AN OILSPILL RISK ANALYSIS FOR THE COOK INLET AND
SHELIKOF STRAIT (PROPOSED SALE 60)
OUTER CONTINENTAL SHELF LEASE AREA

By Robert P. LaBelle, 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 Cook Inlet and Shelikof Strait (Proposed Sale 60) Outer Continental Shelf (OCS) lease area. The probability of spill occurrences, likely movement of oil slicks, and locations of resources vulnerable to spilled oil were analyzed. The times between spill occurrence and contact with various resources were estimated. 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 153 proposed tracts 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 60 will result in an expected 4.0 oilspills. The estimated probability that land will be contacted by one or more oilspills that have been at sea less than 30 days is 0.96.

Introduction

The Federal Government has proposed to offer Outer Continental Shelf (OCS) lands in Cook Inlet and Shelikof Strait for oil and gas leasing. The assumed volume of oil resources for the proposed 153 tracts is 669 million barrels of crude oil; this value is based on the assumption that all tracts will be sold and that oil will be found in all parts of the lease area -- an event considered unlikely. Contingent upon actual discovery of this quantity of oil, production is expected to span a period of 30 years. There are 87 existing Federal lease tracts in the study area, and if oil is found in all of these tracts, it has been assumed that they would contain 826 million barrels of crude oil.

Oilspills are a major problem 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. Although some of this uncertainty reflects incomplete and imperfect data, a considerable amount 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 Cook Inlet and Shelikof Strait OCS Lease Sale 60. The study had the objective of determining relative risks associated with oil and gas production in different regions of the proposed lease area. The study was undertaken for consideration in the draft environmental impact statement (EIS) for the area, and to facilitate final selection of tracts to be offered for sale. A description of the oilspill trajectory analysis model used in this analysis can be found in a previous paper (Lanfear, Smith, and Slack, 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.

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. Although it can not be said with certainty that a probabilistic event (such as an oilspill) will occur, the likelihood of occurrence can be quantified. It is possible to estimate 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 particular 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, will pose 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 153 tracts on the Outer Continental Shelf in Cook Inlet and Shelikof Strait. The study area for this analysis includes all of these tracts and extends from latitude 55 degrees N to 61 degrees N, and from longitude 147 degrees W to 157 degrees W. The study area also includes existing lease tracts from OCS sale CI, held in 1977.

For purposes of this analysis, lease tracts are combined into tract groups; the proposed tract groups are broken into eleven subdivisions

and the existing tract groups into five subdivisions. The study area and the proposed tract groups are shown on a Mercator projection in figure 1. The eleven subdivisions of the proposed tract groups are shown in figure 2. The five subdivisions of the existing tract groups from OCS sale CI are shown in figure 3.

Two deletion alternatives are evaluated in this report. For deletion alternative A, only proposed tracts in subdivisions P2, P4, P6, P7, P8, P10, and P12 are considered. Deletion alternative B is similar to A, except that tracts in subdivision P2 (near Cape Douglas) are not considered.

If oil is discovered and the area is developed for production, there are a number of ways that oil can be transported. Possible transportation routes are shown in figure 4. In the most likely transportation scheme, oil from Shelikof Strait would flow in an offshore pipeline (T18) to a landfall on the northwestern shore of Kodiak Island; transport out of Alaska would be by tanker (T19) from Marmot Bay. Oil from lower Cook Inlet would be piped (T5 to T7) to a terminal near Anchor Point; transport out of Alaska would be by tanker through Kennedy Entrance (T8 to T10 and T20). Three alternative transportation schemes are also evaluated. In transportation alternative A, all oil would be piped (T17) to a location north of Anchor Point, then shipped in tankers through Kennedy Entrance. In transportation alternative B, all oil would be piped eastward (T16) to a

Figure 1.--Map showing the Cook Inlet and Shelikof Strait OCS lease sale 60 study area and the proposed lease tract groups.

Figure 2.--Map showing the eleven subdivisions of the proposed lease tract groups for Cook Inlet and Shelikof Strait OCS lease sale 60.

Figure 3.--Map showing the five subdivisions of the existing lease tract groups in the study area.

Figure 4.-Map showing the transportation route segments (T1-T21); polygons represent proposed lease tract groups.

facility on the western shore of the Kenai Peninsula, then shipped in tankers through Kennedy Entrance. Finally, in transportation alternative C, all oil would be piped (T15) to Perenosa Bay before shipment out of Alaska in tankers (T21).

Environmental Resources

The locations of 19 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 showing the digitized targets are in appendix A, figures A-1 to A-3. The monthly sensitivity of these targets was also recorded so that, for example, contacts by simulated oilspills to a target such as seabird foraging areas could be noted for different seasons of the year. Each seabird foraging area (north and south) has two different sensitivity periods within the same areal extent; therefore, these targets are shown only once in figure A-1. The targets are listed below, and are vulnerable all year, unless indicated otherwise:

Seabird foraging area, south (vulnerable April - September)
Seabird foraging area, south (vulnerable October - March)
Seabird foraging area, north (vulnerable April - September)
Seabird foraging area, north (vulnerable October - March)

Sea otter concentration area A
Sea otter concentration area B
Sea otter concentration area C
Sea otter concentration area D
Sea otter concentration area E
Sea otter concentration area F
Sea otter concentration area G
Sea otter concentration area H
Red River salmon schooling area
Karluk River salmon schooling area
Rocky, Alligator, and Grassy Islands area
Dark and Sentinel Islands, and Latax Rocks area
Barren Islands area
Augustine Island area
Kiukpalik and Shakun Islands, and Shakun Rock area

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 96 segments of approximately equal length.

Estimated Quantity of Oil 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 a benefit/risk analysis.

Benefits and risks (as well as many environmental impacts) are functions of the 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 the presence of a particular volume of oil apply

Figure 5.--Map showing the division of the Alaskan shoreline into 96 segments of approximately equal length.

equally well to the likelihood of the corresponding benefits and risks.

The estimated oil 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 for the area. The assumed volumes of oil are 669 million barrels for the entire sale 60 area, 270 million barrels for deletion alternative A, and 208 million barrels for deletion alternative B. It is important to note that these assumed volumes do not account for the probability that oil will not be found in some or all of the tracts; in reality it is unlikely that all of these oil resources will be discovered. (It should also be noted that the above oil volumes for deletion alternatives A and B may differ by about 10 to 15 percent from original resource estimates. The differences depend upon assumptions made when the existing estimates were regrouped to construct the deletion alternatives.)

The assumed volume of oil for the existing leases was 826 million barrels. Again, it is emphasized that it is very unlikely that all of these oil resources will be discovered. Over the 30-year expected life of the sale 60 leases, BLM estimates that 1,050 million barrels of oil from other sources will be transported by tankers through the study area.

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 1,000 barrels in size were calculated for production and transportation of oil from sale 60, from sale 61, and for existing transportation of oil by tankers within the study area. Table 1 shows the expected number of spills and the most likely number of spills that will occur during the expected production life of the lease area. 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 that collectively represent both the general trend and the variability of winds and currents, and which can be described in statistical terms. One hundred hypothetical oilspill trajectories were simulated in Monte-Carlo fashion for each of the four seasons from 11 potential oilspill locations in the proposed lease areas, 5 locations in the existing lease areas, and from 21 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).

Table 1. -- Oilspill probability estimates for spills greater than 1,000 barrels resulting from OCS lease sale 60, from existing Federal leases, or from existing oil transportation by tanker in the Cook Inlet area.

	Expected number of spills (mean)	Most likely number of spills (mode)	Probability of one or more spills
Sale 60	4.0	4	0.98
Existing leases	5.0	5	0.99
Sale 60 + existing leases	9.0	9	0.99+
Deletion alternative A	1.6	1	0.80
Deletion alternative A + existing leases	6.6	6	0.99+
Deletion alternative B	1.3	1	0.71
Deletion alternative B + existing leases	6.2	6	0.99+
Existing tanker transportation	2.0	2	0.87
Sale 60, existing leases, and existing tanker transportation	11.0	11	0.99+

Figure 6.--Estimated frequency distribution for oil spills greater than 1,000 barrels occurring during the expected production life of the proposed lease area for Cook Inlet and Shellkof Strait OCS lease sale 60.

To simulate oilspill movement in the complex wind and current regime of the study area, two trajectory models were mathematically linked. The first was a model developed by Dames and Moore (1976; 1979) under the BLM Environmental Studies Program, specifically for the Cook Inlet area. This model was used in the present study to calculate trajectories within the boundaries shown in figure 7. Due to the coastal semi-enclosed nature of the study area, tidal forcing was considered to be a significant factor in surface transport behavior. The Dames and Moore model was employed because it had the capability to incorporate tidal currents in trajectory calculations. The model uses spatially dependent deterministic wind and current patterns to provide the driving force for trajectory movement. Tidal currents were represented by unidirectional tidal current constituents that were based on harmonic analyses of current measurements in combination with results of a tidal flow hydrodynamic model. As such, the tidal currents in the model approximate "average" tidal current velocities throughout the study area. The net surface circulation was represented by winter and summer net current patterns derived from analyses of current measurements, published literature, and a previously developed net circulation pattern (Dames and Moore, 1979). Wind fields in the area were defined by five spatially dependent flow patterns and six intensity factors. The wind patterns and intensity factors were correlated to the 22 baric weather patterns developed by Putnins (1966). A catalog of approximately 19 continuous years of daily baric weather patterns (Putnins, P., Unpublished tabulation of daily baric weather types for Alaska from

Figure 7.--Map showing the boundaries of the Dames and Moore trajectory model.

January 1, 1945 to March 31, 1963, University of Alaska) was converted to a corresponding wind pattern and intensity catalog.

A trajectory was initiated in the Dames and Moore model by randomly selecting a day/month/year within the desired season and entering the wind pattern and intensity catalog for that date. The wind field was then sequenced every 24 hours according to the observed wind catalog. The net current pattern for that season was held constant for the duration of the trajectory simulation. The tidal current pattern was time-dependent with the initial tidal phase incremented 30 degrees for each sequential trajectory. The wind-induced velocity vector of the slick centroid was taken to be colinear with the wind velocity and proportional to the wind speed. The proportionality constant was taken to be 3 percent. The current-induced velocity vector of the slick centroid was equal to the sum of the underlying net and tidal current velocity vectors. Each trajectory was simulated using a 30-minute time step to update wind and current velocity vectors. The total set of trajectories for the specified spill locations was transmitted to the U. S. Geological Survey, Reston, Virginia, on computer compatible tapes. A complete description of the methodology, input data, and conclusions of this portion of the study are presented in Dames and Moore (1980).

The second trajectory model was the U. S. Geological Survey Oilspill Trajectory Analysis (OSTA) model, which was used to simulate the movement of any oilspills moving outside the boundaries of the Dames and

Moore model. This was essentially the same model used by Samuels and others (1980) for an oilspill risk analysis of OCS sale 46, Kodiak Island. Representations of the monthly surface water velocity field were based upon data supplied by the National Oceanic and Atmospheric Administration through the BLM Environmental Studies Program. Short-term patterns in wind variability were characterized by a probability matrix for successive 3-hour velocity transitions. A first-order Markov process with 41 wind velocity states (eight compass directions by five wind speed classes, and a calm condition) was assumed. A wind transition matrix was calculated from the U. S. Weather Service records from Data Buoy EBO-3 (station number 46001), located about 100 miles south of Kodiak Island. Surface transport of each simulated oil slick 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.

The grid system of the OSTA model included the entire study area. Both James and Moore model, and equations were derived to readily convert oilspill locations between the two coordinate systems. As the simulated oilspills were moved within either model, the tracking system of the OSTA model was used to record any contacts with targets. Oilspill movement continued until the spill hit land, moved off the map, or aged

more than 30 days.

It should be emphasized that the trajectories simulated by the models 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 in tables 2, 3, and 4 represents the probability (expressed as percent chance) that, if an oilspill starts from a certain location, it will contact a particular target within 3, 10, or 30 days. Tables 5 to 7 show similar probabilities for land segments. These conditional probabilities allow for the possibility that the targets may not be vulnerable to oilspills for the entire year; a target that is vulnerable for only 1 month, for example, could have a conditional probability no higher than about 1/12.

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

Target	Hypothetical Spill Location																T2	T3
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16 (T1)		
Land	55	38	47	51	35	25	44	64	47	42	46	34	13	12	45	62	57	50
Seabird, S., Apr-Sep	31	16	11	9	4	1	3	2	2	1	1	1	n	n	n	37	42	31
Seabird, S., Oct-Mar	47	35	31	16	10	7	11	9	9	5	4	1	1	n	n	45	44	44
Seabird, N., Apr-Sep	1	26	26	15	50	50	30	6	13	17	13	15	37	24	5	n	n	4
Seabird, N., Oct-Mar	n	16	12	3	50	50	26	n	9	17	12	19	41	22	6	n	n	n
Sea otter, area A	n	n	n	n	1	3	n	n	n	n	n	n	8	n	n	n	n	n
Sea otter, area B	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea otter, area C	n	3	16	6	12	4	5	1	1	1	n	n	1	n	n	n	n	1
Sea otter, area D	32	23	16	10	5	2	3	n	1	n	n	n	n	n	n	14	18	22
Sea otter, area E	1	2	6	5	2	1	2	1	2	1	1	n	n	n	1	1	7	8
Sea otter, area F	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea otter, area G	n	n	n	n	1	6	n	n	n	n	n	n	17	1	n	n	n	n
Sea otter, area H	n	2	7	30	23	19	32	38	33	29	26	18	4	10	15	2	1	1
Red River salmon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Karluk River salmon	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	2	1
Rocky, All., Grassy	13	4	3	2	n	n	1	n	n	n	n	n	n	n	n	2	1	9
Dark, Sent., Latax	2	8	1	3	1	1	1	n	n	n	n	n	n	n	n	n	n	3
Barren Islands	n	5	18	7	15	6	6	2	3	1	n	n	1	n	n	n	n	1
Augustine Island	n	n	n	3	7	4	15	39	30	25	24	19	10	13	15	n	n	n
Kiukpalik, Shakun	2	1	5	3	1	n	n	1	1	n	n	n	n	n	n	11	10	3

Target	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21
Land	41	31	23	32	35	27	42	10	16	39	53	64	38	27	63	8	4	5
Seabird, S., Apr-Sep	10	3	n	n	n	1	n	n	n	n	n	30	1	n	50	n	n	n
Seabird, S., Oct-Mar	29	10	1	1	2	4	1	n	n	n	n	34	9	n	50	n	n	n
Seabird, N., Apr-Sep	18	43	18	28	51	50	36	25	6	1	1	1	51	19	n	n	6	1
Seabird, N., Oct-Mar	8	42	19	35	50	51	37	27	8	1	1	n	50	29	n	n	8	2
Sea otter, area A	n	1	n	5	5	15	8	3	n	n	n	n	19	4	n	n	1	n
Sea otter, area B	n	n	n	n	5	1	n	n	n	n	n	n	n	n	n	n	3	n
Sea otter, area C	5	3	n	n	17	4	n	n	n	n	n	n	4	n	n	n	2	n
Sea otter, area D	16	2	n	n	2	1	n	n	n	n	n	57	2	n	32	n	1	4
Sea otter, area E	3	1	1	n	1	1	n	1	n	n	n	n	1	n	4	n	n	n
Sea otter, area F	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea otter, area G	n	1	1	35	11	25	50	2	1	n	1	n	9	22	n	n	n	n
Sea otter, area H	10	22	14	4	13	7	2	5	2	1	1	n	16	2	n	n	n	n
Red River salmon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Karluk River salmon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n
Rocky, All., Grassy	3	1	n	n	n	n	n	n	n	n	n	49	n	n	n	n	n	n
Dark, Sent., Latax	6	n	n	n	1	n	n	n	n	n	n	1	n	n	n	n	n	n
Barren Islands	6	4	n	n	28	5	n	n	n	n	n	n	7	n	n	n	3	1
Augustine Island	n	11	15	7	1	4	4	8	2	1	1	n	6	6	n	n	n	n
Kiukpalik, Shakun	3	n	n	n	1	n	n	n	n	n	n	1	1	n	6	n	n	n

Note: n = less than 0.5 percent.

For tables 2 to 7:

P1 to P16 are lease tract groups,

T1 to T21 are transportation routes,

P16 and T1 and considered as one oilspill starting location for purposes of this analysis.

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

	Hypothetical Spill Location																		
Target	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16 T2		T3	
Land	90	85	89	88	85	86	90	95	91	92	93	91	81	86	93	(T1) 94 94		90	
Seabird, S., Apr-Sep	38	25	18	17	8	5	10	7	7	5	6	6	4	8	8	40	45	38	
Seabird, S., Oct-Mar	50	40	39	23	18	19	17	17	20	15	16	14	14	17	13	46	45	47	
Seabird, N., Apr-Sep	2	27	28	18	50	50	32	9	16	19	15	19	40	28	7	1	1	6	
Seabird, N., Oct-Mar	n	16	12	4	50	50	27	2	11	17	13	20	43	27	8	n	n	n	
Sea otter, area A	n	1	1	1	3	6	1	n	n	1	n	2	12	4	n	n	n	1	
Sea otter, area B	n	3	1	1	3	2	2	1	1	1	n	1	1	1	n	n	n	n	
Sea otter, area C	1	5	17	9	18	7	10	4	6	6	4	4	4	2	3	n	n	1	
Sea otter, area D	43	35	26	21	12	10	12	10	11	9	10	9	12	10	7	19	26	32	
Sea otter, area E	7	6	8	8	4	2	4	3	4	3	2	3	2	4	2	11	10	7	
Sea otter, area F	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Sea otter, area G	n	n	n	n	2	11	1	n	n	n	1	2	19	2	n	n	n	n	
Sea otter, area H	1	4	11	34	34	34	40	44	39	42	34	36	24	32	26	3	2	3	
Red River salmon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
Karluk River salmon	4	2	1	1	1	1	1	1	1	n	1	n	n	n	1	4	3	1	
Rocky, All., Grassy	14	7	5	5	1	2	2	3	1	3	2	2	2	2	1	3	4	11	
Dark, Sent., Latax	3	9	2	4	2	1	4	2	3	2	1	2	2	2	1	n	1	4	
Barren Islands	1	7	20	11	20	9	11	4	8	9	5	4	5	4	3	n	n	2	
Augustine Island	n	n	1	4	12	11	18	40	33	31	28	27	20	23	20	n	n	n	
Kiukpalik, Shakun	9	5	8	5	2	3	3	2	3	1	1	1	2	2	1	15	14	8	

Target	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21
Land	88	88	88	88	78	90	88	85	79	83	89	92	89	86	94	18	20	17
Seabird, S., Apr-Sep	21	9	5	3	2	3	2	3	3	2	1	32	5	2	50	n	n	n
Seabird, S., Oct-Mar	36	23	18	12	9	18	11	16	11	5	6	36	22	10	50	n	n	n
Seabird, N., Apr-Sep	20	44	20	31	51	50	36	29	14	8	6	2	51	24	n	1	8	4
Seabird, N., Oct-Mar	8	43	20	37	50	52	38	32	19	11	8	1	50	32	n	3	11	6
Sea otter, area A	n	2	3	7	8	18	12	9	3	1	1	n	19	8	n	n	3	2
Sea otter, area B	1	1	n	n	12	2	1	n	n	n	n	1	2	n	n	1	13	5
Sea otter, area C	9	7	7	4	22	7	4	4	2	1	1	1	10	4	n	1	4	4
Sea otter, area D	30	11	7	8	9	11	5	7	4	4	2	63	12	6	37	2	2	5
Sea otter, area E	5	5	3	1	2	2	1	3	1	1	1	3	3	2	7	n	n	n
Sea otter, area F	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea otter, area G	n	2	2	37	12	27	52	6	5	1	2	n	9	23	n	n	n	n
Sea otter, area H	14	34	31	20	20	26	17	27	24	16	16	1	25	22	n	n	n	n
Red River salmon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Karluk River salmon	1	n	1	n	n	1	1	1	n	n	n	1	n	n	4	n	n	n
Rocky, All., Grassy	7	3	1	2	1	3	2	1	1	n	n	50	3	1	1	n	n	n
Dark, Sent., Latax	7	3	1	2	3	2	1	1	1	n	n	2	2	1	n	n	n	n
Barren Islands	10	8	7	5	32	9	4	5	3	1	1	1	12	5	n	1	5	5
Augustine Island	1	15	25	14	3	10	12	20	20	13	14	n	9	17	n	n	n	n
Kiukpalik, Shakun	9	2	3	1	2	1	1	2	1	n	n	4	3	1	10	n	n	n

Note: n = less than 0.5 percent.

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

	Hypothetical Spill Location																	
Target	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16 (T1)	T2	T3
Land	99	96	97	98	98	99	99	99	99	99	99	99	99	99	**	**	99	99
Seabird, S., Apr-Sep	38	25	19	17	9	5	10	7	7	5	7	6	5	8	8	40	46	38
Seabird, S., Oct-Mar	50	40	39	23	19	19	17	17	20	15	16	15	16	18	13	46	45	47
Seabird, N., Apr-Sep	4	28	28	18	50	50	32	9	17	20	15	19	40	28	8	1	2	6
Seabird, N., Oct-Mar	n	16	12	4	50	50	27	2	11	17	13	20	44	27	8	n	n	n
Sea otter, area A	1	1	1	1	3	7	2	1	1	1	n	2	13	5	n	n	n	1
Sea otter, area B	1	4	2	2	6	4	3	1	2	2	1	1	2	2	1	n	n	1
Sea otter, area C	2	6	18	10	18	9	11	4	7	7	5	4	4	3	3	1	n	2
Sea otter, area D	44	36	26	22	13	11	13	10	11	10	11	10	16	12	8	20	27	33
Sea otter, area E	7	7	8	8	4	2	5	4	5	3	2	3	4	4	2	11	10	7
Sea otter, area F	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	1	n
Sea otter, area G	n	n	n	n	2	11	1	n	n	1	1	2	20	3	n	n	n	n
Sea otter, area H	1	5	12	34	34	36	40	44	39	42	35	37	25	34	27	3	2	3
Red River salmon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Karluk River salmon	4	2	1	1	1	1	1	1	1	n	1	n	n	1	1	4	3	1
Rocky, All., Grassy	14	7	5	5	1	2	2	3	1	3	2	2	3	2	1	3	4	12
Dark, Sent., Latax	4	9	3	4	2	2	4	2	3	2	1	2	3	2	1	1	1	4
Barren Islands	2	9	21	11	21	11	12	5	9	9	5	5	5	5	4	1	n	2
Augustine Island	n	1	1	4	12	11	18	40	33	31	28	27	21	24	21	n	n	n
Kiukpalik, Shakun	9	6	8	6	3	3	4	3	3	1	1	1	2	2	2	15	14	9

Target	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21
Land	98	99	99	99	94	98	99	99	99	94	**	**	99	**	**	36	37	37
Seabird, S., Apr-Sep	22	9	5	3	2	3	3	4	4	2	1	32	5	3	50	n	n	n
Seabird, S., Oct-Mar	36	23	18	13	10	18	11	16	13	6	6	36	22	11	50	n	n	n
Seabird, N., Apr-Sep	20	44	21	31	51	50	36	30	14	8	8	3	51	24	1	4	9	6
Seabird, N., Oct-Mar	8	43	21	37	51	52	39	52	20	11	8	1	50	32	n	4	12	8
Sea otter, area A	1	4	4	7	9	19	15	11	4	1	3	1	20	9	n	1	4	3
Sea otter, area B	3	3	2	1	16	3	2	1	1	1	1	2	3	2	n	4	18	8
Sea otter, area C	9	8	8	4	22	8	4	6	3	2	2	1	10	4	n	3	5	6
Sea otter, area D	30	12	7	9	10	12	6	7	7	5	3	64	13	8	37	2	2	7
Sea otter, area E	6	5	4	2	2	3	2	4	2	1	1	3	4	2	7	n	n	n
Sea otter, area F	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	3	1	2
Sea otter, area G	n	2	3	38	12	27	52	7	6	1	3	n	9	24	n	n	n	n
Sea otter, area H	15	35	32	21	21	26	18	28	26	18	17	2	26	23	n	1	n	n
Red River salmon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Karluk River salmon	1	1	1	n	1	1	1	1	1	n	n	1	1	1	4	n	n	n
Rocky, All., Grassy	7	3	1	3	2	3	2	1	1	n	n	50	4	1	1	n	n	n
Dark, Sent., Latax	7	3	1	2	3	2	1	1	1	1	1	2	2	2	n	1	1	1
Barren Islands	11	9	8	5	33	10	5	7	4	2	2	1	12	5	n	4	6	7
Augustine Island	1	16	25	15	3	10	12	20	21	15	14	n	9	17	n	1	n	n
Kiukpalik, Shakun	9	2	3	1	2	2	1	3	2	n	1	5	3	2	10	n	n	n

Note: n = less than 0.5 percent.
 ** = greater than 99.5 percent.

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

Land Segment	Hypothetical Spill Location (T1)																							
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	T2	T3	T4	T5	T6	T7	T8	T9
55	n	n	n	n	n	n	n	3	1	n	1	12	1	n	n	1	n	n	n	n	n	n	n	n
56	n	n	n	2	4	2	9	29	21	13	15	1	7	11	n	n	n	n	n	5	11	1	n	1
57	n	n	n	n	n	n	1	2	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n
58	n	n	n	n	1	n	3	21	3	1	3	3	n	n	n	5	n	n	n	1	2	n	n	n
59	n	n	n	n	n	n	n	8	2	2	5	1	n	n	n	4	n	n	n	n	n	n	n	n
60	n	n	n	n	1	1	3	1	3	9	13	10	1	1	7	n	n	n	n	2	2	n	n	n
61	n	n	n	n	n	n	n	n	n	2	2	2	1	n	6	n	n	n	n	1	1	n	n	n
62	n	n	n	n	n	n	n	n	n	n	1	1	n	n	6	n	n	n	n	n	2	n	n	n
63	n	n	n	n	n	n	n	n	n	n	n	1	n	n	6	n	n	n	n	n	2	n	n	n
64	n	n	n	n	n	n	n	n	n	n	n	1	2	3	n	n	n	n	n	n	2	n	n	n
65	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
66	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
67	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
68	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
69	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
70	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
71	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
72	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
73	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
74	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
75	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
76	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
77	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
78	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
79	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
80	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
81	n	n	2	5	1	1	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
82	n	1	n	n	5	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
83	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
84	n	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.
Land segments for which all probabilities are less than 0.5 percent are not shown.

Table 7. (Continued) -- Probabilities (expressed as 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	P13	P14	P15	P16	P17	P18	P19	T1
50	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
51	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
52	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
53	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
54	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
55	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
56	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
57	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
58	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
59	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
60	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
61	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
62	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
63	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
64	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
65	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
66	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
67	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
68	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
69	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
70	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
71	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
72	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
73	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
74	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
75	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
76	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
77	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
78	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
79	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
80	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
81	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
82	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
83	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
84	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
85	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
86	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
87	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
88	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
89	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
90	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
91	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
92	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
93	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
94	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.
Land segments for which all probabilities are less than 0.5 percent are not shown.

Combined Analysis of Oilspill Occurrence and

Oilspill Trajectory Simulations

Data in figure 6 indicate the probabilities of different numbers of oilspills occurring. Tables 2 to 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 in the study area -- elements over which the decisionmaker has no control. Overall probabilities, on the other hand, depend not only on the physical conditions, but also on the course of action chosen by the decisionmaker, e.g., choosing to sell or not to sell the lease tracts.

Tables 8 to 13 show the probabilities (expressed as 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 expected production life of the lease area. These probabilities are calculated for the proposed leasing

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

Target	Within 3 days			Within 10 days			Within 30 days		
	Proposed	Existing and Proposed	Prob Mode Mean	Proposed	Existing and Proposed	Prob Mode Mean	Proposed	Existing and Proposed	Prob Mode Mean
Land	77	1	1.5	95	2	2.9	94	2	2.8
Seabird, S., Apr-Sep	49	0	0.7	54	0	0.8	54	0	0.8
Seabird, S., Oct-Mar	57	0	0.8	69	1	1.2	63	0	1.0
Seabird, M., Apr-Sep	35	0	0.4	84	1	1.8	38	0	0.5
Seabird, M., Oct-Mar	33	0	0.4	83	1	1.8	36	0	0.4
Sea otter, area A	3	0	0.0	12	0	0.1	5	0	0.1
Sea otter, area B	1	0	0.0	6	0	0.1	8	0	0.1
Sea otter, area C	5	0	0.1	22	0	0.3	11	0	0.1
Sea otter, area D	35	0	0.4	42	0	0.6	48	0	0.7
Sea otter, area E	8	0	0.1	12	0	0.1	17	0	0.2
Sea otter, area F	n	0	0.0	n	0	0.0	n	0	0.0
Sea otter, area G	12	0	0.1	37	0	0.5	13	0	0.1
Sea otter, area H	22	0	0.2	60	0	0.9	33	0	0.4
Red River salmon	n	0	0.0	n	0	0.0	n	0	0.0
Karluk River salmon	3	0	0.0	3	0	0.0	6	0	0.1
Rocky, All., Grassy	6	0	0.1	7	0	0.1	10	0	0.1
Dark, Sent., Latax	3	0	0.0	4	0	0.0	6	0	0.1
Barren Islands	7	0	0.1	29	0	0.3	14	0	0.1
Augustine Island	11	0	0.1	41	0	0.5	16	0	0.2
Kiakpalk, Shakun	11	0	0.1	13	0	0.1	19	0	0.2

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table 9. --- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the proposed lease area, deletion alternative A.

Target	Within 3 days			Within 10 days			Within 30 days		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	38	0	0.5	69	1	1.2	74	1	1.4
Seabird, S., Apr-Sep	5	0	0.1	12	0	0.1	12	0	0.1
Seabird, S., Oct-Mar	13	0	0.1	23	0	0.3	23	0	0.3
Seabird, N., Apr-Sep	34	0	0.4	36	0	0.4	36	0	0.4
Seabird, N., Oct-Mar	32	0	0.4	33	0	0.4	34	0	0.4
Sea otter, area A	3	0	0.0	5	0	0.0	6	0	0.1
Sea otter, area B	1	0	0.0	7	0	0.1	10	0	0.1
Sea otter, area C	5	0	0.1	10	0	0.1	11	0	0.1
Sea otter, area D	6	0	0.1	17	0	0.2	18	0	0.2
Sea otter, area E	2	0	0.0	5	0	0.1	6	0	0.1
Sea otter, area F	n	0	0.0	n	0	0.0	n	0	0.0
Sea otter, area G	10	0	0.1	36	0	0.4	11	0	0.1
Sea otter, area H	20	0	0.2	29	0	0.3	30	0	0.4
Red River salmon	n	0	0.0	n	0	0.0	n	0	0.0
Karluk River salmon	n	0	0.0	1	0	0.0	1	0	0.0
Rocky, Atl., Grassy	1	0	0.0	4	0	0.0	4	0	0.0
Dark, Sent., Latax	2	0	0.0	4	0	0.0	4	0	0.0
Barreh Islands	7	0	0.1	12	0	0.1	14	0	0.1
Augustine Island	9	0	0.1	13	0	0.1	14	0	0.1
Kiupalik, Shakun	1	0	0.0	4	0	0.0	4	0	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table 10. -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the proposed lease area, deletion alternative B.

Target	----- Within 3 days -----			----- Within 10 days -----			----- Within 30 days -----		
	Proposed	Existing and Proposed	Prob Mode Mean	Proposed	Existing and Proposed	Prob Mode Mean	Proposed	Existing and Proposed	Prob Mode Mean
Land	32	0	0.4	83	1	1.2	59	0	0.9
Seabird, S., Apr-Sep	3	0	0.0	13	0	0.1	8	0	0.1
Seabird, S., Oct-Mar	8	0	0.1	35	0	0.4	17	0	0.2
Seabird, N., Apr-Sep	27	0	0.3	82	1	1.7	29	0	0.3
Seabird, N., Oct-Mar	26	0	0.3	81	1	1.7	27	0	0.3
Sea otter, area A	2	0	0.0	11	0	0.1	4	0	0.0
Sea otter, area B	1	0	0.0	5	0	0.1	5	0	0.1
Sea otter, area C	4	0	0.0	22	0	0.2	6	0	0.1
Sea otter, area D	3	0	0.0	14	0	0.2	11	0	0.1
Sea otter, area E	1	0	0.0	6	0	0.1	4	0	0.0
Sea otter, area F	n	0	0.0	n	0	0.0	n	0	0.0
Sea otter, area G	8	0	0.1	34	0	0.4	9	0	0.1
Sea otter, area H	18	0	0.2	58	0	0.9	26	0	0.3
Red River salmon	n	0	0.0	n	0	0.0	n	0	0.0
Karluk River salmon	n	0	0.0	n	0	0.0	n	0	0.0
Rocky, All., Grassy	1	0	0.0	2	0	0.0	3	0	0.0
Dark, Sent., Latex	1	0	0.0	3	0	0.0	3	0	0.0
Barren Islands	5	0	0.1	28	0	0.3	10	0	0.1
Augustine Island	9	0	0.1	33	0	0.5	12	0	0.1
Klukpak, Shakum	1	0	0.0	3	0	0.0	2	0	0.0

Note: n = less than 0.5 percent.

Table 11. -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the proposed lease area, transportation alternative A.

Target	Within 3 days			Within 10 days			Within 30 days		
	Proposed	Existing and Proposed	Prob Mode Mean	Proposed	Existing and Proposed	Prob Mode Mean	Proposed	Existing and Proposed	Prob Mode Mean
Land	72	1	1.3	93	2	2.7	95	2	2.9
Seabird, S., Apr-Sep	28	0	0.3	36	0	0.4	39	0	0.5
Seabird, S., Oct-Mar	42	0	0.5	59	0	0.9	55	0	0.8
Seabird, N., Apr-Sep	51	0	0.7	88	2	2.1	55	0	0.8
Seabird, N., Oct-Mar	52	0	0.7	88	2	2.1	55	0	0.8
Sea otter, area A	7	0	0.1	15	0	0.2	12	0	0.1
Sea otter, area B	3	0	0.0	7	0	0.1	14	0	0.2
Sea otter, area C	8	0	0.1	25	0	0.3	17	0	0.2
Sea otter, area D	22	0	0.2	31	0	0.4	40	0	0.5
Sea otter, area E	6	0	0.1	10	0	0.1	15	0	0.2
Sea otter, area F	n	0	0.0	n	0	0.0	n	0	0.0
Sea otter, area G	19	0	0.2	42	0	0.5	21	0	0.2
Sea otter, area H	28	0	0.3	63	1	1.0	47	0	0.6
Red River salmon	n	0	0.0	n	0	0.0	n	0	0.0
Kariuk River salmon	1	0	0.0	1	0	0.0	4	0	0.0
Rocky, Ali., Grassy	6	0	0.1	8	0	0.1	11	0	0.1
Dark, Sent., Latax	4	0	0.0	5	0	0.1	8	0	0.1
Barren Islands	11	0	0.1	33	0	0.4	22	0	0.2
Augustine Island	16	0	0.2	44	0	0.6	27	0	0.3
Klukpakik, Shakun	7	0	0.1	9	0	0.1	14	0	0.2

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table 13. -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the proposed lease area, transportation alternative C.

Target	Within 3 days			Within 10 days			Within 30 days								
	Proposed	Existing and Proposed	Prob Mode Mean	Proposed	Existing and Proposed	Prob Mode Mean	Proposed	Existing and Proposed	Prob Mode Mean						
Land	78	1	1.5	95	2	2.9	93	2	2.7	96	3	3.2	**	7	1.4
Seabird, S., Apr-Sep	47	0	0.6	53	0	0.7	55	0	0.8	66	1	1.1	67	1	1.1
Seabird, S., Oct-Mar	59	0	0.9	71	1	1.2	64	1	1.0	83	1	1.6	83	1	1.8
Seabird, N., Apr-Sep	21	0	0.2	81	1	1.6	28	0	0.3	83	1	1.8	84	1	1.8
Seabird, N., Oct-Mar	15	0	0.2	79	1	1.5	21	0	0.2	81	1	1.7	82	1	1.7
Sea otter, area A	n	0	0.0	9	0	0.1	3	0	0.0	18	0	0.3	24	0	0.3
Sea otter, area B	n	0	0.0	4	0	0.0	7	0	0.1	25	0	0.2	38	0	0.5
Sea otter, area C	4	0	0.0	21	0	0.2	12	0	0.1	40	0	0.5	45	0	0.5
Sea otter, area D	53	0	0.8	58	0	0.9	63	0	1.0	77	1	1.5	79	1	1.5
Sea otter, area E	6	0	0.1	10	0	0.1	15	0	0.2	26	0	0.3	28	0	0.3
Sea otter, area F	n	0	0.0	4	0	0.0	n	0	0.0	n	0	0.0	4	0	0.0
Sea otter, area G	n	0	0.0	29	0	0.3	1	0	0.0	32	0	0.4	33	0	0.4
Sea otter, area H	17	0	0.2	58	0	0.9	25	0	0.3	75	1	1.4	76	1	1.4
Red River salmon	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
Kariuk River salmon	2	0	0.0	2	0	0.0	4	0	0.0	6	0	0.1	7	0	0.1
Pucey, Aft., Grassy	35	0	0.4	36	0	0.4	38	0	0.5	43	0	0.6	44	0	0.6
Dark, Sent., Latax	5	0	0.0	6	0	0.1	8	0	0.1	16	0	0.2	18	0	0.2
Barren Islands	7	0	0.1	28	0	0.3	14	0	0.2	46	0	0.6	46	0	0.7
Augustine Island	5	0	0.1	38	0	0.5	9	0	0.1	49	0	0.7	50	0	0.7
Lukpatik, Shokun	8	0	0.1	11	0	0.1	18	0	0.2	25	0	0.3	27	0	0.3

Note: n = less than U.S. percent; ** = greater than 99.5 percent.

Table 14. -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting land segments over the production life of the proposed lease area.

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

Note: n = less than 0.5 percent. Those land segments for which all probabilities are less than 0.5 percent are not shown.

Table 14. (Continued) -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting land segments over the production life of the proposed lease area.

Land Segment	----- Within 3 days -----			----- Within 10 days -----			----- Within 30 days -----		
	Proposed		Existing and Proposed Prob Mode Mean	Proposed		Existing and Proposed Prob Mode Mean	Proposed		Existing and Proposed Prob Mode Mean
	Prob	Mode		Prob	Mode		Prob	Mode	
49	3	0	0.0	5	0	0.1	7	0	0.1
50	2	0	0.0	5	0	0.0	3	0	0.0
51	1	0	0.0	1	0	0.0	1	0	0.0
53	6	0	0.1	18	0	0.2	10	0	0.1
54	6	0	0.1	24	0	0.3	12	0	0.1
55	n	0	0.0	1	0	0.0	1	0	0.0
56	6	0	0.1	24	0	0.3	9	0	0.1
57	n	0	0.0	n	0	0.0	n	0	0.0
58	2	0	0.0	5	0	0.0	3	0	0.0
59	1	0	0.0	7	0	0.1	2	0	0.0
60	2	0	0.0	8	0	0.1	4	0	0.0
61	1	0	0.0	2	0	0.0	1	0	0.0
62	1	0	0.0	1	0	0.0	2	0	0.0
63	1	0	0.0	1	0	0.0	4	0	0.0
64	n	0	0.0	n	0	0.0	2	0	0.0
65	n	0	0.0	n	0	0.0	n	0	0.0
66	n	0	0.0	n	0	0.0	1	0	0.0
70	n	0	0.0	1	0	0.0	1	0	0.0
72	n	0	0.0	1	0	0.0	n	0	0.0
73	n	0	0.0	1	0	0.0	n	0	0.0
74	n	0	0.0	1	0	0.0	1	0	0.0
75	7	0	0.1	24	0	0.3	8	0	0.1
76	n	0	0.0	n	0	0.0	n	0	0.0
77	n	0	0.0	n	0	0.0	n	0	0.0
78	n	0	0.0	n	0	0.0	n	0	0.0
79	1	0	0.0	4	0	0.0	3	0	0.0
80	1	0	0.0	5	0	0.0	5	0	0.0
81	3	0	0.0	10	0	0.1	8	0	0.1
82	1	0	0.0	6	0	0.1	3	0	0.0
83	n	0	0.0	1	0	0.0	4	0	0.0
84	n	0	0.0	1	0	0.0	3	0	0.0
85	n	0	0.0	n	0	0.0	2	0	0.0
86	n	0	0.0	n	0	0.0	1	0	0.0
87	n	0	0.0	n	0	0.0	1	0	0.0
88	n	0	0.0	n	0	0.0	n	0	0.0
89	n	0	0.0	n	0	0.0	n	0	0.0
90	n	0	0.0	n	0	0.0	n	0	0.0
91	n	0	0.0	n	0	0.0	n	0	0.0
92	n	0	0.0	n	0	0.0	n	0	0.0
93	n	0	0.0	n	0	0.0	n	0	0.0
94	n	0	0.0	n	0	0.0	n	0	0.0

Note: n = less than 0.5 percent. Those land segments for which all probabilities are less than 0.5 percent are not shown.

Table 15. -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting land segments over the production life of the proposed lease area, deletion alternative A.

Land Segment	Within 3 days			Within 10 days			Within 30 days		
	Proposed	Existing and Proposed	Prob Mode Mean	Proposed	Existing and Proposed	Prob Mode Mean	Proposed	Existing and Proposed	Prob Mode Mean
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
7	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	n	0	0.0	n	0	0.0	n	0	0.0
11	n	0	0.0	n	0	0.0	n	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	n	0	0.0
15	n	0	0.0	n	0	0.0	n	0	0.0
16	n	0	0.0	n	0	0.0	n	0	0.0
17	n	0	0.0	n	0	0.0	n	0	0.0
18	n	0	0.0	n	0	0.0	n	0	0.0
20	n	0	0.0	n	0	0.0	n	0	0.0
22	n	0	0.0	n	0	0.0	n	0	0.0
23	n	0	0.0	n	0	0.0	n	0	0.0
24	n	0	0.0	n	0	0.0	n	0	0.0
28	n	0	0.0	n	0	0.0	n	0	0.0
29	n	0	0.0	n	0	0.0	n	0	0.0
30	n	0	0.0	n	0	0.0	n	0	0.0
33	n	0	0.0	n	0	0.0	n	0	0.0
34	n	0	0.0	n	0	0.0	n	0	0.0
35	n	0	0.0	n	0	0.0	n	0	0.0
38	n	0	0.0	n	0	0.0	n	0	0.0
39	n	0	0.0	n	0	0.0	n	0	0.0
40	n	0	0.0	n	0	0.0	n	0	0.0
41	n	0	0.0	n	0	0.0	n	0	0.0
42	n	0	0.0	n	0	0.0	n	0	0.0
43	n	0	0.0	n	0	0.0	n	0	0.0
44	n	0	0.0	n	0	0.0	n	0	0.0
45	n	0	0.0	n	0	0.0	n	0	0.0
46	n	0	0.0	n	0	0.0	n	0	0.0
47	n	0	0.0	n	0	0.0	n	0	0.0
48	n	0	0.0	n	0	0.0	n	0	0.0
49	n	0	0.0	n	0	0.0	n	0	0.0
50	n	0	0.0	n	0	0.0	n	0	0.0
51	n	0	0.0	n	0	0.0	n	0	0.0

Note: n = less than 0.5 percent. Those land segments for which all probabilities are less than 0.5 percent are not shown.

Table 15. (Continued) -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting land segments over the production life of the proposed lease area, detection alternative A.

Land Segment	----- Within 3 days -----		----- Within 10 days -----		----- Within 30 days -----	
	Proposed	Existing and Proposed	Proposed	Existing and Proposed	Proposed	Existing and Proposed
53	6	0	10	0	29	0
54	/	0	11	0	41	0
55	n	0	1	0	3	0
56	5	0	34	0	34	0
57	n	0	2	0	2	0
58	1	0	3	0	12	0
59	1	0	2	0	13	0
60	1	0	3	0	15	0
61	n	0	1	0	4	0
62	n	0	1	0	5	0
63	n	0	1	0	3	0
64	n	0	2	0	9	0
65	n	0	n	0	1	0
66	n	0	n	0	2	0
70	n	0	1	0	3	0
72	n	0	n	0	1	0
73	n	0	n	0	1	0
74	n	0	3	0	26	0
75	6	0	7	0	1	0
76	n	0	n	0	1	0
77	n	0	n	0	1	0
78	n	0	1	0	2	0
79	1	0	3	0	12	0
80	1	0	4	0	14	0
81	3	0	6	0	24	0
82	1	0	2	0	12	0
83	n	0	3	0	10	0
84	n	0	2	0	8	0
85	n	0	1	0	5	0
86	n	0	n	0	5	0
87	n	0	1	0	2	0
88	n	0	n	0	1	0
89	n	0	n	0	1	0
91	n	0	n	0	2	0
92	n	0	n	0	1	0
93	n	0	n	0	1	0
94	n	0	n	0	1	0

Note: n = less than 0.5 percent. Those land segments for which all probabilities are less than 0.5 percent are not shown.

Table 16. -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting land segments over the production life of the proposed lease area, deletion alternative 8.

Land Segment	Within 3 days			Within 10 days			Within 30 days		
	Proposed	Existing and Proposed	Prob Mode Mean	Proposed	Existing and Proposed	Prob Mode Mean	Proposed	Existing and Proposed	Prob Mode Mean
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	n	0	0.0	n	0	0.0	n	0	0.0
11	n	0	0.0	n	0	0.0	n	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	n	0	0.0
15	n	0	0.0	n	0	0.0	n	0	0.0
16	n	0	0.0	n	0	0.0	n	0	0.0
17	n	0	0.0	n	0	0.0	n	0	0.0
18	n	0	0.0	n	0	0.0	n	0	0.0
19	n	0	0.0	n	0	0.0	n	0	0.0
20	n	0	0.0	n	0	0.0	n	0	0.0
21	n	0	0.0	n	0	0.0	n	0	0.0
22	n	0	0.0	n	0	0.0	n	0	0.0
23	n	0	0.0	n	0	0.0	n	0	0.0
24	n	0	0.0	n	0	0.0	n	0	0.0
25	n	0	0.0	n	0	0.0	n	0	0.0
26	n	0	0.0	n	0	0.0	n	0	0.0
27	n	0	0.0	n	0	0.0	n	0	0.0
28	n	0	0.0	n	0	0.0	n	0	0.0
29	n	0	0.0	n	0	0.0	n	0	0.0
30	n	0	0.0	n	0	0.0	n	0	0.0
31	n	0	0.0	n	0	0.0	n	0	0.0
32	n	0	0.0	n	0	0.0	n	0	0.0
33	n	0	0.0	n	0	0.0	n	0	0.0
34	n	0	0.0	n	0	0.0	n	0	0.0
35	n	0	0.0	n	0	0.0	n	0	0.0
36	n	0	0.0	n	0	0.0	n	0	0.0
37	n	0	0.0	n	0	0.0	n	0	0.0
38	n	0	0.0	n	0	0.0	n	0	0.0
39	n	0	0.0	n	0	0.0	n	0	0.0
40	n	0	0.0	n	0	0.0	n	0	0.0
41	n	0	0.0	n	0	0.0	n	0	0.0
42	n	0	0.0	n	0	0.0	n	0	0.0
43	n	0	0.0	n	0	0.0	n	0	0.0
44	n	0	0.0	n	0	0.0	n	0	0.0
45	n	0	0.0	n	0	0.0	n	0	0.0
46	n	0	0.0	n	0	0.0	n	0	0.0
47	n	0	0.0	n	0	0.0	n	0	0.0
48	n	0	0.0	n	0	0.0	n	0	0.0
49	n	0	0.0	n	0	0.0	n	0	0.0
50	n	0	0.0	n	0	0.0	n	0	0.0
51	n	0	0.0	n	0	0.0	n	0	0.0

Note: n = less than 0.5 percent. Those land segments for which all probabilities are less than 0.5 percent are not shown.

Table 16. (continued) -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting land segments over the production life of the proposed lease area, deletion alternative B.

Land Segment	----- Within 3 days -----			----- Within 10 days -----			----- Within 30 days -----		
	Proposed	Existing and Proposed	Prob Mode Mean	Proposed	Existing and Proposed	Prob Mode Mean	Proposed	Existing and Proposed	Prob Mode Mean
53	6	0	0.1	28	0	0.3	8	0	0.1
54	6	0	0.1	39	0	0.5	10	0	0.1
55	n	0	0.0	2	0	0.0	n	0	0.0
56	4	0	0.0	32	0	0.4	7	0	0.1
57	n	0	0.0	1	0	0.0	n	0	0.0
58	1	0	0.0	10	0	0.1	3	0	0.0
59	1	0	0.0	12	0	0.1	2	0	0.0
60	8	0	0.0	14	0	0.2	3	0	0.0
61	n	0	0.0	3	0	0.0	1	0	0.0
62	n	0	0.0	5	0	0.0	1	0	0.0
63	n	0	0.0	3	0	0.0	1	0	0.0
64	n	0	0.0	7	0	0.1	2	0	0.0
65	n	0	0.0	1	0	0.0	n	0	0.0
66	n	0	0.0	2	0	0.0	n	0	0.0
70	n	0	0.0	2	0	0.0	1	0	0.0
72	n	0	0.0	1	0	0.0	n	0	0.0
73	n	0	0.0	n	0	0.0	n	0	0.0
74	n	0	0.0	n	0	0.0	1	0	0.0
75	5	0	0.0	24	0	0.3	6	0	0.1
76	n	0	0.0	n	0	0.0	n	0	0.0
77	n	0	0.0	1	0	0.0	n	0	0.0
78	n	0	0.0	n	0	0.0	n	0	0.0
79	1	0	0.0	9	0	0.1	2	0	0.0
80	1	0	0.0	10	0	0.1	3	0	0.0
81	2	0	0.0	20	0	0.2	5	0	0.0
82	1	0	0.0	10	0	0.1	2	0	0.0
83	n	0	0.0	8	0	0.1	2	0	0.0
84	n	0	0.0	5	0	0.0	1	0	0.0
85	n	0	0.0	3	0	0.0	1	0	0.0
86	n	0	0.0	1	0	0.0	1	0	0.0
87	n	0	0.0	1	0	0.0	n	0	0.0
88	n	0	0.0	n	0	0.0	n	0	0.0
89	n	0	0.0	n	0	0.0	n	0	0.0
91	n	0	0.0	n	0	0.0	n	0	0.0
92	n	0	0.0	n	0	0.0	n	0	0.0
93	n	0	0.0	n	0	0.0	n	0	0.0
94	n	0	0.0	n	0	0.0	n	0	0.0

Note: n = less than 0.5 percent. Those land segments for which all probabilities are less than 0.5 percent are not shown.

Table 17. -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting land segments over the production life of the proposed lease area, transportation alternative A.

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

Note: n = less than 0.5 percent. Those land segments for which all probabilities are less than 0.5 percent are not shown.

Table 17. (Continued) -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting land segments over the production life of the proposed lease area, transportation alternative A.

Land Segment	----- Within 3 days -----			----- Within 10 days -----			----- Within 30 days -----		
	Proposed		Existing and Proposed	Proposed		Existing and Proposed	Proposed		Existing and Proposed
	Prob	Mode		Prob	Mode		Prob	Mode	
51	1	0	0	1	0	0	2	0	0
52	n	0	0	n	0	0	n	0	0
53	8	0	0	14	0	0	14	0	0
54	9	0	0	19	0	0	20	0	0
55	n	0	0	1	0	0	1	0	0
56	7	0	0	15	0	0	16	0	0
57	n	0	0	1	0	0	1	0	0
58	2	0	0	5	0	0	6	0	0
59	1	0	0	3	0	0	4	0	0
60	2	0	0	5	0	0	6	0	0
61	1	0	0	2	0	0	3	0	0
62	n	0	0	3	0	0	3	0	0
63	n	0	0	1	0	0	3	0	0
64	1	0	0	6	0	0	7	0	0
65	n	0	0	1	0	0	1	0	0
66	n	0	0	1	0	0	1	0	0
70	1	0	0	3	0	0	3	0	0
71	1	0	0	1	0	0	1	0	0
72	1	0	0	1	0	0	1	0	0
73	2	0	0	2	0	0	2	0	0
74	6	0	0	9	0	0	9	0	0
75	5	0	0	22	0	0	26	0	0
76	n	0	0	n	0	0	1	0	0
77	n	0	0	n	0	0	1	0	0
78	3	0	0	6	0	0	3	0	0
79	3	0	0	6	0	0	17	0	0
80	4	0	0	11	0	0	18	0	0
81	2	0	0	6	0	0	28	0	0
82	1	0	0	11	0	0	14	0	0
83	n	0	0	2	0	0	13	0	0
84	n	0	0	1	0	0	10	0	0
85	n	0	0	1	0	0	7	0	0
86	n	0	0	1	0	0	2	0	0
87	n	0	0	1	0	0	2	0	0
88	n	0	0	1	0	0	2	0	0
89	n	0	0	1	0	0	1	0	0
90	n	0	0	1	0	0	1	0	0
91	n	0	0	1	0	0	1	0	0
92	n	0	0	1	0	0	1	0	0
93	n	0	0	1	0	0	1	0	0
94	n	0	0	1	0	0	1	0	0

Note: n = less than 0.5 percent. Those land segments for which all probabilities are less than 0.5 percent are not shown.

Table 18. -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting land segments over the production life of the proposed lease area, transportation alternative B.

Land Segment	----- Within 3 days -----		----- Within 10 days -----		----- Within 30 days -----	
	Proposed Prob Mode Mean	Existing and Proposed Prob Mode Mean	Proposed Prob Mode Mean	Existing and Proposed Prob Mode Mean	Proposed Prob Mode Mean	Existing and Proposed Prob Mode Mean
3	n 0 0.0	n 0 0.0	n 0 0.0	n 0 0.0	1 0 0.0	1 0 0.0
4	n 0 0.0	n 0 0.0	n 0 0.0	n 0 0.0	1 0 0.0	2 0 0.0
/	n 0 0.0	n 0 0.0	n 0 0.0	n 0 0.0	1 0 0.0	1 0 0.0
8	n 0 0.0	n 0 0.0	n 0 0.0	n 0 0.0	3 0 0.0	1 0 0.0
9	n 0 0.0	n 0 0.0	n 0 0.0	n 0 0.0	1 0 0.0	2 0 0.0
10	n 0 0.0	n 0 0.0	1 0 0.0	1 0 0.0	1 0 0.0	3 0 0.0
11	1 0 0.0	1 0 0.0	2 0 0.0	4 0 0.0	3 0 0.0	6 0 0.1
12	3 0 0.0	3 0 0.0	6 0 0.1	10 0 0.1	6 0 0.1	11 0 0.1
13	5 0 0.0	6 0 0.1	10 0 0.1	19 0 0.2	11 0 0.1	20 0 0.2
14	3 0 0.0	6 0 0.1	8 0 0.1	16 0 0.2	8 0 0.1	17 0 0.2
15	4 0 0.0	6 0 0.1	11 0 0.1	20 0 0.1	12 0 0.1	21 0 0.1
16	3 0 0.0	4 0 0.1	6 0 0.1	12 0 0.3	7 0 0.1	12 0 0.1
17	9 0 0.1	11 0 0.1	17 0 0.2	27 0 0.3	18 0 0.2	29 0 0.3
18	1 0 0.0	1 0 0.0	3 0 0.0	7 0 0.1	4 0 0.0	6 0 0.1
20	n 0 0.0	1 0 0.0	1 0 0.0	2 0 0.0	1 0 0.0	2 0 0.0
21	n 0 0.0	n 0 0.0	n 0 0.0	n 0 0.0	n 0 0.0	1 0 0.0
22	n 0 0.0	n 0 0.0	n 0 0.0	n 0 0.0	n 0 0.0	1 0 0.0
23	n 0 0.0	n 0 0.0	n 0 0.0	n 0 0.0	1 0 0.0	1 0 0.0
24	n 0 0.0	n 0 0.0	n 0 0.0	n 0 0.0	1 0 0.0	2 0 0.0
27	n 0 0.0	n 0 0.0	n 0 0.0	n 0 0.0	1 0 0.0	1 0 0.0
28	n 0 0.0	n 0 0.0	n 0 0.0	n 0 0.0	1 0 0.0	1 0 0.0
29	n 0 0.0	n 0 0.0	1 0 0.0	1 0 0.0	1 0 0.0	2 0 0.0
30	n 0 0.0	n 0 0.0	n 0 0.0	n 0 0.0	1 0 0.0	2 0 0.0
33	n 0 0.0	n 0 0.0	n 0 0.0	n 0 0.0	1 0 0.0	2 0 0.0
34	n 0 0.0	n 0 0.0	n 0 0.0	1 0 0.0	1 0 0.0	2 0 0.0
35	n 0 0.0	n 0 0.0	n 0 0.0	1 0 0.0	1 0 0.0	2 0 0.0
37	n 0 0.0	n 0 0.0	n 0 0.0	n 0 0.0	1 0 0.0	1 0 0.0
38	n 0 0.0	n 0 0.0	1 0 0.0	2 0 0.0	1 0 0.0	3 0 0.0
39	n 0 0.0	n 0 0.0	1 0 0.0	3 0 0.0	2 0 0.0	4 0 0.0
40	n 0 0.0	n 0 0.0	1 0 0.0	4 0 0.0	3 0 0.0	4 0 0.0
41	n 0 0.0	n 0 0.0	2 0 0.0	4 0 0.0	2 0 0.0	5 0 0.0
42	n 0 0.0	n 0 0.0	3 0 0.0	5 0 0.0	3 0 0.0	7 0 0.1
43	n 0 0.0	1 0 0.0	5 0 0.0	10 0 0.1	5 0 0.0	11 0 0.1
44	n 0 0.0	1 0 0.0	5 0 0.0	10 0 0.1	5 0 0.0	11 0 0.1
45	19 0 0.2	22 0 0.3	29 0 0.3	41 0 0.5	29 0 0.3	42 0 0.5
46	2 0 0.0	4 0 0.0	7 0 0.1	13 0 0.1	7 0 0.1	14 0 0.2
47	1 0 0.0	1 0 0.0	3 0 0.0	4 0 0.0	3 0 0.0	5 0 0.1
48	3 0 0.0	4 0 0.0	7 0 0.1	10 0 0.1	7 0 0.1	11 0 0.1
49	3 0 0.0	6 0 0.1	8 0 0.1	14 0 0.2	9 0 0.1	17 0 0.2
50	3 0 0.0	6 0 0.1	4 0 0.0	9 0 0.1	5 0 0.0	10 0 0.1

Note: n = less than 0.5 percent. Those land segments for which all probabilities are less than 0.5 percent are not shown.

Table 18. (Continued) -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting land segments over the production life of the proposed lease area, transportation alternative B.

Land Segment	----- Within 3 days -----		----- Existing and Proposed -----		----- Within 10 days -----		----- Existing and Proposed -----		----- Within 30 days -----	
	Prob Mode	Mean	Prob Mode	Mean	Prob Mode	Mean	Prob Mode	Mean	Prob Mode	Mean
51	1	0.0	2	0.0	1	0.0	3	0.0	1	0.0
52	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
53	10	0.1	21	0.2	16	0.2	34	0.4	16	0.2
54	11	0.1	28	0.3	17	0.2	44	0.6	18	0.2
55	n	0.0	1	0.0	1	0.0	3	0.0	1	0.0
56	8	0.1	26	0.3	12	0.1	36	0.4	13	0.1
57	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
58	2	0.0	5	0.1	4	0.0	12	0.1	5	0.0
59	1	0.0	7	0.1	4	0.0	14	0.2	4	0.0
60	3	0.0	9	0.1	6	0.1	17	0.2	6	0.1
61	1	0.0	2	0.0	2	0.0	4	0.0	2	0.0
62	n	0.0	1	0.0	2	0.0	6	0.1	2	0.0
63	1	0.0	1	0.0	2	0.0	4	0.0	2	0.0
64	n	0.0	n	0.0	2	0.0	8	0.1	3	0.0
65	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0
66	n	0.0	n	0.0	n	0.0	2	0.0	1	0.0
67	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0
68	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0
69	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0
70	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0
71	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0
72	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0
73	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0
74	n	0.0	n	0.0	n	0.0	3	0.3	1	0.0
75	2	0.0	19	0.2	3	0.0	23	0.3	3	0.0
76	1	0.0	1	0.0	1	0.0	2	0.0	1	0.0
77	n	0.0	n	0.0	n	0.0	1	0.0	1	0.0
78	1	0.0	1	0.0	1	0.0	2	0.0	2	0.0
79	6	0.1	9	0.1	8	0.1	15	0.2	9	0.1
80	3	0.0	7	0.1	7	0.1	15	0.2	9	0.1
81	5	0.0	12	0.1	11	0.1	26	0.3	13	0.1
82	2	0.0	7	0.1	4	0.0	13	0.1	5	0.1
83	1	0.0	2	0.0	6	0.1	12	0.1	7	0.1
84	1	0.0	1	0.0	3	0.0	5	0.1	4	0.0
85	n	0.0	1	0.0	2	0.0	2	0.0	3	0.0
86	n	0.0	n	0.0	1	0.0	1	0.0	1	0.0
87	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
88	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
89	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
90	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
91	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
92	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
93	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
94	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0

Note: n = less than 0.5 percent. Those land segments for which all probabilities are less than 0.5 percent are not shown.

Table 19. -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting land segments over the production life of the proposed lease area, transportation alternative C.

Land 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
1	n	0	n	0	1	0
3	n	0.0	n	0.0	1	0.0
4	n	0.0	n	0.0	1	0.0
7	n	0.0	n	0.0	n	0.0
8	n	0.0	n	0.0	n	0.0
9	n	0.0	n	0.0	n	0.0
10	n	0.0	1	0.0	2	0.0
11	1	0.0	3	0.0	3	0.0
12	3	0.0	6	0.1	6	0.1
13	8	0.1	12	0.1	13	0.1
14	4	0.0	8	0.1	8	0.1
15	7	0.1	13	0.1	14	0.2
16	5	0.1	10	0.1	10	0.2
17	36	0.4	41	0.5	42	0.5
18	1	0.0	2	0.0	3	0.0
20	1	0.0	2	0.0	2	0.0
21	2	0.0	3	0.0	4	0.0
22	1	0.0	2	0.0	4	0.0
23	n	0.0	n	0.0	n	0.0
24	n	0.0	n	0.0	1	0.0
26	n	0.0	n	0.0	1	0.0
27	n	0.0	1	0.0	1	0.0
28	n	0.0	1	0.0	1	0.0
29	n	0.0	n	0.0	1	0.0
30	n	0.0	n	0.0	2	0.0
32	n	0.0	n	0.0	2	0.0
33	n	0.0	n	0.0	1	0.0
34	n	0.0	n	0.0	1	0.0
35	n	0.0	n	0.0	1	0.0
37	n	0.0	n	0.0	n	0.0
38	n	0.0	1	0.0	2	0.0
39	n	0.0	1	0.0	1	0.0
40	n	0.0	1	0.0	2	0.0
41	n	0.0	3	0.0	4	0.0
42	n	0.0	4	0.0	4	0.0
43	n	0.0	3	0.0	4	0.0
44	2	0.0	7	0.1	7	0.1
45	28	0.3	55	0.4	35	0.4
46	4	0.0	7	0.1	7	0.1
47	1	0.0	5	0.0	5	0.1
48	4	0.0	9	0.1	9	0.1

Note: n = less than 0.5 percent. Those land segments for which all probabilities are less than 0.5 percent are not shown.

Table 19. (Continued) -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting land segments over the production life of the proposed lease area, transportation alternative C.

Land 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
49	3	0	0.0	6	0	0.1	9	0	0.1
50	2	0	0.0	5	0	0.0	3	0	0.0
51	1	0	0.0	2	0	0.0	1	0	0.0
53	5	0	0.0	17	0	0.2	7	0	0.1
54	4	0	0.0	22	0	0.3	7	0	0.1
55	4	0	0.0	1	0	0.0	6	0	0.0
56	7	0	0.0	23	0	0.3	6	0	0.1
57	n	0	0.0	n	0	0.0	n	0	0.0
58	2	0	0.0	5	0	0.0	2	0	0.0
59	1	0	0.0	7	0	0.1	1	0	0.0
60	1	0	0.0	8	0	0.1	2	0	0.0
61	1	0	0.0	2	0	0.0	1	0	0.0
62	1	0	0.0	2	0	0.0	3	0	0.0
63	n	0	0.0	1	0	0.0	3	0	0.0
64	n	0	0.0	n	0	0.0	1	0	0.0
65	n	0	0.0	n	0	0.0	1	0	0.0
66	n	0	0.0	n	0	0.0	1	0	0.0
70	n	0	0.0	n	0	0.0	2	0	0.0
72	n	0	0.0	1	0	0.0	1	0	0.0
73	n	0	0.0	n	0	0.0	1	0	0.0
74	n	0	0.0	1	0	0.0	2	0	0.0
75	n	0	0.0	18	0	0.2	n	0	0.0
76	n	0	0.0	n	0	0.0	n	0	0.0
77	n	0	0.0	n	0	0.0	n	0	0.0
78	n	0	0.0	n	0	0.0	n	0	0.0
79	n	0	0.0	3	0	0.0	1	0	0.0
80	n	0	0.0	4	0	0.0	4	0	0.1
81	3	0	0.0	10	0	0.1	5	0	0.0
82	n	0	0.0	5	0	0.0	4	0	0.0
83	n	0	0.0	1	0	0.0	2	0	0.0
84	n	0	0.0	1	0	0.0	1	0	0.1
85	n	0	0.0	n	0	0.0	1	0	0.0
86	n	0	0.0	n	0	0.0	n	0	0.0
87	n	0	0.0	n	0	0.0	n	0	0.0
88	n	0	0.0	n	0	0.0	n	0	0.0
89	n	0	0.0	n	0	0.0	n	0	0.0
90	n	0	0.0	n	0	0.0	n	0	0.0
91	n	0	0.0	n	0	0.0	n	0	0.0
92	n	0	0.0	n	0	0.0	n	0	0.0
93	n	0	0.0	n	0	0.0	n	0	0.0
94	n	0	0.0	n	0	0.0	n	0	0.0

Note: n = less than 0.5 percent. Those land segments for which all probabilities are less than 0.5 percent are not shown.

project and for deletion alternatives A and B, and for transportation alternatives A, B, and C. Tables 14 to 19 show similar probabilities for land segments. Only the impact of Federal oil and gas leasing is shown in tables 8 to 19. Tables of probabilities that show the effects of existing oil transportation combined with existing and proposed leasing are presented in appendix D.

The overall probabilities are also shown graphically in appendices B and C. Figures B-1 to B-7 are histograms which show probabilities of 1, 2, ... N spills occurring and contacting the targets within periods of 3, 10, and 30 days. (Only targets with more than a 5-percent probability of 2 or more oilspill contacts are shown.) Figures C-1 to C-6 indicate, by means of circles superimposed on maps of the coastline, the probabilities of one or more spills occurring and contacting land segments within 3, 10, and 30 days, for the proposed leasing action and all alternatives.

Discussion of Results

The oilspill risks associated with OCS sale 60 generally reflect the proximity of the lease tract groups to the coastline and the various targets. Land segments on both sides of Shelikof Strait have the highest probability of being contacted by an oilspill that has weathered less than 3 days, as is shown in table 14. Other land segments subject

to risks of contact by an oilspill that has weathered less than 30 days include the Barren Islands, Augustine Island, and Anchor Point. The main risk to Anchor Point arises from the tanker terminal and the transportation activity in that area. Nearly every land segment within the study area has at least a small probability of being contacted by an oilspill that has weathered less than 30 days, indicating a very large number of possible oilspill trajectories. Although most risks are concentrated in the land segments mentioned above, this wide scattering could make it difficult to plan oilspill cleanup activities in advance.

Among the targets most likely to suffer oilspill contacts are seabird nesting colonies. Considering contact by oilspills weathered up to 30 days, the tracts proposed for sale 60 would affect, primarily, the southern seabird habitats, while the existing tracts would affect the northern area. The combined results show that each area is nearly at equal risk.

Risks to sea otters generally corresponded to risks to land segments. The locations of sea otter concentration areas A to H are shown in figure A.2. Sea otter concentration areas D (Afognak Island, Shuyak Island, and northwest Kodiak Island), H (Augustine Island), and G (Anchor Point) have the highest risks. Concentration area E (northwest Shelikof Strait) probably also has a high risk per unit area, but this is masked by a smaller size than the other concentration areas. Concentration areas A, B, and F have little likelihood of being

contacted by an oilspill that has weathered less than 3 days.

One target which suffers almost no risk is the Red River Salmon schooling area. Its location below Cape Ikolik, off the southwestern coast of Kodiak Island (see figure A.3), makes contact by an oilspill from sale 60 unlikely.

Both deletion alternatives A and B significantly reduce risks to land in general, the southern seabird foraging area, and sea otter concentration area D. Part of this reduction in risk is the result of reducing the assumed volume of oil, and (by assumptions made in this study) the consequent probability of oilspills occurring. However, a detailed analysis of the conditional probabilities reveals that the tracts deleted in alternatives A and B also pose the most risk per barrel of oil. In other words, these are the tracts where, if an oilspill occurs, it is most likely to contact the above targets.

It is useful to compare the probabilities of spills occurring and contacting targets over the expected production life of the proposed lease area with the total risks from the proposed leases, existing leases, and existing tanker transportation. In this way the cumulative effect of adding the proposed tracts to the study area may be examined. As seen in appendix table D-1, such cumulative effects substantially increase the risk to certain targets. For example, the northern seabird foraging area is shown to have a 33-35 percent chance of being hit

within 3 days by one or more spills from the proposed tracts. The cumulative effect of such leasing raises the probability to 93 percent, however. Other targets subject to high cumulative risks are sea otter areas G and H, and Barren and Augustine Islands.

The risks of sale 60 should also be considered in relation to the risks of other OCS lease sales in the Gulf of Alaska. Samuels and others (1980) analyzed the risks from sale 46, Kodiak Island, and concluded that most risks from sale 46 leases were to the eastern side of Kodiak Island. (Note: sale 46 was recently renumbered as sale 61.) This analysis has shown that sale 60 poses little risk to the eastern side of Kodiak Island. Therefore, it can be concluded that there are few direct cumulative effects from the two sales. Rather, the effect is that of extending the risks to a larger area. Lanfear and others (1979) studied oilspill risks from sales 55 and 39 (Northern Gulf of Alaska), and concluded that there was little possibility of these sales affecting the Cook Inlet and Kodiak Island area.

Conclusions

This analysis indicates that OCS lease sale 60 will result in an expected 4.0 oilspills occurring in the Cook Inlet - Shelikof Strait area. The probability that one or more oilspills will occur and contact land within 3 days is 0.77; for contacts within 30 days, the

probability increases to 0.96. Risks to land are most concentrated on both sides of Shelikof Strait, on the Barren Islands, on Augustine Island, and near Anchor Point. There is little cumulative effect of risks from sale 60 and those of sales 46, 55 or 39.

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Appendix A

Figure A.1.--Map showing the location of seabird foraging areas, north and south. Cook Inlet OCS lease sale 60: crosshatching indicates areal extent of targets.

Figure A.2.--Map showing the location of sea otter concentration areas A through H, Cook Inlet OCS lease sale 60: crosshatching indicates areal extent of targets.

Figure A.3.--Map showing the locations of seven targets, Cook Inlet OCS lease sale 60; crosshatching indicates areal extent of targets.

Appendix B

Figure B-1.--Histograms showing the probabilities of specific numbers of oilspills occurring and contacting land as a result of (1) the proposed leasing action, (2) deletion alternative A, and (3) deletion alternative B for OCS Sale 60.

TARGET - SEABIRD FORAGING AREA SOUTH
APRIL - SEPTEMBER

Figure B-2.---Histograms showing the probabilities of specific numbers of oilspills occurring and contacting seabird foraging area south, April-September, as a result of (1) the proposed leasing action, (2) deletion alternative A, and (3) deletion alternative B for OCS Sale b0.

TARGET SEABIRD FORAGING AREA SOUTH
OCTOBER - MARCH

Figure B-3.--Histograms showing the probabilities of specific numbers of oil spills occurring and contacting seabird foraging area south, October-March, as a result of (1) the proposed leasing action, (2) deletion alternative A, and (3) deletion alternative B for UCS Sale 60.

TARGET - SEABIRD FORAGING AREA NORTH
APRIL - SEPTEMBER

Figure B-4.--Histograms showing the probabilities of specific numbers of oil spills occurring and contacting seabird foraging area north, April-September, as a result of (1) the proposed leasing action, (2) deletion alternative A, and (3) deletion alternative B for OCS Sale 60.

TARGET - SEABIRD FORAGING AREA NORTH
OCTOBER - MARCH

Figure B-5.--Histograms showing the probabilities of specific numbers of oilspills occurring and contacting seabird foraging area north, October-March, as a result of (1) the proposed leasing action, (2) deletion alternative A, and (3) deletion alternative B for for GCS Sale 60.

Figure B-6.--Pistograms showing the probabilities of specific numbers of oil spills occurring and contacting sea otter concentration area D as a result of (1) the proposed leasing action, (2) deletion alternative A, and (3) deletion alternative B for OCS Sale 60.

Figure B-7. --Histograms showing the probabilities of specific numbers of oilspills occurring and contacting sea otter concentration area H as a result of (1) the proposed leasing action, (2) deletion alternative A, and (3) deletion alternative B for OCS Sale 60.

Appendix C

f

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 (proposed leasing action).

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 (deletion alternative A).

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 (deletion alternative B).

Figure C-4.--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 (transportation alternative A).

DAY 3

DAY 10

DAY 30

Figure C-5.---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 (transportation alternative B).

Figure C-6. ---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 (transportation alternative C).

Appendix D

Table D-1. -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting targets over the production life of the proposed lease area, compared with total risks from the proposed leases, existing leases, and existing tanker transportation.

Target	----- Within 3 days -----			----- Within 10 days -----			----- Within 30 days -----		
	Proposed Prob Mode Mean	Existing, Pro- posed + tanker Prob Mode Mean	Prob Mode Mean	Proposed Prob Mode Mean	Existing, Pro- posed + tanker Prob Mode Mean	Prob Mode Mean	Proposed Prob Mode Mean	Existing, Pro- posed + tanker Prob Mode Mean	
Land	77	1	1.5	97	3	3.6	94	2	2.8
Seabird, S., Apr-Sep	49	0	0.7	54	0	0.8	54	0	0.8
Seabird, S., Oct-Mar	57	0	0.8	70	1	1.2	63	0	1.0
Seabird, N., Apr-Sep	35	0	0.4	93	2	2.7	38	0	0.5
Seabird, N., Oct-Mar	33	0	0.4	93	2	2.7	36	0	0.4
Sea otter, area A	3	0	0.0	22	0	0.3	5	0	0.1
Sea otter, area B	1	0	0.0	11	0	0.1	8	0	0.1
Sea otter, area C	5	0	0.1	28	0	0.3	11	0	0.1
Sea otter, area D	35	0	0.4	43	0	0.6	48	0	0.7
Sea otter, area E	8	0	0.1	13	0	0.1	17	0	0.2
Sea otter, area F	n	0	0.0	n	0	0.0	n	0	0.0
Sea otter, area G	12	0	0.1	58	0	0.9	13	0	0.1
Sea otter, area H	22	0	0.2	65	1	1.0	33	0	0.4
Red River salmon	n	0	0.0	n	0	0.0	n	0	0.0
Karluk River salmon	3	0	0.0	3	0	0.0	6	0	0.1
Rocky, Atl., Grassy	6	0	0.1	7	0	0.1	10	0	0.1
Dark, Sent., Latex	3	0	0.0	5	0	0.0	6	0	0.1
Barren Islands	7	0	0.1	36	0	0.4	14	0	0.1
Augustine Island	11	0	0.1	50	0	0.7	16	0	0.2
Kukpatik, Shalun	11	0	0.1	14	0	0.1	19	0	0.2

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Table 0-2. -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) of the proposed lease area, compared with total risks from the proposed leases, existing leases, and existing tanker transportation.

Land Segment	Within 3 days			Within 10 days			Within 33 days		
	Proposed	Existing, Proposed + tanker	Prob Mode Mean	Proposed	Existing, Proposed + tanker	Prob Mode Mean	Proposed	Existing, Proposed + tanker	Prob Mode Mean
3	n	0	0.0	n	0	0.0	1	0	0.0
4	n	0	0.0	n	0	0.0	1	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	1	0	0.0
9	n	0	0.0	1	0	0.0	1	0	0.0
10	n	0	0.0	1	0	0.0	2	0	0.0
11	3	0	0.0	5	0	0.0	6	0	0.1
12	4	0	0.0	6	0	0.1	12	0	0.1
13	10	0	0.1	14	0	0.2	14	0	0.2
14	5	0	0.0	9	0	0.1	9	0	0.1
15	17	0	0.2	23	0	0.3	24	0	0.3
16	3	0	0.0	6	0	0.1	7	0	0.1
17	8	0	0.1	14	0	0.2	16	0	0.2
18	n	0	0.0	2	0	0.0	2	0	0.0
20	n	0	0.0	1	0	0.0	1	0	0.0
21	n	0	0.0	1	0	0.0	1	0	0.0
22	1	0	0.0	2	0	0.0	2	0	0.0
23	2	0	0.0	3	0	0.0	3	0	0.0
24	2	0	0.0	3	0	0.0	4	0	0.1
26	1	0	0.0	2	0	0.0	2	0	0.0
27	1	0	0.0	2	0	0.0	3	0	0.0
28	n	0	0.0	n	0	0.0	1	0	0.0
29	n	0	0.0	n	0	0.0	1	0	0.0
30	n	0	0.0	n	0	0.0	1	0	0.0
32	n	0	0.0	n	0	0.0	1	0	0.0
33	n	0	0.0	n	0	0.0	1	0	0.0
34	n	0	0.0	n	0	0.0	2	0	0.0
35	n	0	0.0	n	0	0.0	1	0	0.0
37	n	0	0.0	n	0	0.0	n	0	0.0
38	n	0	0.0	2	0	0.0	2	0	0.0
39	n	0	0.0	1	0	0.0	1	0	0.0
40	1	0	0.0	5	0	0.1	5	0	0.1
41	2	0	0.0	4	0	0.0	4	0	0.0
42	2	0	0.0	4	0	0.0	5	0	0.1
43	3	0	0.0	8	0	0.1	9	0	0.1
44	23	0	0.3	31	0	0.4	31	0	0.4
45	3	0	0.0	4	0	0.0	7	0	0.1
46	1	0	0.0	4	0	0.0	4	0	0.0
47	6	0	0.1	11	0	0.1	11	0	0.1
48	3	0	0.0	7	0	0.1	8	0	0.1
49									

Note: n = less than 0.5 percent. Those land segments for which all probabilities are less than 0.5 percent are not shown.

Table D-2. (Continued) -- Probabilities (expressed as percent chance) of one or more spills, the most likely number of spills (mode), and the expected number of spills (mean) occurring and contacting land segments over the production life of the proposed lease area, compared with total risks from the proposed leases, existing leases, and existing tanker transportation.

Land Segment	----- Within 3 days -----			----- Within 10 days -----			----- Within 30 days -----		
	Proposed		Existing, Proposed + tanker Prob Mode Mean	Proposed		Existing, Proposed + tanker Prob Mode Mean	Proposed		Existing, Proposed + tanker Prob Mode Mean
	Prob Mode	Mean		Prob Mode	Mean		Prob Mode	Mean	
50	2	0	0.0	5	0	0.0	3	0	0.1
51	1	0	0.0	2	0	0.0	1	0	0.0
53	6	0	0.1	19	0	0.1	10	0	0.1
54	6	0	0.1	26	0	0.3	12	0	0.1
55	n	0	0.0	1	0	0.0	1	0	0.0
56	6	0	0.1	28	0	0.3	9	0	0.1
57	n	0	0.0	n	0	0.0	n	0	0.0
58	2	0	0.0	5	0	0.0	3	0	0.0
59	1	0	0.0	7	0	0.1	2	0	0.0
60	2	0	0.0	5	0	0.1	4	0	0.0
61	1	0	0.0	2	0	0.0	1	0	0.0
62	1	0	0.0	1	0	0.0	2	0	0.0
63	1	0	0.0	1	0	0.0	1	0	0.0
64	n	0	0.0	11	0	0.1	2	0	0.0
65	n	0	0.0	n	0	0.0	n	0	0.0
66	n	0	0.0	n	0	0.0	1	0	0.0
67	n	0	0.0	n	0	0.0	n	0	0.0
69	n	0	0.0	n	0	0.0	n	0	0.0
70	n	0	0.0	4	0	0.0	1	0	0.0
72	n	0	0.0	1	0	0.0	n	0	0.0
73	n	0	0.0	1	0	0.0	2	0	0.0
74	n	0	0.0	3	0	0.0	1	0	0.0
75	7	0	0.1	40	0	0.5	6	0	0.1
76	n	0	0.0	1	0	0.0	n	0	0.0
77	n	0	0.0	n	0	0.0	n	0	0.0
78	n	0	0.0	n	0	0.0	n	0	0.0
79	1	0	0.0	8	0	0.1	3	0	0.0
80	3	0	0.0	11	0	0.1	6	0	0.1
81	1	0	0.0	8	0	0.1	3	0	0.0
82	1	0	0.0	8	0	0.1	2	0	0.0
83	n	0	0.0	2	0	0.0	1	0	0.0
84	n	0	0.0	1	0	0.0	1	0	0.0
85	n	0	0.0	n	0	0.0	n	0	0.0
86	n	0	0.0	n	0	0.0	n	0	0.0
87	n	0	0.0	n	0	0.0	n	0	0.0
88	n	0	0.0	n	0	0.0	n	0	0.0
89	n	0	0.0	n	0	0.0	n	0	0.0
90	n	0	0.0	n	0	0.0	n	0	0.0
91	n	0	0.0	n	0	0.0	n	0	0.0
92	n	0	0.0	n	0	0.0	n	0	0.0
93	n	0	0.0	n	0	0.0	n	0	0.0
94	n	0	0.0	n	0	0.0	n	0	0.0

Note: n = less than 0.5 percent. Those land segments for which all probabilities are less than 0.5 percent are not shown.