

DEC 14 1976

Docket Nos. 50-275
50-323

Mr. E. C. Fullerton, Director
Department of Fish and Game
State of California
1416 Ninth Street
Sacramento, California 95814

Dear Mr. Fullerton:

Thank you for your letter, received on September 20, 1976, commenting on the Addendum to the Final Environmental Statement for the operation of the Diablo Canyon Nuclear Generating Station, issued in May 1976. Your letter was apparently written on the assumption that the Addendum is a draft document which was to be circulated for comments and subsequently revised. However, the Addendum was issued as a final document and will be revised only through the environmental phase of the operating license hearing.

The Diablo Canyon Station was under construction when the National Environmental Policy Act became law on January 1, 1970; therefore, the usual practice of preparing a draft and a final environmental impact statement for the construction permit and another draft and final for the operating license was not followed. Instead, one draft and one final statement were written to discuss the impacts of both construction and operation.

Later it was decided that only a single updating report, the Addendum, was necessary for discussing the construction impacts which occurred at Diablo Canyon after the FES issued in May 1973 and for revising discussion of the operating impacts where necessary to reflect more recent information.

As Mr. John Gill, the NRC Environmental Project Manager for Diablo Canyon, discussed with Mr. John Day of your staff, the environmental hearing for Diablo Canyon is scheduled for December 7-17, 1976 at the Madonna Inn in San Luis Obispo, California. Your letter of comment on the Addendum and

50-275
end 2

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Mr. E. C. Fullerton

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this letter complete with the enclosed responses from the NRC staff will be entered into the record of that hearing.

Thank you for your comments.

Sincerely,

Original signed by
George W. Knighton

George W. Knighton, Chief
Environmental Projects Branch No. 1
Division of Site Safety and
Environmental Analysis

Enclosure:
As stated

cc: CEQ (5)

bcc: Applicant and Service List

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506-955 SURNAME▶	<i>JG</i> JAGill:ehd	<i>GK</i> GKnighton				
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ENCLOSURE

RESPONSES TO COMMENTS BY THE CALIFORNIA DEPARTMENT OF FISH AND GAME ON THE ADDENDUM TO THE FINAL ENVIRONMENTAL STATEMENT FOR THE DIABLO CANYON NUCLEAR GENERATING STATION, UNITS NOS. 1 AND 2

Mitigation for Losses of Fish and Wildlife Resources Due to Construction and Operation of the Power Station

The California Department of Fish and Game (CDF&G) letter received September 20, 1976 raised the subject of mitigation in connection with siltation of Intake Cove, entrainment of larval fish and plankton, effects of heated water discharges, effects of past releases of copper and nickel, and effects of foam in Diablo Cove. The NRC Staff understands that an agreement has been reached between the Pacific Gas and Electric Company (PG&E) and the CDF&G as to the kind and level of mitigation needed to compensate for losses of fish and wildlife resources. In view of this agreement, the NRC staff believes that it is unnecessary to consider further mitigation at this time.

Copper And Nickel Discharges

Upon startup for testing of the Unit 1 circulating water pumps in 1974, copper and nickel were discharged into Diablo Cove. Subsequently, PG&E eliminated the source of the copper and nickel by replacing the original condenser tubes (which were an alloy of 90 percent copper and 10 percent nickel) with titanium condenser tubes. PG&E also coated the copper-nickel tube sheets of the condensers with epoxy.

The NRC Staff has concentrated its impact assessment on the effects of the copper on the biota of Diablo Cove because the small quantity of nickel discharged was considered to be of little biological consequence. PG&E chemically analyzed the discharge water and tissues of bull kelp (Nereocystis luetkeana) and found approximately nine times as much copper as nickel (approximately the same 90-10 ratio of copper to nickel that occurred in the original condenser tubes). Also, as seen by comparing Tables 5.9 and 5.10 of the Final Environmental Statement (FES), nickel is far less toxic than copper to killifish (Fundulus heteroclitus) and giant kelp (Macrocystis pyrifera).

The CDF&G letter refers to trace metals discharged into Diablo Cove. The FES issued in May 1973, on pages 5-14 through 5-21, contained a discussion of the substances known to be in the station discharge. None was concluded to be at or near toxic levels during normal operation. Since January 1975, PG&E has submitted monthly reports to the California Regional Water Quality Control Board in compliance with the Waste Discharge Monitoring Program. These reports contained a table in which concentrations of eight heavy metals were shown in the discharge water. These metals are arsenic, copper, iron, lead, mercury, nickel, zinc, and cobalt and all were shown to occur in acceptably low levels.

The Staff's assessment is that the copper which was released into Diablo Cove in 1974 has been flushed from the Cove, taken up by biota, or incorporated in sediment. The copper presently in the waters and kelp of the Cove occurs at levels similar to those in water and kelp analyzed at control stations. It is the Staff's position that any copper remaining in the Cove in excess of the concentration normally found in sea water is bound up in sediment and would have to become soluble before it could be taken up by the Cove's biota. PG&E has measured copper concentrations in the sediment of Diablo Cove which are high enough to indicate presence of some of the copper that was discharged in 1974. The insoluble copper which remains in the rubble on the bottom of Diablo Cove is not likely to become soluble because the pH and dissolved oxygen levels in the water are too high. The Staff does not expect any residual effects of copper or nickel such as bioaccumulation in organisms. McKee and Wolf (1963) state that copper is not a cumulative systemic poison being unlike lead or mercury. The ultimate sink for both the soluble and insoluble forms of copper and nickel is the Pacific Ocean because of the exchange of water between the Cove and the Ocean.

Bull kelp is an important element in the food chain of Diablo Cove, being a chief food of abalones and sea urchins. Bull kelp takes in nutrients from the water rather than directly from the sediment thus copper in the sediment must first dissolve in order for it to be taken up by the kelp. Bull kelp has increased in abundance several-fold since the copper was released, according to the California Department of Fish and Game Quarterly Report Number 8. This indicates that copper in the sediment has had no detrimental effect on growth of bull kelp.

Soon after the copper releases occurred, initial copper concentrations were more than 100 times higher in bull kelp in the affected portion of the Cove than in bull kelp at control stations (PG&E 1974). Copper levels in kelp as measured by PG&E in 1975 had decreased to levels found in kelp at control stations.

The Staff believes there is no need to attempt to remove the copper and nickel that remains in Diablo Cove because very little soluble copper or nickel remains there.

Ecological Effects Of Foam

PG&E studies have shown the froth and the foam at the discharge to be similar to froth and foam produced by natural wave action (PG&E Jan. 1976).

McKee, J. E. and H. W. Wolf. 1963. Water quality criteria, 2nd edition. Resources Agency of California, State Water Quality Control Board, Publ. No. 3-a.

PG&E. 1974. Environmental Investigations at Diablo Canyon. Page 56.

PG&E. Jan. 1976. Foam Control at Diablo Canyon, Report to the California Regional Water Quality Control Board.

PG&E has also done studies which show that toxicity of the foam is not of concern (PG&E Aug. 1976).

The Staff intends to require in the Environmental Technical Specifications a program for monitoring the foam and any effects it might have on light inhibition and decreased photosynthetic activity. The National Pollutant Discharge Elimination System (NPDES) permit also contains a program for foam control and monitoring. However, the Staff recognizes that it may be impossible to separate the adverse effects of the foam from the adverse effects of the heated discharge water. Also, it may not be practical to attempt to lessen the impact of the foam if the thermal plume precluded certain organisms from a portion of the Cove.

PG&E formed its opinion that carrageenin contributes to foam production in Diablo Cove through deductive reasoning. The Applicant observed more foam was produced when the tide was high than when it was low. PG&E reasoned that the foam was produced in part by carrageenin because bull kelp produces carrageenin, a mucus substance, and because bull kelp makes up most of the biomass in the surface waters of Diablo Cove. After receiving the CDF&G letter, the NRC Staff checked with PG&E and learned the Applicant is now uncertain of the role of carrageenin in producing foam.

Siltation In Intake Cove

Modifications could be made to the breakwater to decrease silt in Intake Cove and a requirement to begin engineering studies on possible modifications could be included in the Environmental Technical Specifications. However, Intake Cove is now a quiet-water environment and is developing biotic communities adapted to this condition. Observations made by PG&E in 1976(a) during repairs of the inside of the breakwaters have affirmed the Staff's prediction that new ecological communities will reestablish themselves in the Cove. Biological monitoring by PG&E in 1976 (b) during the repair work found 183 species inhabiting the breakwater suggesting that the inboard breakwater was "excellent habitat supporting a diverse assemblage of animal and plant life." Modifications to increase circulation and wave action could adversely affect the biotic communities which are becoming established in the Cove; therefore, the NRC Staff does not consider modifications to the Intake Cove desirable.

PG&E. Aug. 1976. Toxicity of Concentrated Seafoam Generated at Diablo Canyon Nuclear Power Plant. Report No. 7846.6-76.

PG&E. 1976.a Environmental Monitoring and Animal Transplanting During Breakwater Repair Work at Diablo Canyon Nuclear Power Plant. Report 7846.4-76.

PG&E. 1976.b Supplement to Environmental Monitoring and Animal Transplanting During Breakwater Repair Work at Diablo Canyon Nuclear Power Plant. Report 7846.10-76.

The Addendum recognized that PG&E terminated its efforts to clean up Intake Cove in November 1975 because of decreasing effectiveness of the dredging technique. The December 1974 reports referenced by the CDF&G in its letter describe inspections performed nearly a year before the dredging was terminated. Because of the tendency for particulate matter to settle in the Cove, further cleanup of the Cove is not likely to be effective. PG&E has exercised erosion control practices to further limit the siltation of Intake Cove. The silt remaining in the Cove will reduce use of its bottom by organisms which prefer rocky surfaces, thus some impact on the Cove will continue during existence of the breakwater. The NRC Staff is of the opinion that PG&E has honored the cleanup and abatement agreement with the State of California. The Staff also understands that the CDF&G has remained cognizant of the cleanup effort by PG&E through contact with the California Water Quality Control Board--Central Region, review of the NPDES permit, and onsite monitoring activities.

The Staff's major interest in the silt in Intake Cove is whether this material could be drawn into the power station and pumped into Diablo Cove thereby creating turbidity and adverse effects in this Cove also, Environmental Technical Specifications calling for monitoring of this potential problem will be required. However, the Staff does not foresee placing any other monitoring or reporting requirements on PG&E with regard to siltation in Intake Cove.

Thermal Plume Characterization

Impacts associated with water discharges at a $19^{\circ}\text{F}\Delta\text{T}$ (difference in temperature between the water at the intake and at the discharge) were studied extensively and are discussed in the Addendum. Since issuance of the Addendum, analyses of additional test results have shown that thermal plumes expected with a $22^{\circ}\text{F}\Delta\text{T}$ will not differ significantly from the plumes evaluated for the lower ΔT . The $22^{\circ}\text{F}\Delta\text{T}$ is authorized by the State of California in the NPDES permit.

The NRC Staff believes that its analyses yielded reliable predictions concerning thermal impacts. However, because of the complexity of the analyses, and to confirm Staff predictions, the Applicant will be required to carry out an extensive environmental monitoring program, as stated in the Addendum.

The CDF&G letter asked whether the thermal plume will sweep along the shoreline into North, Intake, or South Coves and whether such an event could affect the distribution of marine organisms. The momentum of the discharge carries the plume offshore (see Figures 3-5 and 3-6 of the Addendum). The Staff does not expect the 4°F isotherm to sweep along the shoreline, but the Staff cannot state there will be no temperature rise

along the shore. However, if the plume impinges the shoreline, it will be only the fringe and cause very little temperature rise that probably could not be distinguished from natural temperature variations.

The CDF&G letter asked what data are available for onshore currents and local gyre conditions. The Staff's data come from Environmental Report Supplements. These supplements show that the predominant currents are parallel to the coast. PG&E's physical model tests were run to simulate no-current conditions as well as upcoast and downcoast currents.

The Staff does not consider it necessary to model all the current conditions of short duration in order to make an environmental assessment. Also, because the ecological impacts outside Diablo Cove are expected to be minimal, the Staff's conclusions would not be changed by small alterations of the plume in that region.

Inside Diablo Cove, the plume is dependent on the inflow characteristics in the two channels. The tests conducted with upcoast, downcoast, and no-current conditions modelled the range of expected inflow currents. Additionally, the estimates of plume configurations discussed in the Addendum are conservative, that is, they are overestimates of the plume sizes.

The CDF&G letter asked what impacts would be caused by gyres and stagnant areas in Diablo Cove during operation of both Units of the Diablo Canyon Station. The gyres and stagnant areas which the Staff depicted in Figures 3.3 and 3.4 of the FES Addendum were drawn from physical model test data. The same tests were used to obtain information about the thermal characteristics in Diablo Cove. The gyres and stagnant regions do not have a separate effect on the plume; rather, both are effects of the discharge system. Thermal plume data also were used in the assessment of chemical and ecological impacts; therefore, these impacts are not separately affected by the circulation pattern in Diablo Cove.

Other Effects Of Circulation Patterns

The CDF&G letter recommended the Applicant demonstrate that future plant operation will not cause toxic conditions in Diablo Cove or surrounding receiving water, given certain circulation patterns in north and central Diablo Cove. CDF&G indicated concern over the distribution of chlorine, chlorinated organics, trace metals, and temperature, as well as the impacts of scouring.

Toxic conditions result from release of toxic materials, not from the circulation patterns in Diablo Cove. All tests show considerable and rapid dilution of discharge water in the Cove. The gyres and stagnant

areas are a manifestation of the dynamic nature of the Cove's circulation. Figures 3.3, 3.4, 3.5, and 3.6 in the Addendum are schematics and do not depict the continuous changes in the gyres and stagnant areas. In addition, the stagnant area of the Cove contains water that has entered from the Pacific Ocean, not water discharged from the power station. Also, because the gyres and stagnant regions were seen in the thermal tests, their effects on water parameters are part of the results and do not require separate analysis.

The CDF&G letter recommended that the impact and scouring be addressed. Because Diablo Canyon is rock-bottomed, no scouring is expected.

Because knowledge of the current field is essential to understanding the behavior of the thermal plume, the Environmental Technical Specifications will include a requirement for making measurements of both current and temperature.

Biological Evaluations At ΔT 's Of 19°F And 22°F

The CDF&G stated that impact predictions at ΔT 's of 19°F and 22°F are inconclusive. The Staff interprets this to mean that CDF&G considers the prediction of biological impacts to be unsupported. The Staff analyzed operation of the plant at the design ΔT of 19°F and described the resultant biological impacts in the FES Addendum. The Staff had not completed its biological evaluation for a ΔT of 22°F when the Addendum was issued in May 1976 because the State of California did not authorize this ΔT until the NPDES permit was issued in April 1976. The Staff assumes that the CDF&G reviewed the NPDES permit before it was issued and would appreciate receiving the CDF&G's appraisal of the biological impact at the higher ΔT approved by the State. This information would be helpful in confirming the Staff's assessment. In this regard, on May 18, 1976 the Staff sent a letter to Kenneth Jones of the California Regional Water Quality Control Board requesting the basis for approval of the ΔT at 22°F, but no response was received.

Status Of The Bull Kelp Community In Diablo Cove

The CDF&G disagreed with the NRC Staff evaluation that the loss of 10 to 20 acres of bull kelp will not adversely affect the regional marine life that is dependent on kelp. The CDF&G pointed out that 20 acres of kelp contribute approximately 150,000 pounds of biomass to the marine food chain of Diablo Cove and that the kelp also provides habitat for a variety of plants and animals.

The NRC Staff agrees that those organisms dependent on the kelp within the 20 acres will be adversely affected although the urchins and abalones dependent on kelp in the Cove already have been reduced to low levels by sea otter foraging. However, the CDF&G statement that significant

impacts will occur outside the Cove because of the loss of kelp within the Cove is unsubstantiated. The size of the kelp beds along the Pacific Coast vary considerably from year to year without documented impacts to other species. For example, Burge and Schultz (1973) of the CDF&G in their report on the marine environment in the vicinity of Diablo Cove note that a large bed of bull kelp was nearly destroyed by sea urchins in North Cove. These authors also indicate that heavy rains and runoff caused a major decline of giant kelp beds in the Point Estero area in 1969. Giant kelp beds in the Morro Bay area were noted to exist seasonally for many years but often disappear for a year or more. The CDF&G has not indicated that any of these declines of kelp beds had significant impacts beyond their immediate vicinity.

Abalones and urchins, the primary grazers on kelp, have declined in number by as much as 95 percent in Diablo Cove. These reductions, coupled with the three-to four-fold increase in kelp densities along the Pacific Coast in the last two years assure that sufficient biomass exists for other food chains.

Species of algae and kelp other than bull kelp are abundant in Diablo Cove. Some of these species occur much farther south than the bull kelp and probably are tolerant of higher temperatures than bull kelp. These species may flourish in Diablo Cove after the bull kelp dies and ceases to compete for space, light, and nutrients. The increase in abundance and growth of the temperature-tolerant algal species will supplement the biomass of the reduced population of bull kelp. The CDF&G states on page 72 of its 1973 Burge and Schultz report on Diablo Cove that "other members of the phaeophyta such as Macrocystis, Alaria, Costaria, Egregia, and Postelsia are also important abalone foods in central and northern California, especially where bull kelp does not exist."

The CDF&G letter questioned the accuracy of the Staff's statement in the Addendum that kelp is not abundant outside of Diablo Cove because the water is too deep. However, the 1973 Burge and Schultz report by the CDF&G states that, "In the Diablo study area, ...few beds were seen outside 40 foot depths" and, "In general, the important algal production, of abundant kelps and foliose beds, is limited to depths shallower than 50 feet throughout the Diablo system."

The CDF&G letter indicated that giant kelp is a southern California species with higher temperature tolerance than the bull kelp. Therefore,

Burge, R. T. and S. A. Schultz, 1973. The marine environment in the vicinity of Diablo Cove with special reference to abalone and bony fishes. Calif. Dept. Fish & Game. March Resour. Tech. Report No. 19.

CDF&G maintained that the Staff should not have predicted the tolerance of bull kelp to higher temperatures on the basis of data for giant kelp. However, the NRC Staff believes the two species are similar in their general response to temperatures and much data on thermal tolerance are available for the giant kelp which can be extrapolated to indicate the response to thermal changes by bull kelp.

Status Of Abalone And Urchin Populations

The Addendum indicates that Diablo Cove has been degraded as a fishery by natural predation and human activities. The Staff was using the term "human activities" primarily to mean construction and operation of the Diablo Canyon Power Station.

The CDF&G stated that abalone and sea urchin declines were primarily due to factors related to the operation of the power station. The FES Addendum acknowledges that the copper discharges from the Diablo Canyon Station killed abalones in the outfall area. However, the CDF&G letter dated October 7, 1975 to NRC (Appendix A of the Addendum) states that sea otters reduced abalone numbers by 75 and 80 percent in control areas north of Diablo Canyon. The CDF&G further indicated in the October letter that sea urchin numbers declined at similar rates in Diablo Cove and control areas. It is the Staff's opinion that plant-related factors such as copper discharges contributed to the decline of abalones and urchins; however, the primary reason for the major and earlier decline appears to be predation by sea otters.

The CDF&G letter (page 8, item 13) asked four questions about the mortality rates of larval red abalones as caused by increases of 18°F in water temperatures during the PG&E laboratory studies that were referenced in the Addendum. The answer to the first of the four questions is that three experimental and three control replicates of the temperature tests were performed. For the second question, the data are as reliable as allowed by the state of the art for mariculture experiments. The third question was whether abnormally high mortalities occurred in the control group of abalones in experiments 1, 2, 3, and 5. High mortality occurred; however, it was not abnormal because high natural mortalities are common during mariculture work on early life stages of molluscs. In response to the fourth question, a t-test statistic was used to establish the "insignificant mortality" of abalones.

The CDF&G letter asked about the impact of the thermal plume on abalone outside of Diablo Cove. The Staff's assessment in the Addendum shows that this impact will be negligible because the plume will be on the surface and have a much smaller ΔT than inside the Cove.

Status Of Finfish Populations

CDF&G stated that existing finfish fisheries and projected fisheries in the vicinity of the power station were not adequately addressed in the Addendum. The Staff reviewed the finfish data which were collected by CDF&G for the Diablo Canyon area. However, impacts on fisheries were not discussed because CDF&G reports indicated that sport and commercial fishing for the inshore fish species was minimal. Burge and Schultz (1973) noted that sport fishing from the shore in the Diablo Cove area is limited because of the rugged coastline and lack of public access to the shore. The FES (page 5-47) concluded that operation of the Diablo Canyon Station was not expected to have an adverse effect on sport or commercial fisheries outside Diablo Cove; therefore, the Staff does not consider it necessary to expand the discussion on finfish fisheries.

The CDF&G annual report for 1975 states that the catch-per-unit effort for sportfish was less in Diablo Cove than control stations because fishing in Diablo Cove was almost impossible because of the dense bull kelp canopy. The hook-and-line method of determining sport fish abundance used by the CDF&G is at best semi-quantitative. For example, in the summer of 1975, Diablo Cove yielded a catch rate of 2.89 fish per hour while control stations produced 2.7 fish per hour. During the previous quarter only 0.5 fish per hour were caught in Diablo Cove.

CDF&G states that nearshore larval fishes, zooplankton, and phytoplankton have a great potential for entrainment impacts. The Staff has determined on a conservative basis that only 1.9 percent of the water flowing by the plant will be passed through the power plant. On this basis and those described in the FES Addendum, the Staff believes that impacts to these populations will be negligible.