Harbor and Elkhorn Slough were used.
2. Elkhorn Slough has approximately 4000 surface (wetted area) acres. It is estimated that it will take an acre-for-acre replacement of new wetland to mitigate/compensate for the biological productivity lost due to the intake water volume as a percentage of the wetted area of the Elkhorn Slough. An example is 6% volume multiplied by 4000 acres of surface water area in the Elkhorn Slough equals 240 acres of wetlands that need to be replaced/restored to make up for the loss of biological resources.

Entrainment due to the Moss Landing Power Plant project (new combined cycle units 1&2) cooling water system will carry essentially all pelagic organisms in the volume of water entrained through the power plant to their death. This is a similar way of assessing losses to the harbor and Elkhorn Slough ecosystem as discussed above. In the case of the new combined cycle power plant this results in the loss of an average of 13 percent (see Table 3) of the fish larvae (other pelagic eggs and larvae are also lost, such as crabs and clams) in the Harbor and Elkhorn Slough. If all units (units 1&2 and 6&7) are operating the percentage would be several times greater. These pelagic organisms are important living material that provide food (primary productivity) for many creatures in the harbor and slough ecosystems. The loss of this amount of productivity is significant. The Elkhorn Slough covers about 4000 acres of wetted surface, and the loss of 13 percent of the fish larvae will require an acre-for-acre replacement of wetland in order to replace the lost productivity of the harbor and Elkhorn Slough ecosystem. In this case 13 percent of the 4000 acres of wetted surface equals 520 acres of needed wetland acres restored. Table 3 below illustrates these figures.

BIOLOGICAL RESOURCES Table 3
Percentage of Fish Larvae Lost Due to the Cooling Water Intake System and Replacement Wetland Acres

SOURCE WATER		
	Large Volume	Small Volume
Unidentified Gobies	3%	11%
Bay Goby	4%	21%
Blackeye Goby	4%	7%
Longjaw Mudsucker	5%	9%
Combtooth Blenny	11%	18%
Pacific Herring	5%	13%
White Croaker	?	?
Pacific Staghorn Sculpin	4%	12%
Average % loss (small volume) (From 316 (b) report)		**13%**
13% of 4000 surface acres in Elkhorn Slough equals[1]		**520 wetland replacement acres**

1. It is estimated that an acre-for-acre replacement/restoration percentage of wetland is needed to make up for each average percent of fish larvae (and other biological resources) removed from Elkhorn Slough ecosystem. This loss in productivity can be replaced by improving the quality and productivity of the Elkhorn Slough through wetland restoration type actions. Thirteen percent of 4000 acres equals 520 acres of replacement wetland acres.

The above two assessment methods are similar and rely on the same concept of the operation of the once through cooling system resulting in loss of productivity to the harbor and Elkhorn Slough ecosystems and that in order to replace those losses, the productivity of the Elkhorn Slough ecosystem needs to be improved, thereby enhancing the ability of Elkhorn Slough to replace the primary productivity lost due to the combined cycle power plant operation. This requires restoration of wetland acres and other enhancement of the Elkhorn Slough ecosystem. As mentioned above, this approach to mitigating/compensating for the biological resources losses has been agreed to as reasonable and acceptable methods for determining mitigation/compensation, by staff of the state agencies involved in permitting the Moss Landing Power Plant project. These agencies are the California Central Coast Regional Water Quality Control Board, California Department of Fish and Game, California Coastal Commission, and the California Energy Commission.

A reasonable wetland replacement amount taken from the range of acres and costs displayed in Tables 2-6. will be considered along with BTA options that would eliminate or reduce biological resource impacts. A mitigation/compensation amount will be derived at a publically noticed workshop by the agencies and the project owner, prior to the Evidentiary Hearing. Those determinations will be presented at the Evidentiary Hearing.

Table 4 displays the range of losses and the restored wetland acres needed. Table 5 displays a range of wetland restoration costs and cost estimates. Table 6 displays the range of wetland restoration costs to be applied to Moss Landing Power Plant project. Table 7 lists other BTA options that would significantly reduce biological resources losses due to impingement, entrainment, and thermal discharge. In some cases these BTA options eliminate the cooling water system impacts (dry cooling) and in other cases the cooling water system impacts are significantly reduced (cooling towers) and would be balanced with reduced mitigation/compensation requirements. The feasibility of the various BTAs are weighed against the effectiveness to reduce cooling water system adverse impacts to biological resources and the costs of wetlands restoration and other Elkhorn Slough enhancements. A specific mitigation/compensation amount for Elkhorn Slough enhancement (wetland acres to be restored and other enhancements) is yet to be determined.

BIOLOGICAL RESOURCES Table 4
Range of replacement Wetland Acres

	% Loss	Restored Wetland Acres Needed
% volume of water (C C units)	6%	**240** Acres
% volume of water (All units)	28%	**1135** Acres
% fish larvae lost (small volume)	13%	**520** Acres

BIOLOGICAL RESOURCES Table 5
Range of Wetland Restoration Costs (excludes endowment costs)

Port of Santa Cruz[1]		$100,000 /acre
San Onofre[2]	Horseworld property	$260,000 /acre
	Airfield property	$152,750 /acre
Southern California Wetlands Restoration (Range)[3]		$60,000 /acre- $180,000 /acre
Estimate for Elkhorn Slough (with qualifications)[4]		$12,000 /acre- $25,000 /acre

Range of costs per acre **$12,000---$260,000 /acre**

1. Personal communication with Mr. Tim Duff of the California Coastal Conservancy, regarding wetland restoration at the Port of Santa Cruz.
2. California Coastal Commission staff recommendation: Permit Amendment and Condition Compliance for San Onofre Nuclear Generating Station for mitigation of adverse impacts to the marine environment. October, 1996.
3. Personal communication with Dr. Peter Raimondi. Dr. Raimondi provides these estimates for wetland restoration work for which he has personal knowledge.
4. Personal communication with Dr. Peter Raimondi. Dr. Raimondi estimates that with minimum earth movement and disposal costs, these would be reasonable estimates.

BIOLOGICAL RESOURCES Table 6
Range of Wetland Restoration Costs for Moss Landing Power Plant Project[1]

Method	Acres	$12,000/Ac	$260,000/Ac
Water Volume (small)	240	$2.88M	$62.0 M
Water Volume (large)	1135	$13.6M	$265.1M
% Fish Larvae Loss	520	$6.2M	$135.2M
Range	**240-1135 Ac**	**$2.88M**	**$265.1M**

Range of acreage 240-1135 Acres

Range of Wetland Restoration costs $2.88M---$265.1M

1. Does not include endowment for short-term and long-term Maintenance, management, monitoring, administration, operation, and etc.

BIOLOGICAL RESOURCES Table 7
Best Technology Available: Intake and Discharge (CC only)

Cost over project life	
Cooling Towers with Recirculating Cooling Water[1]	$60M
Cooling Towers---Natural Draft	$51M
Air Cooled Condenser (Drycooling)[2]	$114M
Offshore Intake	?????
Seasonal Operation Curtailment	$59M
Gunderboom	?????
Thermal Dischsrge---Multiport Diffuser (CC)	$29M
---Multiport Diffuser (Units 6&7)	$20M

1. The last four near shore power plants that applied to the California Energy Commission for Certification (Delta, Pittsburgh, Contra Costa, and San Francisco Energy) proposed cooling towers.
2. Three recent power plant projects have proposed dry cooling (Otay Mesa, Crockett, and Sutter).

CUMULATIVE IMPACTS

Cumulative impacts refer to two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts.

Considering the level of industrial development within the existing power plant complex at Moss Landing, Energy Commission staff does not regard the potential incremental terrestrial biological resources impacts of the proposed project as significant. The recommended mitigation measures will reduce impacts to acceptable levels.

With respect to the harbor and estuarine environment, Energy Commission staff does find the cumulative impacts to be significant. The cumulative estuarine and marine losses due to the operation of the new units, 1&2, and the existing units, 6&7, will cause significant chronic loss of biological resources productivity impacts to the harbor and Elkhorn Slough ecosystems. Although the power plant has been operating since 1950 and no substantive mitigation/compensation for biological resources losses have been offered or required, staff considers only the future chronic losses of productivity in this assessment. Mitigation/compensation is necessary in order to reduce cumulative impacts below a significant level. The resulting mitigation/compensation measures will consider estimates of impingement

losses and adult equivalent losses for entrained species as well as any primary productivity losses and will be intended to support ongoing and planned management practices being implemented in the Elkhorn Slough National Estuarine Research Reserve. The mitigation/compensation for cumulative impacts will be in addition to project specific impacts discussed above. A specific mitigation/compensation amount for cumulative impacts will be determined for Elkhorn Slough enhancement (wetland acres to be restored and other enhancements). This mitigation/compensation will be added to the project specific impacts mitigation/compensation for a total mitigation/compensation package, and then presented at the Evidentiary Hearing.

FACILITY CLOSURE

For the eventual permanent closure of the power plant project, the project owner must utilize methods and measures that protect the environment and public health and safety. To achieve this, the project owner will develop an "on-site contingency plan" for facility closure as required in General Conditions of Certification. Detailed measures specifically addressing biological resources, such as structure removal and habitat restoration, should be done according to Biological Resources Condition of Certification **BIO-6**. The plan should also include the anticipated measures that would be implemented in case of a temporary, but prolonged closure.

MITIGATION

Small wetlands that have become established in oil spill retention areas around oil tanks scheduled for removal due to project construction should be mitigated for in a manner specified by the California Department of Fish and Game.
To mitigate for potential impacts to Santa Cruz long-toed salamanders (SCLTS), that is, if the California Department of Fish and Game and the U. S. Fish and Wildlife Service are agreeable, it is suggested that the following be done:
A salamander exclusion fence or fence addition shall be constructed at the project perimeter (perimeter fence) in order to exclude any salamanders (SCLTS) that may venture onto the site. The fence should encircle the entire project construction site and construction support areas to exclude any SCLTS from moving into the project site. The exclusion fence should be installed before October 15 of the year construction begins and be maintained for the life of the project to reduce the likelihood of a loss of a SCLTS.

During the initial grading process, biological monitors should be present to search through the spoils to recover any remaining salamanders. All SCLTSs collected should be photographed, sexed and measured, then relocated to a suitable off-site location.

To ensure the likelihood of successful completion of required mitigation, the project owner should designate a qualified biologist to advise the project owner or its project manager on the implementation of the Conditions of Certification, for this project and to supervise or conduct mitigation, monitoring, and other biology compliance efforts.

To promote project personnel's general understanding of environmental concerns associated with the project and enhance the likelihood of their compliance with conditions of certification, the owner should institute an employee environmental awareness program in which each of its own employees, as well as employees of contractors and subcontractors who work on the project site during construction and operation are informed about biological resource sensitivities associated with the project.

To make sure required biological resources mitigation measures are successfully completed during construction and operation of the project, a Biological Resources Mitigation Implementation and Monitoring Plan should be developed by the project owner and reviewed and approved by the Energy Commission Compliance Project Manager.

In order to prevent animals from becoming trapped in any trenches excavated while installing natural gas pipelines or other underground project features, the project owner, at the end of the workday, should have any open portions of the trench covered if left unattended.

Best technology available for reducing impacts associated with the once-through cooling water system should be considered for this project. For marine and estuarine biological resource losses that exceed the capabilities of best technology available, reasonable and satisfactory compensation needs to be provided. This will include wetland restoration in the Elkhorn Slough and other improvements and enhancements to increase the productivity of the slough ecosystem. This compensation will include an endowment to accomplish short-term and long-term administration, management, maintenance, monitoring, research, and annual operation expenses in perpetuity.

A monitoring program to determine the actual impingement and entrainment losses of the new project and the cumulative operations of the power plant (new units 1&2 and existing units 6&7), and to characterize the extent of the thermal plume during operation of the new units 1&2 and the cumulative operation (including units 1&2 and 6&7) of the facility (thermal plume condition is in Water Resources Section). These monitoring efforts will be designed prior to the start of the new units 1&2 operation and be conducted as the new units come on line. The study objectives, protocols, and length of the monitoring for the impingement, entrainment, and thermal plume, will be established by a technical advisory group made up of representatives of the California Central Coast Regional Water Quality Control Board, California Department of Fish and Game, California Coastal Commission, the California Energy Commission, and the project owner.

COMPLIANCE WITH LAWS, ORDINANCES, REGULATIONS AND STANDARDS

The U.S. Army Corps of Engineers has issued a "Letter of Permission" (Dated June 21, 1999) authorizing Duke Energy Power Services to make modifications to the Units 1-5 cooling water intake structure so it can be used for the new project.

The U.S. Army Corps of Engineers has issued a determination (dated September 23, 1999) that the small wetlands in the some of the oil spill containment areas that will be affected by project construction are not waters of the U.S. As such, no permit is required under Section 404 of the Clean Water Act (33 U.S.C. 1344). The Central Coast Regional Water Quality Control Board has not issued an NPDES permit for the proposed project. The respective objectives of the 316(a) and 316(b) studies are to determine if Thermal Plan standards for new facilities can be met and that cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts. The California Energy Commission staff are coordinating closely with Central Coast Regional Water Quality Control Board staff on NPDES permit requirements. It is anticipated that the NPDES permit and the California Energy Commissions certificate will include the same requirements where jurisdictions overlap.

The suitability of thermal plume data assessed in the 316(a) study is supposed to allow for a determination of whether or not the proposed discharge is able to meet required standards which prohibit a discharge that exceeds the receiving water ambient temperature by more that 20°F for a specified period or 4°F above natural water temperatures at the shoreline, the surface of any ocean substrate, or the ocean surface beyond 1,000 feet from the discharge for a specified period. The project owner has determined the 20° F standard cannot be met and has requested an exception to this standard and requested a variance. The Central Coast Regional Water Quality Control Board regulatory process will make this determination. The 4° F standard may not be met either (see Water Resources Section) although the project owner has not yet requested and exception to this standard. Not meeting these standards may increase the biological resources impacts of the project. Staff is working with the Central Coast Regional Water Quality Control Board staff to assess and mitigate these possible additional impacts.

Likewise, for the 316(b) studies, the California Energy Commission staff are working with the California Central Coast Regional Water Quality Control Board staff to assess the impacts due to impingement and entrainment on species' populations and harbor and Elkhorn Slough ecosystems, and weigh those impacts against BTA alternatives that would eliminate or reduce the impacts. The once-through cooling water system impacts are considered significant, but with reasonable and satisfactory mitigation measures or BTA alternative(s) it is anticipated impacts will be mitigated to an acceptable level.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Impacts associated with the project site and laydown area are likely to be insignificant, but where the potential for impacts to listed species exists, they can be mitigated to acceptable levels. However, the impacts from the once-through cooling water system (impingement, entrainment, and thermal) are considered to be project specifically and cumulatively significant. It is anticipated that with sufficient

mitigation/compensation or the use of BTA alternatives those impacts can be mitigated to an acceptable level.

RECOMMENDATIONS

Until the mitigation/compensation package for the once-through cooling system impacts is determined and agreed to by the staff of the agencies and the project applicant (California Central Coast Regional Water Quality Control Board, California Department of Fish and Game, California Coastal Commission, the California Energy Commission, and Duke Energy Moss Landing LLC), the proposed project should not be approved. When the mitigation/compensation amount is determined to the satisfaction of both the California Energy Commission staff and the Central Coast Regional Water Quality Board staff for their NPDES permit, these mitigation/compensation measures should be incorporated into Energy Commission staff's proposed Conditions of Certification. It is anticipated this agreement will be reached by the Evidentiary Hearing.

CONDITIONS OF CERTIFICATION

BIO-1 Any ground disturbing activity (at the site and/or ancillary facilities) other than allowed geotechnical work shall not begin until an Energy Commission Compliance Project Manager (CPM) approved designated biologist is available to be on site.

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,
2) three years of experience in field biology and current certification of a nationally recognized biological society, such as the Ecological Society of America or The Wildlife Society,
3) one year of field experience with biological 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.

No disturbance will be allowed in any designated sensitive area(s) until the CPM approves a designated biologist and that designated biologist is on-site. At least 30 days prior to the start of surface disturbing activities at the project site and/or at

ancillary facilities, 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 project owner must submit the information on a replacement designated biologist to the CPM for approval 10 days prior to the actual replacement.

For any necessary corrective action taken by the project owner, a determination of success or failure of such action will be made by the CPM 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-2 The CPM approved designated biologist shall perform the following duties:

1) advise the project owner's supervising construction or operations engineer on the implementation of the biological resource conditions of certification,

2) 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

3) 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 along with the Monthly Compliance Reports to the CPM.

BIO-3 The project owner's supervising construction and operating engineer shall act on the advice 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 ensure that potential significant biological resource impacts are avoided.

The designated biologist shall:

1) advise 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 two 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 five 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 Worker Environmental Awareness 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:

a) shall be developed by the designated biologist and consist of an on-site or classroom presentation in which supporting written material is made available to all participants;

b) must discuss the locations and types of sensitive biological resources on the project site and adjacent areas;

c) must present the reasons for protecting these resources;

d) must present the meaning of various temporary and permanent habitat protection measures;

e) must identify who to contact if there are further comments and questions about the material discussed in the program; and,

f) shall inform workers of the potential biological resource impact risk associated with all construction and operational activities as is appropriate and emphasize protection of sensitive resources such as the Santa Cruz long-toed salamander.

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. The person administering the Worker Environmental Awareness Program shall also sign each statement.

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. The project owner shall keep signed statements for active operational personnel on file for the duration of their employment and for six months after their termination.

Verification: At least 30 days prior to the start of surface disturbing activities at the project site and/or at ancillary facilities, 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 submit to the CPM for review and approval a copy of the Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP) for this project.

Protocol: The BRMIMP shall:

- identify all sensitive biological resources to be impacted and avoided by project construction and operation;
- identify all mitigation, monitoring and compliance conditions included in the Commission's Final Decision;
- identify all conditions agreed to in any CDFG Streambed Alteration Agreement;
- indicate the placement of transmission line towers so that wetland resources will be avoided, or if not avoided, constructed in such a way that impacts will be minimized to the extent practicable.
- design new above-ground transmission lines and other facilities such as substations to reduce the risk of electrocution for large birds;
- clearly delineate construction area boundaries with stakes, flagging, and/or rope to minimize inadvertent degradation or loss of wetland habitat during construction activities associated with pipelines and transmission lines;
- show all locations requiring temporary protection/signs during construction on a map of suitable scale;
- indicate duration for each type of monitoring established for mitigation actions and include a description of the monitoring methodologies and frequency;
- describe performance standards to be used to help decide if/when proposed mitigation is or is not successful;
- identify all remedial measures to be implemented if performance standards are not met;
- reduce potential bird collisions with boiler stacks, cooling towers, turbine stacks and other structures by reducing exterior lighting on all structures to the minimum except for those required for aviation warning, while all other required exterior lighting on structures will be shielded to direct light downward;
- reduce soil erosion during construction and operation by applying measures identified in the proposed Soil Resources and Water

Resources conditions of certification of the Energy Commission Decision for the project;

- include, with concurrence of the California Department of Fish and Game and the U. S. Fish and Wildlife Service mitigation for potential impacts to Santa Cruz long-toed salamanders (SCLTS), comprised of the following actions:

  1) A salamander exclusion fence or fence addition shall be constructed at the project perimeter (perimeter fence) in order to exclude any salamanders (SCLTS) that may venture onto the site. The fence should encircle the entire project construction site and construction support areas to exclude any SCLTS from moving into the project site. The exclusion fence should be installed before October 15 of the year construction begins and be maintained for the life of the project to reduce the likelihood of a loss of a SCLTS.
  2) During the initial grading process, biological monitors should be present to search through the spoils to recover any remaining salamanders. All SCLTSs collected should be photographed, sexed and measured, then relocated to a suitable off-site location.

- reduce the potential for animals falling into trenches or other excavated sites by covering them at the end of the workday if left unattended.

Verification: At least 60 days prior to the start of surface disturbing activities at the project site and/or at ancillary facilities, 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. After the plan is approved, the project owner shall notify the CPM five working days before implementing any agreed to 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 Resources 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-6 The project owner shall incorporate into the facility closure plan a Biological Resources Element that includes measures to address current local biological resource issues. The biological resource facility closure measures shall also be incorporated into the Moss Landing Power Plant Project BRMIMP.

Protocol: For permanent closure, biological resource-related measures shall include:

1) Removal of all power plant site facilities;
2) Measures to restore wildlife habitat to promote the re-establishment of native plant and wildlife species; and

3) Updating the plan to address current biological resources issues.

Protocol: For temporary, but prolonged closure, biological resource-related measures shall include:

1) Notifying the CPM within two weeks of the project owner's decision to initiate a temporary, but prolonged closure;
2) Turning off the once-through cooling water system pumps; and
3) Updating the plan to address current biological resources issues.

Verification: At least twelve months (or a mutually agreed upon time) prior to the commencement of permanent closure activities a Biological Resources Element will be incorporated into the Facility Closure Plan and the BRMIMP and submitted to the CPM for review and comment. The CPM will be notified within two weeks of the project owner's decision for a temporary, but prolonged closure and provide an updated plan of action.

BIO-7 Following the certification of the Moss Landing Power Plant project, the project owner will provide the funds (amount TBD) for mitigation/compensation for Elkhorn Slough National Estuarine Research Reserve enhancement to the Elkhorn Slough Foundation. The funds shall include those monies for wetlands restoration and other improvements and include an endowment that will cover short- and long-term administration, maintenance, management, monitoring, research, and operation costs in perpetuity. It is anticipated these funds will represent satisfactory mitigation/compensation to satisfy the other agencies permits listed below.

A Memorandum of Understanding (MOU) will be created between the agencies and the Elkhorn Slough Foundation clearly identifying acceptable uses of the funds, including an accounting of how the funds are spent. The details of the MOU will be worked out by representatives of the California Central Coast Regional Water Quality Control Board, California Department of Fish and Game, California Coastal Commission, the California Energy Commission, the project owner (if they desire), and the Elkhorn Slough Foundation within 120 days of the project certification.

Until the MOU is signed, the Elkhorn Slough Foundation will not spend any of the funds. Once the MOU is signed. The funds can be used for wetlands restoration, erosion control and property cleanup, and other actions that improve the quality and enhance the productivity of the Elkhorn Slough. The funds can be used on Foundation property, California Department of Fish and Game property and properties that may be purchased or conserved as discussed in the Elkhorn Slough Conservation Plan (1999). These details will be worked out to the satisfaction of all agencies to the extent possible and included in the BRMIMP when available.

Verification: The project owner will provide written verification to the CEC CPM that the mitigation/compensation funds have been paid within 15 days of certification. The CPM will review the MOU when it is in draft in order to ensure the wording is clear, meets the terms of the presiding member decision, and is

enforceable. The CPM will ensure the MOU is completed within 120 days of certification. The CPM will ensure the Elkhorn Slough Foundation complies with the terms of the MOU.

If the project owner has not complied with any aspect of this condition, the CPM will notify the project owner of making this determination.
For any necessary corrective action taken by the project owner, a determination of success or failure of such action will be made by the CPM 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-8 The project owner will conduct one year of monitoring to determine the actual impingement and entrainment looses resulting from the operation of the cooling water system for the new units 1&2 and the existing units 6&7 and the project owner will sample the source water to determine fractional losses relative to their abundance in the source water. The study objectives, sample design, metrics, and methods (protocols) will be developed by a technical advisory committee made up of representatives of the agencies (California Central Coast Regional Water Quality Control Board, California Department of Fish and Game, California Coastal Commission, California Energy Commission)(hereafter called the "agencies"), and the project owner. The study protocols will be developed and put into a study plan within twelve months of the certification. The project owner will commence the monitoring within one month of the start of operation of the new power plant. The methods, analysis, results, and conclusions of the monitoring study will be documented in a scientific style report and submitted to the CPM for review and approval. The other agencies shall be included in the review of the draft report as they desire. A final report shall be completed within nine months of the completion of the field sampling.

Verification: The project owner will submit a draft study plan (based on technical advisory committee direction) to the CEC CPM within nine months of certification for review and approval. Within twelve months of certification, an approved final study plan will be provided to the CPM. This study plan will be prepared by the project owner as guided by the technical advisory committee established by CEC biology staff and CEC CPM in consultation with the agencies. The CPM will ensure that the monitoring studies are conducted according to the study plan.
The project owner will submit quarterly reports during the study sampling period, that are due two months following the completion date of that quarter of field sampling. The project owner will verify in writing that they are following the approved study plan protocols on a quarterly basis.

The project owner will submit a draft report that discusses the results of the impingement, entrainment and source water sampling studies, that is a scientific style report including methods, analysis, results, and conclusions within six months of the end of field sampling, and they will submit a final report within nine months from the end of field sampling. The CPM will ensure that a study results draft report is submitted within six months of the completion of the field sampling, and that a

final report is completed within nine months from the completion of the field sampling.

Within 30 days following certification the CPM shall ensure that a technical advisory committee has been established and is progressing toward the creation of the study plan. Within 30 days following the start of operation of new units 1&2 of the Moss Landing Power Plant, the impingement, entrainment, and source water sampling studies will commence.

If the project owner has not complied with any aspect of this condition, the CPM will notify the project owner.

For any necessary corrective action taken by the project owner, a determination of success or failure of such action will be made by the CPM 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.

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SOIL & WATER RESOURCES

Testimony of Joe O'Hagan, Dominique Brocard and Jim Henneforth

INTRODUCTION

This section of staff's Final Staff Assessment (FSA) analyzes potential effects on soil and water resources by the Moss Landing Power Plant Project (MLPPP), specifically focusing on the potential for the project to induce erosion and sedimentation, adversely affect surface and groundwater supplies, and degrade ocean, inland surface and groundwater quality. This assessment also addresses the project's ability to comply with all applicable federal, state and local laws, ordinances, regulations and standards, identifies mitigation measures and recommends conditions of certification.

Flooding and drainage issues are addressed in the **Facility Design** section of this document. Biological issues associated with cooling water intake and discharge are addressed in the **Biological Resources** section and sediment and soil contamination is addressed in the **Waste Management** section of this FSA.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

FEDERAL

CLEAN WATER ACT

The Clean Water Act (33 USC § 1257 et seq.) requires states to set standards to protect water quality. Point source discharges to surface water are regulated by this act through requirements set forth in specific or general National Pollutant Discharge Elimination System (NPDES) permits. Stormwater discharges during construction and operation of a facility and incidental non-stormwater discharges associated with pipeline and transmission line construction also fall under this act, and are addressed through a general NPDES permit. In California, requirements of the Clean Water Act regarding regulation of point source discharges and stormwater discharges are delegated to and administered by the nine Regional Water Quality Control Boards (RWQCB). For this project, the California Regional Water Quality Control Board, Central Coast Region will issue a new NPDES permit for the project that will regulate point and stormwater discharges during operation. A separate general construction activity permit will still be required.

Section 316 [33 U.S.C. 1326] of the Clean Water Act specifically addresses thermal discharges and cooling water intake structures. Subsection (a) provides that "…the owner or operator of any such source… can demonstrate to the satisfaction of the …the State that any effluent limitation proposed for the control of the thermal component of any discharge from such source will require effluent limitations more stringent than necessary to assure the projection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made…the State may impose an effluent limitation

…that will assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on that body of water.

Subsection (b) requires that "…the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact".

The Environmental Protection Agency (EPA), under a court decree, will be proposing draft regulations regarding cooling water intake structures in July, 2000 for new sources of discharge. Specifically, the

Section 404 of the act regulates the discharge of dredged or fill material into waters of the United States, including rivers, streams and wetlands. Site specific or general (nationwide) permits for such discharges are issued by the Army Corp of Engineers (ACOE) and are certified by the RWQCBs under section 401 of the Act.

RIVERS AND HARBOR ACT OF 1899 (AS AMENDED):

Section 10 of the River and Harbors Act regulates work in navigable waters of the United States and is enforced by US Army Corps of Engineers. Repair, rehabilitation and or replacement of structures that had prior authorization or permits are addressed in Rivers and Harbors Act Section 10, 33 USC 40 et seq., 33 USC 1344, 1413; 33 CFR Part 330.3 and applies to modification of intake and outfall structures. Such work requires a Nationwide Permit no. 3 from the US Army Corps of Engineers. Rivers and Harbors Act Section 10, 33 USC 403; 33 CFR Part 322 provides for temporary structures, work and discharges associated with construction activities, access fills or dewatering to minimize impacts on aquatic resources. Such work requires a Nationwide Permit no. 33 issued by the Corp.

STATE

PORTER-COLOGNE WATER QUALITY CONTROL ACT

The Porter-Cologne Water Quality Control Act of 1967, Water Code section 13000 et seq., requires the State Water Resources Control Board (SWRCB) and the nine RWQCBs to adopt water quality criteria to protect state waters. These criteria include the identification of beneficial uses, narrative and numerical water quality standards and implementation procedures. These criteria for the proposed project are contained in the Central Coast Region Water Quality Control Plan (Basin Plan 1994), the California Ocean Plan (1997) and the Thermal Plan (1975).

STATE WATER RESOURCES CONTROL BOARD POLICIES

The SWRCB has also adopted a number of policies that provide guidelines for water quality protection. The principle policy of the State Board which addresses the specific siting of energy facilities is the "Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Power Plant Cooling" (adopted by the Board on June 19, 1976 by Resolution 75-58). While this policy specifically discourages the use of fresh inland waters for power plant cooling, it does give priority to the use of ocean water for this purpose.

The principal policy of the State Board which addresses enclosed bays and estuaries is the "Water Quality Control Policy for the Enclosed Bays and Estuaries of California" (adopted by the Board on May 16, 1974 by Resolution 74-43). This policy contains a number of prohibitions on waste discharges including chemical, biological and petroleum related waste.

STATE WATER RESOURCES CONTROL BOARD PLANS

a) CALIFORNIA THERMAL PLAN

In 1972, the State Water Resources Control Board adopted the "Water Quality Control Plan for the Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California", more commonly known as the Thermal Plan. The Thermal Plan, which was later amended in 1975, sets limits on the discharge of wastewaters with elevated temperatures into coastal, estuarine and interstate waters in order to meet water quality objectives. A major aim of the Thermal Plan is to protect marine resources in the ocean, enclosed bays and estuaries from the adverse impacts of thermal waste.

Thermal waste is defined as cooling water and industrial process water used to carry waste heat from such large point sources as power plants. Two categories of discharges exist: "existing" which are discharges in place or under construction prior to the plan's 1971 adoption and "new" which are discharges developed after the plan was adopted. The proposed project is considered a new discharge under the Thermal Plan by Energy Commission and RWQCB staff (Thomas 1999;2000). The project will be discharging to the existing outfall located in Monterey Bay. Under the Thermal Plan, Monterey Bay is considered to be coastal waters.

Therefore, specific water quality objectives in the Thermal Plan applicable are:

- Elevated temperature wastes shall be discharged to the open ocean away from the shoreline to achieve dispersion through the vertical water column.
- Elevated temperature wastes shall be discharged a sufficient distance from areas of special biological significance to assure the maintenance of natural temperature in these areas.
- The maximum temperature of thermal waste discharges shall not exceed the natural temperature of receiving water by more than 20^{o} F.
- The discharge of elevated temperature wastes shall not result in increases in the natural water temperature exceeding 4^{o} F at (a) the shoreline, (b) the surface of any ocean substrate, or (c) the ocean surface beyond 1,000 feet from the discharge system. The surface temperature limitation shall be maintained at least 50 percent of the duration of any complete tidal cycle.
- Additional limitations shall be imposed when necessary to assure protection of beneficial uses.

The Thermal Plan provides the authority for the RWQCB to grant exceptions to the specific water quality objectives in accordance with Section 316(a) of the Clean Water Act. Such exemptions also require the approval of the SWRCB.

b) CALIFORNIA OCEAN PLAN

In 1997, the SWRCB (Resolution 97-026) adopted the latest version of the Water Quality Control Plan for Ocean Waters of California (California Ocean Plan). The California Ocean Plan establishes beneficial uses and water quality objectives for the state's ocean waters outside of enclosed bays, estuaries and lagoons. The plan also sets forth effluent limitations, management practices and prohibitions. Every three years the plan is reviewed and, if necessary, updated.

CALIFORNIA COASTAL ACT OF 1976 (PUB. RESOURCES CODE §30000 ET SEQ.)

Chapter 3. Coastal Resources Planning and Management Policies. Article 4. Marine Environment. Section 30231. This section requires that the "…biological productivity and the quality of coastal waters, wetlands, estuaries and lakes shall be maintained by minimizing adverse effects of wastewater discharges and entrainment, controlling runoff, preventing depletion of groundwater…"

LOCAL

Monterey County-Regulations for Development in the North County Land Use Plan Area-Chapter 20.144: Section 20.144.070-

Water Resources Development Standards-These regulations set forth standards, including the development of erosion control and hydrologic reports for new development.

Water Service Policy from the Monterey County General Plan (1982), Chapter IV, Area Development: Policy 53.1.3 states that Monterey County shall not allow water-consuming development in areas that do not have proven adequate water supplies.

Monterey County Coastal Implementation Plan (Chapter 20.144) which requires, for expanded wastewater discharges, "tests of ocean waters at the proposed discharge site and surrounding waters to establish baseline or background levels of various water quality parameters no more than 1 year prior to submittal of the proposal."

Monterey County Grading Ordinance sets forth grading requirements.

ENVIRONMENTAL SETTING

TOPOGRAPHY AND SOILS

The 239-acre MLPPP site is located inland approximately one-quarter mile from the edge of the Pacific Ocean adjacent to Monterey Bay in Central California. Forming a barrier from the Central Valley, the Coast Ranges lie several miles to the east. MLPPP is located in the Salinas River Basin, a broad alluvial plain between the Salinas River and Elkhorn Slough. The project vicinity consists of industrial

development, recreational beaches, dunes, tidal wetlands, agricultural lands and commercial and recreational boat harbors. Located in DWR Hydrological Unit 18060011, the sites is bounded by the Moss Landing Harbor to the west, the Elkhorn Slough and the Elkhorn Estuarine Research Reserve to the north, agricultural lands to the east and the Moro Cojo Slough to the south (CPUC 1997). The power plant site is relatively flat with an elevation of approximately 30 feet above mean sea level. In 1986, the Federal Emergency Management Agency determined that the site was outside the 100-year flood plain (Duke Energy 1999a)

The site is underlain by a thick series of westerly dipping beds of sand, silt and clay. Major soil types in the project area include Elkhorn fine sandy loam, Oceano loamy sand, Santa Ynez fine sandy loam, and Dune land (DEML 1999a) While Dune land is highly susceptible to wind-induced erosion, the other soils are reported to have only a slight to moderate erosion hazard rating to wind-induced soil erosion (DEML 1999a). Some artificial fill has been deposited on the site consisting of clayey sands and native silty sands in the upper 3-12 feet below grade (PG&E 1996).

Land uses in the vicinity of MLPPP include agriculture (cattle grazing, cropland), open space/wildlife habitat (including Elkhorn Slough National Estuarine Research Reserve), and marine-related uses. The site is currently zoned heavy industrial by the Monterey County General Plan.

HYDROLOGY

Temperatures in the area are mild, ranging between 40-70 degrees ^{o}F, although summer maximums can reach 90 ^{o}F. Average annual rainfall at the site is nearly 30 inches, with most rainfall occurring between November and April. The 24-hour one-year storm event is measured at 3.6 inches (PG&E 1996). Prevailing winds are from the west in the winter, from the east in the summer and variable during the spring and fall (PG&E 1996; Duke Energy 1999a).

GROUNDWATER

Four water-bearing formations exist below MLPPP. Forming the uppermost hydrologic unit, the marine terrace and alluvial deposits are of poor water quality and occur up to 200 feet below the surface. Aromas Reds Sands consisting of well-sorted sands and gravels with thin clay interbeds is the major water-bearing unit in the area. This formation occurs between 200 to 800 feet below the surface with variable water quality. Below this formation is the Purisima Formation occurring at a depth of 800 to at least 1,200 feet The lower-most hydrologic unit, Tertiary sediment, is comprised of consolidated marine sediments of sandstone, siltstone and mudstone underlain by granite bedrock. The tertiary sediment is of poor water quality and is characterized by high salinity.

The groundwater table at the site occurs about 3.6 to 9 feet below the surface with flow converging from the northeast and southeast into a western trending potentiometric trough beneath the plant. The thick clay layer underlying Elkhorn Slough forms a major barrier to groundwater flows in the area. In its 1996 assessment, PG&E suggested that this trough might be related to pumping in the area. The groundwater gradient is relatively flat, ranging from 0.0004 ft/ft to 0.005

ft/ft during 1999 (Duke 2000). Surface water and precipitation infiltration, irrigation return flows and water-bearing formations that underlie the uplands east of the plant are the major sources of groundwater recharge in the project vicinity (PG&E 1996;Duke Energy 1999a). Saltwater intrusion due to groundwater pumping and poor well construction is a problem in the Moss Landing area.

Onsite wells were tested to determine the transmissivity of the aquifer. Two shallow test wells were installed and the maximal pumping rate for these wells was determined. As a result of the tests, a transmissivity value of 14,035 $ft.^2$/day and storativity of 0.004 were calculated. This indicates a highly transmissive formation that is unconfined to semi-unconfined (AFC pg. 6.5-14).

SURFACE WATER

Surface water bodies in the vicinity of the project include Monterey Bay, Elkhorn Slough, Moro Cojo Slough and Moss Landing Harbor. Beneficial uses of these water bodies identified by the RWQCB (1994) are identified in **Soil & Water Resources Table 1**.

c) MONTEREY BAY

Located along California's Central Coast, Monterey Bay is about 26 miles long and 10 miles wide. Deep ocean currents driven by seasonal winds cause an upwelling of cold water in the bay and the near-shore currents result in a high degree of circulation in the Moss Landing area (Duke Energy 1999a). Subject to variations, the semidiurnal tides have a mean range of 3.6 feet and diurnal range of 5.3 feet (Duke Energy 1999a). Ocean and bay waters are typically 45 ^{o} and 60 ^{o} F (PG&E 1996).

Water quality information on Monterey Bay is available from a variety of sources including the Central Coast RWQCB and the National Oceanic and Atmospheric Agency. To meet Monterey County Local Coastal Plan requirements, Duke Energy will be conducting water quality analysis of source water taken from in front of the cooling water intake, adjacent to the cooling water discharge location in the bay and a location farther out into the bay. Constituents sampled include pH, oil and grease, total suspended solids, metals and organics considered a threat to marine aquatic life and human health. Analyses will be to the parts per billion (ppb) or lower, as required.

SOIL & WATER RESOURCES TABLE 1
Surface Water Beneficial Uses

	Moss Landing Harbor	Elkhorn Slough	Moro Cojo Slough	Monterey Bay*
Water contact recreation	●	●	●	●
Non-contact water recreation	●	●	●	●
Industrial water supply	●			●
Navigation	●	●		●
Marine habitat	●	●		●
Shell fish harvesting	●	●	●	●
Commercial and sport fishing	●	●	●	●
Preservation of rare and endangered species	●	●	●	●
Wildlife habitat	●	●	●	●
Warm fresh water habitat		●	●	
Cold fresh water habitat		●	●	
Migration of aquatic organisms		●		
Spawning, reproduction or early development		●	●	
Preservation of biological habitat of special significance		●	●	
Estuarine habitat		●	●	
Aquaculture		●		
Migration of Aquatic Organisms			●	
Ground water recharge			●	

Source: SWRCB Water Quality Control Plan, Central Coast Region, 1994.
*Soquel Pt. To Salinas River

ELKHORN SLOUGH

One of the four major tributaries that flows into Monterey Bay, Elkhorn Slough is approximately 6 miles long and 300 feet wide at its mouth narrowing as it travels inland. The slough's watershed is approximately 43,000 acres. It is a shallow estuary, decreasing in depth from 16 feet at the mouth to 3.3 feet inland. The Slough is subject to tidal influences for approximately half its length. Near the slough are marshes and mud flats, representing only 10 percent of the wetlands historically present in the 1880s. At the outlet of the Slough to the Bay, the channel is maintained and a man-made harbor, Moss Landing Harbor, extends to the south in what was the Old Salinas River channel. The harbor is regularly dredged.

EXISTING MOSS LANDING POWER PLANT SITE

Duke Energy has proposed to repower and modernize the existing Moss Landing Power Plant that was formerly owned by Pacific Gas and Electric (PG&E). The PG&E site occupied 380-acres and consisted of 19 fuel oil storage tanks, 7 generating units, 10 exhaust stacks, 2 seawater intakes and outfalls, wells, buildings and related equipment (DEML 1999a). Operation of the first three units by PG&E began in 1950 with Units 4 & 5 starting operation in 1952. Units 1 through 5 had a net capacity of 1,478 MW. These five units have not operated since January 1995 and cannot operate since PG&E surrendered the air quality permits for these units in 1997 (Suwell 2000). Units 6 & 7, still operating, came on line in 1968. Each of these two units has a net capacity of 739 MW or a total of 1,478 MW. Duke Energy acquired the power plant site in 1998. PG&E has retained ownership of its adjacent 140-acre Moss Landing Substation north of the plant.

PG&E operated the Moss Landing Power Plant under a NPDES permit last reissued in 1995 (No. CA0006254) by the Central Coast RWQCB (Order No. 95-22). Although Units 1 through 5 have not operated since January 1995 and can not operate without new air quality permits, the NPDES permit provides discharge limitations for Units 1 through 5. Duke is currently operating Units 6 & 7 under this NPDES permit, which expired February 1, 2000. Although the permit is lapsed, its conditions are in place until the new permit is issued. A new, final NPDES permit will be issued for the facility following certification of the project (Thomas 1999). A draft permit, Order No. 00-41,NPDES No. CA006254, is attached as Appendix A. As noted in the permit, this is an agency review draft and may change prior to adoption.

The cooling water intake structure for Units 6 & 7 is located on the eastern shore of Moss Landing Harbor, 700 feet south of the Unit 1 through 5-intake structure. Spent cooling water is discharged approximately 600 feet offshore in Monterey Bay. Permitted discharge limits cannot exceed 890 million gallons per day. The average daily temperature limitations are 28^{o} F above the temperature of the water intake. During heat treatment of the conduit to remove mussels, the daily temperature of the discharge can not exceed the average daily temperature of the intake water by 40^{o} F.

Duke Energy has recently discovered that they exceeded their discharge limitation several times last year due to high operation levels, jelly fish clogging the screens and other factors (RWQCB 2000). The 28^{o} F thermal limitation was apparently exceeded by 2^{o} F. In addition, Duke detected non-permitted discharges from the Moss Landing facility. These involved high temperature discharges to Moss Landing Harbor resulting from backflushing of heated water to clear the cooling water intake structure of marine organisms. Water temperatures of as high as 98^{o} F were detected in the harbor. Duke will discontinue all backflushing and will only conduct manual cleaning of the cooling water intake structures for the existing Units 6 & 7 and the new combined cycle units.

In addition, effluent limitations for the Units 6 & 7 discharge are specified for a variety of constituents to protect aquatic life and human health. The NPDES permit

allows stormwater runoff to be discharged to Elkhorn Horn Slough, Moro Cojo Slough and Monterey Bay and Moss Landing Harbor.

Currently there are three permitted hazardous waste surface impoundments at the existing power plant. Waste streams discharged to these impoundments include: wastewater from boiler chemical cleaning operation; air preheater washes; fireside washes; and boiler blowdown. These waste streams are classified as hazardous, non-hazardous or restricted hazardous under California Code of Regulations Title 22, Division 4 Chapter 30 (DTSC 1995).

Wastewater flows to these ponds are anticipated to remain unchanged with operation of the new units compared to when the original Units 1- 7 were operating (Duke 1999a). Each of the impoundments consist of a concrete base, and walls, three high density polyethylene liners, two leachate collection and removal systems and a groundwater monitoring system (DTSC 1998). Treatment of the wastewater streams consist of raising the pH of the wastewater to neutralize acidity and to precipitate metals. A filter press is used to dewater the resulting sludge which then is transported off-site by a hazardous waste transporter (DTSC 1995). The remaining filtrate is tested before being discharged to Monterey Bay through the Units 6 & 7 discharge system. This latter discharge is addressed through the NPDES permit.

These surface impoundments are permitted by the RWQCB for Waste Discharge Requirement for Class I Waste Water Surface Impoundments. The Board (Schwartzbart 2000; Order No. 99-132) just recently renewed this permit in November, 1999. In addition, the facility has a Hazardous Waste Facility Permit from the Department of Toxic Substances Control (DTSC) which was issued in March of 1995 and is good until March, 2005. This permit allows storage of hazardous waste at the impoundments for up to one year. Both permits allow discharge of waste streams that would result from operation of the original seven units. Staff anticipates that wastewater flows to these impoundments from the proposed units will be significantly less than permitted.

An environmental site assessment of the Moss Landing facility indicated the presence of soil and groundwater contamination (CPUC 1997; Duke Energy 1999a; Levine Fricke 1999). PG&E retains all liability for soil and groundwater contamination at the sites resulting from on-site PG&E activities (CPUC 1997). For more information on soil contamination please refer to the **Waste Management** section of this document. Chromium, petroleum hydrocarbons and volatile organic compounds (VOCs) have been identified in groundwater beneath the site. Please see Figure 6.14-2 in the AFC (Duke Energy 1999a) for a map showing the location and concentrations of these contaminants in the groundwater.

Domestic water for the facility is provided by the Moss Landing Mutual Water Company, from two wells south of the facility. The water company is a nonprofit mutual benefit corporation consisting of three members, Duke energy, P.G.& E. and a local dairy (Flake 2000). In 1999, the Mutual Water Company delivered a total of approximately 93-acre feet of water. Approximately 21 acre feet of water was used by Duke (Flake 2000).

WASTE DISCHARGE

Currently, the existing power plant has two structures for cooling water discharge. Outfall 001 (for the retired Units 1-5) discharges into Elkhorn Slough. Outfall 002 (for the operating Units 6 & 7) discharges into Monterey Bay with two vertical risers, approximately 12 feet in diameter located about 20 feet below the water surface (Duke Energy 1999a; PG&E 1996).

As part of a thermal compliance study discussed further below, Duke (2000a) characterized the extent and temperature range for the existing thermal discharge from Units 6 & 7. At highest power plant loading, it appears that the extent of the thermal plume is approximately seven acres, although warm water discharged from the Elkhorn Slough may be influencing this. Temperature survey data halfway between the discharge point and the beach indicates a temperature rise of 4-5 ^{o}F (Duke 2000).

Stormwater runoff is currently discharged to Monterey Bay, Moro Cojo Slough, Elkhorn Slough or Moss Landing Harbor in accordance with an existing Stormwater Pollution Prevention Plan and NPDES requirements.

ENVIRONMENTAL IMPACTS

PROJECT SPECIFIC IMPACTS

Duke Energy proposes to construct two 530 MW, natural gas-fired, combined cycle, units (Duke Energy 1999a,i). Duke Energy also proposes to upgrade each of the existing Units 6 and 7 by 15 MW through replacing the turbine rotors (Duke Energy 1999b,i). The upgrade of Units 6 & 7 are not a portion of this project and are being addressed by the Monterey Bay Air District (Duke Energy 1999i). These changes will result in an overall generating capacity of 1060 MWs. In addition, eight 225-foot tall stacks associated with Units 1-5 will be removed and replaced with four exhaust stacks for the new turbines. Nineteen fuel oil storage tanks (120,000 to 165,000 barrels) are located on the eastside of the overall plant site and will be removed (Duke Energy 1999a). Monterey County (2000) is conducting the environmental assessment associated with removal of these tanks and has recently issued a proposed negative declaration. The new combined cycle units will be located where the current fuel oil tanks 3, 4 and 10 are located. The project will not require any new transmission lines or natural gas pipelines.

WATER SUPPLY

Ocean and groundwater will supply the proposed project's needs. Cooling water requirements for the project will be met through ocean water taken from the existing Units 1 through 5 intake structure located in Moss Landing Harbor. Duke Energy (1999a,b) is proposing to modify this intake structure, which was constructed in 1949, to meet Clean Water Act 316(b) requirements. The existing traveling screens will be moved forward 350 feet from their present location within the existing Units 1-5 cooling water intake structure to within 10 feet of the intake structure entrance.

The screens will also be inclined to reduce entrainment and impingement. This is discussed further below.

Each of the two proposed combine cycle units will require approximately 125,000 gallons per minute (gpm), for a total of 250,000 gpm (Duke Energy 1999b). In comparison, Units 6 & 7 require a total of approximately 600,000 gpm. This water will be used for steam turbine condenser and auxiliary cooling requirements.

Average daily boiler makeup water demand is estimated to be 92,200 gallons per day (gpd). This volume will consist of 31,700 gpd recovered boiler blowdown and approximately 60,500 gpd of ocean water, which will be desalinated by vapor compression evaporation system followed by a polishing demineralizer.

Biological impacts associated with the use of ocean water for once-through cooling facilities deal with the entrainment and impingement of aquatic organisms and thermal effects on aquatic organisms associated with the thermal discharge. For further discussion of these issues, please see the **Biological Resources** section of this Final Staff Assessment. **For discussion of compliance of the proposed project with Clean Water Act cooling water intake structure requirements, please see the discussion under Compliance with Applicable Laws, Ordinances and Standards below.**

Fire, service water and domestic water needs will be supplied through groundwater. Potable water is supplied by the Moss Landing Mutual Water Company from two wells located to the south of the plant. This water is chlorinated before distribution. During construction, Duke Energy (1999a) estimates 10,000 gpd of drinking water will be required. Duke Energy (1999c) also estimates that annual domestic water demand during operation will be no greater than 1.1 million gallons. Potable water may also be used for maintenance activities on an intermittent basis. Water for fire safety for the proposed combine cycle units will also come from potable water. See Soil & Water Resources Table 2 for the proposed water balance.

Historically, 54,200 gpd of well water or approximately 60-acre feet per year was used by the Moss Landing facility (Duke Energy 1999a). This apparently includes groundwater used for plant washdown activities by Units 1 through 5. Duke Energy (1999a) estimates that operation of the proposed project will require 43,000 gpd or approximately 48-acre feet per year.

WATER QUALITY

Wastewater disposal can lead to soil, surface and groundwater degradation and impairment of beneficial uses.

WASTE WATER DISCHARGE

Duke Energy (1999a) proposes to discharge the spent cooling water from the proposed units to the existing Units 6 & 7 wastewater outfall system. This outfall facility is located approximately 600 feet offshore in Monterey Bay and consists of two 12-foot diameter pipes for each of the two existing units. These pipes terminate in head works that direct the discharge flow towards the surface (Duke Energy

1999c). These head works are roughly 12 feet by 18 feet in cross-section and the tops are located approximately 20-feet off the bottom and 20 feet below the surface at low mean tide (Duke Energy 1999c). The head works are approximately 18 feet apart. Flows to the discharge facility will increase above the current five feet per second to approximately 8.6 feet per second.

Other wastewater discharge streams include the concentrated brine from the evaporator system, boiler blowdown, washwater and others. These waste streams are routed to the three-wastewater treatment ponds where they are neutralized, solids are removed and the wastewater is discharged to Monterey Bay.

According to RWQCB staff, the ponds are in good shape and there is no evidence of any contamination or leakage from the ponds to the soil or groundwater (Schwartzbart 2000). A review of the 1999 annual monitoring report (Duke 2000d) indicates that the system is meeting permit requirements and does not appear to be impacting groundwater quality.

Although Duke will not discharge cooling water to Elkhorn Slough, stormwater will continue to be discharged to the slough as permitted by the existing NPDES permit and covered in their Stormwater Pollution Prevention Plan (SWPPP).

Non-hazardous wastewaters, including cooling water, intake screen wash, evaporator blowdown, boiler blowdown, bearing cooling water, stormwater, floor drainwater, demineralization unit bleed, ion exchange washwater will be generated and disposed of via existing outfalls. Other waste streams will be neutralized and routed to the wastewater treatment ponds for further treatment before discharge. Waste streams that may be contaminated by oil are routed through an oil and water separator before discharge. Sanitary waste will be handled by the existing on-site septic systems.

THERMAL DISCHARGE

Duke Energy evaluated the proposed discharge of MLPPP to determine whether or not operation of the proposed combined cycle units can comply with the California Thermal Plan standards (Duke Energy 1999m). A study plan was developed by Duke Energy in consultation with the Central Coast Regional Water Quality Control Board. The objective of the study was to characterize the existing thermal plume from operation of Units 6 & 7, predict temperature changes in the discharge plume resulting from operation of the proposed combined cycle units and determine if there is a potential for interference with larval fish in the vicinity of the discharge (pg. 4). The study, which also included an assessment of alternatives and modifications that can be made to the project to achieve compliance with the thermal plan, if necessary, was initiated in March 1999. After a series of draft reports reviewed by a technical advisory group, the Final Thermal Plan Compliance Report was issued on May 1, 2000 (Duke 2000). The existing, design and predicted discharge flow rates are shown in **Soil & Water Resources Table 2**.

Soil & Water Resources Table 2
Specifications of the Cooling Water Systems at MLPP

	Design	Actual	Projected
Units 6 & 7	600,000 gpm	532,000 gpm	600,000 gpm
Combined Cycle Units 1 & 2	250,000 gpm	-	250,000 gpm
All four units	850,000 gpm	850,000 gpm	850,000 gpm

Source: Duke 2000c

The thermal discharge study was based on data collected over 3 to 8 months by stationary temperature recorders placed in the bay, harbor and Elkhorn Slough, temperature measurements from a boat during March and July 1999 and aerial infra-red plume surveys at the same time as the boat surveys.

Data collected from the stationary recorders consisted of hourly temperature readings from seventeen permanent and three temporary recorder locations from March to October 1999. Also used was data for Units 6&7 output (thermal loading) and sea levels during these months. Boat-based temperature readings for the study were collected at various sites and depths from the point of discharge to well beyond the plume. These measurements were taken at times that coincided with the aerial thermal imaging, six occasions in March and three occasions in July 1999. The empirical data sets produced were used to generate mathematical projections to describe future plume configurations.

To predict future thermal plume characteristics (Duke 2000) selected three monitoring stations where temperature changes correlated with thermal loading from Units 6 & 7. A temperature difference time series between each primary site and a range of reference sites was created. Temperature variation due to tidal conditions was removed and the correlation between the residual temperature values and thermal loading from Units 6 & & were calculated. Average slope and intercept values with the highest correlation were then computed. Extrapolated temperature differences were computed using the average temperature and future peal operating loads. These estimates are based upon two assumptions. First, that the spatial extent of the future thermal plume will be the same as the existing plume. Second, changes in temperature values in the future plume will increase over present temperature values proportionately to future increases in heat loading. Future maximum heat loading for both the new units and Units 6 & 7 is estimated to average 93.6 million BTU/min. with the maximum reaching 182.0 BTU/min (Duke 2000a, table 1-2). The worse case considered for the future plume estimation occurs under maximum thermal loading from all four units – 182.0 BTU/min. and incoming (flood) tide. Given these conditions, Soil & Water Figure 1, extrapolated from Figure 2-20 of the Final Thermal Plan Compliance Report (Duke 2000a), shows the estimated surface temperature rise relative to offshore reference values based upon present conditions. This figure is based upon an infrared photo of the existing plumes with the isotherms reflecting worse case conditions added. Since an oblique photo was used, the entire extent of the plume is not depicted. It is assumed in the study that the future plume is expected to have a configuration

Insert figure 1 here

similar to the present plume with temperature increases about 600 feet from the discharge up to 41 percent higher (Duke 2000a, page 53). Based upon this evaluation, Duke (2000a) does not expect, even under worse case conditions, to exceed the 4^{o} F above receiving water temperatures 1,000 feet from the discharge, at the shoreline or at the surface of any ocean substrate for more than 50 percent of any tidal cycle. The Thermal Plan does not specify how a tidal cycle is determined, therefore, varying amounts of time could be calculated to represent 50 percent of the cycle. As shown on the figure, the thermal plume with temperatures of 3.5 ^{o} F approach the beach south of the harbor entrance.

The study also concludes that the maximum thermal plume temperatures will not exceed the natural water temperatures by more than 20 ^{o} F under most operating conditions at any point on the ocean surface based on vigorous mixing around the discharge point (Duke 2000a, page 55). However, the study (Duke 2000a, page 55) also states that "…maximum temperature of the thermal discharge will exceed the natural temperature of the receiving water by more than 20 ^{o} F under some operating conditions." It is anticipated that this would occur when only the older units, 6 & 7 are operating or during extended periods of high power generation with all units operating. Therefore, Duke has requested an exemption from the Thermal Plan to allow, under certain operating conditions, exceedance of the 20 ^{o} F standard. The Regional Water Quality Control Board, in response to a request from Duke has proposed the following daily and instantaneous thermal effluent limitations based upon varying operating conditions.

SOIL & WATER RESOURCES TABLE 3
Proposed NPDES Thermal Effluent Limitations

Operating Condition	Daily Temperature*	Instantaneous Maximum*
Case A	28°F (15.6°C)	34°F (18.9°C)
Case B	26°F (14.4°C)	32°F (17.8°C)
Case C	20°F (11.1°C)	26°F (14.4°C)

* These are the maximum temperatures by which discharge water temperatures are allowed to exceed receiving water temperatures for each time period.

Case A: Either one or both Units 6 and 7 in operation, but neither Unit 1 nor 2 in operation.

Case B: Either one or both Units 1 and 2 in operation, and either one or both Units 6 and 7 in operation.

Case C: Either one or both Units 1 and 2 in operation, but neither Unit 6 nor 7 in operation.

Staff feels that there are several limitations in the monitoring program used to characterize the existing plume and to predict of the temperature increase in the future thermal plume. For example, Assessment of temperature rises for existing conditions were made using an elaborate 7-step procedure (Duke 2000a, pages 44-49) which has the following limitations:

The procedure includes removing the "best-fit semidiurnal constituent from each day of the difference (between projection and reference points) time series". The motivation is to remove the effect of natural heating at some of the reference points at low tide. However, some of the tidal variations of temperature differences are due to the presence or absence of the plume and these should not be removed from the evaluation.

For example, Station ML 11/10 located at the navigation buoy near the discharge at 10 ft depth was selected as representative of "ambient" conditions relative to the 20^{o}F maximum discharge temperature rise criterion.

It was found that, on average, the intake temperature was 1.9^{o}F higher than this "ambient" and it is proposed to subtract 1.9^{o}F from measured intake temperatures to evaluate compliance with the maximum temperature rise requirement. There are several issues with this proposal:

- Being so close to the discharge, it is not clear that station ML 11/10 is not occasionally affected by the discharge, which would have the effect of raising the "ambient" temperature used for compliance monitoring.

- The temperature difference between ML 11/10 and the intake temperature varies during the year from 0.7 to 3.8^{o}F, and using a constant 1.9^{o}F is not representative.

- The procedure does not resolve the distance from the discharge point, i.e. projections of temperature rises are made for three points without regard to their distance from the discharge point.

- The procedure predicts negative temperature rises for plant loads below about 800 MW.

To extrapolate the monitoring data to the proposed discharge, plume temperatures inferred from the monitoring were increased by 41%, reflecting the increase in heat loading. While this approach is not entirely inappropriate and would be suitable for a preliminary evaluation, it does not account for the change in plume dynamics that will accompany the increase in discharge flowrate. This increase will result in an increase of the plume size, which is not well represented by simply increasing temperature rises by 4%. It is said in the Final Thermal Plan Compliance Report (Duke 2000a) that "the modeling experts from both coasts that were consulted believe that the behavior of the MLPP discharge structure cannot be accurately simulated by an available hydrodynamic model". In fact, the discharge configuration is relatively simple and could be modeled using existing models. Near field plume dynamics can be modeled using a three-dimensional Computational Fluid Dynamic (CFD) model, whose results would be input to a three-dimensional regional model. However, because the California Thermal Plan criteria are primarily far-field criteria, the near field model may actually not be required. An advantage of using a model is that the effect of the plant can be separated from the natural heating that occurs in the harbor and Elkhorn Slough.

Staff agrees that compliance with the California Thermal Plan cannot be considered to have been demonstrated and that exceedences could occur both in terms of the 20 ^{o}F maximum temperature rise and the 4 ^{o}F maximum temperature rise beyond 1,000 ft and on the shore. This issue will be discussed further under the section titled Compliance with Applicable Laws, Ordinances and Standards found below.

Because Duke requested an exemption from the Thermal Plan, they provided a discussion of potential alternatives that could be implemented at the facility to ensure compliance with the Thermal Plan. The evaluation includes a separate offshore discharge for the new units, use of closed-cycle cooling technology and additional pumping to limit temperature rise.

The evaluation for a new offshore discharge system would separate the discharge from the new combined cycle units from the existing discharge from Units 6 & 7 that would continue to use the existing facility. The new offshore discharge system would consist of two new 10-foot concrete pipes that would be routed west from the power plant, across Moss Landing Harbor and out to sea approximately 700 feet at a depth of 30 feet. Duke (2000a) estimates the cost to construct this alternative is approximately $19 million. A key concern for this alternative, besides those environmental impacts associated with construction of the line is that the modifying effects of the combined cycle discharge on Unit 6 & 7 discharge would be lost.

Closed-cycle cooling systems, either mechanical or natural draft cooling towers or dry cooling, could be used in place of once-through cooling and would drastically reduce the temperature and volume of the wastewater discharge. Installed cost estimates for wet or dry cooling range from $13 million to $15 million above the anticipated costs of the proposed cooling water intake structure improvements. In addition, there would be costs associated with decreased capacity. For wet cooling towers, blowdown disposal would raise environmental concerns.

Another alternative considered is additional pumping of water to reduce the thermal load per volume of water. While thermal loading would go down, entrainment and impingement would increase.

The final alternative considered was general curtailment of Units 6 & 7 to ensure compliance with the Thermal Plan standard of 20 ^{o}F. above the receiving water. Since the proposed combined cycle units are more efficient than the existing units, curtailment would probably focus on the older units. Costs associated with this would result from lost capacity for the project owner. Duke (2000a) estimates that replacement costs for this lost capacity, about 430 MW, would range from $150 million to $260 million.

An alternative not considered by Duke (2000a) is the use of a multiport diffuser. The existing structure proposed for discharging the cooling water to Monterey Bay consists of two 12-ft pipes discharging vertically about 20 ft below the water surface. This type of discharge appears to provide “intense mixing”, as evidenced by the clearly visible boil at the water surface. However, in fact, this discharge provides relatively little dilution of the effluent with ambient water. The distance from the outlet to the water surface is less than the length of the zone of flow establishment

(ZOFE) of the buoyant jets, in which the radial velocity and temperature profiles gradually change from their essentially uniform shape at the outlet to a Gaussian shape in the zone of established flow. In the ZOFE, both the velocity and temperature remain equal to the discharge values in an area of diminishing size at the center of the jet. The length of the ZOFE is on the order of 6 times the discharge diameter, here 72 ft. Thus, when the discharge jets impinge on the water surface, the temperature in a significant portion of the jet is essentially unchanged from the discharge temperature. Some amount of dilution occurs as the jet rises through the water column, but because of the relatively small distance, this dilution is limited. A comparatively greater amount of dilution occurs in the internal hydraulic jump which forms just downstream of the impingement zone. For over 20 years, most if not all, new power projects in the US using once through cooling with discharge to the ocean have used multiport diffusers. Thus, the proposed project cannot be considered to qualify as using BTA relative to its cooling water disposal.

The design of a multiport diffuser for any given application depends on numerous factors including discharge flowrate, water depths, currents, stratification and required performance. For the Moss Landing Project, a separate diffuser could be built for the proposed new combined cycle units. As a very preliminary estimate, a diffuser length of 1,000 ft can be used with a cost of $10,000 per ft (including engineering design and construction supervision). The resulting cost would be approximately $10 Million, in addition to the $19 Million cost estimated in the Final Thermal Plan Compliance Report for the separate outfall for the combined cycle units. Another alternative would be to append a multiport diffuser to the existing outfall. The required length of this diffuser would depend on whether compliance is sought for both existing and proposed units or only for the new units. Assuming a 2,000 ft diffuser length, the cost would be approximately $20 Million. The exit velocity of the proposed cooling water discharge will increase from approximately 5.2 ft/s for the 532,000 gpm present discharge to 8.4 ft/s for the proposed 600,000 discharge. Because the discharge depth is less than the length of the zone of flow establishment of the discharge jets, the velocity impinging on the surface is approximately equal to the discharge velocity and the height of the boil is approximately equal to the corresponding velocity head, V2/2g. This boil height will increase from about 0.4 ft to 1.1 ft. While this boil height remains relatively small relative to the waves which can occur at this location, the new boil will have considerably more energy than the existing one and the issue of potential hazard to boating should be reviewed.

WATER QUALITY

The attached NPDES permit identifies a number of effluent limitations that the proposed discharge must meet to protect marine aquatic life and human health. These effluent limitations reflect those contained in the California Ocean Plan (State Water Resources Control Board 1997). Duke (Fleck 2000b, RWQCB 2000a) uses sodium hypochlorite for bio-fouling reduction and calcium hypochlorite as a backup. The effluent limitations include the requirement that residual chlorine does not exceed 0.2 mg/l.

Accelerated wind and water induced erosion may result from earth moving activities associated with construction of the proposed project. Removal of the vegetative cover and alteration of the soil structure leaves soil particles vulnerable to detachment and removal by wind or water. Significant precipitation typical of California's coastal region may increase the potential for water erosion. Grading activities may redirect runoff into areas more vulnerable to erosion.

Upgrades to Units 6 & 7 will occur within the boundaries of the existing 10-acre site at the southwest portion of MLPPP. Soils in the area of the tank removal where the new combined cycle units are to be located are the Elkhorn loams and Santa Ynez loams. These soils have obviously been significantly modified by construction activities. Once the protective covering of the soil has been disturbed during project construction, these soils can be highly vulnerable to erosion.

Because of previous activities and uses at the site, it is essentially flat with little grading required. Demolition of the existing tank farm is part of a separate project under the jurisdiction of Monterey County. Existing grades and slopes in the tank farm areas will be maintained and existing swales and culverts will be used to divert surface run-off. See Figure 6.3-4 in the AFC (Duke Energy 1999a) and Figure ML-1 in Duke Energy (1999e). The finished grade will be approximately 20 feet msl. Surface drainage will primarily be gravity flow accomplished with a mild slope away from structures of about 2 percent and a minimum of 1 percent (AFC pg. 2-26). Site preparation for the construction laydown area and for construction of the new combined cycle units will result in new temporary and permanent disturbances. No new offsite linear facilities will be needed to serve the project. Duke Energy (1999i) submitted a copy of the existing Stormwater Pollution Prevention Plan (SWPPP) for the operation of the facility and plot plans showing proposed drainage patterns. In addition, Duke (2000c) has submitted a draft erosion control plan for the construction phase of the project. This plan identifies best management practices to be used to control erosion and the discharge of contaminated stormwater offsite.

Once tanks are removed, soil testing for contamination can occur. Concern has been expressed by DTSC and the Coastal Commission about earth moving activities occurring prior to site remediation by PG&E. As noted above, PG&E is responsible for site remediation, but has not initiated this activity. DTSC was unable to provide staff with an expected schedule of when this would occur and when it may be completed. Staff will need to further evaluate this issue and hopes to have it resolved prior to the evidentiary hearings.

During project operation wind and water action can continue to erode unprotected soils. A net increase in the amount of impervious surfaces at the site will occur and may increase the amount of stormwater runoff from the site (Duke Energy 1999a). Unprotected soils may be eroded as a result of this increased run-off. Onsite drainage will be gravity flow whenever possible accomplished through mild slopes and existing culverts. According to Duke (2000c), excavation for the new combined cycle units and associated pipelines are not expected to be encounter groundwater, therefore, significant amounts of dewatering are not anticipated. Given the shallow

depth of groundwater at the site and concern about the source of water found in the wetlands present at the tank farm, staff does not share this confidence. The graded areas will have approximately a 2 percent slope away from structures. Site drainage facilities and ditches will be designed for 100-year, 24-hour rainfall. As proposed, the majority of surface drainage will be directed to the outfall in Monterey Bay. Stormwater run-off from industrial areas, roof drains and storm drains will be directed to an oil/water separator prior to being combined with the cooling water discharge (Outfall 002). Stormwater from roads and parking lots will be routed directly to Moss Landing Harbor via existing structures (Outfall 004). Plant modifications will include a small reduction in the amount of surface drainage directed to Elkhorn Slough via the existing Outfall 001 and Moro Cojo Slough via the existing Outfall 003 (Duke Energy 1999a, Figures 6.5-3 & Figure 6.5-20).

As noted above, the existing SWPPP addresses pollutant sources that may affect stormwater quality and control measures and management practices to reduce pollutants in stormwater run-off. Duke Energy has indicated that it will design and construct the new facilities in conformance with the existing SWPPP or if necessary, seek amendments to the plan to reflect specific project components and pollution prevention practices (Duke Energy 1999a). A review of stormwater monitoring information submitted by Duke (1999j) indicates no significant water quality impacts and staff concludes that, with implementation of the best management practices contained in the Stormwater Pollution Prevention Plan, operation of the new units will not lead to the discharge of stormwater pollution.

Installation and Maintenance of the New Intake Structure

To supply cooling water to the proposed project, Duke (1999a,b) intends to modify the existing Units 1 through 5 cooling water intake facility. This includes: moving the traveling screens closer to the intake; using incline instead of vertical screens, installing new stop log guides; replacement of the silt diversion structures; modification of the inlet tunnel to allow for thermal treatment; and removal of collected sediment from the entrance of the intake structure (Lynch 1999). This will require:

- Construction of a coffer dam around the front of the intake structure to dewater the facility.
- The water will be pumped back into the harbor.
- Sediment to be removed will be sampled for contamination, and disposed of based on the sample results.
- The existing bar racks and stop logs will be replaced.
- A new silt diversion system will be inserted.
- Pumping will stop and the cofferdam will be removed.

The Army Corps of Engineers (Grass 1999) has granted for Duke Energy to install a sheet pile cofferdam into Moss Landing Harbor to allow dewatering of the cooling water inlet structure to remove silt accumulations, relocate the traveling screens,

install new stop log guides, replace the silt diversion structures, and modify the inlet tunnel.

According to Duke Energy, siltation periodically occurs around the existing intake structure for the retired Units 1-5 in Elkhorn Slough. The applicant proposes to replace silt diversion panels and continue practices of periodically clearing the build-up away. Such activities will be undertaken by the Moss Landing Harbor. The harbor conducts dredging operations under an Army Corps of Engineers approved plan. This plan identified dredging and disposal operations as well as sediment testing procedures. **Waste Management** has a proposed condition regarding testing of this dredge material prior to disposal.

d) Intake Modifications

Duke Energy (2000c) submitted a Resource Assessment Report that evaluates alternative cooling water intake designs with respect to Section 316(b) of the Clean Water Act. This section of the act requires that the "…location, design, construction and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact." While the Clean Water Act (CWA) under Section 316(b) requires that the location, design, construction and capacity of the cooling water intake structures reflect the "Best Technology Available (BTA)" for minimizing adverse environmental impacts, the definition of this standard has been a matter of debate. Aquatic life can be impacted in the power plant circulating water intake system by impingement and entrainment. Impingement occurs when fish or other sea life becomes trapped in the cooling water system and entrainment where aquatic organisms such as larvae and fish eggs are drawn in to the facility's cooling system. Compliance with the requirements of subsection 316(b) is affected by several variables and may therefore result in differing approaches for different installations. These variables include site location, local environment, aquatic species and organisms, plant configuration (i.e. new or refurbished facility), and cost-effectiveness. To determine the appropriate BTA for the Moss Landing Power Plant Project the applicant studied and evaluated several alternative technologies. The results and analysis of their efforts have been presented in the "Moss Landing Power Plant Modernization Project 316(b) Resource Assessment (Duke Energy 2000c).

The alternative technologies evaluated in the report included:

1. Offshore and onshore intake locations/configurations.
2. A once-through cooling water system
3. Various behavioral barriers, which include light, sound, bubble screens, and velocity caps.
4. Diversion systems
5. Physical barriers.
6. Fish collection, removal, and conveyance systems.
7. Operational and flow-reduction alternatives.

A hierarchical evaluation system of four criteria using a site-specific approach was applied to assess which alternative intake technologies are both feasible and would reduce biological losses:

1. The alternative technology is available and proven.
2. Implementation of the alternative technology will result in a reduction in the loss of aquatic organisms compared to present conditions.
3. Implementation of the alternative technology is feasible at the Moss Landing Power Plant Project (MLPPP) site.
4. The total economic cost of the alternative technology is proportional to the environmental benefits.

The four criteria were applied progressively such that only alternative technologies that met the previous criterion were evaluated under the next criteria, e.g., if a alternative did not meet the first criterion it was eliminated from evaluation under the next and remaining criteria.

Of the alternatives included above, only those involving operational and flow-reduction alternatives, and those involving behavioral barriers met the first criterion, were considered proven technology by Duke Energy, and were further evaluated under the remaining criteria.

Several alternatives were not considered likely to result in a reduction in the loss of aquatic organisms compared to present conditions. Duke considered both onshore and offshore alternative intake locations and behavioral barriers not acceptable. Entrainment and impingement losses were not expected to be substantially reduced through the use of physical barriers, which include travelling screens, barrier nets, a Gunderboom, and a fish pump system. Cooling system changes and discharge temperature regulation were not expected to substantially reduce entrained organism mortality, and were also rejected from further consideration.

The remaining alternatives were evaluated against the feasibility and cost analysis criterion. Curtailment of power generation, mechanical draft and natural draft cooling options, air-cooled condenser (dry cooling) reduced cooling water flow at reduced loads, and alternatives to chemical biocides were eliminated based on either cost or feasibility.

Duke Energy concluded that the currently proposed design is the best technology available to reduce entrainment and impingement of aquatic organisms. The modifications proposed by Duke (1999a) to the existing Units 1-5 cooling water intake structure will involve the addition of new angled traveling screens to reduce approach velocities and keep the intake free from debris. Approach velocity will be 0.5 feet per second (fps) compared to 0.8 fps at the existing Units 6 & 7 intake.

These screens will be located near the front of the intake, which will eliminate the entrapment of aquatic organisms in the existing 350-foot tunnel which connects from the shoreline to the pumps. The new circulating water system will consist of the shoreline intake with silt diversion skirts, six bar trash racks with 4 inch spacing, a curtain wall with stop logs for isolation, six inclined traveling screens placed at

angle of 55° from the horizontal with a 5/16 inch mesh size, the existing 350 foot long intake tunnel, and six 42,000 gpm circulating water pumps. The study's conclusion states that the BTA requirement will be met by a combination of this design, operation and maintenance procedures, and environmental enhancement projects. Duke (2000c) recommends continuing present operating practices, that include reducing the operation of circulating water pumps when the units are out of service for extended periods of time, and periodic dredging around intakes to reduce sediment accumulation in intake areas to maintain intake water velocities.

In utilizing the existing intake and making modifications to comply with BTA requirements, Duke (2000c) has attempted to create an environment that will reduce flow velocities, eliminate the 350 foot long tunnel as an area subject to entrapment, and control debris accumulation within the constraints of the existing intake structure. This is accomplished by using an inclined traveling screen design located at the front of the intake and a reduction in the flow requirements for the combined cycle units. This design approach does create the potential for entrapment and higher than expected flows specifically in the area around the stop log/curtain wall and traveling screens. Insufficient information is available to confirm whether velocities will be above the design, if an even flow distribution across the screens will occur, and if fish entrapment in this area will result.

It should be noted that while a number of alternate technologies have been tested and developed, they may not be universally applicable in all situations. Some may be of these technologies have been used hydroelectric or irrigation applications involving lakes, rivers and may not for seawater once through cooling facilities The following is a brief description of the technologies evaluated by the applicant.

(1) Closed-Cycle Cooling Water System

There are alternate cooling technologies using mechanical or natural draft recirculating cooling towers using either fresh water or seawater as the cooling medium. The application of these systems would totally eliminate the need for the massive intake structures described in the application but would involve other impacts. Water use would be reduced to that required for system makeup from blowdown, evaporative losses, and drift losses. The fresh water towers were ruled out due to the limitations on freshwater supply. The seawater towers were eliminated due to considerations of discharge of concentrated effluent, visibility impacts of the towers themselves, noise, visible vapor plume emissions, additional energy requirements, and capital costs.

(a) Air Cooled Condensers

The use of air-cooled condensers would totally eliminate the use of water for cooling altogether. However, for the Moss landing Power Plant Project these would cover an area of 1.5 acres, extend to a height of 80-90 feet, consume 60 MW of power, and cost an additional $30 million in capital costs. Therefore, air cooled condensers have been eliminated as an alternative technology.

(2) Intake Locations

(a) Offshore

The proposed configuration is to make use of the existing onshore intake structure of units 1 through 5 by modifying it in a manner that would reduce impacts from the old operation. An alternative to this would be to construct a new intake located offshore in either the Moss Landing Harbor or in the Monterey Bay. In either case due to mixing and tidal actions between the Elkhorn Slough, the harbor and the bay, the applicant concluded that "an offshore intake appears to offer little or no potential for reducing the losses of fish and invertebrates entrained or impinged at the new combined cycle units intake."

(b) Alternate Onshore Location

The purpose of using an alternate onshore location would be to take advantage of a shore zone in which the habitat of species would be reduced from the current location. Considering the pattern of tidal currents and sampling studies performed by the applicant, it was concluded that the potential for entrainment and impingement would not be substantially different at any other available shoreline locations.

(3) Behavioral Barriers

Behavioral guidance technologies are designed to produce stimuli that potentially can alter the behavior of fish to produce avoidance responses and thus prevent entrainment into the water intakes. These technologies include the use of strobe lights, air bubble curtains, underwater sounds, mercury lights, electric barriers, and velocity caps. Certain of these technologies have had varying degrees of success with some fish species and it is agreed that in some cases that further study is warranted. For application at the Moss Landing site there is no compelling evidence that behavioral barriers would be an effective deterrent to entrainment or impingement on a consistent basis for the aquatic life in the area.

(4) Physical Barriers

Physical barriers principally are designed to block the passage of fish from entering the intake, usually in combination with low water velocity.

(a) Traveling Screens

Traveling screens have historically been used to block the intrusion of debris and fish from entering the cooling water systems of power generating facilities. As such there is usually a high mortality rate to the sea life that has been drawn into the structures. More recently designs have included various fish handling and operational features to reduce the impingement of fish. Vertical traveling screens equipped with fish lifting buckets will be addressed under Fish Collection Removal, and Conveyance.

In addition to vertical traveling screens alternate types of screens include drum type and wedge wire screens. Drum type screens that have been used primarily at irrigation and hydroelectric facilities have experienced problems with impingement

and blockage due to poor design application, lack of bypasses and physical seals. Wedge-wire screens utilize a “V” or wedge shaped cross-section that forms a slotted screening element. To work properly this design requires a small screen slot, low through-slot velocity, and an ambient cross-flow current. Another problem due to a lack of accessibility is the lack of ability to prevent or control biofouling of the interior surfaces by mussels, barnacles and other organisms. Due to these problems drum and wedge wire screens are not currently considered to be applicable technologies for the Moss Landing Power Plant Project.

(b) Barrier Nets

Barrier nets have the ability to exclude fish from water intakes by blocking the entrance to the intake structure. The mesh size and surface area of the net must be properly selected to block fish passage but not cause the fish to become gilled in the net. This can be controlled by the use of relatively low velocities (generally less than 1 ft/sec). Some concerns of barrier nets include blockage due to debris, clogging, and biofouling. While labor intensive, regularly scheduled cleaning programs can address these factors. Barrier nets have been used successfully at a number of power plant installations although it is not practical within the Moss Landing Harbor.

(c) Gunderboom

The Gunderboom is a newer technology for protecting fish at circulating water intakes that consists of polyester fiber strands which are pressed into a water-permeable fabric mat. It is then made into a curtain that is floated and anchored to block the impingement of fish but also has the potential for preventing entrainment of the earlier life stages. While a promising technology the Gunderboom is still acknowledged to be experimental in nature requiring additional development and therefore not currently applicable at the Moss Landing Power Plant Project.

(d) Pours Dikes

Porous dikes allow water to pass through them while preventing fish passage. They have been shown to be effective blocking juvenile and adult fish on an experimental basis; however, they do not reduce entrainment of the passive life stages which will get trapped in the porous medium or entrained in the pump flow. Since this technology is still considered to be experimental and has yet to be demonstrated in cooling water intake applications, it is not considered to be a viable alternative for the Moss Landing Power Plant Project.

(5) Fish Collection, Removal, And Conveyance System

Fish collection technologies have been developed that either actively or passively collect fish for transport back to the source of the cooling water through a return system.

(a) Modified Traveling Screens

Modifications have been incorporated into vertical traveling screens to reduce the mortality of fish and organisms. These modifications incorporate the addition of water-filled buckets that collect the fish and with the aide of low-pressure washes

and transport them into a sluice trough. The fish are then transported back to a safe release location. This system used in conjunction with continuous rotation of the screens is a viable alternative for protecting fish.

(b) Fine-Mesh Screens

Fine-mesh screens with openings as small as 0.5 mm have been used in conjunction with the traveling screens described above. The concept of using the fine-mesh screens is that they will collect not only fish but also fish eggs and larvae. However, for some species impingement on the fine-mesh screens can actually result in higher mortality than if the organism were allowed to pass completely through the circulating water system. Therefore, it cannot be concluded that the use of fine mesh screens would enhance the prevention of impingement of the early sea life forms.

(6) Fish Return Conveyance Systems

Duke (2000c) has stated that using a trash pump to transport material away from the intake often results in mechanical abrasion and high mortality of organisms. The study therefore concludes “that no further consideration should be given to a fish pump return system for diverting fishes from the new combined cycle units intake because of the uncertainties associated with the effectiveness of such a system in successfully diverting the fish species found at the site and returning them alive to Moss Landing Harbor.”

Recent results using new designs indicate that pumps are available that induce little injury and mortality. These designs include the use of a screw-impeller pump that potentially offers an effective means of transporting larvae, juvenile, and adult fishes with low resultant mortality. Fish return conveyance systems are considered to be a viable application to reduce impacts to fish and other aquatic organisms.

(7) Intake Maintenance and Operational Modifications

To reduce flow velocities through the intake structure it is proposed that dredging to control sediment build up that would block cross-sectional area is used. This control measure is considered proper and effective. Reduction of circulating water pump operation during periods of reduced electrical generation is also considered a viable proposal with potential energy savings by reducing auxiliary load requirements.

(8) Diversion Systems

Fish diversion systems redirect the fish away from the impingement area to a return system or safe area for return to the ambient water source. The alternate designs include angled screens, modular inclined screens, and louvers.

(a) Angled Screens

Traveling screens are set at an angle to the flow of the water (about 25º) in either a “V” or slant configuration. At the apex of the angle are fish bypass slots that collect the fish that are then pumped or sluiced back to the cooling water source. Fish that do not enter the bypass and become impinged on the traveling screens are then

removed by a low-pressure backwash system. Even though there are limited applications using seawater-cooling systems, results of fresh water and testing have shown this technology to be viable and worthy of consideration.

(b) Modular Inclined Screens

The modular inclined screen consists of an inclined screen installed after the trash racks at a shallow vertical angle of 10-20 degrees to the flow. Fish are directed to a transport pipe for return to the sea water source. Early laboratory testing has shown modular inclined screens to have potential but this technology has yet to be demonstrated on a full scale circulating water system and is therefore not considered to be a viable application for the Moss Landing Power Plant Project.

(c) Louvers

A louver system consists of an array of evenly spaced, vertical slats aligned across a channel at a specified angle which leads to a bypass. These systems have limited applications at cooling water intake systems but have been applied successfully at hydroelectric and irrigation facilities. Laboratory studies have showed reasonably high diversion efficiencies; however, these are dependent on swimming capabilities, behavioral tendencies, life-stage, and site specific characteristic of the local species impacted. Although louvers may be considered an alternative for the Moss Landing Power Plant Project, further evaluation with the local species would be required to define the full potential of this technology.

The Moss Landing Power Plant Project as proposed makes use of the existing circulating water intake structure originally designed and built to provide cooling water to units 1-5 which have been down since 1995. The applicant has proposed to modify the intakes to relocate the traveling screens to the front of the intake, replace them with inclined traveling screens, and reduce the cooling water flowrate. From an assessment of the existing alternative technologies it is concluded that these measures alone would not constitute compliance with the Clean Water Act section 316(b) requirement to provide the Best Technology Available to minimize adverse environmental impacts. Alternate potentially acceptable technologies, which were dismissed by Duke, include barrier nets, fish collection by modifying traveling screens, diversion technologies of angled screens or louvers, and fish return conveyance systems. While each of these deserves further consideration not all of them would be required to meet BTA requirements.

It is recommended that further study be done on the design configuration of the intake structure specifically in the area of the stoplogs/wall curtain to verify that low flowrates are achieved and that fish entrapment will be minimized.

The following recommendations should be considered in determining BTA. In addition, since there are off-site opportunities to mitigate entrainment and impingement impacts, the proposed mitigation measures identified in the **Biological Resources** section must be taken into account.

It is recommended that traveling screens that have been modified to reduce the mortality of fish and organisms by a collection system using fish buckets in

combination with a return conveyance system be considered as a possible viable design.

It is recommended that a diversion design using angled screens or louvers in combination with a return conveyance system be considered as a possible viable design.

CUMULATIVE IMPACTS

Staff concludes that the proposed project will not contribute to any significant cumulative impacts to soil and water resources. The one exception may be regarding site contamination and project construction activities. Staff is continuing to evaluate this issue and hopes to have this issue resolved prior to the evidentiary hear. The proposed project's groundwater demand will be less than historic demand. Although the discharge of the once-through cooling water from the new unit will raise, under certain operating conditions, temperatures above that of the receiving water, this will not contribute to cumulative water quality impacts.

FACILITY CLOSURE

For soil and water resources, issues raised by temporary or permanent closure of the proposed facility are addressed, in part, by existing permits from the RWQCB and DTSC. The remaining issues will be addressed in the closure plan that will be prepared by the project owner.

MITIGATION

APPLICANT PROPOSED MITIGATION

Duke (1999a,I, j; 2000c) has proposed implementing best management practices to minimize erosion and sedimentation and the discharge of contaminated stormwater runoff during construction and operation of the proposed facility. In addition, Duke (1999a) indicated that the project will comply with all applicable permit requirements.

CEC STAFF PROPOSED MITIGATION

Staff is several mitigation measures to ensure the project complies with applicable laws, ordinances and standards.

COMPLIANCE WITH APPLICABLE LORS

Duke Energy has applied to the Central Coast RWQCB for a NPDES permit for the new combined cycle units. The RWQCB (Thomas 1999) has determined that the proposed project, the new combined cycles units, constitutes a "new facility" under the Thermal Plan and a new discharge under the Clean Water Act. To meet these requirements, the RWQCB staff laid out a number of studies Duke Energy must

undertake to provide information necessary for the RWQCB to determine the project's compliance with the Thermal Plan.

As discussed above under this plan, the thermal discharge of a new facility into coastal waters must meet several requirements including not exceeding a maximum temperature of 20^{o} F above the receiving water. Under provisions of the Thermal Plan and Clean Water Act Section 316(a), the RWQCB and the SWRCB can issue a variance to these specific plan objectives. Duke Energy (Thomas 2000) has requested a variance for the 20^{o} F limitation. This allows Duke Energy to discharge at greater temperature relative to receiving water ambient levels as long as the discharge levels "…will assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on that body of water." RWQCB staff (Thomas 2000) feel that the studies being conducted now by Duke Energy will suffice in this determination and should not require additional time beyond that necessary for completing and analyzing the survey information. Therefore, the thermal limit for the discharge will be based upon potential biological impacts. For a discussion of biological impacts, please see the Biological Resources section of this FSA.

From a water quality perspective, staff is supportive of the thermal limits identified in the proposed NPDES permit. Staff is, however, concerned that Duke may exceed other specific objectives of the Thermal Plan, such as the discharge not resulting in temperature increases exceeding 4^{o} F at the shoreline over 50 percent of the tidal cycle. Since whether the project will exceed this provision of the thermal plan is unclear, staff has identified a proposed condition of certification that will develop, with the RWQCB, and in consultation with other agencies and the project owner, a limited monitoring program to determine the degree of project compliance with the Thermal Plan.

As discussed above, Duke Energy (2000a) provides a discussion of alternative design and operational factors to minimize thermal impacts. Staff has concluded that the existing discharge structure for Units 6 & 7 is not best technology available. However, since staff has failed to identify any significant water quality impacts associated with the thermal plume, and the project may comply with the Thermal Plan, staff is not recommending modifications to the thermal discharge system. Mitigation of the proposed project failing to meet thermal plan requirements should include consideration of modifying the existing discharge structure to a multiport facility that would lessen thermal effects.

Also as discussed above, there are several alternatives to Duke's (2000c) proposed modification to the existing Units 1-5 cooling water intake structure to comply with Clean Water Act Section 316(b) best technology available requirements. Given that there are alternative mitigation measures to reduce the impact of entrainment and impingement, staff has not made a final decision whether the proposed project meets BTA. Please see the **Biological Resources** section for further discussion of this issue.

CONCLUSIONS AND RECOMMENDATIONS

Staff recommends approval of the proposed MLPPP for the technical area of Soil and Water Resources. Although staff has concerns about the project's compliance with certain provisions of the Thermal Plan, a proposed condition of certification would ensure determination of the project's compliance with these requirements. In addition, compliance with the best technology provisions of Section 316(b) of the Clean Water Act has not been resolved. Please refer to the Biological Resources Section of this testimony.

CONDITIONS OF CERTIFICATION

SOILS&WATER-1: Prior to the initiation of any earth moving activities, the project owner shall submit the CBO approved erosion control and sediment control plan.

Verification: The final erosion and sediment control plan shall be approved by the designated CBO and be submitted to the Energy Commission CPM 30 days prior to the initiation of any earth moving activities.

SOIL&WATER-2: The project owner shall submit the final, approved National Pollutant Discharge Elimination System Permit from the Central Coast Regional Water Quality Control Board governing the discharge of the project's once through cooling water to the Energy Commission. The project owner shall comply with all provisions of the National Pollutant Discharge Elimination System Permit. The project owner shall notify the Energy Commission CPM of any proposed changes to this permit or waste discharge requirements for Class I Surface Water Impoundments (Order 99-132), including any application for permit renewal.

Verification: Within 30 days following receipt of a final, approved National Pollutant Discharge Elimination System Permit from the Central Coast Regional Water Quality Control Board, the project owner shall submit to the Energy Commission CPM a copy of the permit. The project owner shall submit to the Energy Commission CPM in the annual compliance report a copy of the annual monitoring report submitted to the Central Coast Regional Water Quality Control Board for NPDES No. CA006254 (Order 00-41) and for Waste Discharge Requirements for Class I Wastewater Surface Impoundments (Order No. 99-132). The project owner shall notify the Energy Commission CPM in writing of any changes to and/or renewal of either permit.

SOIL&WATER-3: The project owner shall characterize the extent and influence of the thermal plume under the varying conditions experienced at the discharge. A technical advisory committee shall be established by CEC Water and Biological Resources staff and Central Coast Regional Water Quality Control Board staff with representatives of California Department of Fish and Game, California Coastal Commission, Regional Water Quality Control Board, Energy Commission, and the project owner. The study

objectives, sample design, metrics and methods (protocols) will be developed by the technical advisory committee. The goal of the study is to provide a detailed, three-dimensional characterization of the thermal plume and project compliance with applicable permit requirements. The study protocols will be developed and put into a study plan within twelve months of the certification. The project owner will commence the thermal plume characterization and monitoring study within one month of the start of operation of the new power plant. All units (1&2 and 6&7) should be in operation during the study (worst case). The project owner will prepare the study plan and conduct the data collection. The project owner shall prepare a draft report of the study results that is scientific in style and includes methods, analysis, results, and conclusions, within six months from the end of data gathering and submit it to the CEC CPM. The other agencies shall be included in the review, as they desire. A final report shall be completed within nine months of the end of data collection.

Verification: The project owner will submit a draft study plan (based on technical advisory committee direction) to the CEC CPM within nine months of certification for review and approval. Within twelve months of certification, an approved final study plan will be provided to the CPM. This study plan will be prepared by the project owner as guided by the technical advisory committee established by CEC Water Resources staff and CEC CPM in consultation with the agencies. The CPM will ensure that the monitoring studies are conducted according to the study plan.

The project owner will submit a draft report that discusses the results of the thermal plume characterization and monitoring, that is a scientific style report including methods, analysis, results, and conclusions within six months of the end of field sampling, and they will submit an approved final report within nine months from the end of field sampling. The CPM will ensure that a study results draft report is submitted within six months of the completion of the field sampling, and that a final report is completed within nine months from the completion of the field sampling.

Within 30 days following certification the CPM shall ensure that a technical advisory committee has been established and is progressing toward the creation of the study plan. Within 30 days following the start of operation of new units 1&2 of the Moss Landing Power Plant, the thermal plume characterization and monitoring efforts will commence.

If the project owner has not complied with any aspect of this condition, the CPM will notify the project owner of making this determination.

REFERENCES

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Duke Energy (Duke Energy Moss Landing LLC). 1999j. Supplemental Data Adequacy Information Request, Moss Landing Power Plant Project. Prepared by TENERA.

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SWRCB (State Water Resources Control Board) 1998. "Review of the California Thermal Plan (Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California), Initial Staff Report, State Water Quality Control Board, July 1998.

Thomas, Michael. 1999. Water Quality Control Engineer. Central Coast Regional Water Quality Control Board. Various.

Thomas, Michael. 2000. Water Quality Control Engineer. Central Coast Regional Water Quality Control Board. January 27.

Hoffman 1999. Letter to R. Briggs, Regional Water Quality Control Board, Central Coast Region, from Wayne Hoffman, Duke Energy-North America, September 28, 1999: plant is currently regulate by NPDES permit CA0006254 issued to PG&E and adopted by the Regional Board on February 10, 1995. In this letter, Duke informed Briggs that they had notified the Board of the change in ownership and were requesting a two-year extension of the current permit to allow for the new plant to be incorporated.