United States Department of the Interior

FISH AND WILDLIFE SERVICE

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PORTLAND, OREGON 97232

June 19, 1980

In reply refer to:
AFA-SE, #1-1-80-F-31

Mr. William H. Regan, Jr.
Acting Assistant Director
Environmental Projects
Division of Site Safety and Environmental Analysis
Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Regan:

This is in response to your letter dated January 23, 1980, requesting consultation pursuant to Section 7 of the Endangered Species Act of 1973, as amended, as to the effects of operation of the Diablo Canyon Nuclear Power Plant (DCNPP) on five endangered species. The original list included the gray whale, Eschrichtius robustus. The gray whale is under the jurisdiction of the National Marine Fisheries Service and will not be considered in this consultation. The remaining species, southern sea otter (SSO), Enhydra lutris nereis; California least tern (CLT), Sterna albifrons browni; California brown pelican (CBP), Pelecanus occidentalis californicus; and the American peregrine falcon (APF), Falco peregrinus anatum, are considered in this examination for potential impacts subsequent to project operation.

In addition to your request for consultation, we have received Volumes I and II of PG&E's Environmental Investigations at Diablo Canyon, 1975-1977; and the Final Environmental Statement for the operation of the Diablo Canyon Nuclear Power Plant Units 1 and 2 (1973) and addendum (1976). On January 8, 1980, representatives from the U.S. Fish and Wildlife Service, California Department of Game (CDFG), and the Nuclear Regulatory Commission (NRC) met to review the project and potential impacts to endangered and threatened species.

SPECIES ACCOUNTS

Southern Sea Otter

The sea otter is the largest member of the family Mustelidae and is one of the smallest species of marine mammals. It inhabits a narrow ecological zone in the marine environment, the nearshore community of rocky shoreline with kelp beds. C002 S

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The species historically ranged throughout much of the northern Pacific coastal region. However, after 170 years of commercial harvest for their pelts, the population was virtually extirpated from its entire range. In fact, in 1910 it was believed by some that the California population of sea otters was extinct. The SSO was "rediscovered" in 1938 when approximately 50 animals were observed rafting off Bixby Creek, Monterey County (Bolin, 1938; Fisher, 1939).

The California population has been under protective State legislation since 1913. In 1972, protective responsibility for sea otters was assigned to the Federal government by the U.S. Congress under the Marine Mammal Protection Act. Further protection was given the otter in 1977 when the Secretary of the Interior, in accordance with the Endangered Species Act of 1973, determined that the SSO population in California was threatened.

The current range of the SSO extends about 200 miles, from Pismo Beach, San Luis Obispo County in the south to Soquel Point, Santa Cruz County in the north. This range is less than 10 percent of historic range. The 1979 census by the CDFG estimated the population at 1,443 animals. This count is below that made in 1976 by CDFG which estimated the population at 1,789 animals.

The densities of SSO within their range give the population distribution a dumbell-like configuration. At the peripheries of the range are large aggregations of animals composed mostly of adult and subadult males. The front groups concentrate along about 4 miles of coast at both ends of the range. Numbers in these front groups vary seasonally, increasing in the winter and early spring to near 150 individuals. During the summer and fall, numbers decrease presumably as mature males disperse into the center of the range (Jameson, pers. comm.). The population of otters inhabiting the center of the range apparently is stable and is composed of approximately 70 percent females including females with pups (Ames, pers. comm.). Density variation throughout the center of the range correlates to substrate type with greater densities of otters found in areas with a rocky bottom than in areas with a sandy bottom (CDFG, 1976).

Sea otters are polygamous and the male does not participate in the rearing of the young. Breeding and pupping occur throughout the year (Kenyon, 1969); however, Sandegren et al. (1973) reported the maximum birth rate occurs from December to February in California. The average birth rate is unknown. Young are dependent upon the female for nourishment, care, and training for about 8 months (Vandever, 1979).

Otters are active both day and night and forage in both rock and soft-sediment communities, on or near the bottom as well as in the kelp forest and canopy. Foraging occurs in both the intertidal and subtidal zones. Preferred food items are sea urchins (Strongylocentrotus sp.), abalone (Haliotis sp.), and rock crabs (Cancer sp.); however, sea otters do consume a wide variety of food items including Pismo clams, squid, turban snails, kelp crabs, mussels, octopuses, etc. (Ebert, 1968; Wild and Ames, 1974). In Monterey Bay, squid (Loligo opalescens) spawn seasonally during the fall and spring. The large aggregation of spawning squid provides an alternative food source which the local sea otters readily use. Costa (1978) estimated energy consumption for a free ranging otter to be 270 kcal/kg/day. To satisfy this requirement, otters will eat approximately 20-25 percent of their body weight (which averages 19.5 kg for females and 29 kg for males) every day (Costa, 1976; Fausett, 1976).

There is little subcutaneous fat for energy storage and no layer of blubber for thermoinsulation as in pinnipeds and cetaceans. Insulation from cold sea water is provided entirely by air trapped in the fur (Morrison et al., 1974). The small body size of the otter and the relatively inefficient insulation provided by its fur necessitates a high standard metabolic rate (SMR) for survival in the marine environment.

The interrelationship between food consumption and SMR in critical. Kenyon (1969) reported that otters, when not fed, may lose up to 10 percent of their body weight per day and that a 25 percent weight loss is normally fatal.

The effect of non-human predation on sea otter numbers is unknown. Shark teeth from the white shark (Carcharodon carcharias) and wounds suggestive of shark attack have been found in beached carcasses in California (Morejohn et al., 1975).

At present, the greatest threat to the survivorship and recovery of the SSO population is oil contamination within the sea otters' range. Otters are among the marine mammals most likely to be affected by oil spills (Davis and Anderson, 1976; Geraci and Smith, 1977). It is not known whether sea otters are capable of detecting and avoiding oil contaminated areas. Preliminary studies by Williams (1978) on Alaskan sea otters in captivity demonstrated that otters do not avoid oil contaminated areas and even repeatedly enter such areas after initial exposure. Over 100 otters died as a result of contamination from a tanker grounding and subsequent oil spill at Paramushir Island (Barabash-Nikiforov et al., 1968), thus suggesting that otters are not capable of avoiding oil nor possibly even detecting it. Kooyman

and Costa (1979) conclude that crude oil contamination over small areas of the sea otter's fur would probably cause significant thermal stress and could lead to hypothermia and/or pneumonia resulting in death.

The U.S. Fish and Wildlife Service is currently drafting the Southern Sea Otter Recovery Plan. The Service and CDFG recognize the establishment of a viable population of SSO in at least one disjunct translocation site would in all probability be adequate to delist the otter from its present status as threatened.

California Brown Pelican

CBP's formerly nested in the Monterey region in large colonies on many of the islands off southern California and the northern Baja coast. In 1968 Schreiber and DeLong (1969) surveyed brown pelicans in the Channel Islands and found nest abandonment prevalent in those areas where breeding birds were found. Risebrough et al. (1971) found an incredibly high degree of nest failures due to a 50 percent reduction in mean eggshell thickness. This significant reduction in productivity as a result of environmental pollution by DDT and its metabolites led the Secretary of the Interior to declare the CBP an endangered species. The species is also listed by the State of California as endangered.

The degree of eggshell thinning has been shown in many studies to be highly correlated with concentrations of DDE, a metabolite of DDT in egg lipids (Gress 1970; Jehl 1973; Risebrough et al., 1971; Schreiber and Risebrough, 1972). The high levels of contamination began to subside when the manufacturer of DDT ceased dumping liquid wastes into the Los Angeles sewage system. Subsequently, the percentage of young fledged from breeding colonies increased. Although we are unaware of pollutant levels still reaching the marine environment, we suspect contamination still exists.

The northern anchovy is the main constituent of the pelican diet. Anderson (pers. comm.) believes that reproductive success directly correlates with anchovy abundance. Any factors that would depress population levels of anchovies or food availability could have a severe impact on the recoverability of the pelican.

The Monterey region is an area of great importance to the CBP, particularly during the northward post-breeding dispersal (Baldridge, 1973). Although not common until June, numbers of birds increase steadily through July and August, with peak numbers in December and January.

Historically and presently, important large summer and fall roosts have been located on Big Sur coastal rocks, on offshore rocks at Pt. Lobos and Pt. Pinos, at the sand spit at the mouth of the Salinas River, Elkhorn Slough, Moss Landing, and at the mouth of the Pajaro River.

The pelican situation off southern California continues to remain bleak. Apparently as one problem lessens, others intensify. As DDT and PCB pollution subsides (Anderson et al., 1977), offshore oil development and increasing tanker traffic, increased anchovy harvests, sonic booms by the space shuttle, and other impacts constitute new threats to pelicans.

California Least Tern

Least terns are the smallest member of the tern family. Historical breeding range extends along the Pacific Coast from Moss Landing, Monterey County, to San Jose del Cabo, southern Baja California (Dawson, 1924; Grinnell and Miller, 1944). Although the present breeding range extends north to South San Francisco Bay, the continuing loss of both shoreside nesting habitat to human disturbance and development, and feeding habitat to dredging, diking, filling, and pollution have been responsible for a decline in numbers up to the present time (Craig, 1971). The CLT is not only protected by the Endangered Species Act but the State of California has also listed the CLT as endangered.

The tern is migratory, usually arriving at its breeding grounds during the last week in April and departing in August (Davis, 1968; Massey, 1974, Swickard, 1971).

Least terns are colonial but do not nest in dense concentrations as do many other terns. They normally select a nesting site on an open expanse of sand, dirt, or dried mud with loose substrate adjacent to a lagoon, estuary, or a wetland where food is available (Davis, 1968; Craig, 1971; Massey, 1971 and 1974; Swickard, 1971). Formerly sandy ocean beaches were used, but increased human activity has rendered many of these sites uninhabitable. Recently most nesting has occurred on mud and sand flats back from the ocean or on manmade land fills (Craig, 1971; Longhurst, 1969).

The CLT obtains most of its food from shallow estuaries and lagoons and only occasionally forages offshore in the ocean. These terns are known to eat only fish, especially small-bodied species such as the northern anchovy (*Engraulis mordax*), deepbody anchovy (*Anchoa compressa*), jack-smelt (*Atherinopsis californiensis*), topsmelt (*Ahterinops affinis*),

California grunion (Leuresthes tenuis), shiner surfperch (Cymatogaster aggregata), California killifish (Fundulus parvipinnis), and mosquitofish (Gambusia affinis) (Massey, 1974).

The importance of productive foraging sites near the breeding grounds is evident since parental feeding of young continues until migration. Only after the young birds migrate from the breeding grounds do they become competent fishers (Massey, 1974; Swickard, 1971; Tompkins, 1959).

The destruction and loss of nesting habitat are considered to be the major factors in the decline of the species. At the same time, feeding areas have been filled and polluted. Similarly, the disturbance of breeding areas and nesting birds can pose significant threats to the reproductive efforts of this bird. Predators such as Norway rats, dogs, and gulls have been implicated in a number of egg losses. Losses of tern chicks have been attributed to the American kestrel (Falco sparverius) (Craig, 1971), house cats, and dogs. All factors that have contributed to the decline of the tern continue to operate and the bird's status continues to be precarious.

American Peregrine Falcon

The American peregrine falcon historically nested throughout North America, south of the boreal forest, wherever suitable nesting habitat and prey species occurred together. In the first half of this century, the peregrine population in the western United States declined due to direct and indirect impacts, particularly due to habitat loss and shooting (Bond, 1946). Herman et al. (1970) estimated the breeding population in California to be about 100 pairs prior to 1947. A rapid decline in peregrine populations occurred throughout most of Europe and North America during the years following World War II due to widespread use of chlorinated hydrocarbon pesticides (Hickey and Anderson, 1969). By 1970, the California population was estimated to be less than 10 reproductive pairs (Herman et al., 1970). By this time, the peregrine was extirpated as a breeding species in Canada south of the boreal forest and in the United States east of the Rockies. In 1978 the 23 pairs of peregrines in California fledged an average of 1.38 young, with the North Coast Range population fledging an average of 1.82 young (Harlow, 1978). In 1979, 31 California pairs fledged an average of 1.37 young per pair (Harlow et al., 1979). Although these data are encouraging, reproductive failures due to thin eggshell conditions continue to threaten the California peregrine populations. Recent data show that eggshell thinning occurs in nearly all peregrine nest sites, and some sites suffer severe thinning causing reproductive failure (Kiff, et al., 1979).

PROJECT IMPACTS

DCNPP is located on a marine terrace in San Luis Obispo County on a remote site that is undeveloped and relatively uninhabited. The coast in this area is rugged with tidal pools and offshore rocks. The cliffs rise steeply from the high water line to the marine terraces. The nearest town is Avila Beach about 7 miles east southeast (Figure 1). Construction began in June 1968 and was subsequently completed. At issue are the potential impacts operation of the facility may have on listed endangered species. Of principal concern are the effects from the cooling water system where seawater is taken in to cool the reactor and then discharged back into Diablo Cove.. This heated discharge will dissipate into the cool marine waters. Models have been developed estimating the possible increase in the temperature regime of the local waters. The cooling water flow will be about 3,864 cubic feet per second. The temperature rise through the condenser will be about 19°F. The maximum historical temperature observed in the cove has been 63.5°F. Therefore, the maximum discharge temperature is expected to be 82.5°F. Thermal dissipation is dependent upon tide stages, currents, and sea conditions. An increase in ambient water temperature will affect the local marine community but this change should not be significant. The ranges of thermal dissipation are illustrated in Figures 2, 3, and 4.

Additional to the heated effluent is the concentrated foam generated by this system, plus recirculation of superheated water and chemicals contained in the effluent including antifoaming agents, chlorine, titanium, heavy metals, and radioactive nuclides. Foam will be generated by the discharge of the cooling water. It is believed that the foam composition will be similar to natural seafoam, although it is unknown what might be added to the foam via plant operation. The thickness of the foam, the extent of the mat, its influence on the marine environment (such as eliminating photosynthesis by algae from shading), and how it might affect sea otters (particularly their fur) is unknown. Seafoam is not expected to affect the CBP, CLT, or APF.

Superheated seawater will be recirculated monthly as a heat treatment for defouling the conduits. Water flow through the plant will be reduced to one-fourth of normal and the temperature elevated to about 50 F above ambient. After holding for 1 hour for treatment, this water will then be discharged into the cove. Although this hot water will be cooled by ocean waters, the short term and long term effects are unknown.

Several chemicals will be discharged with the cooling effluent. Chlorine will be used intermittently as a biocide in the auxiliary cooling system and occasionally in the condenser cooling system. Pursuant to the National Pollution Discharge Elimination System permit issued by the California Regional Water Quality Control Board, Central Coast Region, the total residual chlorine in the plant discharge will not exceed 0.1 ppm. Sedentary invertebrates will not be able to avoid any localized discharge plumes of an undesirable nature. Studies using concentrations of residual chlorine to test for chronic mortality (30 daily 20-minute exposures) of 0.5 mg/l(=ppm), free residual chlorine) resulted in mortality to tidepool shrimp (Heptacarpus pictus) and stress responses from abalone (Haliotus cracherodii, H. rufescens), turban snails (Tegula brunnea), and the purple sea urchin (Strongylocentrotus purpuratus). Since test concentrations of residual chlorine exceeded that permitted for discharge, it is expected that the discharge effluent containing chlorine should have no deleterious effects on the invertebrates studied (PG&E, 1978). Toxicity of chlorine to other species was not examined.

Commercially prepared chemical antifoaming agents are proposed to eliminate the generation of foam at DCNPP. Two products were tested - NOPCO 9290-A and NOPCO 2019-R - for toxicity to selected marine organisms (not endangered species). Antifoaming agents have not yet been tested in the DCNPP cooling system to determine effectiveness. NOPCO 9290-A seems to be the less detrimental agent to the species tested (black abalone, purple sea urchins, and copepods). Concentrations of this agent necessary to cause mortality will not be reached in normal discharge. Again, there has been no correlation made to impacts on endangered species.

Titanium (Ti) tubing is used in the condenser cooling system. The corrosion product of Ti, TiO_2, is an inert oxide which forms an adherent protective passivation coating on the surface. The corrosion rates of Ti in sea water have been reported as "nil" ranging from 3×10^{-2} to 3×10^{-5} mil penetration per year. Ti is also resistant to heated seawater and chlorinated seawater. Ti toxicity has been found in very few studies and is not considered to be a problem (PG&E, 1978).

Trace amounts of copper, nickel, chromium, and other elements are expected to be discharged in the effluent. The accumulation of heavy metals in the marine environment is known to be a serious pollution problem with both acute and chronic toxicity effects. The severity of pollution and the resultant impact(s) from the operation of DCNPP are unknown. In October 1975, the original 90-10 copper-nickel condenser tubing was replaced with Ti tubing in the cooling water condensers at DCNPP. The copper-nickel tube sheets were coated with epoxy to eliminate contact of the copper-nickel with seawater. Dissolution of the epoxy into marine water was undetectable under test conditions.

The release of radioactive effluents from normal operations is anticipated. No detectable effect is expected on the aquatic biota or waterfowl.

Environmental Studies (Volumes I and II) and studies for the Final Environmental Statement (1973) indicate that although the environment and biota of Diablo Cove and immediate vicinity will be altered by DCNPP the effects will not likely be significant. However, insufficient information exists at present to accurately determine the long term effects of plant operation. The extent of the thermal plume, the buildup and composition of seafoam, the effect of accumulated heavy metals in the marine environment, and other scenarios all need to be examined when considering the direct and secondary impacts on listed species. There are no foreseeable adverse impacts that would immediately affect the southern sea otter, California brown pelican, California least tern, or American peregrine falcon. However, impacts that may result from the operation of DCNPP, particularly long term impacts, cannot be adequately measured and the NRC cannot protect against adverse impacts to endangered or threatened species until the plant is operating and thereafter the environment is monitored over a period of years. Only then, upon review and evaluation of subsequent reports by the Service, will the effects, if any, of plant operation on the listed species be somewhat identifiable.

BIOLOGICAL OPINION

Based on the above discussion, it is the opinion of this Service that operation of DCNPP is not likely to jeopardize the continued existence of the above listed species. However, in order to insure against irreversible impacts to these species, their habitat and recoverability, we recommend that in furtherance of the purposes of the Act (Section 2(c) and 7(a)(1)), NRC encourage PG&E to pursue the following activities, some of which PG&E currently has planned:

1. Analyze the effluent and content of generated foam and conduct studies on a sample of sea otter fur to determine if there may be any soiling effect or chemical composition that would remove natural oils from sea otter fur.

2. Monitor dispersion of generated foam and study extent of impact on marine biota, particularly marine flora.

3. Monitor discharge of titanium, heavy metals, chlorine, antifoaming agent, oils, and radioactive nuclides.

4. Monitor marine environment to determine if discharge (Item 3) is accumulating in local biota or depressing adult survival, reproduction, or survival of larval stages of local biota which subsequently affects a listed species.

5. Examine the thermal plume (both normal operating plume and the superheated, antifouling plume) for extent of direct and indirect impacts on listed species.

6. Continue sea otter studies such as those conducted by Suzanne Benech who has been studying sea otters in this area since 1973. Someone would be needed who can identify aberrant sea otter behavior that may occur because of plant operation.

7. If contaminants are found to be accumulating in the marine biota, study local current patterns to determine extent and severity of contamination relative to listed species.

8. If generated foam breaks down and does not extend beyond the local area, consider the practicality of not using an antifoaming agent.

Studies 2 through 7 should be maintained for at least 5 years in order to assure a quantifiable data base.

This concludes formal consultation. Should any of the above programs identify potential impacts to the listed species, your agency should reinitiate consultation.

Should you have any questions regarding this opinion, please contact our Area Manager, Sacramento, California (FTS 468-4664 or (916) 484-4664). Thank you for this opportunity to comment on your activity.

Sincerely yours,

R. Kahler Martinson
Regional Director

Attachments

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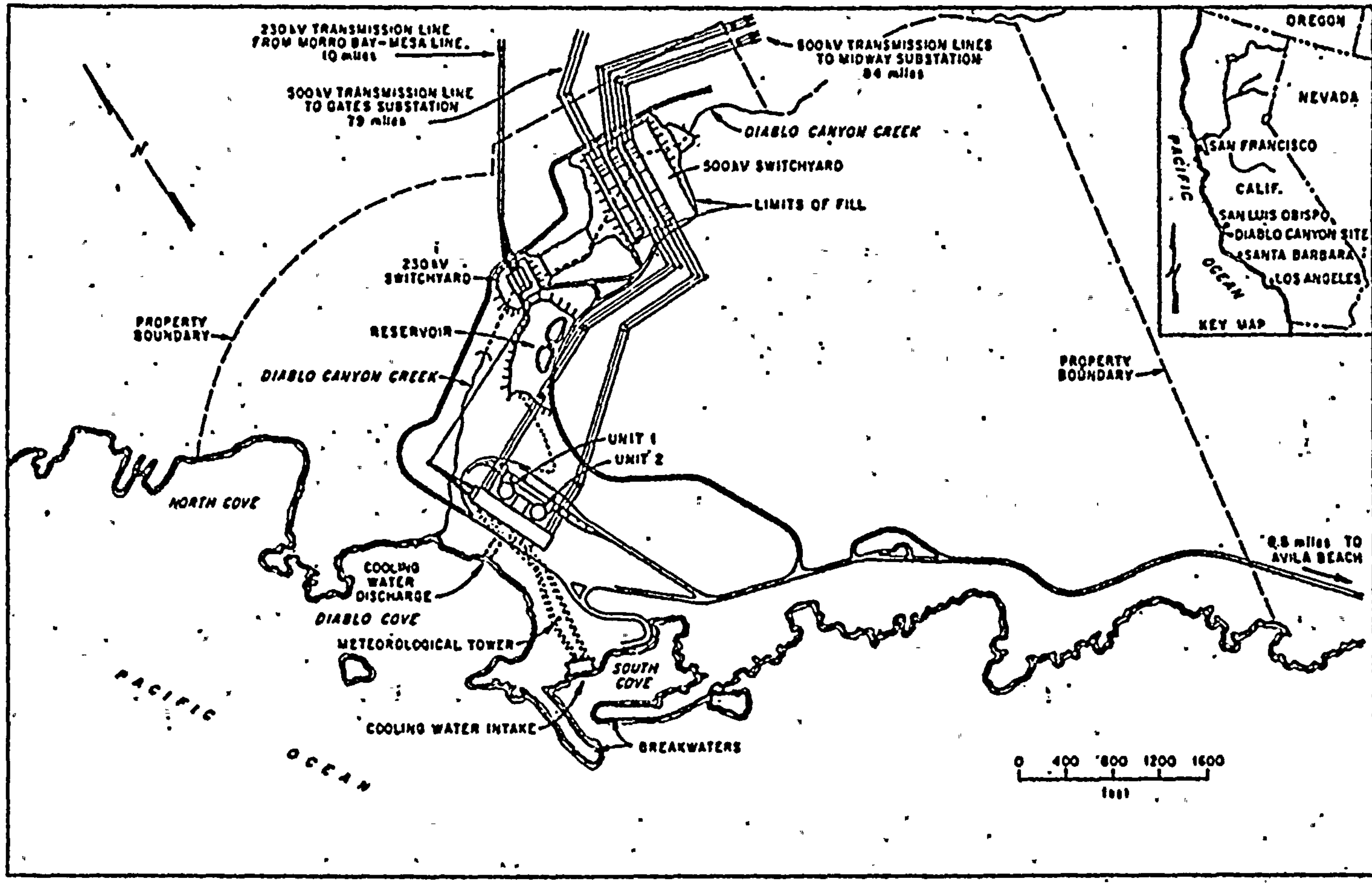

Fig. 1. Plot plan of the Diablo Canyon plant site.

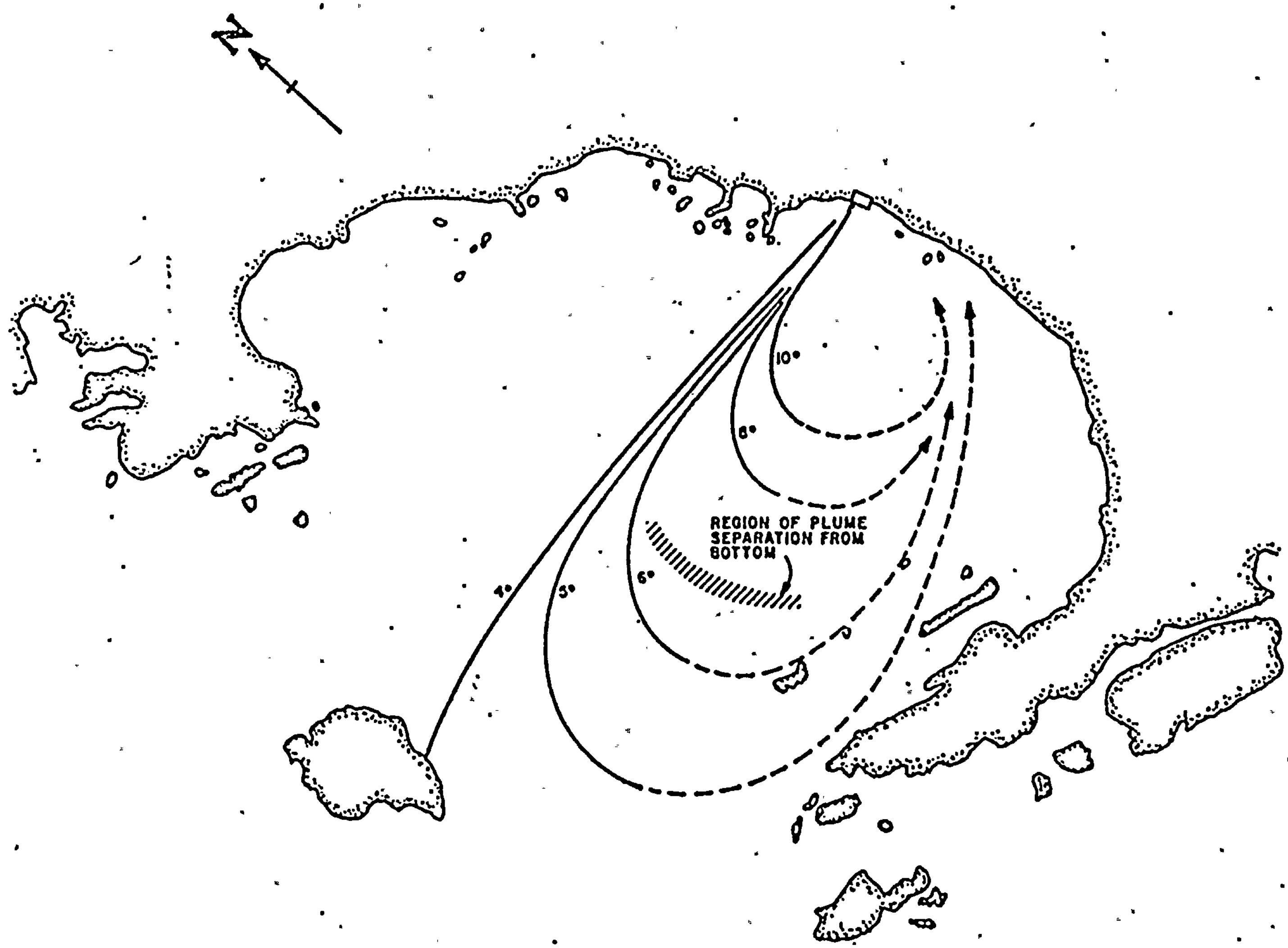

Fig. 2. High tide isotherms of thermal plume in Diablo Cove.

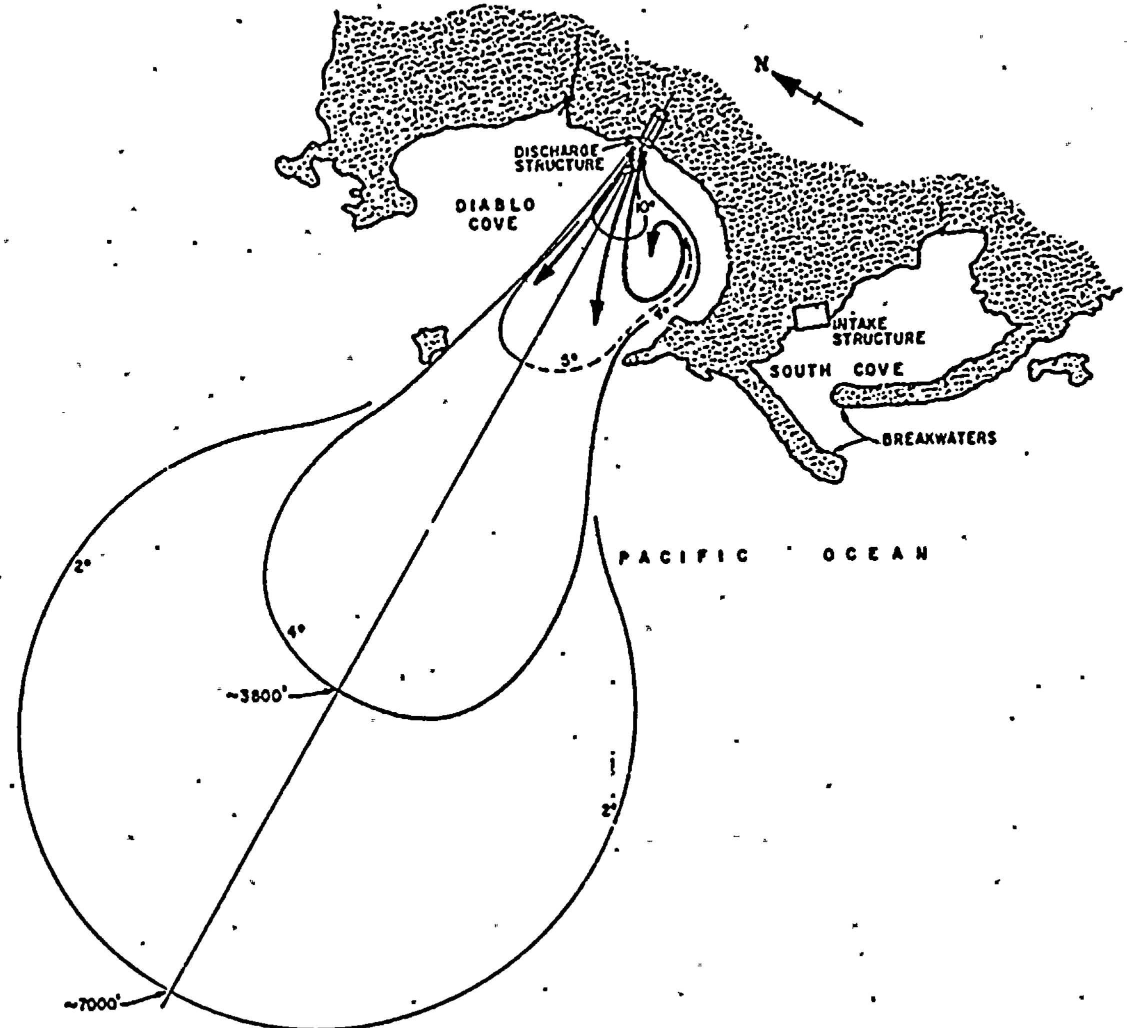

Fig. 3 High tide isotherms of thermal plume outside Diablo Cove.

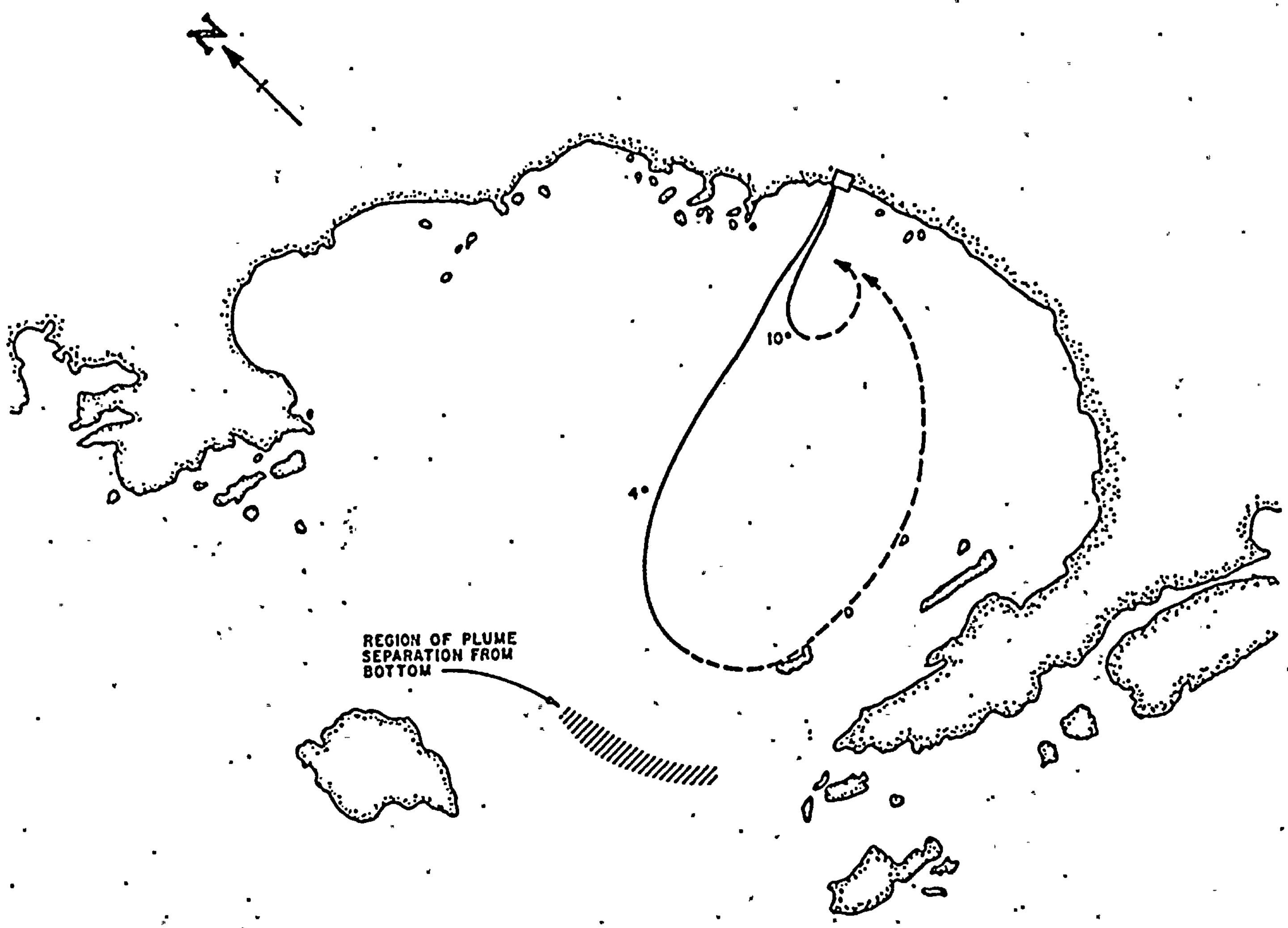

Fig. 4 Low tide isotherms of thermal plume in Diablo Cove.