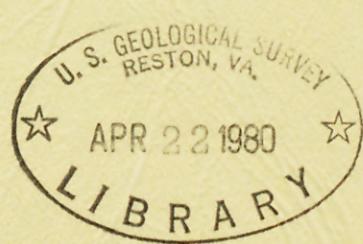


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AN OILSPILL RISK ANALYSIS FOR THE CENTRAL AND NORTHERN
CALIFORNIA (PROPOSED SALE 53)
OUTER CONTINENTAL SHELF LEASE AREA

By William B. Samuels and Kenneth J. Lanfear

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Abstract

An oilspill risk analysis was conducted to determine the relative environmental hazards of developing oil in different regions of the Central and Northern California Outer Continental Shelf (OCS) lease area. The study analyzed the probability of spill occurrences, likely paths of oil slicks, and locations of resources vulnerable to spilled oil. The analysis included estimates of the time between spill occurrence and contact with resources. The combined results yielded estimates of the overall risks associated with development of the proposed lease area. Assuming that oil will be found in all parts of the lease area, and depending upon the routes chosen to transport oil from OCS platforms to the shore, the leasing of the tracts proposed for OCS Sale 53 will, depending upon how oil is transported to shore, result in an expected 2.0 to 3.1 spills. The estimated probability that land will be contacted by one or more oilspills which have been at sea less than 30 days is between 0.49 and 0.86.

Introduction

The Federal Government has proposed to offer Outer Continental Shelf (OCS) lands off the Central and Northern California coast for oil and gas leasing. The risked mean estimate of oil resources for the proposed 243 tracts is 548 million barrels of crude oil. Contingent upon actual discovery of this quantity of oil, production is expected to span a period of 30 years. There are 175 existing Federal lease tracts to the south of the study area, containing an estimated 695 and 394 million barrels of crude oil reserves and resources respectively (risked mean estimate).

Oilspills are one of the major concerns associated with offshore oil production. An important fact that stands out when one attempts to evaluate the significance of accidental oil spillage is that the problem is fundamentally probabilistic. Uncertainty exists about the amount of oil that will be produced from the leases and the number and size of spills that might occur during the life of production, as well as the wind and current conditions that would exist at the time of a spill occurrence and give direction to the oil slick. While some of the uncertainty reflects incomplete and imperfect data, considerable uncertainty is simply inherent in the problem of describing future events over which complete control cannot be exercised. Since it can not be predicted with certainty that a probabilistic event such as an oilspill will occur, only the likelihood of occurrence can be quantified. It is important to consider the range of possible effects that could accompany a decision on oil and gas production. It is equally important, in attempting to maintain perspective on the problem, to associate each potential effect with a quantitative estimate of its probability of occurrence.

This report summarizes results of an oilspill risk analysis conducted for the proposed Central and Northern California OCS Lease Sale 53. The study had the objective of determining relative risks associated with oil and gas production in different regions of the proposed lease area. It was undertaken for consideration in the draft environmental impact statement (EIS), and to facilitate final selection of tracts to be offered for sale. A description of the oilspill trajectory analysis model can be found in a previous paper (Lanfear and others, 1979). The analysis was conducted in three parts corresponding to different aspects of the overall problem. The first part dealt with the probability of oilspill occurrence, and the second with the trajectories of oilspills from potential launch points to various targets. Results of the first two parts of the analysis were then combined to give estimates of the overall oilspill risk associated with oil and gas production in the lease area.

Decisionmaking Under Risk and Uncertainty

Oilspill impacts result primarily from two events which are probabilistic in nature: oilspill occurrence due to accidents, and oilspill movement by random winds and currents. While it can not be said with certainty that a probabilistic event, such as an oilspill will or will not occur, the likelihood of occurrence can be quantified. It is possible to predict the likelihood that oilspills will result from an OCS leasing decision, but whether they will actually occur can only be known after the area is explored and the oil, if any, is produced. This is in contrast to a deterministic situation where a particular action can be depended upon to produce a specific result.

In making decisions under risk and uncertainty, it is important to understand that a choice can have a range of possible outcomes. Generally, a desire to maximize the likelihood of the most favorable outcomes must be tempered by the need to minimize the probability of highly unfavorable outcomes. The USGS Oilspill Trajectory Analysis (OSTA) Model was designed to reflect the range of possible outcomes of leasing decisions by estimating the probability of occurrence for each discrete outcome; specifically, it estimates the likelihood that a target will be contacted by 0, 1, 2, ..., N oilspills during the production life of an OCS lease area.

The probability that, if an oilspill occurs at a given launch point, it will contact a particular target is termed a conditional probability. Such conditional probabilities can be very useful in identifying those launch points at which an oilspill, if it occurs, poses the highest risks to various targets. Tables of conditional probabilities can help the analyst to select alternatives that will reduce overall risk. However, conditional probabilities do not include the probability of oilspill occurrence. A tract that contains little or no oil is a small risk because, no matter how high the conditional probability of contacting a target may be, the small amount of oil makes it unlikely that an oilspill will occur. Also conditional probabilities for spills originating at the production platforms do not necessarily reflect the risks of transportation. For these reasons, analysts are cautioned against basing judgments solely upon conditional probabilities.

Summary of the Proposed Action and the Major Alternatives

The proposed action is to lease 243 tracts on the outer continental shelf off the Central and Northern California coast. The study area for this analysis includes all of these tracts and extends from latitude 32 degrees N to 42 degrees N, and from longitude 117 degrees W to 126 degrees W. The study area is shown as a Mercator projection in Figure 1.

Locations of the existing leases from OCS sales in 1966 and 1968 in the Santa Barbara Channel and from OCS sales 35 and 48 are shown in Figure 2; they are divided into 5 groups for purposes of this

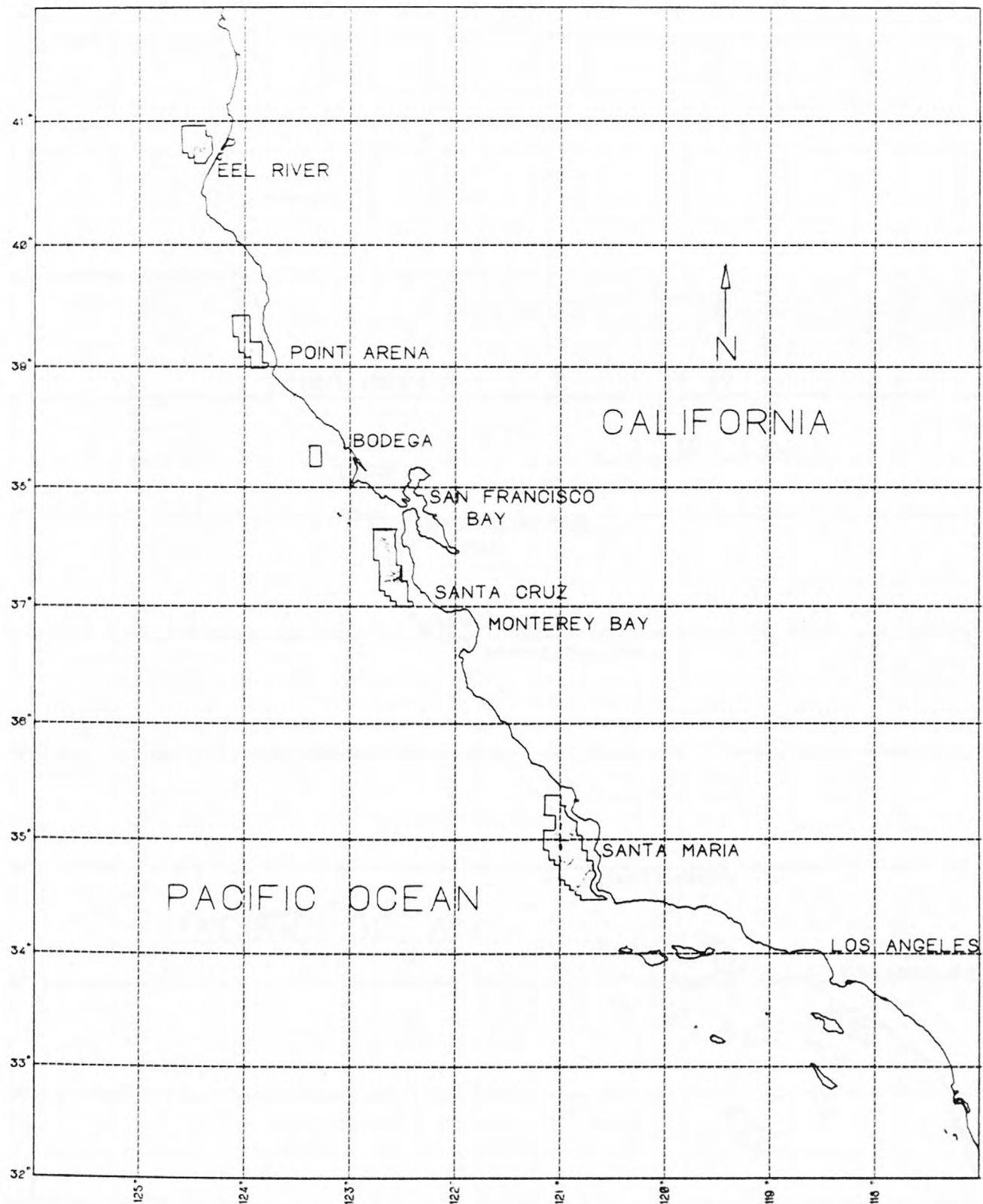


Figure 1.--Map showing the Central and Northern California OCS Lease Sale 53 study area and the proposed lease tracts.

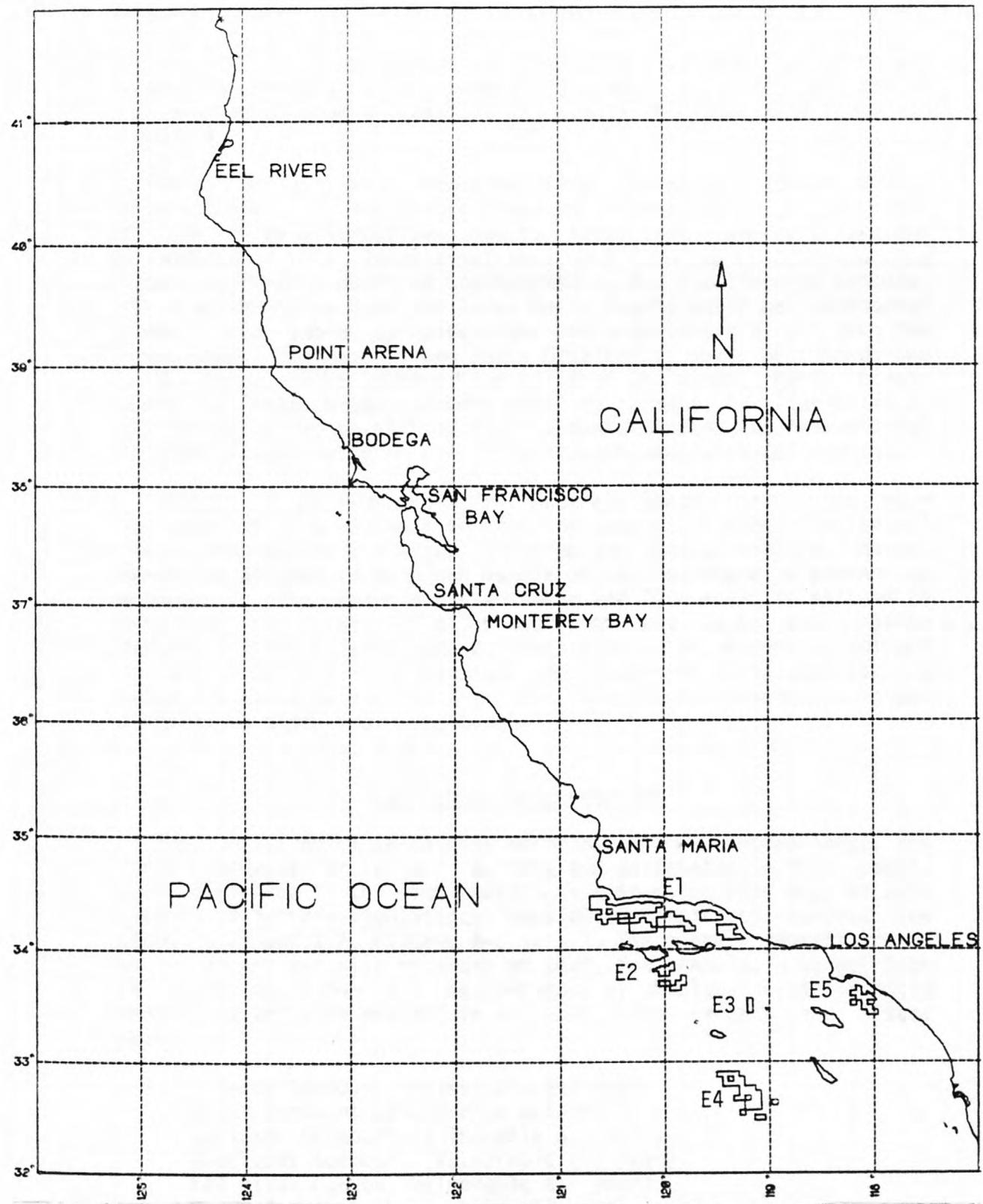


Figure 2.--Map showing the subdivisions of the existing leases in the study area.

analysis. The proposed tracts are located in five areas, identified as Eel River, Point Arena, Bodega Bay, Santa Cruz, and Santa Maria; for this analysis, they are further subdivided into 12 groups, as shown in Figure 3.

If oil is discovered and the area is developed for oil production, there are a number of ways in which oil can be transported to shore. Possible transportation routes are shown in Figure 4.

Three alternative transportation schemes, identified as alternatives 1, 2, and 3 were examined in this analysis. In each of the three alternatives, the Eel River tracts have been assumed to contain no oil. In alternative 1, oil from the Point Arena and Bodega Bay tracts would be transported to San Francisco by tankers; oil from the Santa Cruz and Santa Maria tracts would be transported directly to shore by pipelines. In alternative 2, oil from the Point Arena, Bodega Bay, and Santa Cruz tracts would be transported to San Francisco by tankers; the oil from the Santa Maria tracts would be transported to Long Beach by tankers. In alternative 3, all the oil would be shipped east by tankers using the Panama Canal or other routes, with no oil being brought ashore in California.

Oilspill risks from existing Federal leases have also been included in this analysis so that the cumulative effect of Federal lease sales can be evaluated. Oil from the Santa Barbara Channel leases is assumed to be piped ashore at Oxnard, where 30 percent is shipped to San Francisco via tanker and 70 percent is shipped to Long Beach via tanker. Of oil produced at the Santa Rosa, Santa Barbara Island or Tanner-Cortez Banks tracts, 30 percent is shipped to San Francisco via tankers and 70 percent is shipped to Long Beach via tankers. All oil from the San Pedro tracts is piped directly to shore near Long Beach.

Environmental Resources

The locations of 16 categories of biological, recreational, and other resources (or targets, as they are designated in this paper) were digitized in the same coordinate system, or base map, as that used in trajectory simulations. Maps of the digitized targets are shown in appendix A, Figures A-1 to A-3. The monthly sensitivity of these targets was also recorded so that, for example, a target such as migrating birds can be contacted by simulated oilspills only when it is actually present in an area. The targets are listed below:

- Pioneer Seamount (Vulnerable all year)
- Guide Seamount (Vulnerable all year)
- Davidson Seamount (Vulnerable all year)
- Rodriquez Seamount (Vulnerable all year)
- Eel River Canyon (Vulnerable all year)
- Gorda Seamount (Vulnerable all year)
- Gulf of the Farallons (Vulnerable all year)

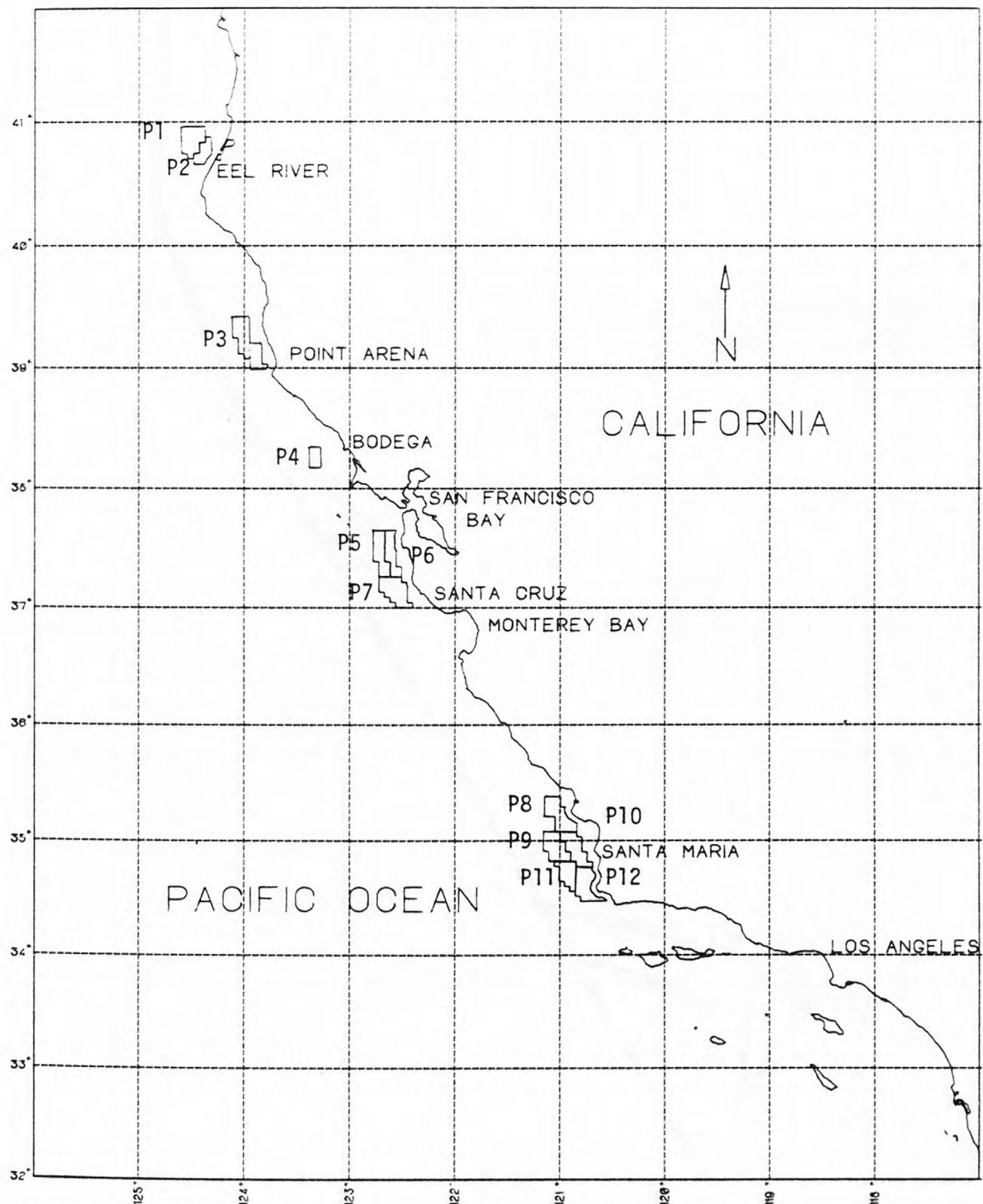


Figure 3.--Map showing subdivisions of the proposed leases for Central and Northern California OCS Lease Sale 53.

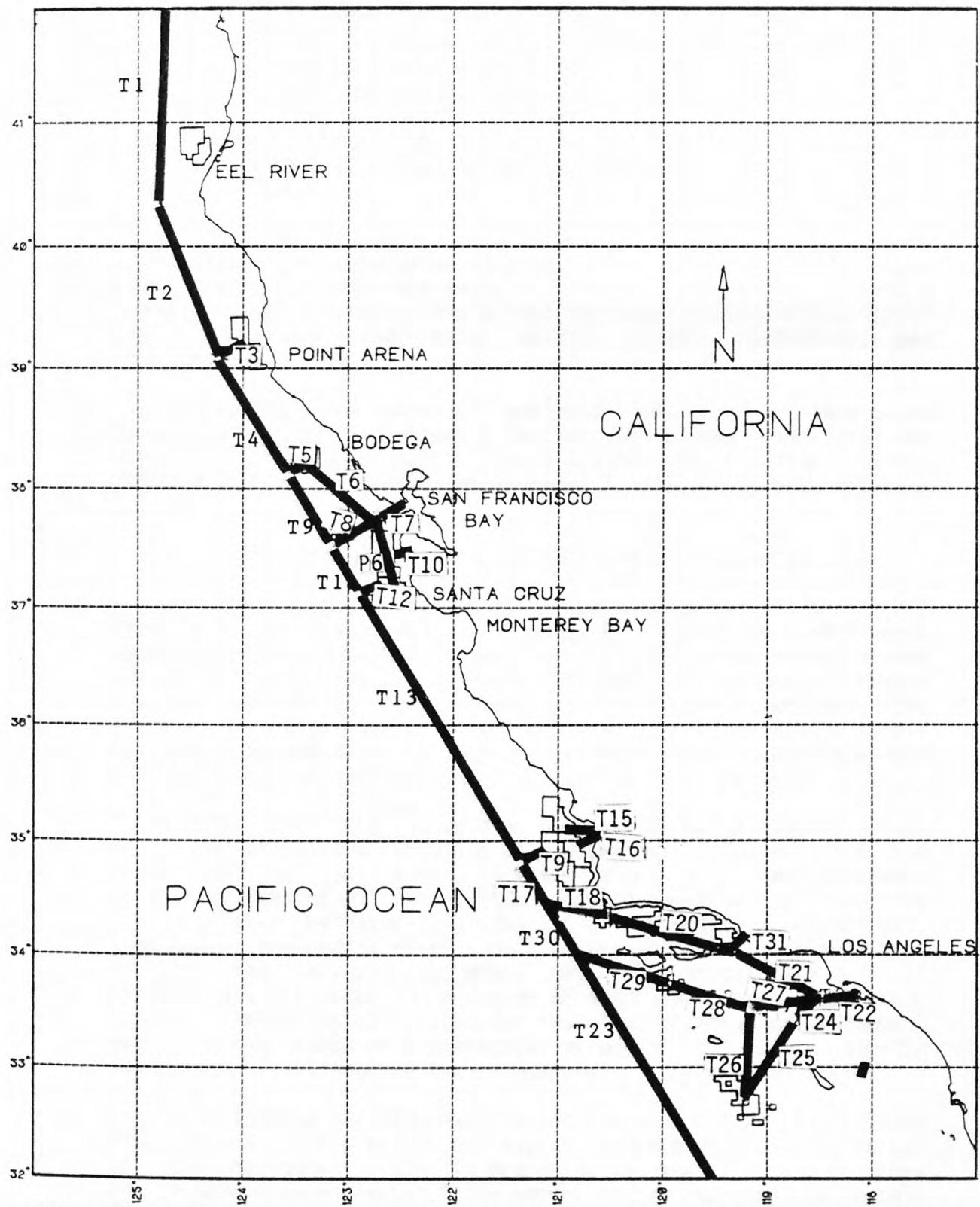


Figure 4.--Map showing the transportation route segments (T1 - T31); polygons represent proposed and existing lease tracts.

Monterey Canyon (Vulnerable all year)
Monterey Bay (Vulnerable September through December)
Sea Otter Range (Vulnerable all year)
Richardson Rock (Vulnerable all year)
Wilson Rock (Vulnerable all year)
Tanner Bank (Vulnerable all year)
Cortez Bank (Vulnerable all year)
Commercial Shellfish (Vulnerable all year)
General Sportfishing (Vulnerable all year)

Because the trajectory model simulates an oilspill as a point, most targets have been given an areal extent slightly greater than they actually occupy. For example, some shoreline targets extend a short distance offshore; this allows the model to simulate a spill that approaches land, makes partial contact, withdraws, and continues on its way.

To provide a more detailed analysis for land or land-based targets, the model includes a feature that allows subdividing the coastline into land segments. Figure 5 shows the coastline divided into segments of approximately equal length, along with offshore islands.

Estimated Quantity of Oil Reserves and Resources

Considerable uncertainty exists in estimating the volume of oil that will be discovered and produced as a result of an OCS lease sale. There is a question of whether oilspill risk calculations should be based upon a single estimate of volume, or should consider volume to be a random variable and include some probability distribution for volume in computing oilspill occurrence probabilities. The choice may depend upon how the results are to be incorporated into benefit/risk analysis.

Benefits and risks (as well as many environmental impacts, such as air pollution) are functions of volume of oil, and are not independent of each other. Greater risks are associated with greater volumes of oil and greater economic benefits. If benefits are evaluated by assuming production of a specific amount of oil, then the corresponding risks should be stated in a conditional form such as, "the risks are ..., given that the volume is ..." If benefits are evaluated for a number of discrete volumes, then risks should likewise be calculated for the same volumes. Any statements about the likelihood of a particular volume of oil apply equally well to the likelihood of the corresponding benefits and risks.

The estimated oil reserves and resources used for oilspill risk calculations in this report correspond to those used by the Bureau of Land Management (BLM) in preparing the draft EIS, i. e., they are "risked mean estimates," the amount of oil expected to result from the proposed sale. Risked mean estimates account for the possibility that oil may not be found in economically recoverable quantities in some or all of the tracts. For oilspill calculations,

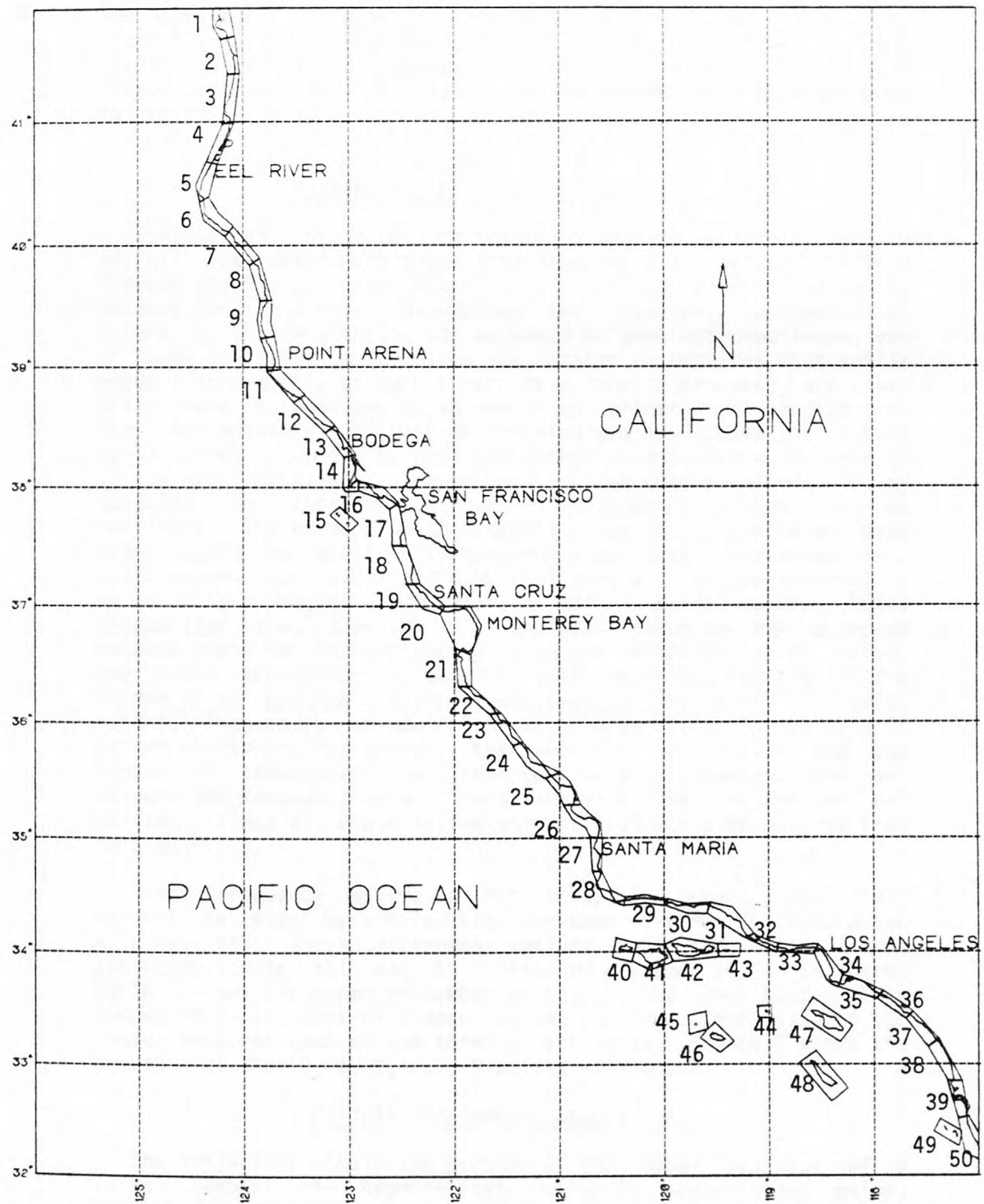


Figure 5.--Map showing the division of the shoreline of Central and Northern California into segments of approximately equal length.

the lease area was divided into smaller subareas than those used by BLM; the individual oil volume estimates for each of these subareas are considered proprietary information. For the entire proposed leasing area, the risked mean estimate of oil resources is 548 million barrels. Estimated reserves and resources from existing leases total 695 and 394 million barrels respectively (risked mean estimate).

Probability of Oilspills Occurring

Statistical distributions for estimating probabilities of oilspill occurrence were taken from Devanney and Stewart (1974) and Stewart (1975), and from USGS files of offshore platform accidents. Besides the fundamental assumption that realistic estimates of future spill frequencies can be based on past OCS experience, use of these distributions requires the further assumptions that spills occur independently of each other (as a Poisson process), and that spill rate is dependent on volume of oil produced and handled. The first assumption - that past spill rates are indicative of future spill rates - might be modified either by assuming a decrease in future spill rates due to experience and improved standards, or by assuming an increase because of unknown conditions in new territory. The assumption that spills occur independently of each other could be modified by assuming a positive correlation (if a spill occurs, conditions are such that more will follow shortly) or by assuming a negative correlation (if a spill occurs, extra precautions are taken). This analysis takes the middle ground between these two assumptions by using the historic spill rates. The final assumption - that the spill rate is a function of the volume of oil handled - might be modified on the basis of size, extent, frequency, or duration of the handling. In the case of tanker transport, for example, the number of port calls and the number of tanker-years have been contemplated (Stewart, 1976, and Stewart and Kennedy, 1978). This analysis uses volume of oil handled, since all other estimates must ultimately be derived from this quantity.

Spill frequency estimates for oilspills greater than 1000 barrels in size were calculated for each of three transportation alternatives. These estimates include both the risks from producing crude oil and the risks of transporting it to shore. Table 1 shows the expected number of spills and the most likely number of spills that will occur during the production lives of the lease area for each of the three alternatives. Figure 6 shows the probability that 0, 1, 2, ..., N spills will occur.

Oilspill Trajectory Simulations

The trajectory simulation portion of the model consists of a large number of hypothetical oilspill trajectories which, collectively, represent both the general trend and the variability of winds and currents, and which can be described in statistical terms. Representations of the monthly surface water velocity field

Table 1. -- Oilspill probability estimates for spills greater than 1000 barrels resulting from OCS Lease Sale 53 or from existing Federal leases in the California area.

	Expected number of spills (mean).	Most likely number of spills (mode).	Probability of one or more spills.
Alternative 1	2.0	2	0.90
Alternative 2	3.1	3	0.95
Alternative 3	2.0	2	0.87
Existing leases	7.6	7	0.99+

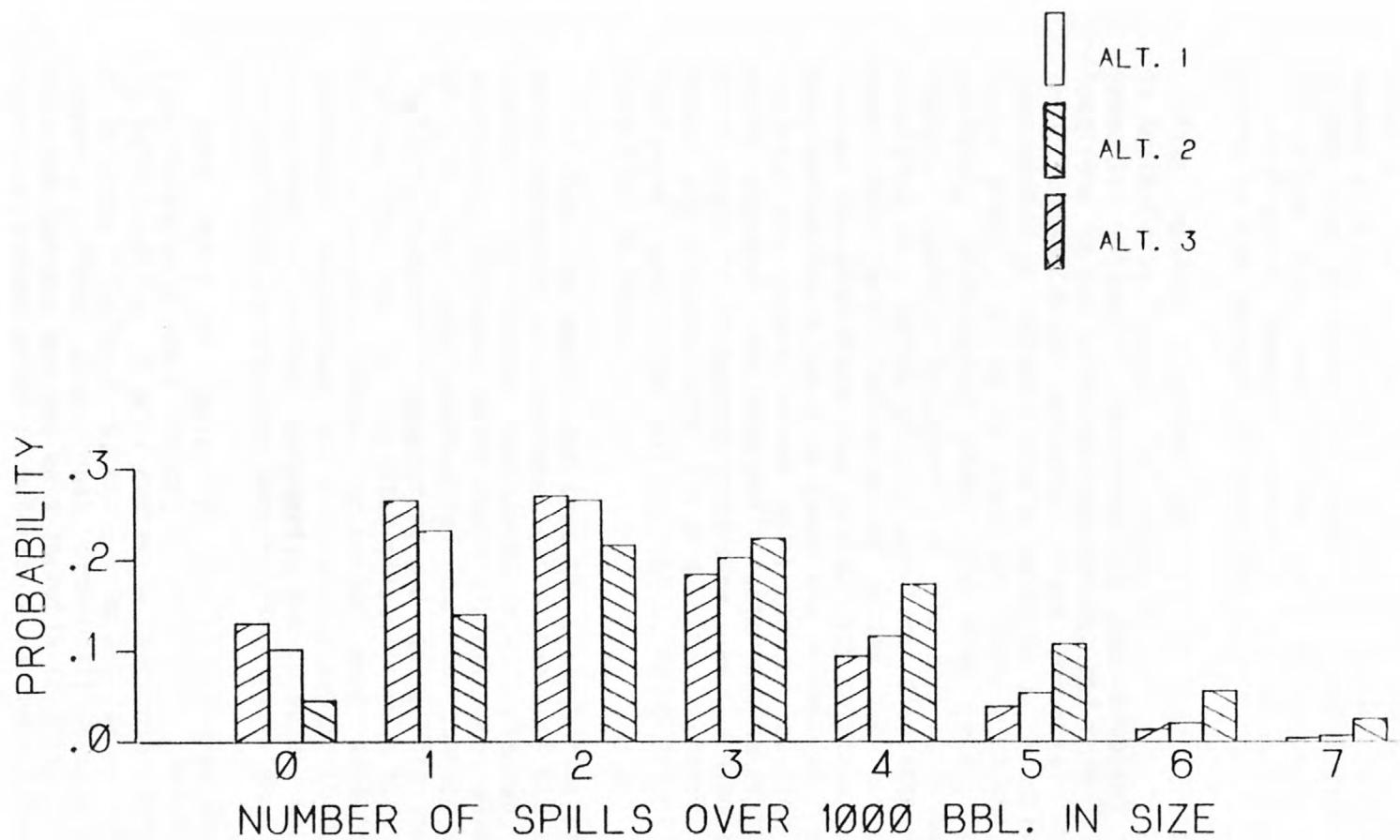


Figure 6.--Estimated frequency distribution for oilspills greater than 1000 barrels occurring during the production life of the proposed lease area for Central and Northern California OCS Lease Sale 53.

variability were characterized by probability matrices for successive 3-hour velocity transitions. A first-order Markov process with 41 wind velocity states (eight compass directions by five wind speed classes, plus the calm condition) was assumed. Wind transition matrices were calculated from the U.S. Weather Service records from Arcata (station number 24283), Monterey (station number 23245), Vandenberg (station number 93214), San Nicolas Island (station number 93116) and San Diego (station number 93112). The study area was divided into zones such that a simulated oilspill would, depending upon its location, be directed by the matrix of the appropriate wind station.

Five hundred hypothetical oilspill trajectories were simulated in Monte-Carlo fashion for each of the four seasons from 12 potential oilspill locations in the proposed lease areas, 5 locations in the existing lease areas, and from 31 locations along the transportation network. Each potential spill source was represented as either a single point (e.g., a small portion of the lease area), or as a straight line with the potential spills uniformly distributed along the line (e.g., a transportation route). Surface transport of the oil slick for each spill was simulated as a series of straight-line displacements of a point under the joint influence of winds and currents for a 3-hour period. The wind transition probability matrix was randomly sampled each period for a new wind speed and direction, and the current velocity was updated as the spill changed location or the simulated month changed. The wind drift factor was taken to be 0.035 with a drift angle of 20 degrees clockwise. As the simulated oilspill was moved, any contacts with targets were recorded. Spill movement continued until the spill hit land, moved off of the map, or aged more than 30 days.

It should be emphasized that the trajectories simulated by the model represent only hypothetical pathways of oil slicks and do not involve any direct consideration of cleanup, dispersion, or weathering processes which would determine the quantity or quality of oil that may eventually come in contact with targets. An implicit analysis of weathering and decay can be considered by noting the age of simulated oilspills when they contact targets. For this analysis, three time periods were selected: 3 days, to represent diminished toxicity of the spill; 10 days, to allow for deployment of cleanup equipment; and 30 days, since most spills are difficult to track or locate after this time.

Each entry of Tables 2, 3, and 4 represents the probability (expressed as percent chance) that, if a spill starts from a certain location, it will contact a particular target within 3, 10, or 30 days. Tables 5, 6, and 7 show similar probabilities for land segments. These conditional probabilities consider, for targets, that the targets may not be vulnerable to oilspills for the entire year: a target which is vulnerable for only 1 month, for example, could have a conditional probability no higher than about 1/12.

Table 2. -- Probabilities (expressed in percent chance) that an oilspill starting at a particular location will contact a certain target within 3 days.

Target	Hypothetical Spill Location																							
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Land	5	29	48	6	15	32	6	10	n	5	n	2	n	1	12	n	1	15	69	17	3	84	1	1
Pioneer Seamount	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	1	n	
Guide Seamount	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Davidson Seamount	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Rodriquez Seamount	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Eel River Canyon	52	43	n	n	n	n	n	n	n	n	n	22	2	n	n	n	n	n	n	n	n	n	n	
Gorda Seamount	12	10	n	n	n	n	n	n	n	n	n	14	18	n	n	n	n	n	n	n	n	n	n	
Gulf of Farallons	n	n	n	5	6	2	n	n	n	n	n	n	n	n	6	10	1	30	10	1	3	n	n	
Monterey Canyon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Monterey Bay	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Sea Otter Range	n	n	n	n	n	n	n	30	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	
Richardson Rock	n	n	n	n	n	n	n	n	n	n	4	n	n	n	n	n	n	n	n	n	n	n	n	
Wilson Rock	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Tanner Bank	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Cortez Bank	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Commercial Shellfish	20	76	49	33	73	70	3	83	41	43	5	4	1	7	12	n	3	75	**	67	3	52	5	4
Gen. Sportfishing	**	**	16	37	87	**	30	**	9	79	2	6	3	7	2	n	10	89	**	86	17	**	13	12

	(E1)																						
	T13	T14	T15	T16	T17	T18	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30	T31	E2	E3	E4	E5
Land	n	n	71	76	n	1	12	43	18	19	n	57	10	11	32	7	5	n	44	11	19	n	15
Pioneer Seamount	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Guide Seamount	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Davidson Seamount	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Rodriquez Seamount	n	n	n	n	2	1	n	n	n	n	1	n	n	n	n	n	n	4	n	n	n	n	n
Eel River Canyon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Gorda Seamount	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Gulf of Farallons	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Monterey Canyon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Monterey Bay	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Otter Range	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Richardson Rock	n	n	n	n	n	9	22	7	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n
Wilson Rock	n	n	n	n	n	n	7	7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Tanner Bank	n	n	n	n	n	n	n	n	n	n	n	n	12	n	n	n	n	n	n	n	57	n	n
Cortez Bank	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	11	n	n
Commercial Shellfish	n	n	42	45	n	3	12	74	19	23	n	25	11	13	22	6	4	n	84	5	24	3	21
Gen. Sportfishing	n	1	**	**	n	3	12	54	29	23	n	60	22	41	47	19	6	n	58	15	44	36	25

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.

Table 3. -- Probabilities (expressed in percent chance) that an oilspill starting at a particular location will contact a certain target within 10 days.

Target	Hypothetical Spill Location																							
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Land	30	48	59	46	61	73	46	30	12	31	10	22	11	36	24	4	24	58	89	58	23	91	24	23
Pioneer Seamount	n	n	n	1	n	n	n	n	n	n	n	n	n	n	2	1	n	n	2	3	n	5	1	
Guide Seamount	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	1	n	1	n	n	
Davidson Seamount	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Rodriquez Seamount	n	n	n	n	n	n	n	n	1	n	3	1	n	n	n	n	n	n	n	n	n	n	n	
Eel River Canyon	64	48	n	n	n	n	n	n	n	n	n	37	6	n	n	n	n	n	n	n	n	n	n	
Gorda Seamount	43	30	1	n	n	n	n	n	n	n	n	35	20	n	n	n	n	n	n	n	n	6	19	17
Gulf of Farallons	n	n	1	25	25	14	12	n	n	n	n	n	2	3	17	17	4	35	15	6	19	17	n	
Monterey Canyon	n	n	n	n	1	1	12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	4	7	
Monterey Bay	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Sea Otter Range	n	n	n	n	n	n	9	34	8	7	4	2	n	n	n	n	n	n	n	n	n	2	7	
Richardson Rock	n	n	n	n	n	n	n	9	9	15	10	19	n	n	n	n	n	n	n	n	n	n	n	
Wilson Rock	n	n	n	n	n	n	n	3	6	9	6	10	n	n	n	n	n	n	n	n	n	n	n	
Tanner Bank	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	
Cortez Bank	n	n	n	n	n	n	n	n	n	n	1	1	n	n	n	n	n	n	n	n	n	n	n	
Commercial Shellfish	47	83	61	56	76	71	25	89	53	62	26	36	24	39	30	9	26	84	**	72	23	52	19	22
Gen. Sportfishing	**	**	21	55	98	**	77	**	31	83	24	36	29	31	12	11	36	92	**	92	40	**	47	54

	(E1)																						
	T13	T14	T15	T16	T17	T18	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30	T31	E2	E3	E4	E5
Land	7	4	86	88	2	6	26	69	50	63	2	70	32	39	55	34	20	1	72	33	41	8	71
Pioneer Seamount	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Guide Seamount	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Davidson Seamount	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Rodriquez Seamount	7	13	n	n	17	5	3	n	n	n	2	n	n	n	n	n	1	8	n	n	n	n	
Eel River Canyon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Gorda Seamount	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Gulf of Farallons	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Monterey Canyon	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Monterey Bay	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Sea Otter Range	9	4	3	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Richardson Rock	n	3	3	2	3	14	30	9	n	1	n	n	n	n	n	2	2	n	n	n	n	n	
Wilson Rock	n	3	1	1	2	2	11	9	n	n	n	n	n	n	n	1	n	n	n	n	n	n	
Tanner Bank	n	n	n	n	n	2	2	n	n	5	n	15	1	n	1	7	2	n	3	n	61	n	
Cortez Bank	n	n	n	n	1	3	1	n	12	n	2	n	1	5	7	n	1	n	16	n	n		
Commercial Shellfish	5	9	50	52	6	12	29	84	44	57	8	35	32	36	38	26	11	5	93	19	40	13	63
Gen. Sportfishing	15	11	**	**	8	12	29	76	62	65	11	76	52	65	70	50	32	7	83	47	65	55	69

Notes: ** = Greater than 99.5 percent; n = less than n.5 percent.

Table 4. -- Probabilities (expressed in percent chance) that an oilspill starting at a particular location will contact a certain target within 30 days.

Target	Hypothetical Spill Location																							
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Land	62	67	65	67	85	91	79	46	26	46	28	40	39	48	43	31	53	78	95	81	52	98	57	60
Pioneer Seamount	n	n	n	2	n	n	n	n	n	n	n	n	1	2	5	4	1	n	2	6	n	7	2	
Guide Seamount	n	n	n	1	n	n	n	n	n	n	n	n	1	3	5	3	n	n	1	4	n	2	1	
Davidson Seamount	n	n	n	2	1	n	1	1	1	n	n	n	1	1	3	3	2	n	2	4	n	1	1	
Rodriquez Seamount	n	n	n	n	n	n	n	1	4	1	4	2	n	n	n	n	n	n	n	n	n	n	n	
Eel River Canyon	68	52	1	n	n	n	n	n	n	n	n	43	7	1	n	n	n	n	n	n	n	n	n	
Gorda Seamount	54	36	2	n	n	n	n	n	n	n	n	47	21	1	n	n	n	n	n	n	n	n	n	
Gulf of Farallons	n	n	3	27	28	17	19	n	n	n	n	n	1	3	9	8	23	18	4	38	19	8	25	23
Monterey Canyon	n	n	n	1	2	1	15	1	1	1	n	n	1	2	2	n	n	3	5	n	8	9	n	
Monterey Bay	n	n	n	n	1	1	7	n	n	n	n	n	n	n	n	n	n	n	1	1	n	1	1	
Sea Otter Range	n	n	n	1	1	n	11	35	13	12	12	9	n	n	1	1	2	n	n	1	4	n	6	9
Richardson Rock	n	n	n	n	n	n	n	14	11	19	12	22	n	n	n	n	n	n	n	n	n	n	n	n
Wilson Rock	n	n	n	n	n	n	n	4	7	9	6	11	n	n	n	n	n	n	n	n	n	n	n	n
Tanner Bank	n	n	n	n	n	n	n	7	11	9	11	10	n	n	n	n	n	n	n	n	n	n	n	n
Cortez Bank	n	n	n	n	n	n	n	10	14	9	15	11	n	n	n	n	n	n	n	n	n	n	n	n
Commercial Shellfish	67	89	66	66	77	72	34	91	65	70	46	54	43	47	42	25	44	87	**	76	39	53	32	32
Gen. Sportfishing	**	**	27	69	99	**	89	**	58	89	57	61	46	42	29	35	58	95	**	95	60	**	67	71

	(E1)																						
	T13	T14	T15	T16	T17	T18	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30	T31	E2	E3	E4	E5
Land	27	18	90	91	16	21	39	80	82	87	13	87	65	74	81	68	44	15	91	63	74	34	90
Pioneer Seamount	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Guide Seamount	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Davidson Seamount	2	1	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Rodriquez Seamount	15	17	1	1	21	6	5	1	n	3	n	n	n	n	n	1	1	11	n	1	n	n	n
Eel River Canyon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Gorda Seamount	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Gulf of Farallons	7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Monterey Canyon	4	1	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Monterey Bay	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea Otter Range	12	10	5	3	9	6	4	1	n	1	n	n	n	n	n	1	4	n	n	n	n	n	n
Richardson Rock	3	6	3	2	5	15	31	10	n	1	n	n	n	n	n	2	2	1	1	n	n	n	n
Wilson Rock	3	7	1	1	6	2	11	10	n	n	n	n	n	n	n	1	1	n	n	n	n	n	n
Tanner Bank	3	10	2	1	10	15	12	2	1	n	13	1	18	5	2	6	16	17	n	9	3	63	1
Cortez Bank	9	18	1	1	18	18	10	2	1	n	20	1	4	2	1	4	13	24	n	5	3	18	n
Commercial Shellfish	26	34	52	53	32	35	45	88	65	73	21	47	58	60	56	52	34	28	97	41	63	38	75
Gen. Sportfishing	44	44	**	**	43	49	53	85	87	85	33	91	79	87	90	80	62	45	90	75	87	73	87

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.

Table 5. -- Probabilities (expressed in percent chance) that an oilspill starting at a particular location will contact a certain land segment within 3 days.

Land Segment	Hypothetical Spill Location																						
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11
1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
3	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
4	2	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
5	2	21	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
6	1	2	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n
7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
8	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
9	n	n	5	n	n	n	n	n	n	n	n	n	n	1	1	n	n	n	n	n	n	n	n
10	n	n	27	n	n	n	n	n	n	n	n	n	n	3	n	n	n	n	n	n	n	n	n
11	n	n	15	n	n	n	n	n	n	n	n	n	n	8	n	n	n	n	n	n	n	n	n
12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
14	n	n	n	5	n	n	n	n	n	n	n	n	n	n	n	n	5	1	n	n	n	n	n
15	n	n	n	1	2	n	n	n	n	n	n	n	n	n	n	1	3	13	3	n	1	n	n
16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	7	n	n	4	n	n	n
17	n	n	n	n	1	7	n	n	n	n	n	n	n	n	n	5	60	2	80	1	n	n	n
18	n	n	n	n	10	24	2	n	n	n	n	n	n	n	n	n	1	1	n	n	n	n	n
19	n	n	n	n	3	1	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
20	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
21	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
22	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
23	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
24	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
25	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
26	n	n	n	n	n	n	n	6	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n
27	n	n	n	n	n	n	n	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n
28	n	n	n	n	n	n	n	n	n	2	n	1	n	n	n	n	n	n	n	n	n	n	n
29	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
30	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
31	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
32	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
33	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
34	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
35	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
36	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
37	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
38	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
39	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
40	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
41	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
42	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
43	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
44	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
45	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
46	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
47	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
48	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
49	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
50	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n

Note: n = less than 0.5 percent.

Table 5. (Continued) -- Probabilities (expressed in percent chance) that an oilspill starting at a particular location will contact a certain land segment within 3 days.

Land Segment	Hypothetical Spill Location (E1)																						
	T13	T14	T15	T16	T17	T18	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30	T31	E2	E3	E4	E5
1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
8	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
11	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
17	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
18	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
19	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
20	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
21	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
22	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
23	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
24	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
25	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
26	n	n	44	40	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
27	n	n	26	34	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
28	n	n	1	2	n	n	3	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
29	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
30	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	1	n	n	n	
31	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	33	n	n	n	n	
32	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	
33	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	
34	n	n	n	n	n	n	n	n	n	1	2	n	n	n	n	n	n	n	1	n	n	n	
35	n	n	n	n	n	n	n	n	n	8	n	n	n	n	n	n	n	n	7	n	n	n	
36	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	4	n	n	n	
37	n	n	n	n	n	n	n	n	n	21	n	n	n	n	n	n	n	n	2	n	n	n	
38	n	n	n	n	n	n	n	n	n	8	4	n	n	n	n	n	n	n	1	n	n	n	
39	n	n	n	n	n	n	n	n	n	10	8	56	4	20	12	4	1	2	1	1	1	1	n
40	n	n	n	n	n	n	n	n	n	1	7	6	n	n	n	n	n	n	1	n	n	n	
41	n	n	n	n	n	n	n	n	n	6	n	n	n	n	n	n	n	n	2	n	n	n	
42	n	n	n	n	n	n	n	n	n	21	n	n	n	n	n	n	n	n	1	n	n	n	
43	n	n	n	n	n	n	n	n	n	8	4	n	n	n	n	n	n	n	10	n	n	n	
44	n	n	n	n	n	n	n	n	n	10	8	56	4	20	12	4	1	2	1	1	19	n	
45	n	n	n	n	n	n	n	n	n	1	2	9	12	4	n	n	n	4	n	n	n	n	
46	n	n	n	n	n	n	n	n	n	1	1	1	1	2	1	1	1	5	n	n	n	n	
47	n	n	n	n	n	n	n	n	n	10	8	56	4	20	12	4	1	2	1	1	1	1	
48	n	n	n	n	n	n	n	n	n	1	7	6	n	n	n	n	n	n	n	n	n	n	
49	n	n	n	n	n	n	n	n	n	6	n	n	n	n	n	n	n	n	n	n	n	n	
50	n	n	n	n	n	n	n	n	n	21	n	n	n	n	n	n	n	n	n	n	n	n	

Note: n = less than 0.5 percent.

Table 6. -- Probabilities (expressed in percent chance) that an oilspill starting at a particular location will contact a certain land segment within 10 days.

Land Segment	Hypothetical Spill Location																						
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11
1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
3	4	3	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n
4	5	8	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n
5	8	27	n	n	n	n	n	n	n	n	n	n	3	11	1	n	n	n	n	n	n	n	n
6	3	5	n	n	n	n	n	n	n	n	n	n	1	3	n	n	n	n	n	n	n	n	n
7	1	1	1	n	n	n	n	n	n	n	n	n	1	1	n	n	n	n	n	n	n	n	n
8	3	2	2	n	n	n	n	n	n	n	n	n	3	11	1	n	n	n	n	n	n	n	n
9	6	3	6	n	n	n	n	n	n	n	n	n	11	1	n	n	n	n	n	n	n	n	n
10	1	n	30	n	n	n	n	n	n	n	n	n	2	11	5	n	n	n	n	n	n	n	n
11	n	n	17	5	n	n	n	n	n	n	n	n	6	11	1	4	2	n	n	2	n	n	n
12	n	n	2	1	n	n	n	n	n	n	n	n	2	3	n	n	1	n	n	n	n	n	n
13	n	n	n	6	n	n	n	n	n	n	n	n	n	1	n	2	2	n	n	n	n	n	n
14	n	n	n	14	1	1	n	n	n	n	n	n	1	3	1	3	10	7	2	2	n	n	n
15	n	n	n	13	13	7	5	n	n	n	n	n	n	1	1	8	10	3	22	7	3	12	7
16	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	3	8	n	n	4	n	n
17	n	n	n	2	11	15	1	n	n	n	n	n	n	n	n	n	20	64	13	n	4	1	1
18	n	n	n	4	28	46	16	n	n	n	n	n	n	n	n	1	6	12	8	20	10	84	8
19	n	n	n	n	7	3	14	n	n	n	n	n	n	n	n	n	n	n	2	n	4	4	4
20	n	n	n	n	n	n	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	2
21	n	n	n	n	n	n	6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
22	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
23	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
24	n	n	n	n	n	n	n	n	n	4	1	n	n	n	n	n	n	n	n	n	n	n	n
25	n	n	n	n	n	n	n	n	6	2	2	1	1	n	n	n	n	n	n	n	n	n	n
26	n	n	n	n	n	n	n	n	9	1	7	1	3	n	n	n	n	n	n	n	n	n	n
27	n	n	n	n	n	n	n	n	4	n	3	n	n	n	n	n	n	n	n	n	n	n	n
28	n	n	n	n	n	n	n	n	2	n	6	1	3	n	n	n	n	n	n	n	n	n	n
29	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
30	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
31	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
32	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
33	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
34	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
35	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
36	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
37	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
38	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
39	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
40	n	n	n	n	n	n	n	n	4	7	10	7	13	n	n	n	n	n	n	n	n	n	n
41	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
42	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
43	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
44	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
45	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n
46	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
47	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
48	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
49	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
50	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n

Note: n = less than 0.5 percent.

Table 6. (Continued) -- Probabilities (expressed in percent chance) that an oilspill starting at a particular location will contact a certain land segment within 10 days.

Land Segment	Hypothetical Spill Location (E1)																					
	T13	T14	T15	T16	T17	T18	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30	T31	E2	E3	E4
1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
8	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
11	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
17	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
18	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
19	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
20	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
21	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
22	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
23	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
24	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
25	n	n	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
26	n	n	49	45	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
27	n	n	29	36	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
28	n	n	3	4	n	n	5	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n
29	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n
30	n	n	n	n	n	n	n	5	1	n	n	n	n	n	n	n	n	9	n	n	n	n
31	n	n	n	n	n	n	n	n	1	3	n	n	n	n	n	n	n	36	n	n	n	n
32	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n
33	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n
34	n	n	n	n	n	n	n	n	n	3	2	n	n	n	n	n	n	n	n	n	n	1
35	n	n	n	n	n	n	n	n	n	8	n	n	n	n	n	n	n	n	n	n	n	8
36	n	n	n	n	n	n	n	n	n	4	n	n	n	n	n	n	n	n	n	n	n	6
37	n	n	n	n	n	n	n	n	n	1	9	n	1	n	n	n	n	n	n	n	n	15
38	n	n	n	n	n	n	n	n	n	1	12	n	1	n	n	n	n	n	n	n	n	19
39	n	n	n	n	n	n	n	n	n	1	5	n	n	n	n	n	n	n	n	n	n	5
40	n	3	1	1	2	4	16	8	n	n	n	n	n	n	n	n	n	2	1	n	1	n
41	n	n	n	n	n	n	n	11	2	n	n	1	n	1	1	2	2	n	1	3	2	n
42	n	n	n	n	n	n	n	30	3	n	n	1	n	1	1	n	6	n	n	1	2	n
43	n	n	n	n	n	n	n	11	9	1	n	1	n	1	1	n	17	n	n	1	6	n
44	n	n	n	n	n	n	n	n	2	1	n	3	5	16	15	10	1	1	3	24	n	1
45	n	n	n	n	n	n	n	1	1	n	n	1	n	1	3	1	5	7	n	10	3	n
46	n	n	n	n	n	n	n	1	1	n	1	n	3	6	2	8	6	n	12	4	2	n
47	n	n	n	n	n	n	n	n	20	18	n	60	8	6	29	4	1	n	1	3	3	13
48	n	n	n	n	n	n	n	n	n	n	1	13	7	2	5	1	n	n	n	3	6	n
49	n	n	n	n	n	n	n	n	n	1	n	1	n	n	n	n	n	n	n	n	n	n
50	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	1

Note: n = less than 0.5 percent.

Table 7. -- Probabilities (expressed in percent chance) that an oilspill starting at a particular location will contact a certain land segment within 30 days.

Land Segment	Hypothetical Spill Location																							
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
2	n	n	n	n	n	n	n	n	n	n	n	n	1	1	n	n	n	n	n	n	n	n	n	
3	8	4	n	n	n	n	n	n	n	n	n	n	3	1	n	n	n	n	n	n	n	n	n	
4	6	8	n	n	n	n	n	n	n	n	n	n	5	1	n	n	n	n	n	n	n	n	n	
5	8	28	n	n	n	n	n	n	n	n	n	n	5	1	n	n	n	n	n	n	n	n	n	
6	3	6	n	n	n	n	n	n	n	n	n	n	1	2	n	n	n	n	n	n	n	n	n	
7	1	2	1	n	n	n	n	n	n	n	n	n	1	1	n	n	n	n	n	n	n	n	n	
8	4	3	3	1	n	n	n	n	n	n	n	n	3	3	n	n	1	2	n	2	n	n	n	
9	17	10	7	3	n	n	n	n	n	n	n	n	10	13	1	2	2	2	n	n	n	n	n	
10	10	6	30	n	n	n	n	n	n	n	n	n	10	12	5	n	n	n	n	n	n	n	n	n
11	2	1	17	6	4	4	4	n	n	n	n	n	3	6	12	1	5	5	2	3	3	2	2	3
12	n	n	2	1	n	n	n	n	n	n	n	n	n	2	3	1	n	1	n	n	n	n	n	
13	n	n	n	8	1	1	n	n	n	n	n	n	n	1	1	2	5	3	1	1	2	n	n	
14	n	n	1	16	2	2	1	n	n	n	n	n	1	3	5	3	7	11	7	2	5	n	n	
15	n	n	2	15	19	13	11	n	n	n	n	n	n	2	4	4	12	11	3	24	10	6	17	14
16	n	n	n	1	1	1	n	n	n	n	n	n	n	n	n	n	3	8	1	1	n	n	n	
17	n	n	1	6	12	15	1	n	n	n	n	n	n	1	1	1	2	22	64	16	3	4	3	3
18	n	n	n	10	36	49	23	n	n	n	n	n	n	2	5	10	13	17	9	26	15	84	15	15
19	n	n	n	1	8	4	19	n	n	n	n	n	n	1	2	3	3	1	n	4	4	n	7	9
20	n	n	n	1	1	n	11	n	n	n	n	n	n	n	1	2	2	n	n	2	4	n	8	9
21	n	n	n	n	1	n	8	1	1	n	n	n	1	n	n	n	1	1	n	n	1	n	3	
22	n	n	n	n	n	n	n	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
23	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
24	n	n	n	n	n	n	n	n	4	3	2	2	2	n	n	n	n	n	n	n	n	n	n	
25	n	n	n	n	n	n	n	6	3	4	3	4	3	4	n	n	n	n	n	n	n	n	n	
26	n	n	n	n	n	n	n	11	2	9	2	7	n	n	n	n	n	n	n	n	n	n	n	
27	n	n	n	n	n	n	n	6	1	3	n	n	n	n	n	n	n	n	n	n	n	n	n	
28	n	n	n	n	n	n	n	2	1	7	1	3	n	n	n	n	n	n	n	n	n	n	n	
29	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
30	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
31	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
32	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
33	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
34	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
35	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
36	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
37	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
38	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
39	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
40	n	n	n	n	n	n	n	n	7	8	11	8	14	n	n	n	n	n	n	n	n	n	n	
41	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	
42	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
43	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
44	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
45	n	n	n	n	n	n	n	n	1	1	1	1	1	2	n	n	n	n	n	n	n	n	n	
46	n	n	n	n	n	n	n	n	1	1	1	1	1	2	2	n	n	n	n	n	n	n	n	
47	n	n	n	n	n	n	n	n	n	1	1	1	2	2	2	n	n	n	n	n	n	n	n	
48	n	n	n	n	n	n	n	n	n	1	1	2	2	2	2	n	n	n	n	n	n	n	n	
49	n	n	n	n	n	n	n	n	n	n	1	1	1	1	1	n	n	n	n	n	n	n	n	
50	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	

Note: n = less than 0.5 percent.

Table 7. (Continued) -- Probabilities (expressed in percent chance) that an oilspill starting at a particular location will contact a certain land segment within 3 days.

Land Segment	Hypothetical Spill Location (E1)																					
	T13	T14	T15	T16	T17	T18	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30	T31	E2	E3	E4
1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
8	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
11	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
15	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
17	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
18	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
19	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
20	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
21	3	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
22	2	1	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
23	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
24	1	2	1	n	2	1	1	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n
25	n	1	3	2	1	1	1	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n
26	1	1	50	45	1	2	2	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n
27	n	n	29	36	n	n	5	2	n	n	n	n	n	n	n	n	n	1	n	n	n	n
28	n	n	3	4	n	n	5	2	n	n	n	n	n	n	n	n	n	1	n	n	n	n
29	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	1	n	n	n	n
30	n	n	n	n	n	n	n	6	1	n	n	n	n	n	n	n	n	10	n	n	n	n
31	n	n	n	n	n	n	n	1	4	1	n	n	n	n	n	n	n	38	n	n	n	n
32	n	n	n	n	n	n	n	1	2	1	n	n	n	n	n	n	n	1	n	n	n	n
33	n	n	n	n	n	n	n	3	1	n	n	n	n	n	n	n	n	1	n	n	n	n
34	n	n	n	n	n	n	n	4	2	n	n	n	n	n	n	n	n	1	n	n	n	n
35	n	n	n	n	n	n	n	1	8	n	n	n	n	n	n	n	n	1	n	n	n	n
36	n	n	n	n	n	n	n	1	4	n	n	n	n	n	n	n	n	1	n	n	n	n
37	n	n	n	n	n	n	n	2	9	n	n	n	n	n	n	n	n	1	n	n	n	n
38	n	n	n	n	n	n	n	1	3	13	n	n	n	n	n	n	n	1	n	n	n	n
39	n	n	n	n	n	n	n	1	n	3	8	n	n	n	n	n	n	1	n	n	n	n
40	3	8	1	1	6	5	17	9	n	n	n	n	n	n	n	n	n	1	1	1	1	1
41	n	n	n	n	n	n	n	12	3	1	n	n	n	n	n	n	n	1	2	2	2	2
42	n	n	n	n	n	n	n	32	4	1	n	n	n	n	n	n	n	8	n	1	1	1
43	n	n	n	n	n	n	n	12	10	1	n	n	n	n	n	n	n	19	1	5	27	2
44	n	n	n	n	n	n	n	1	3	1	n	n	n	n	n	n	n	1	1	1	1	2
45	n	1	n	n	n	2	2	1	2	1	n	n	n	n	n	n	n	14	6	8	4	2
46	n	1	n	n	1	3	3	1	3	2	n	n	n	n	n	n	n	15	2	11	15	1
47	n	2	n	n	2	4	3	1	2	1	4	2	2	3	5	3	1	2	1	1	2	2
48	n	2	n	n	1	1	n	4	7	2	4	1	2	3	5	3	1	2	1	1	2	2
49	n	n	n	n	n	n	n	2	4	4	1	2	3	2	3	1	2	1	1	1	2	3
50	n	n	n	n	n	n	n	1	1	n	24	19	1	62	11	11	33	9	1	1	1	2

Notes: n = less than 0.5 percent.

Combined Analysis of Oilspill Occurrence and Oilspill Trajectory Simulations

Data in Figure 6 indicates the probabilities of different numbers of oilspills occurring as a result of the various alternatives. Tables 2 through 7 indicate the probabilities that targets or land segments will be contacted, given that an oilspill occurs. Combining these two sets of probabilities yields the chances that oilspills will occur and contact targets or land segments.

There is a critical difference between the conditional probabilities calculated in the previous section and the overall probabilities calculated in this section. Conditional probabilities depend only on the winds and currents of the study area - elements over which the decisionmaker has no control. Overall probabilities, on the other hand, will depend not only on the physical conditions, but also on the course of action chosen by the decisionmaker, e. g. choosing one of the alternatives.

Tables 8 through 10 show, for the three alternatives, the probabilities (expressed in percent chance) of one or more oilspills, the most likely number of oilspills, and the expected number of oilspills occurring and contacting targets within periods of 3, 10, and 30 days, over the production life of the lease area. Tables 11 through 13 show similar probabilities for land segments.

The overall probabilities are also shown graphically in Appendices B and C. Figures B-1 through B-3 are histograms which show probabilities of 1, 2, ... N spills occurring and contacting the targets commercial shellfish, general sportfishing, and land within periods of 3, 10, and 30 days; the probabilities for the three alternatives are all shown on the same histogram, for easier comparison. Figures C-1 through C-3 indicate, through circles superimposed on a map of the coastline, the probabilities of one or more spills occurring and contacting the land segments within 3, 10, and 30 days, for each of the alternatives.

Discussion of Results

The distribution of oilspill risks from OCS Sale 53 along the shoreline of Central and Northern California generally reflects the proximity of the groups of lease tracts to the particular land segments. Each group appears to present risks to a specific portion of the coastline, and there is little overlap among these portions; the only exception to this is near San Francisco, where tanker routes from several lease groups converge. The Point Arena tracts present relatively small risks to land segments 10 and 11. The Bodega Bay tracts could affect segments 12, 13, and 14, but the oilspills could be expected to take more than 3 days to reach these segments. The Santa Cruz tracts could affect segments 17, 18, and

Table 8. -- Probabilities (expressed in percent chance) of one or more spills,
 the most likely number of spills, and the expected number of spills
 occurring and contacting targets over the production life of the
 lease area, alternative number 1.

Target	----- Within 3 days -----						----- Within 10 days -----						----- Within 30 days -----					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	38	0	0.5	91	2	2.4	61	0	0.9	99	5	5.1	72	1	1.3	**	6	7.0
Pioneer Seamount	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
Guide Seamount	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
Davidson Seamount	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	3	0	0.0
Rodríguez Seamount	n	0	0.0	n	0	0.0	2	0	0.0	8	0	0.1	4	0	0.0	16	0	0.2
Eel River Canyon	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Gorda Seamount	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Gulf of Farallons	3	0	0.0	5	0	0.1	9	0	0.1	14	0	0.1	12	0	0.1	19	0	0.2
Monterey Canyon	n	0	0.0	n	0	0.0	1	0	0.0	3	0	0.0	3	0	0.0	6	0	0.1
Monterey Bay	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
Sea Otter Range	9	0	0.1	10	0	0.1	16	0	0.2	20	0	0.2	22	0	0.3	29	0	0.3
Richardson Rock	n	0	0.0	20	0	0.2	14	0	0.1	35	0	0.4	17	0	0.2	41	0	0.5
Wilson Rock	n	0	0.0	19	0	0.2	8	0	0.1	30	0	0.4	8	0	0.1	34	0	0.4
Tanner Bank	n	0	0.0	20	0	0.2	n	0	0.0	23	0	0.3	12	0	0.1	41	0	0.5
Cortez Bank	n	0	0.0	4	0	0.0	n	0	0.0	7	0	0.1	15	0	0.2	32	0	0.4
Commercial Shellfish	62	0	1.0	98	4	4.0	71	1	1.2	**	5	5.7	76	1	1.4	**	6	6.8
Gen. Sportfishing	72	1	1.3	98	4	4.1	79	1	1.6	**	6	6.5	84	1	1.8	**	8	8.0

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.

Table 9. -- Probabilities (expressed in percent chance) of one or more spills,
 the most likely number of spills, and the expected number of spills
 occurring and contacting targets over the production life of the
 lease area, alternative number 2.

Target	----- Within 3 days -----					----- Within 10 days -----					----- Within 30 days -----				
	Proposed			Existing and Proposed		Proposed			Existing and Proposed		Proposed			Existing and Proposed	
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	45	0	0.6	92	2	2.6	75	1	1.4	**	5	5.5	86	1	2.0
Pioneer Seamount	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
Guide Seamount	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Davidson Seamount	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
Rodriquez Seamount	n	0	0.0	1	0	0.0	4	0	0.0	10	0	0.1	7	0	0.1
Eel River Canyon	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Gorda Seamount	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Gulf of Farallons	3	0	0.0	6	0	0.1	12	0	0.1	16	0	0.2	14	0	0.2
Monterey Canyon	n	0	0.0	n	0	0.0	1	0	0.0	3	0	0.0	3	0	0.0
Monterey Bay	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
Sea Otter Range	6	0	0.1	7	0	0.1	11	0	0.1	15	0	0.2	17	0	0.2
Richardson Rock	6	0	0.1	24	0	0.3	16	0	0.2	37	0	0.5	19	0	0.2
Wilson Rock	4	0	0.0	23	0	0.3	11	0	0.1	33	0	0.4	12	0	0.1
Tanner Bank	n	0	0.0	20	0	0.2	1	0	0.0	23	0	0.3	12	0	0.1
Cortez Bank	n	0	0.0	4	0	0.0	1	0	0.0	8	0	0.1	15	0	0.2
Commercial Shellfish	75	1	1.4	99	4	4.4	83	1	1.8	**	6	6.2	88	2	2.1
Gen. Sportfishing	75	1	1.4	99	4	4.2	86	1	2.0	**	6	6.9	91	2	2.5
													**	8	8.7

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.

Table 10. -- Probabilities (expressed in percent chance) of one or more spills,
 the most likely number of spills, and the expected number of spills
 occurring and contacting targets over the production life of the
 lease area, alternative number 3.

Target	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	9	0	0.1	87	2	2.1	30	0	0.4	99	4	4.5	49	0	0.7	**	6	6.3
Pioneer Seamount	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	2	0	0.0
Guide Seamount	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
Davidson Seamount	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
Rodriquez Seamount	1	0	0.0	1	0	0.0	5	0	0.0	11	0	0.1	8	0	0.1	19	0	0.2
Eel River Canyon	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Gorda Seamount	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Gulf of Farallons	1	0	0.0	4	0	0.0	5	0	0.0	9	0	0.1	7	0	0.1	15	0	0.2
Monterey Canyon	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0	2	0	0.0	5	0	0.1
Monterey Bay	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
Sea Otter Range	6	0	0.1	6	0	0.1	11	0	0.1	15	0	0.2	16	0	0.2	24	0	0.3
Richardson Rock	n	0	0.0	20	0	0.2	9	0	0.1	32	0	0.4	12	0	0.1	37	0	0.5
Wilson Rock	n	0	0.0	19	0	0.2	5	0	0.1	28	0	0.3	6	0	0.1	33	0	0.4
Tanner Bank	n	0	0.0	20	0	0.2	4	0	0.0	25	0	0.3	17	0	0.2	44	0	0.6
Cortez Bank	n	0	0.0	4	0	0.0	9	0	0.1	15	0	0.2	24	0	0.3	39	0	0.5
Commercial Shellfish	37	0	0.5	97	3	3.5	49	0	0.7	99	5	5.1	60	0	0.9	**	6	6.3
Gen. Sportfishing	38	0	0.5	96	3	3.3	53	0	0.8	**	5	5.7	68	1	1.2	**	7	7.4

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.

Table 11. -- Probabilities (expressed in percent chance) of one or more spills,
 the most likely number of spills, and the expected number of spills
 occurring and contacting land segments over the production life
 of the lease area, alternative number 1.

Segment	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing and Proposed			Proposed			Existing and proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
1	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
2	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
3	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
5	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
6	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
7	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
8	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
9	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
10	1	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
11	1	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	3	0	0.0	4	0	0.0
12	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
13	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
14	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0	2	0	0.0
15	1	0	0.0	2	0	0.0	5	0	0.0	8	0	0.1	8	0	0.1	13	0	0.1
16	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0
17	2	0	0.0	4	0	0.0	5	0	0.1	8	0	0.1	6	0	0.1	9	0	0.1
18	10	0	0.1	10	0	0.1	17	0	0.2	19	0	0.2	20	0	0.2	24	0	0.3
19	1	0	0.0	1	0	0.0	3	0	0.0	4	0	0.0	4	0	0.0	8	0	0.1
20	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	3	0	0.0
21	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0	2	0	0.0	3	0	0.0
22	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
23	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
24	n	0	0.0	n	0	0.0	2	0	0.0	2	0	0.0	4	0	0.0	4	0	0.0
25	1	0	0.0	1	0	0.0	3	0	0.0	3	0	0.0	6	0	0.1	6	0	0.1
26	15	0	0.2	15	0	0.2	19	0	0.2	19	0	0.2	21	0	0.2	22	0	0.3
27	12	0	0.1	12	0	0.1	14	0	0.2	14	0	0.2	15	0	0.2	15	0	0.2
28	1	0	0.0	3	0	0.0	3	0	0.0	8	0	0.1	4	0	0.0	10	0	0.1
29	n	0	0.0	1	0	0.0	n	0	0.0	3	0	0.0	n	0	0.0	4	0	0.0
30	n	0	0.0	4	0	0.0	n	0	0.0	16	0	0.2	n	0	0.0	18	0	0.2
31	n	0	0.0	2	0	0.0	n	0	0.0	6	0	0.1	n	0	0.0	9	0	0.1
32	n	0	0.0	1	0	0.0	n	0	0.0	3	0	0.0	n	0	0.0	4	0	0.0
33	n	0	0.0	1	0	0.0	n	0	0.0	4	0	0.0	n	0	0.0	5	0	0.0
34	n	0	0.0	3	0	0.0	n	0	0.0	6	0	0.1	n	0	0.0	8	0	0.1
35	n	0	0.0	9	0	0.1	n	0	0.0	11	0	0.1	n	0	0.0	11	0	0.1
36	n	0	0.0	4	0	0.0	n	0	0.0	7	0	0.1	n	0	0.0	7	0	0.1
37	n	0	0.0	2	0	0.0	n	0	0.0	16	0	0.2	n	0	0.0	18	0	0.2
38	n	0	0.0	n	0	0.0	n	0	0.0	20	0	0.2	n	0	0.0	25	0	0.3
39	n	0	0.0	n	0	0.0	n	0	0.0	8	0	0.1	n	0	0.0	15	0	0.2
40	n	0	0.0	17	0	0.2	9	0	0.1	30	0	0.4	11	0	0.1	34	0	0.4
41	n	0	0.0	17	0	0.2	n	0	0.0	31	0	0.4	n	0	0.0	37	0	0.5
42	n	0	0.0	48	0	0.6	n	0	0.0	62	0	1.0	n	0	0.0	66	1	1.1
43	n	0	0.0	27	0	0.3	n	0	0.0	38	0	0.5	n	0	0.0	42	0	0.5
44	n	0	0.0	2	0	0.0	n	0	0.0	7	0	0.1	n	0	0.0	13	0	0.1
45	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	2	0	0.0	10	0	0.1
46	n	0	0.0	n	0	0.0	n	0	0.0	4	0	0.0	2	0	0.0	17	0	0.2
47	n	0	0.0	24	0	0.3	n	0	0.0	44	0	0.6	n	0	0.0	51	0	0.7
48	n	0	0.0	1	0	0.0	n	0	0.0	7	0	0.1	2	0	0.0	19	0	0.2
49	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	17	0	0.2
50	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	10	0	0.1

n = less than 0.5 percent.

Table 12. -- Probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting land segments over the production life of the lease area, alternative number 2.

α = less than 0.5 percent.

Table 13. -- Probabilities (expressed in percent chance) of one or more spills,
 the most likely number of spills, and the expected number of spills
 occurring and contacting land segments over the production life
 of the lease area, alternative number 3.

Segment	----- Within 3 days -----			----- Within 10 days -----			----- Within 30 days -----		
	Proposed			Existing and Proposed			Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
1	n	0	0.0	n	0	0.0	n	0	0.0
2	n	0	0.0	n	0	0.0	n	0	0.0
3	n	0	0.0	n	0	0.0	n	0	0.0
4	n	0	0.0	n	0	0.0	n	0	0.0
5	n	0	0.0	n	0	0.0	n	0	0.0
6	n	0	0.0	n	0	0.0	n	0	0.0
7	n	0	0.0	n	0	0.0	n	0	0.0
8	n	0	0.0	n	0	0.0	n	0	0.0
9	n	0	0.0	n	0	0.0	n	0	0.0
10	1	0	0.0	1	0	0.0	1	0	0.0
11	1	0	0.0	1	0	0.0	2	0	0.0
12	n	0	0.0	n	0	0.0	n	0	0.0
13	n	0	0.0	n	0	0.0	n	0	0.0
14	n	0	0.0	n	0	0.0	1	0	0.0
15	n	0	0.0	1	0	0.0	4	0	0.0
16	n	0	0.0	2	0	0.0	5	0	0.0
17	1	0	0.0	2	0	0.0	n	0	0.0
18	3	0	0.0	7	0	0.1	9	0	0.1
19	1	0	0.0	2	0	0.0	3	0	0.0
20	n	0	0.0	n	0	0.0	1	0	0.0
21	n	0	0.0	1	0	0.0	1	0	0.0
22	n	0	0.0	n	0	0.0	1	0	0.0
23	n	0	0.0	n	0	0.0	1	0	0.0
24	n	0	0.0	n	0	0.0	1	0	0.0
25	n	0	0.0	n	0	0.0	2	0	0.0
26	n	0	0.0	n	0	0.0	3	0	0.0
27	1	0	0.0	2	0	0.0	4	0	0.0
28	n	0	0.0	1	0	0.0	6	0	0.0
29	n	0	0.0	n	0	0.0	7	0	0.0
30	n	0	0.0	n	0	0.0	1	0	0.0
31	n	0	0.0	n	0	0.0	1	0	0.0
32	n	0	0.0	n	0	0.0	2	0	0.0
33	n	0	0.0	n	0	0.0	3	0	0.0
34	n	0	0.0	n	0	0.0	4	0	0.0
35	n	0	0.0	n	0	0.0	5	0	0.0
36	n	0	0.0	n	0	0.0	6	0	0.0
37	n	0	0.0	n	0	0.0	7	0	0.0
38	n	0	0.0	n	0	0.0	8	0	0.0
39	n	0	0.0	n	0	0.0	9	0	0.0
40	n	0	0.0	n	0	0.0	4	0	0.0
41	n	0	0.0	n	0	0.0	5	0	0.0
42	n	0	0.0	n	0	0.0	6	0	0.0
43	n	0	0.0	n	0	0.0	7	0	0.0
44	n	0	0.0	n	0	0.0	8	0	0.0
45	n	0	0.0	n	0	0.0	9	0	0.0
46	n	0	0.0	n	0	0.0	10	0	0.0
47	n	0	0.0	n	0	0.0	11	0	0.0
48	n	0	0.0	n	0	0.0	12	0	0.0
49	n	0	0.0	n	0	0.0	13	0	0.0
50	n	0	0.0	n	0	0.0	14	0	0.0
51	n	0	0.0	n	0	0.0	15	0	0.0
52	n	0	0.0	n	0	0.0	16	0	0.0
53	n	0	0.0	n	0	0.0	17	0	0.0
54	n	0	0.0	n	0	0.0	18	0	0.0
55	n	0	0.0	n	0	0.0	19	0	0.0
56	n	0	0.0	n	0	0.0	20	0	0.0
57	n	0	0.0	n	0	0.0	21	0	0.0
58	n	0	0.0	n	0	0.0	22	0	0.0
59	n	0	0.0	n	0	0.0	23	0	0.0
60	n	0	0.0	n	0	0.0	24	0	0.0
61	n	0	0.0	n	0	0.0	25	0	0.0
62	n	0	0.0	n	0	0.0	26	0	0.0
63	n	0	0.0	n	0	0.0	27	0	0.0
64	n	0	0.0	n	0	0.0	28	0	0.0
65	n	0	0.0	n	0	0.0	29	0	0.0
66	n	0	0.0	n	0	0.0	30	0	0.0
67	n	0	0.0	n	0	0.0	31	0	0.0
68	n	0	0.0	n	0	0.0	32	0	0.0
69	n	0	0.0	n	0	0.0	33	0	0.0
70	n	0	0.0	n	0	0.0	34	0	0.0
71	n	0	0.0	n	0	0.0	35	0	0.0
72	n	0	0.0	n	0	0.0	36	0	0.0
73	n	0	0.0	n	0	0.0	37	0	0.0
74	n	0	0.0	n	0	0.0	38	0	0.0
75	n	0	0.0	n	0	0.0	39	0	0.0
76	n	0	0.0	n	0	0.0	40	0	0.0
77	n	0	0.0	n	0	0.0	41	0	0.0
78	n	0	0.0	n	0	0.0	42	0	0.0
79	n	0	0.0	n	0	0.0	43	0	0.0
80	n	0	0.0	n	0	0.0	44	0	0.0
81	n	0	0.0	n	0	0.0	45	0	0.0
82	n	0	0.0	n	0	0.0	46	0	0.0
83	n	0	0.0	n	0	0.0	47	0	0.0
84	n	0	0.0	n	0	0.0	48	0	0.0
85	n	0	0.0	n	0	0.0	49	0	0.0
86	n	0	0.0	n	0	0.0	50	0	0.0
87	n	0	0.0	n	0	0.0	51	0	0.0
88	n	0	0.0	n	0	0.0	52	0	0.0
89	n	0	0.0	n	0	0.0	53	0	0.0
90	n	0	0.0	n	0	0.0	54	0	0.0
91	n	0	0.0	n	0	0.0	55	0	0.0
92	n	0	0.0	n	0	0.0	56	0	0.0
93	n	0	0.0	n	0	0.0	57	0	0.0
94	n	0	0.0	n	0	0.0	58	0	0.0
95	n	0	0.0	n	0	0.0	59	0	0.0
96	n	0	0.0	n	0	0.0	60	0	0.0
97	n	0	0.0	n	0	0.0	61	0	0.0
98	n	0	0.0	n	0	0.0	62	0	0.0
99	n	0	0.0	n	0	0.0	63	0	0.0
100	n	0	0.0	n	0	0.0	64	0	0.0

n = less than 0.5 percent.

19, although some of the risk to segment 17 occurs from tankers originating from Point Arena or Bodega Bay (depending upon the alternative). The Santa Maria tracts would affect primarily segments 25 through 28, however the tanker route from the Santa Maria tracts for alternative 2 would also pose risks to the Channel Islands and southern California.

There are some land segments which do not appear to be exposed to significant risks from OCS Sale 53. The northern California coastline, segments 1 through 8, is not exposed to oilspill risks because it has been assumed there is no oil in the Eel River tracts, and because tanker routes from the Point Arena and Bodega Bay tracts head south; currents and winds are unlikely to bring oilspills originating near Point Arena northward as far as these segments. It also appears that any oilspills from OCS Sale 53 will not contact the Big Sur area, segments 21 through 25, without aging more than 3 days and diminishing in toxicity; older oilspills from the Santa Cruz and Santa Maria tracts could reach this area, but the likelihood is still small.

Commercial shellfish and general sportfishing are the only targets to which OCS Sale 53 presents a substantial oilspill risk, mostly because these targets are distributed along much of the coastline. Risks to specific portions of these targets can be inferred from the land segment risks.

Although alternative 3 appears to present smaller risks than alternative 2, this conclusion must be viewed with some caution. Since it was assumed in this study that the number of oilspills that will occur along a transportation route is proportional to the volume of oil shipped and are likely to occur anywhere along the route, it was necessary to also assume that half of the tanker oilspills for alternative 3 would occur outside of the study area: these oilspills are not included in the probabilities shown for alternative 3. If another exposure variable, such as distance travelled, had been chosen for predicting oilspill occurrence, the risks of alternative 3 would appear higher.

Conclusions

This analysis indicates that OCS Lease Sale 53 will result in an expected 2.0 to 3.1 oilspills occurring off the coast of California, depending upon the transportation alternative chosen. The probability that one or more oilspills will occur and contact land within 3 days is 0.38 for alternative 1, 0.45 for alternative 2, and 0.09 for alternative 3: for contacts within 30 days, these probabilities increase to 0.72, 0.86, and 0.49.

Risks to land are distributed along many segments of the shoreline, rather than concentrated in a single area. Each group of proposed lease tracts poses risks to a specific portion of coastline, with little cumulative risks from the other groups.

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Appendix A

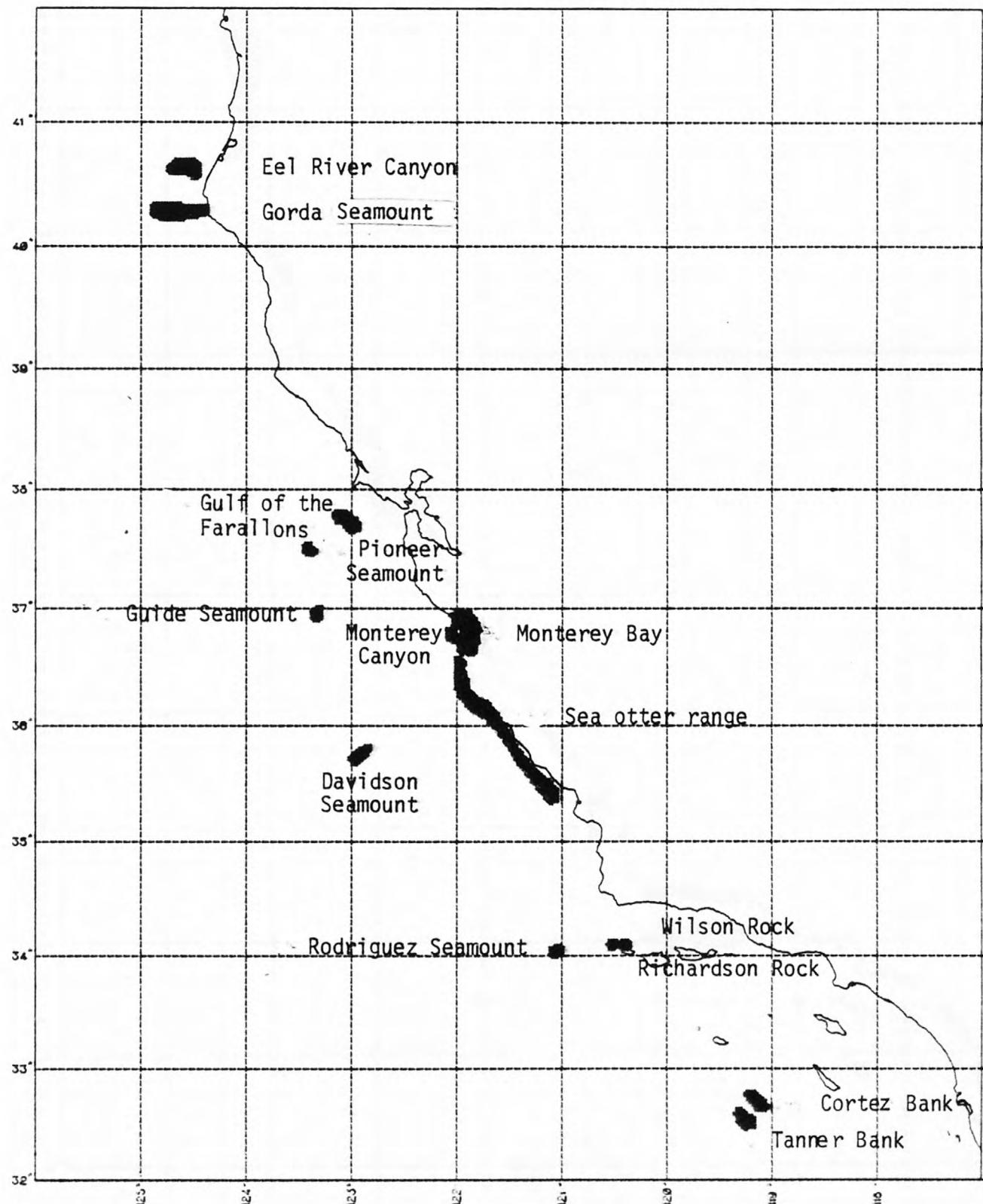


Figure A.1--- Map showing the locations of 14 targets, Northern and Central California OCS Lease Sale 53: cross hatching indicates areal extent of targets.

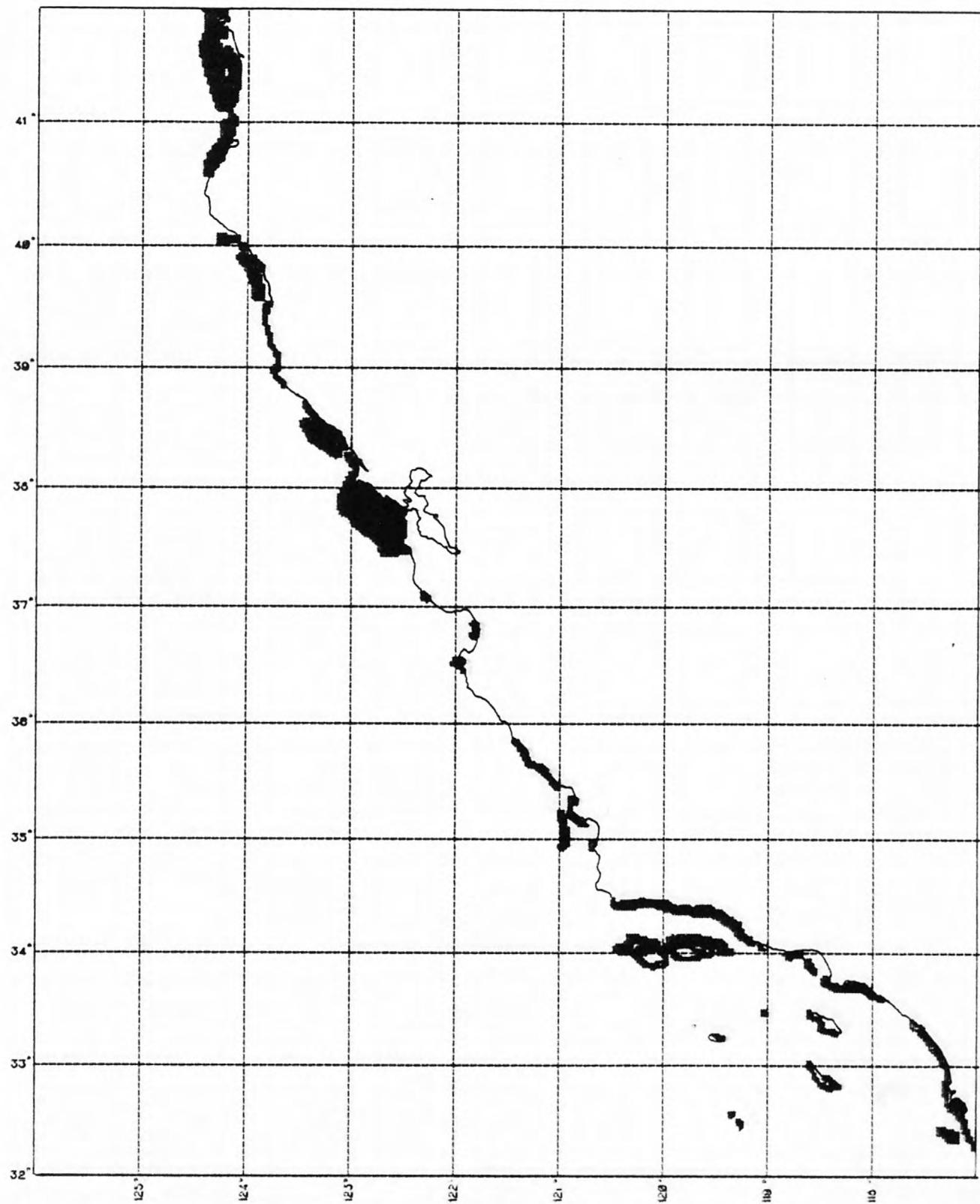


Figure A.2.-- Map showing the location of commercial shellfish areas, Northern and Central California OCS Lease Sale 53: cross hatching indicates areal extent of commercial shellfish areas.

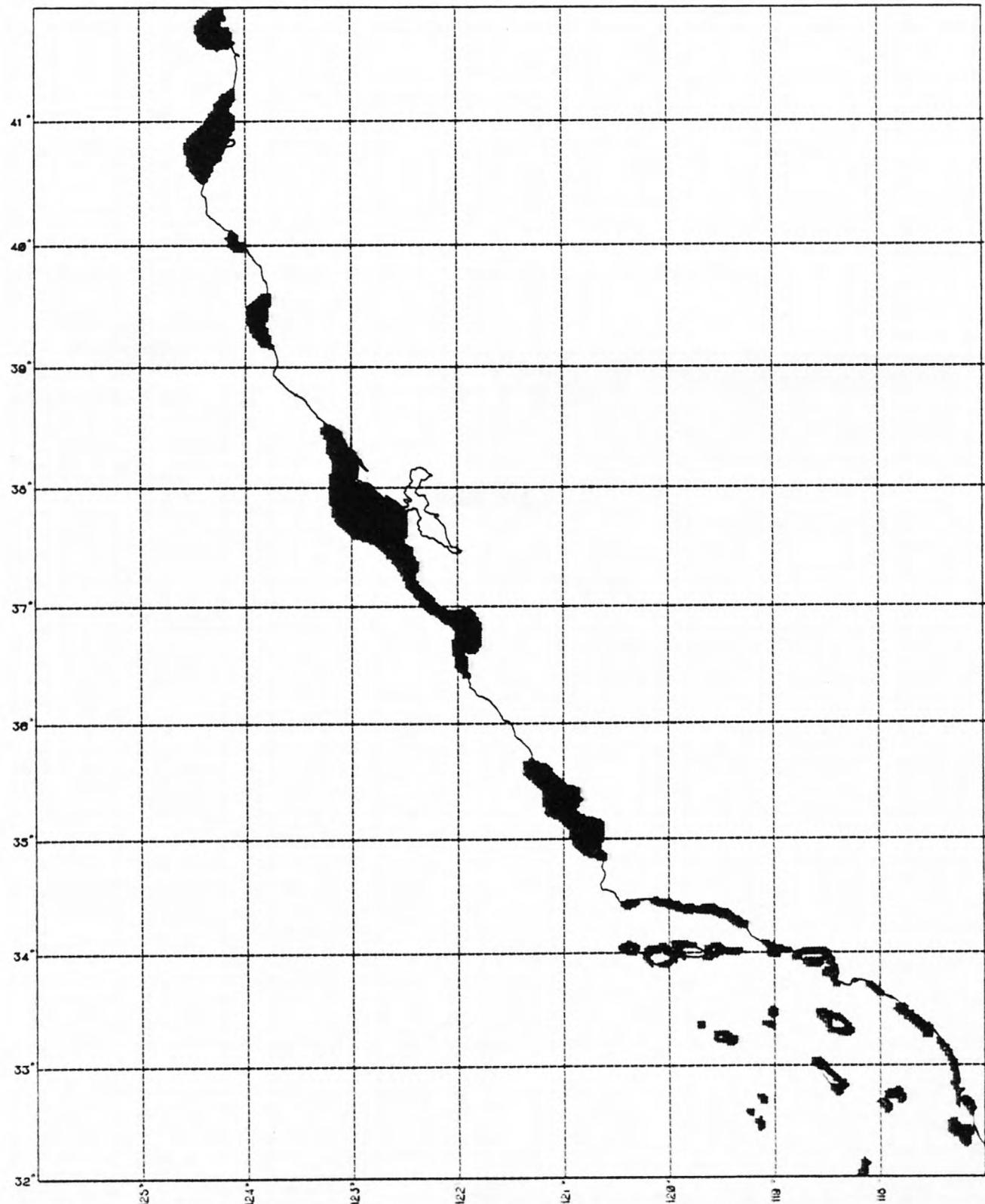


Figure A.3.-- Map showing the location of general sportfishing areas, Northern and Central California OCS Lease Sale 53: cross hatching indicates areal extent of general sportfishing areas.

Appendix B

TARGET - COMMERCIAL SHELLFISH

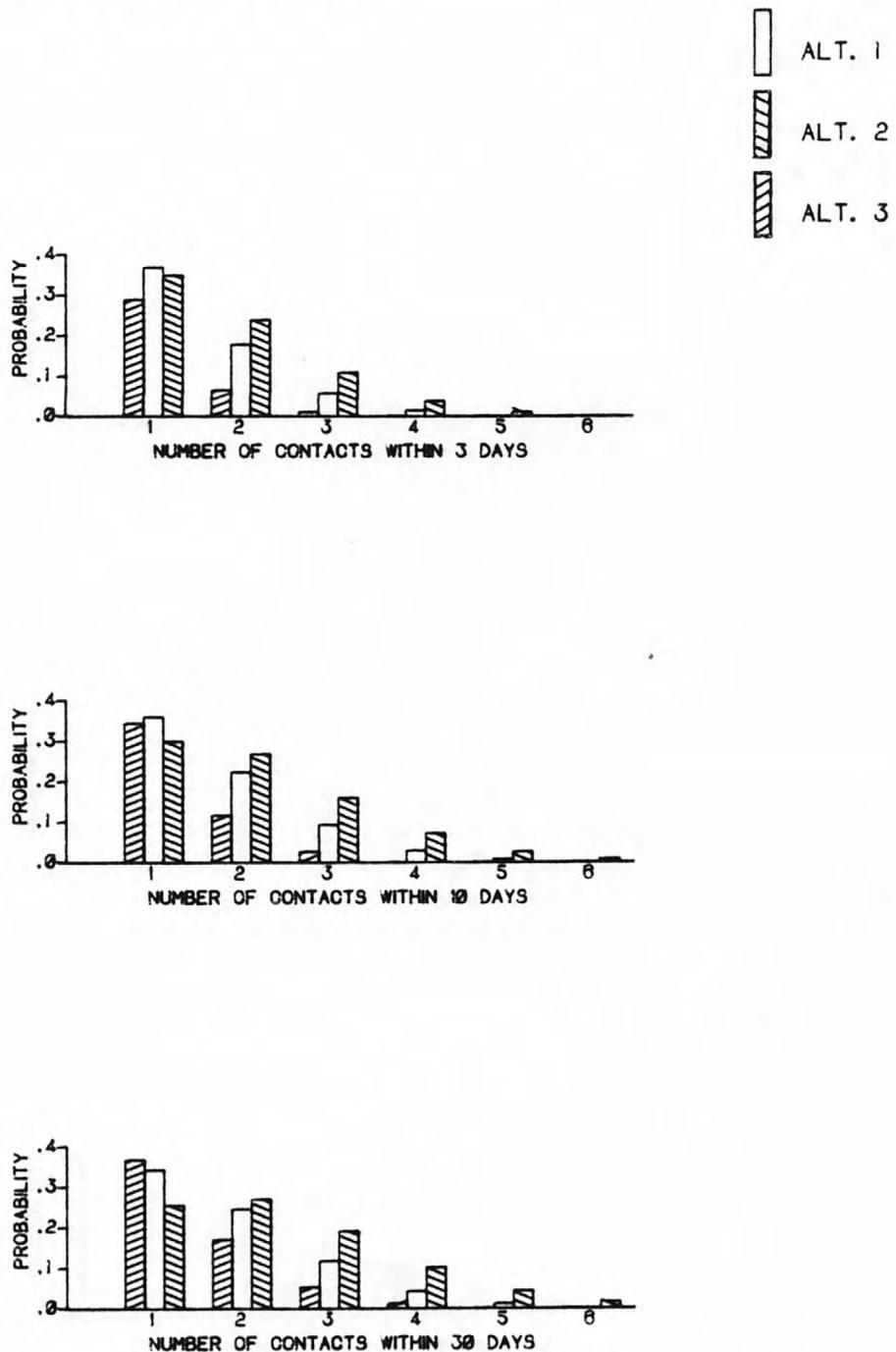


Figure B-1.--Histograms showing the probabilities of specific numbers of oilspills occurring and contacting commercial shellfish, as a result of three alternatives for OCS Sale 53.

TARGET - GENERAL SPORTFISHING

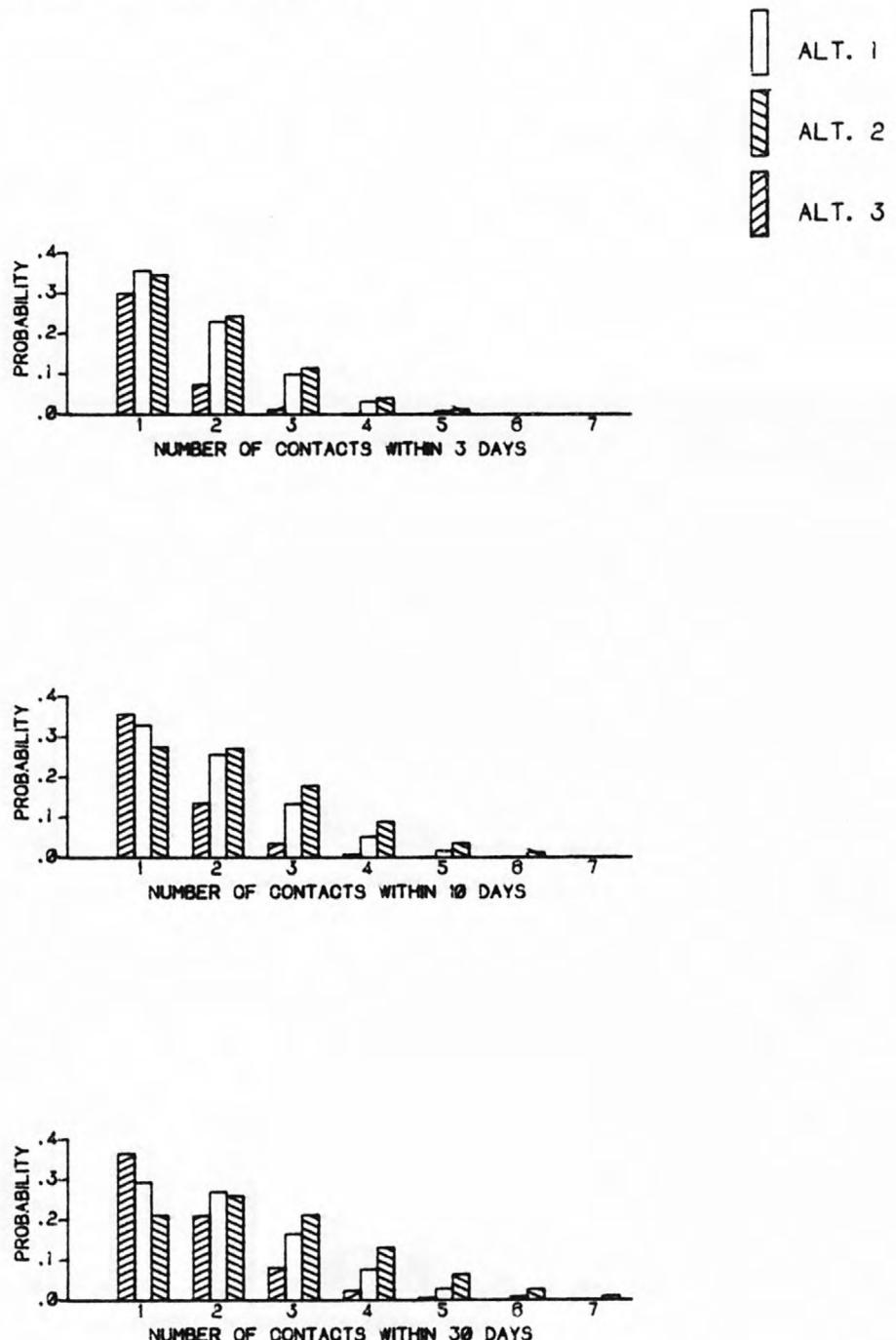


Figure B-2.--Histograms showing the probabilities of specific numbers of oilspills occurring and contacting general sportfishing areas as a result of three alternatives for OCS Sale 53.

TARGET - LAND

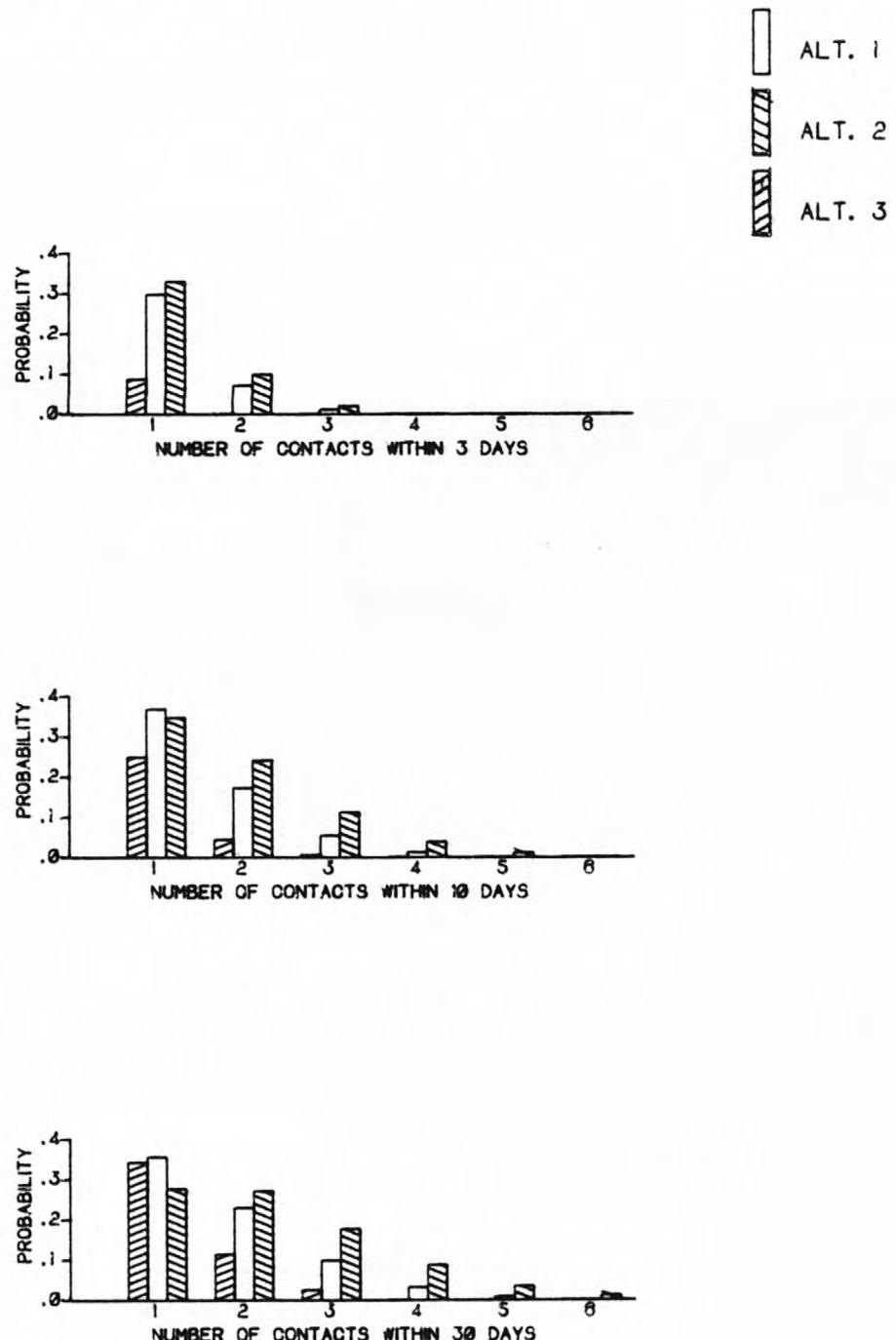
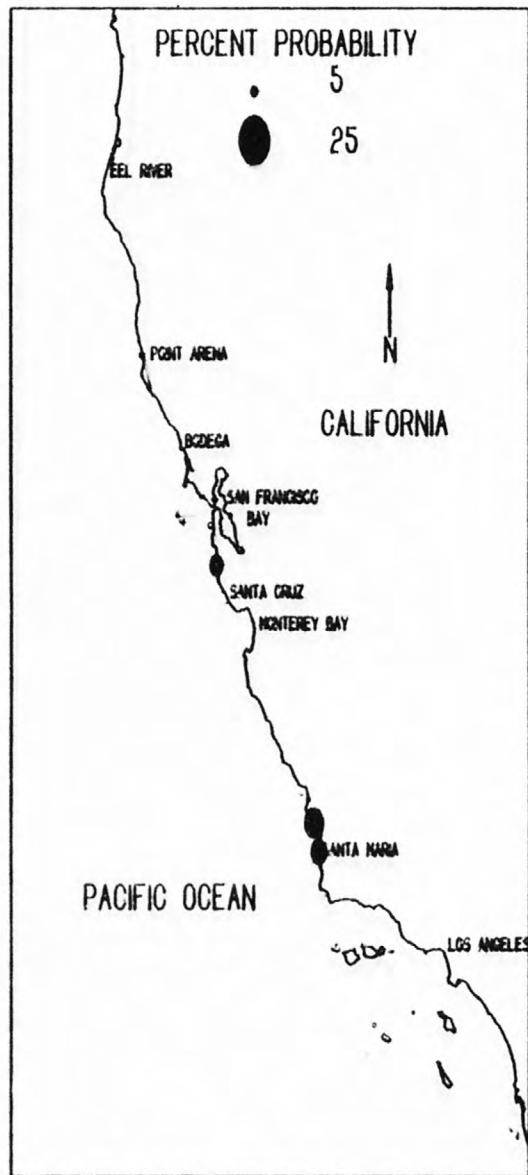


Figure B-3.--Histograms showing the probabilities of specific numbers of oilspills occurring and contacting land as a result of three alternatives for OCS Sale 53.

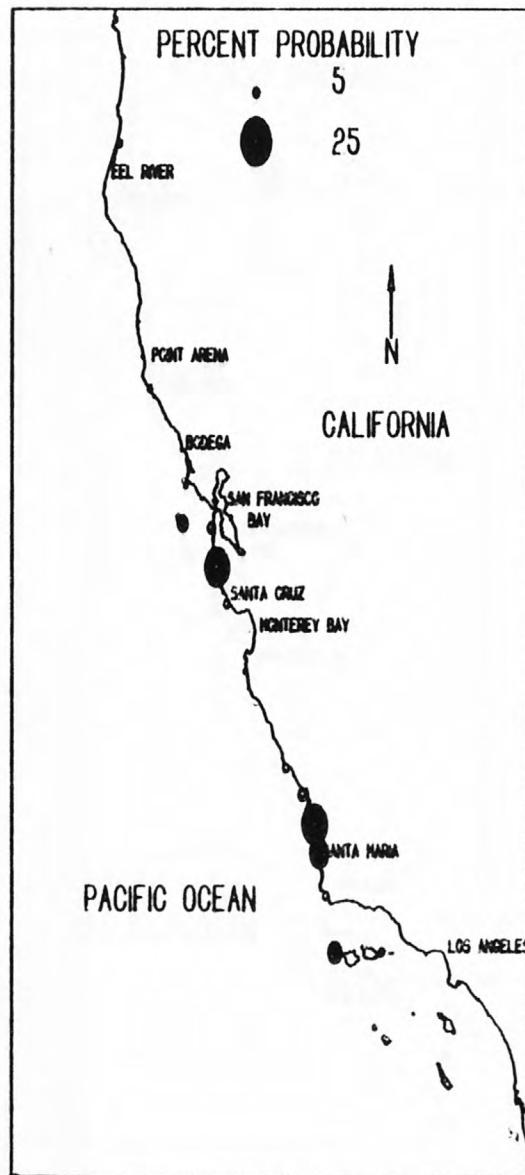
Appendix C



DAY3

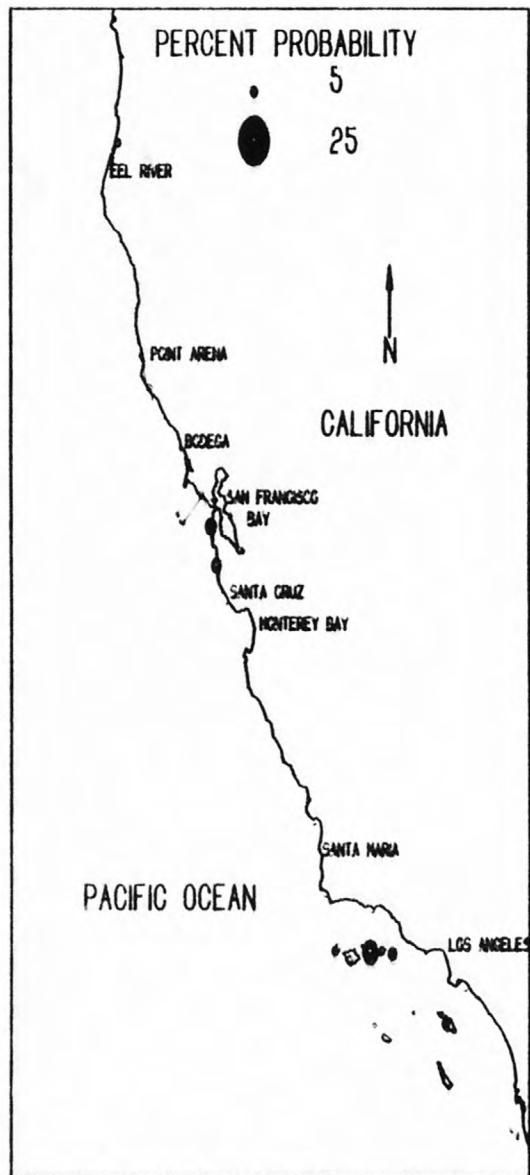


DAY10

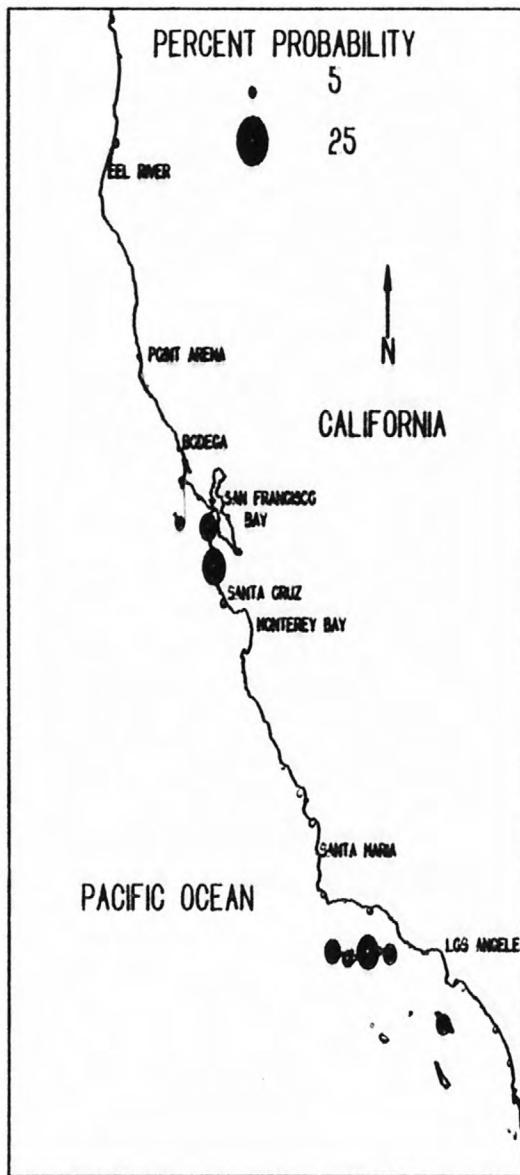


DAY30

Figure C-1.--Maps showing the probability (percent chance) of one or more spills occurring and contacting sections of the coastline for 3, 10, and 30 day travel times (alternative 1).



DAY3

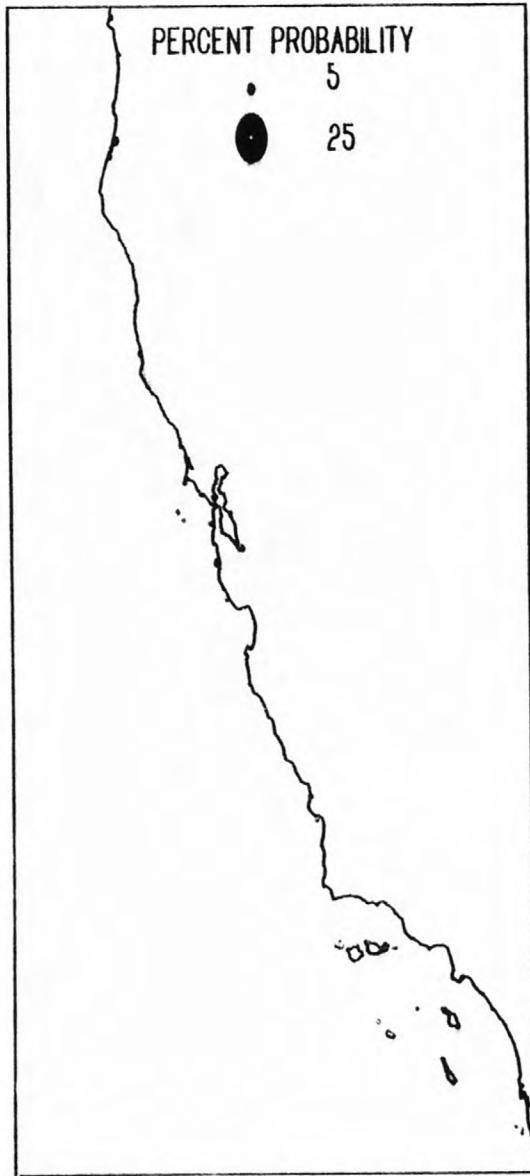


DAY10

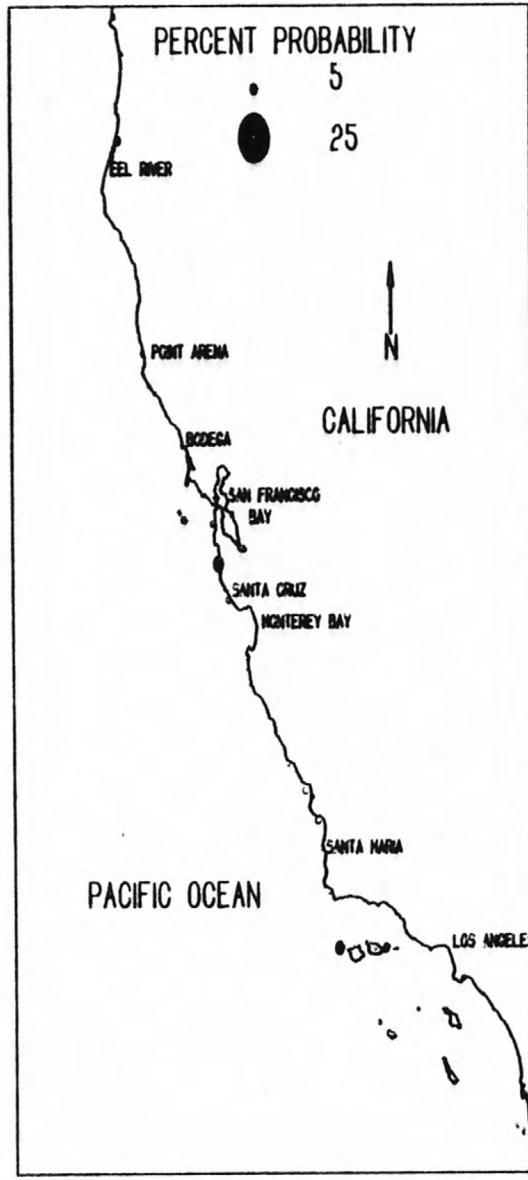


DAY30

Figure C-2.--Maps showing the probability (percent chance) of one or more spills occurring and contacting sections of the coastline for 3, 10, and 30 day travel times (alternative 2).



DAY3



DAY10



DAY30

Figure C-3.--Maps showing the probability (percent chance) of one or more spills occurring and contacting sections of the coastline for 3, 10, and 30 day travel times (alternative 3).

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