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Oil Spill Risk Analysis: Gulf of Mexico Outer Continental Shelf (OCS) Lease Sales, Central and Western Planning Areas, 2012-2017, and Gulfwide OCS Program, 2012-2051

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Table of Contents

List of Tables

List of Figures

Figure **Page**

Acronyms

bbl	barrel= 42 U.S. gallons
Bbbl	Billion barrels = 10^9 barrels
BOEM	Bureau of Ocean Energy Management
CPA	Central Planning Area
GOM	Gulf of Mexico
HAPC	Habitat Areas of Particular Concern
ID	Identification
MMS	Minerals Management Service
OCS	Outer Continental Shelf
OSRA	Oil Spill Risk Analysis
POM	Princeton Ocean Model
WPA	Western Planning Area
USDOI	United States Department of the Interior

1.0 Introduction

The Federal Government plans to offer U.S. Outer Continental Shelf (OCS) lands in the Central and Western Planning Areas of the Gulf of Mexico (GOM) for oil and gas leasing (Figure B-1). Because oil spills may occur from activities associated with offshore oil exploration, production, and transportation resulting from these lease sales, the Bureau of Ocean Energy Management (BOEM) conducts a formal oil-spill risk analysis (OSRA) to support the environmental impact statement (EIS) completed prior to conducting the proposed leasing of these areas. This report summarizes results of that analysis, the objective of which was to estimate the risk of oil-spill contact to sensitive offshore and onshore environmental resources and socioeconomic features from oil spills accidentally occurring from the OCS activities.

The occurrence of oil spills is fundamentally a matter of probability. There is no certainty regarding the amount of oil that would be produced, or the size or likelihood of a spill that would occur during the estimated life of a given lease sale. Neither can the winds and ocean currents that transport oil spills be known for certain. A probabilistic event such as an oil-spill occurrence or oil-spill contact to an environmentally sensitive area cannot be predicted, but an estimate of its likelihood (its probability) can be quantified.

The OSRA was conducted in three parts, corresponding to different aspects of the overall problem.

1. The probability of oil-spill occurrence, which is based on spill rates derived from historic data and on estimated volumes of oil produced and transported.
2. The trajectories of oil spills from hypothetical spill locations to locations of various environmental resources, which are simulated using the OSRA Model (Smith et al., 1982).
3. The combination of results of the first two to estimate the overall oil-spill risk if there is oil development.

This report is available from the BOEM's Internet site (*http://www.boem.gov*).

2.0 Framework of the Analysis

2.1 The Proposed Actions and the Gulfwide OCS Program

The proposed Federal actions addressed in this report are oil and gas lease sales in the Central Planning Area (CPA) and Western Planning Area (WPA) of the Gulf of Mexico OCS (Figure B-1). Under the *Proposed Outer Continental Shelf Oil and Gas Leasing Program: 2012-2017 (5-Year Program)* (United State Department of the Interior (USDOI), BOEM, 2011 5-Year Program), two sales would be held each year—one in the CPA and one in the WPA. The purpose of the proposed Federal actions is to offer for lease those areas that may contain economically recoverable oil and natural gas resources. The Gulfwide OCS Program comprises all future operations that will occur over a 40-year time period (2012-2051) from proposed, existing, and future leases in all three GOM planning areas: Western, Central, and Eastern. The development scenario assumes that the oil produced in the lease areas will be transported to shore predominantly by pipelines, with a small quantity transported by barge/shuttle tankers (LaBelle, 2001).

The proposed actions analyzed in this report are one "typical" CPA lease sale and one "typical" WPA lease sale. A set of ranges for resource estimates and projected exploration and development activities developed for each "typical" proposed action was used to analyze spill risk. The analyses of oil-spill risk for these "typical" proposed actions are expected to be "typical" of any of the other proposed CPA or WPA sales scheduled in the 5-Year Program. In other words, each of the proposed sales in the 5-Year Program is expected to be within the ranges used for the analyzed "typical" proposed action in the corresponding planning area. The proposed actions for the Eastern Planning Area lease sales (225 and 226) will be presented in a separate Environmental Impact Statement (EIS), and a separate OSRA report will contain those results.

2.2 Domain/Study Areas

The domain (shown in Figure B-1) defines the geographic boundaries that encompass the environmental resources at risk from a hypothetical oil spill from OCS operations in the lease areas. Although few hypothetical oil spills were likely to extend beyond the borders of the domain within 30 days after release (the maximum elapsed time considered), we have tracked and tabulated some spills that would travel beyond the open-ocean boundaries. These spills could contact land or other environmental resources outside the domain.

The two study areas are the CPA and WPA (shown in Figure B-1). The planning areas encompass the offshore waters within the Gulf of Mexico (beginning 3 miles offshore Louisiana, Mississippi, and Alabama; and 3 leagues offshore Texas) and extend seaward to the limits of the Exclusive Economic Zone.

The study areas were divided into offshore subareas based upon ranges in water depth. These water depth ranges reflect the technological requirements and related physical and economic impacts as a consequence of the oil and gas potential, exploration and development activities, and lease terms unique to each water-depth range.

In the OSRA Model, hypothetical spill sites are called launch points. A cluster analysis (Everitt, 1993) is used to further divide the planning areas into 50 hypothetical spill subareas. Cluster analysis is a multivariate technique that groups entities based on similar characteristics. In this case, the BOEM used the probability of contact to shoreline segments to identify offshore areas that showed similar risk based on similarity in patterns of trajectories. The study area and the hypothetical spill sites (launch subareas), which are used to represent oil-spill risks from drilling and production at a fixed facility, are shown in Figure B-2.

To account for the risk of spills occurring from the transportation of oil to shore via pipeline, generalized pipeline corridors originating within each of the offshore cluster areas and terminating at existing major oil pipeline shore bases were identified. These pipeline corridors represent the complex matrix of pipeline systems existing offshore that are likely to be used in support of each proposed action. The oil volume estimated to be produced within each cluster area was proportioned among likely pipeline corridor routes, representing the transportation of the oil beginning within a cluster area and terminating at State/Federal boundaries proximate to known pipeline shore bases.

2.3 Hypothetical Spill Locations

The OSRA Model initiated hypothetical oil spills uniformly in space and time from within each study area, as shown in Figure B-2. At $1/10^o$ intervals in the north-south direction (about 11 km) and $1/10^o$ intervals in the east-west direction (about 10 km), the model launched a hypothetical oil spill every 1-day time interval. At this resolution, there were 6,045 total launch points in space, and a total of 5,400 oil-spill trajectories were launched from each spatial grid point over a period from 1993 to 2007. The spatial resolution of the spill simulations was well within the spatial resolution of the input data, and the interval of time between releases was sufficiently short to sample weather-scale changes in the input winds (Price et al., 2002). The sensitivity tests on the OSRA Model (Price et al., 2002) indicated that, statistically, the above-mentioned spatial resolution ($1/10^o$ by $1/10^o$) and time resolution (1-day) are sufficient to represent the spatial and time variations of the oil-spill trajectories in the area.

2.4 Estimated Volume of Oil Resources

For this analysis, both benefits and risks are functions of the volume of oil produced and are mutually dependent. For example, greater volumes of produced oil are associated with greater economic benefits, as well as greater risks. If the benefits are evaluated by assuming production of a specific amount of oil, then the corresponding risks should be stated conditionally, such as “the risks are . . . , given that the volume is . . . .” Any statements about the likelihood of a particular volume of oil being developed also apply to the likelihood of the corresponding benefits and risks.

The resource estimates are presented for the following scenarios:

Proposed Action—the range of oil resources estimated to be leased, discovered, and produced over a 40-year time period as a result of a typical WPA or CPA lease sale, as found in the proposed 5-Year Program for 2012-2017.

OCS Program—the range of oil resources estimated to be leased, discovered, and produced as a result of prior lease sales, the proposed actions, and future lease sales that will occur during the life of a proposed action (40 years).

The range in oil resource projections used to develop the proposed actions and OCS Program scenarios are based on resource and reserves estimates as presented in the *2011 Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation’s Outer*

Continental Shelf (USDOI, BOEM, 2011), current industry information, and historical trends. The resource estimates for the proposed actions are based on two factors: (1) the conditional estimates of undiscovered, unleased, conventionally recoverable oil and gas resources in the proposed lease sale areas; and (2) estimates of the portion or percentage of these resources assumed to be leased, discovered, developed, and produced as a result of the proposed actions. The estimates of undiscovered, unleased, conventionally recoverable oil and gas resources are based upon a comprehensive appraisal of the conventionally recoverable petroleum resources of the Nation as of January 1, 2009. Due to the inherent uncertainties associated with an assessment of undiscovered resources, probabilistic techniques were employed, and the results were reported as a range of values corresponding to different probabilities of occurrence. A thorough discussion of the methodologies employed and the results obtained in the assessment are presented in USDOI, Minerals Management Service (MMS) (2006). The estimates of the portion of the resources assumed to be leased, discovered, developed, and produced as a result of the proposed actions are based upon logical sequences of events that incorporate past experience, current conditions, and foreseeable development strategies. A wealth of historical data and information derived from over 50 years of oil and gas exploration, development, and production activities were used extensively by BOEM (formerly MMS)). The undiscovered, unleased, conventionally recoverable resource estimates for the proposed actions are expressed as ranges, from low to high. The range reflects a range of projected economic valuations of the produced oil and gas.

The projected life of all exploration, development, production, and abandonment activities that result from a typical proposed lease sale is assumed to be 40 years. This is based on averages for the amount of time required for these activities for Gulf of Mexico leases. The projected oil production (in billion barrels [Bbbl]) for a typical proposed lease sale and the OCS Program are shown in Table 1 below.

Table 1. Projected Oil Production for the OCS Program and for a Typical Proposed Lease Sale

Action or Program	Estimated Production (Bbbl)[1]	Analysis Period
Proposed Action		
Low Estimate:		
Western GOM	0.114	40 years
Central GOM	0.460	40 years
High Estimate:		
Western GOM	0.199	40 years
Central GOM	0.894	40 years
OCS Program		
Low Estimate:		
Western GOM	2.51	40 years
Central GOM	15.83	40 years
Gulfwide	18.34	40 years
High Estimate:		
Western GOM	3.7	40 years
Central GOM	21.73	40 years
Gulfwide	25.43	40 years

[1] Bbbl= Billion (10^9) barrels; 1 barrel = 42 U.S. Gallons.

2.5 Environmental Resources

The environmental resources considered in this analysis were selected by BOEM analysts in the OCS Gulf of Mexico Region with supplementary input from the National Marine Fisheries Service and U.S. Fish and Wildlife Service. BOEM analysts also used information from its Environmental Studies Program results, literature reviews, and professional exchange with other scientists to define resources. The analysts used geographic digital information on the biological, physical, and socioeconomic resources that could be exposed to contact from OCS oil spills to create maps of resource locations vulnerable to oil-spill impact. These maps (Figs. 3 through 31) depict locations that were analyzed by the OSRA Model, representing either the locations of onshore environmental resource habitats or the surface waters overlying or surrounding offshore environmental features. Some maps were specifically created to represent the location of a resource or resource habitat, while other maps, such as those for counties or parishes, are used to assess risk to multiple resources, even though the map is not labeled with the names of those resources. Discussions of risks to all considered resources can be found in the EIS for each proposed action.

All of the onshore, coastal environmental resource locations were represented by one or more partitions of the coastline, herein called land. The study area coastline was partitioned into 210 equidistant land segments of approximately 10-mile (16-km) length. The partitions were formed by creating straight lines between two points projected onto the coast; therefore, the actual miles of shoreline represented by each land segment may be greater than 10 miles, depending upon the complexity of the coastal area.

In addition, the State offshore waters were included as environmental resources. The limits of State waters have been defined by the States. Texas and Florida State offshore waters extend 3 marine leagues (just over 9 nautical miles) seaward from the baseline from which the breadth of the territorial sea is measured (1 marine league = 1,8228.3 ft). Louisiana State offshore waters extend 3 imperial nautical miles ((just over 3 nautical miles) seaward of the baseline from which the breadth of the territorial sea is measured (1 imperial nautical mile = 6,080 ft). Mississippi and Alabama State offshore waters extend 3 nautical miles seaward of the baseline from which the breadth of the territorial sea is measured (1 nautical mile = 6,076 ft).

The offshore and onshore environmental resources and socioeconomic features that are examined in this OSRA Report, are listed in tables A-3 through A-6 in Appendix A, along with their identification (ID) numbers. Periods of habitat or beach use are identified in parentheses. These lists also indicate which figures illustrate the areas associated with each resource. Appendix B contains the figures, which show the locations of each potentially affected resource (Figures B-3 through B-31).

3.0 Oil-Spill Risk Analysis

The OSRA was conducted in three parts, corresponding to different aspects of the overall problem: (1) the probability of oil-spill occurrence, (2) the trajectories of oil spills from hypothetical spill locations to various environmental resources, and (3) a combination of the first two to estimate the overall oil-spill risk of combined occurrence and contact if there is oil development. The second and third parts were completed for the analysis of spills from the proposed actions.

Risk analyses may be characterized as “hazard-based” or “risk-based.” A hazard-based analysis examines possible events regardless of their low (or high) likelihood. For example, a potential impact would not lose significance because the risk has been reduced due to an increase in the level of control, such as engineering standards. A risk-based analysis, on the other hand, does take into account the likelihood of the event occurring or the measures that can be taken to mitigate against its potential impacts.

This OSRA is designed for use as a risk-based assessment. Therefore, the likelihood of oil spills (≥ 1,000 bbl in size) occurring on the OCS plays an integral role in the analysis. In addition to the estimated chance of spills occurring, the analysis entails an extensive oil-spill trajectory model. Results from the trajectory analysis provide input to the final product by estimating where spills might travel on the ocean’s surface and what resources might be contacted.

Results from the OSRA are, therefore, expressed as the combined probability of spills both occurring and contacting modeled offshore and coastal environmental resource locations. Note that the analysis estimates spill contacts, not impacts. Further measures that should be evaluated to determine impacts, such as the natural weathering of oil spills and the effects of cleanup activities, are not directly factored into the analysis, but should be added to the interpretation of its results.

3.1 Probability of Oil Spills Occurring

The probability of oil spills occurring assumes that spills occur independently of each other as a Poisson process. The Poisson process is a statistical distribution that is commonly used to model random events. The probability of oil spills occurring is based on spill rates derived from the historical OCS platform and OCS pipeline spill record and the historical tanker spill record in U.S. waters, and it depends on the volume of oil produced and transported. All types of accidental spills greater than or equal to 1,000 bbl were considered in this analysis. These spills include those from well blowouts, other accidents that occur on platforms, and during transportation of oil to shore. These spills were classified as platform, pipeline, or tanker spills. This classification allows the analyst to compare the risks from each spill source between a proposed action and any alternatives.

Anderson et al., (2012) examined oil-spill occurrence rates applicable to the OCS. Their results, adjusted for recent experience and based upon more complete databases than were available for earlier analyses (Anderson and LaBelle, 1990, 1994, 2000; Lanfear and Amstutz, 1983), indicated some significant changes in the spill rates for platforms, pipelines, and tankers. This report uses the updated spill occurrence rates.

Spill rates are expressed as number of spills per billion barrels (spills/Bbbl), defined as 10^9 bbl of oil produced or transported. Only spills greater than or equal to 1,000 bbl are addressed because smaller spills may not persist long enough to be simulated by trajectory modeling. Another consideration is that these large spills are likely to be identified and reported; therefore, these records are more comprehensive than those of smaller spills. (Smaller spills are addressed in the EIS for each proposed action without the use of trajectory modeling.)

Two basic criteria were used in selecting the volume of oil handled as the risk exposure variable: (1) the exposure variable should be simple to define, and (2) it should be a quantity that can be estimated. The volume of oil produced or transported was the chosen exposure variable primarily for the following reasons: historic volumes of oil produced and transported are well documented; using these volumes makes the calculation of the estimated oil-spill occurrence rate simple—the ratio of the number of historic spills to the volume of oil produced or transported; and future volumes of oil production and transportation are routinely estimated. Estimates of volume to be developed for a proposed action and the Gulfwide OCS Program, which were prepared by analysts in the BOEM Resource Evaluation Division, Gulf of Mexico Regional Office, are derived from the assessment of oil resources by using comprehensive geological and geophysical databases and related models. In addition, the BOEM analysts estimate other exposure variables, such as number of platforms and tanker trips, as a function of the volume of oil estimated to be produced or transported.

Anderson et al. (2012) analyzed platform and pipeline spills in Federal waters that occurred from OCS oil and gas development from 1964 through 2010 and crude oil tanker spills that occurred in U.S. waters from 1974 through 2008. In these analyses, every spill record was examined and verified to the furthest extent possible. Each spill was classified for size, product spilled, and spill source according to its applicability to the analysis. Spill rates were estimated for platforms, pipelines and tankers on the OCS, as shown in Table 2.

Table 2. Oil Spill Rates

Spill Source	Number of Spills	
	≥ 1,000 bbl[1] (spills /Bbbl[2])	≥10,000 bbl[1] (spills /Bbbl[2])
OCS Platforms	0.25	0.13
OCS Pipelines	0.88	0.18
OCS Tankers	0.34	0.11

[1] bbl = Barrels = 42 U.S. gallons

[2] Bbbl= billion barrels ; billion = 10^9

Anderson et al., (2012)

For this OSRA study, the analysis used the spill rates in Table 2, which are based on a 15-year period (1996-2010) for OCS platforms and pipelines and a 20-year period (1989-2008) for tankers, as found in Anderson et al. (2012) as best representing current technology. The rates are based on number of spills per billion barrels of oil (spills/Bbbl) produced at OCS platforms or transported by OCS pipelines or OCS tankers.

Using Bayesian techniques, Devanney and Stewart (1974) showed that the probability of *n* oil-spill contacts can be described by a negative binomial distribution. Smith et al. (1982), however, noted that when actual exposure is much less than historical exposure, as is the case here, the negative binomial distribution can be approximated by a Poisson distribution. The Poisson distribution has a significant advantage in calculations because it is defined by only one parameter, the assumed number of spills. If $p(n,i)$ is the probability of exactly *n* contacts to environmental resource *i*, then:

$$p(n,i) = \frac{\lambda_i^{\,n} \cdot e^{-\lambda i}}{n!}$$

where *n* is the specific number of spills (0, 1, 2, ..., *n*), *e* is the base of the natural logarithm, and λ is the parameter of the Poisson distribution. For oil spills, the Poisson parameter (λ) is equal to the spill rate multiplied by the volume of oil to be produced or transported. The spill rate has dimensions of number of spills/Bbbl, and the volume is expressed in Bbbl. Therefore, λ denotes the mean number of spills estimated to occur as a result of production or transportation of a specific volume of oil.

Oil-spill occurrence estimates for spills greater than or equal to 1,000 bbl were calculated for production and transportation of oil during the 40-year analysis period associated with the proposed actions in the WPA, CPA, and the Gulfwide OCS Program (2012-2051). These probabilities are based on the volume of oil estimated to be found, produced, and transported over the life of a typical lease sale and on the rates that have been calculated for oil spills from OCS platforms, pipelines, and tankers by Anderson et al., (2012). The probabilities of one or more oil spills greater than or equal to 1,000 bbl occurring as a result of OCS exploration, development, and production and transportation resulting from a typical lease sale or the OCS Program are found in Table A-1. The probabilities for spills greater than or equal to 10,000 bbl are shown in Table A-2.

3.2 Oil-Spill Trajectory Simulations

The OSRA Model, originally developed by Smith et al. (1982) and enhanced by BOEM over the years (LaBelle and Anderson, 1985; Ji et al., 2002, 2004a, 2004b, 2011), simulates oil-spill transport using realistic data fields of winds and ocean currents in the GOM. An oil spill on the ocean surface is moved around by the complex surface ocean currents exerting a shear force on the spilled oil from below. In addition, the prevailing wind exerts an additional shear force on the spill from above, and the combination of the two forces causes the transportation of the oil spill away from its initial spill location. In the OSRA Model, the velocity of a hypothetical oil spill is the linear superposition of the surface ocean current and the wind drift caused by the winds. The model calculates the movement of hypothetical spills by successively integrating time sequences of two spatially gridded input fields: the surface ocean currents and the sea-level winds. In this fashion, the OSRA Model generates time sequences of hypothetical oil-spill locations–essentially, oil-spill trajectories.

At each successive time step, the OSRA Model compares the location of the hypothetical spills against the geographic boundaries of shoreline and designated offshore environmental resources. The model counts the occurrences of oil-spill contact to these areas during the time periods that the habitat is known to be used by the resource. Finally, the frequencies of oil-spill contact are computed for designated oil-spill travel times (e.g., 3, 10, or 30 days) by dividing the total number of oil-spill contacts by the total number of hypothetical spills initiated in the model from a given hypothetical spill location. The frequencies of oil-spill contact are the model-estimated probabilities of oil-spill contact. The OSRA Model output provides the estimated probabilities of contact to all identified offshore environmental resources and segments of shoreline from locations chosen to represent hypothetical oil spills from oil production and transportation facilities, at several selected oil-spill travel times.

There are factors not explicitly considered by the OSRA Model that can affect the transport of spilled oil as well as the dimensions, volume, and nature of the oil spills contacting environmental resources or the shoreline. These include possible cleanup operations, chemical composition of the spilled oil, weathering of oil spills, or the spreading and splitting of oil spills. The OSRA analysts have chosen to take a more environmentally conservative approach by presuming persistence of spilled oil over the selected time duration of the trajectories.

In the trajectory simulation portion of the OSRA Model, many hypothetical oil-spill trajectories are produced by numerically integrating a temporally and spatially varying ocean current field, and superposing on that an empirical wind-induced drift of the hypothetical oil spills (Samuels et al., 1982). Collectively, the trajectories represent a statistical ensemble of simulated oil-spill displacements produced by a field of winds derived from observations and numerically derived ocean currents. The historical data on winds and currents in the GOM are assumed to be statistically similar to those that will occur in the Gulf during future offshore activities. In other words, the oil-spill risk analysts assume that the frequency of strong wind events in the wind field is the same as what will occur during future offshore activities. By inference, the frequencies of contact by the simulated oil spills are the same as what could occur from actual oil spills during future offshore activities.

Another portion of the OSRA Model tabulates the contacts by the simulated oil spills. The model contains the geographical boundaries of a variety of identified environmental features. At every integration time step, the OSRA Model tracks the locations of the simulated spills and counts the number of oil-spill contacts to segments of shoreline (counties/parishes). A contact to shore will stop the trajectory of an oil spill; no re-washing is assumed in this model. After specified periods of time, the OSRA Model will divide the total number of contacts to the coastline segments by the total number of simulated oil spills from a given geographic location. These ratios are the estimated probabilities of oil-spill contact from offshore activities at that geographic location, assuming spill occurrence.

Conducting an oil-spill risk analysis needs detailed information on ocean currents and wind fields (Ji, 2004). The ocean currents used are numerically computed from an ocean circulation model of the GOM driven by analyzed meteorological forces (the near-surface winds and the total heat fluxes) and observed river inflow into the GOM (Oey, 2005; 2008). The model used is a version of the Princeton Ocean Model (POM), which is an enhanced version of the earlier constructed Mellor-Blumberg Model. It is a three-dimensional, time-dependent, primitive equation model using orthogonal curvilinear coordinates in the horizontal and a topographically conformal coordinate in the vertical. The use of these coordinates allows for a realistic coastline and bottom topography, including a sloping shelf, to be represented in the model simulation. The model incorporates the Mellor-Yamada turbulence closure model to provide a parameterization of the vertical mixing process through the water column.

The prognostic variables of the model are velocity, temperature, salinity, turbulence kinetic energy, and turbulence macroscale. The momentum equations are nonlinear and incorporate a variable Coriolis parameter. Prognostic equations governing the thermodynamic quantities (temperature and salinity) account for water mass variations brought about by highly time-dependent coastal upwelling processes. The processes responsible for eddy production, movement, and eventual dissipation are also included in the model physics. Other computed variables include density, vertical eddy viscosity, and vertical eddy diffusivity.

The POM calculation was performed by Princeton University (Oey, 2005; 2008). This simulation covered the 15-year period, 1993 through 2007, and the results were saved at 3-hour intervals. The simulation period covers the data available for this study. These ocean model runs included the assimilation of sea surface altimeter observations, to improve the ocean model results. The surface currents were then computed for input into the OSRA Model along with the concurrent wind field. The OSRA Model used the same wind field to calculate the empirical wind drift of the simulated spills. The statistics for the contacts by the trajectories forced by the model runs were combined for the average probabilities.

The ocean model simulations were extensively skill-assessed with many observations from the GOM (Oey, 2005; 2008). These extensive sets of observations afford a rigorous test of the model's ability to reproduce ocean transport as well as prominent features of the Gulf such as the Loop Current and strong mesoscale eddies, which are easily observed from satellite-borne instrumentation. With these observations and other current measurements from moored current meters, a good determination of the model's veracity was made. The POM model reproduced the characteristics of the GOM surface currents both on and off the continental shelf. The surface current field manifests all the dominant structures in time and space as the observed currents and is, therefore, applicable in the statistical estimation of future spill risk that the OSRA Model makes.

Trajectories of hypothetical spills were initiated every 1 day from each of the launch points in space over the simulation period from January 1, 1993 to December 31, 2007. The chosen number of trajectories per site was small enough to be computationally practical and large enough to reduce the random sampling error to an insignificant level. Also, the weather-scale changes in the winds are at least minimally sampled with simulated spills started daily.

The OSRA Model integrates the spill velocities (a linear superposition of surface ocean currents and empirical wind drift) by integrating in time to produce the spill trajectories. The time step selected was 1 hour to fully utilize the spatial resolution of the ocean current field and to achieve a stable set of trajectories. The velocity field was bi-linearly interpolated from the 3-hourly or 1-hourly grid to get velocities at 1-hour intervals. Smaller time steps did not produce significant differences in the simulated trajectories after 30 model days, so the 1-hour time step was chosen for this analysis. Ji et al. (2011) summarized the latest improvement on the OSRA Model and the model sensitivity tests.

3.3 Conditional Probabilities of Contact

The probability that an oil spill will contact a specific environmental resource within a given time of travel from a certain location or spill point is termed a *conditional probability*, the condition being that a spill is assumed to have occurred. Each trajectory was allowed to continue for as long as 30 days. However, if the hypothetical spill contacted shoreline sooner than 30 days after the start of the spill, the spill trajectory was terminated, and the contact was recorded.

The trajectories simulated by the model represent only hypothetical pathways of oil slicks; they do not involve any direct consideration of cleanup, dispersion, or weathering processes that could alter the quantity or properties of oil that might eventually contact the environmental resource locations. However, an implicit analysis of weathering and decay can be considered by choosing a travel time for the simulated oil spills when they contact environmental resource locations that represent the likely persistence of the oil slick on the water surface. The BOEM performed an analysis of the likely weathering and cleanup of a typical offshore oil spill of 1,000 bbl or greater occurring under the proposed action scenarios (USDOI, MMS, 2002). The analysis of the slick's fate showed that a typical GOM oil slick of 1,000 bbl or greater, exposed to typical winds and currents, would not persist on the water surface beyond 30 days. Therefore, OSRA Model trajectories were analyzed only up to 30 days. Any spill contacts occurring on or before this elapsed time are reported in the probability tables. Conditional probabilities of contact with environmental resource locations and land segments within 10 and 30 days of travel time were calculated for each of the hypothetical spill sites by the model to serve as input into the final calculation of risk.

3.4 Combined Probabilities of Contact

A critical difference exists between the conditional probabilities and the combined probabilities calculated. Conditional probabilities depend only on the winds and currents in the study area. Combined probabilities, on the other hand, depend not only on the physical conditions, but also on the chance of spill occurrence, the estimated volume of oil to be produced or transported, and the oil transportation scenario. The combined probabilities for this analysis of the proposed action activities are presented in TablesA-3 to A-6.

In calculating the combined probabilities, those that represent probabilities of both oil-spill occurrence and contact, the following steps are performed:

1. For a set of n_t environmental resources and n_l launch points, the conditional probabilities can be represented in a matrix form. Let [C] be an $n_t \times n_l$ matrix, where each element $c_{i,j}$ is the probability that an oil spill will contact environmental resource *i*, given that a spill occurs at launch point *j*. Note that launch points can represent potential starting points of spills from production areas or transportation routes.

2. Spill occurrence can be represented by another matrix [S]. With n_l launch points and n_s production sites, the dimensions of [S] are $n_l \times n_s$. Let each element $s_{j,k}$ be the estimated mean number of spills occurring at launch point *j* owing to production of a unit volume (1 Bbbl) of oil at site *k*. These spills can result from either production or transportation.The $s_{j,k}$ can be determined as a function of the volume of oil (spills/Bbbl). Each column of[S] corresponds to one production site and one transportation route. If alternative and mutually exclusive transportation routes are considered for the same production site, they can be represented by additional columns of [S], thus increasing n_s.

3. Matrix [U] is defined as

$$[U] = [C] \times [S]$$

   Matrix [U]—which has dimensions $n_t \times n_s$—is termed the unit risk matrix. Each element $u_{i,k}$ corresponds to the estimated mean number of spills occurring and contacting environmental resource *i*, owing to the production of a unit volume (1 Bbbl) of oil at site *k*.

4. With [U], the mean contacts to each environmental resource are estimated, given a set of oil volumes at each site. Let [V] be a vector of dimension n_s where each element v_k corresponds to the volume of oil expected to be found at production site *k*. Then, if [L] is a vector of dimension n_t, where each element λ_i corresponds to the mean number of contacts to environmental resource *i*, the formula is

$$[L] = [U] \times [V]$$

Thus, estimates of the mean number of oil spills that are likely to occur and contact environmental resources (or land segments) can be calculated. (Note that, as a statistical parameter, the mean number can assume a fractional value, even though fractions of oil spills have no physical meaning.)

4.0 Discussion

As one might expect, environmental resource locations closest to the spill sites had the greatest risk of contact. As the model run duration increases, more of the identified environmental resources and shoreline segments could have meaningful probabilities of contact (≥0.5%). The longer transit times up to 30 days allowed by the model enable more hypothetical spills to reach the environmental resources and the shoreline from more distant spill locations. With increased travel time, the complex patterns of wind and ocean currents produce eddy-like motions of the oil spills and multiple opportunities for a spill to make contact with any given environmental resource or shoreline segment.

For instance, Table A-3 provides the probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 bbl, and the number of spills (mean), of the estimated volume of oil produced from the proposed action in the Gulf of Mexico CPA that could occur and could contact a certain offshore environmental resource within 10 and 30 days. This table shows that environmental resource # 8, Texas state waters, has a probability of 3 percent of being contacted by the spilled oil within 10 days, if there is an oil spill from the proposed action in the CPA with the low oil production of 0.460 Bbbl (Table A-3). Its probability increases to 9 percent of being contacted by the spilled oil within 30 days. The location of resource #8 is shown in Figure B-3.

5.0 References Cited

Anderson, C.M., and R.P. LaBelle. 1990. Estimated Occurrence Rates for Accidental Oil Spills on the U.S. Outer Continental Shelf: Oil and Chemical Pollution 6:21-35.

Anderson, C.M., and R.P. LaBelle. 1994. Comparative Occurrence Rates for Offshore Oil Spills. Spill Science and Technology Bulletin 1(2):131-141.

Anderson, C.M., and R.P. LaBelle. 2000. Update of Comparative Occurrence Rates for Offshore Oil Spills. Spill Science and Technology Bulletin 6(5-6):303-321.

Anderson, C.M., M. Mayes, and R.P. LaBelle. 2012. Oil Spill Occurrence Rates for Offshore Spills. Bureau of Ocean Energy Management, Herndon, VA, OCS Report 2012-069..

Devanney, M.W., III, and R.J. Stewart. 1974. Analysis of Oilspill Statistics, April 1974. Massachusetts Institute of Technology (Cambridge) Report No. MITSG-74-20. Prepared for the Council on Environmental Quality.

Everitt, B.S. 1993. Cluster Analysis. 3rd Edition. Edward Arnold.

Ji, Z.-G., 2004, Use of physical sciences in support of environmental management. Environmental Management, 34(2), Springer-Services and Business Media., New York, NY, pp. 159-169.

Ji, Z.-G., W. R. Johnson, and Z. Li, 2011, Oil Spill Risk Analysis Model and Its Application to the Deepwater Horizon Oil Spill Using Historical Current and Wind Data, in Monitoring and Modeling the Deepwater Horizon Oil Spill: A Record-Breaking Enterprise, Geophys. Monogr. Ser., doi:10.1029/2011GM001117, pp 227-236.

Ji, Z.-G., W.R. Johnson, and C.F. Marshall, 2004a, Deepwater oil-spill modeling for assessing environmental impacts. Coastal Environment V (Brebbia et al., eds), WIT Press, Southampton, MA, pp. 349-358.

Ji, Z.-G., W.R. Johnson, C.F. Marshall, G.B. Rainey, and E.M. Lear, 2002, Oil-spill risk analysis: Gulf of Mexico Outer Continental Shelf (OCS) lease sales, central planning area and western planning area, 2003-2007, and Gulfwide OCS program, 2003-2042. Minerals Management Service, Herndon, VA, OCS Report 2002-032, 61 pp.

Ji, Z.-G., W.R. Johnson, C.F. Marshall, and E.M. Lear, 2004b, Oil-spill risk analysis: Contingency planning statistics for Gulf of Mexico OCS activities. Minerals Management Service, Herndon, VA, OCS Report 2004-026, 62 pp.

LaBelle, R. P. 2001. Overview of US Minerals Management Service Activities in Deepwater Research. Marine Pollution Bulletin 43(7-12): 256-261.

LaBelle, R. P., and C. M. Anderson. 1985. The Application of Oceanography to Oil-Spill Modeling for the Outer Continental Shelf Oil and Gas Leasing Program: Marine Technology Society Journal 19(2):19-26.

Lanfear, K.J., and D.E. Amstutz. 1983. A Reexamination of Occurrence Rates for Accidental Oil Spills on the U.S. Outer Continental Shelf: Proceedings of the Eighth Conference on the Prevention, Behavior, Control, and Cleanup of Oil Spills, San Antonio, Texas, February 28-March 3, 1983.

Price, J. M., W. R. Johnson, Z.-G. Ji, C. F. Marshall, and G. B. Rainey. 2002. Sensitivity Testing for Improved Efficiency of a Statistical Oil Spill Risk Analysis Model. Submitted to Journal of Marine Systems.

Oey, L.-Y. 2005. Circulation Model of the Gulf of Mexico and the Caribbean Sea: Development of the Princeton Regional Ocean Forecast (& Hindcast) System - PROFS, and Hindcast Experiment for 1992-1999. Final Report. OCS Study MMS 2005-049. U.S. Dept. of the Interior, Minerals Management Service, Environmental Division, Herndon, Virginia. 174 pp.

Oey, L.-Y., 2008, Loop Current and Deep Eddies. J. Phys. Oceanogr. 38: 1426-1449.

Samuels, W. B., N. E. Huang, and D.E. Amstutz. 1982. An Oil Spill Trajectory Analysis Model with a Variable Wind Deflection Angle. Ocean Engineering 9:347-360.

Smith, R. A., J. R. Slack, T. Wyant, and K. J. Lanfear. 1982. The Oil Spill Risk Analysis Model of the U.S. Geological Survey. U.S. Geological Survey Professional Paper 1227.

U.S. Department of the Interior (USDOI), Minerals Management Service (MMS). 2002. Gulf of Mexico OCS Oil and Gas Lease Sales: 2003-2007, Central Planning Area Sales 185, 190, 194, 198, and 201; Western Planning Area Sales 187, 192, 196, and 200 Final Environmental Impact Statement. OCS EIS/EA MMS 2002-052. 2 Vols.

U.S. Department of the Interior (USDOI), Bureau of Ocean Energy Management (BOEM). 2011. Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's Outer Continental Shelf, 2011. BOEM Fact Sheet RED-2011-01a U.S. Department of the Interior, Bureau of Ocean Energy Management, Resources Evolution Division, Herndon, VA, 8 pp.

Appendix A. Oil Spill Risk Analysis Tables

Table A-1. Oil-spill occurrence probability estimates for offshore spills greater than or equal to *1,000 barrels* resulting from the proposed actions in the Western and Central Gulf of Mexico Planning Areas (2012-2017) and the Gulfwide Program (2012-2051)

Action or Program	Production Volume (Bbbl)[1]	Mean Number of Spills from			Mean Number of Spills (Total)	Probability (% Chance) of One or More Spills from			Probability (% Chance) of One or More Spills (Total)
		Platforms[2]	Pipelines	Tankers		Platforms	Pipelines	Tankers	
Proposed Actions									
Western (Low Estimate)	0.144	0.03	0.10	0.00	0.13	3	10	n	12
Central (Low Estimate)	0.46	0.12	0.40	0.00	0.52	11	33	n	41
Western (High Estimate)	0.199	0.05	0.17	0.00	0.22	5	15	n	20
Central (High Estimate)	0.894	0.22	0.74	0.02	0.98	20	52	2	62
OCS Program									
Western (Low Estimate)	2.51	0.63	2.21	0.00	2.84	56	**	24	**
Central (Low Estimate)	15.83	3.96	13.93	0.00	17.89	98	**	n	**
Gulfwide (Low Estimate)	18.34	4.59	16.14	0.00	20.73	99	**	n	**
Western (High Estimate)	3.70	0.92	2.77	0.19	3.88	63	**	28	**
Central (High Estimate)	21.73	5.43	18.01	0.43	23.87	**	**	35	**
Gulfwide (High Estimate)	25.43	6.36	20.78	0.62	27.75	**	**	46	**

1 Bbbl= billion (10^9) barrels; a barrel is 42 U.S. gallons

2 Platforms refers to facilities used in exploration, development, or production.

n= less than 0.5%

** = greater than 99.5%.

Table A-2. Oil-spill occurrence probability estimates for offshore spills greater than or equal to *10,000 barrels* resulting from the proposed actions in the Western and Central Gulf of Mexico Planning Areas (2012-2017) and the Gulfwide Program (2012-2051)

Action or Program	Production Volume (Bbbl)[1]	Mean Number of Spills from			Mean Number of Spills (Total)	Probability (% Chance) of One or More Spills from			Probability (% Chance) of One or More Spills (Total)
		Platforms[2]	Pipelines	Tankers		Platforms	Pipelines	Tankers	
Proposed Actions									
Western (Low Estimate)	0.114	0.01	0.02	0.00	0.04	1	2	n	3
Central (Low Estimate)	0.46	0.06	0.08	0.00	0.14	6	8	n	13
Western (High Estimate)	0.199	0.03	0.03	0.00	0.06	3	3	n	6
Central (High Estimate)	0.894	0.12	0.15	0.01	0.27	11	14	1	24
OCS Program									
Western (Low Estimate)	2.51	0.33	0.45	0.00	0.78	28	36	n	54
Central (Low Estimate)	15.83	2.06	2.85	0.00	4.91	87	94	n	99
Gulfwide (Low Estimate)	18.34	2.38	3.30	0.00	5.69	91	96	n	**
Western (High Estimate)	3.70	0.48	0.57	0.06	1.11	38	43	6	67
Central (High Estimate)	21.73	2.83	3.68	0.14	6.65	94	97	13	**
Gulfwide (High Estimate)	25.43	3.31	4.25	0.20	7.76	96	99	18	**

1 Bbbl= billion (10^9) barrels; a barrel is 42 U.S. gallons

2 Platforms refers to facilities used in exploration, development, or production.

n= less than 0.5%

** = greater than 99.5%.

Table A-3. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Central GOM Planning Area and contacting certain offshore environmental resource locations within 10 and 30 days for low and high oil resource estimates

ID #	Offshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
1	Cayman Islands	B-1	n	n	0	0	n	n	0	0
2	Northwest Bahamas	B-1	n	n	0	0	n	n	0	0
3	Northeast Bahamas	B-1	n	n	0	0	n	n	0	0
4	Midwest Bahamas	B-1	n	n	0	0	n	n	0	0
5	Mideast Bahamas	B-1	n	n	0	0	n	n	0	0
6	South Bahamas	B-1	n	n	0	0	n	n	0	0
7	Jamaica	B-1	n	n	0	0	n	n	0	0
8	TX State Waters	B-3	3	9	0.03	0.09	5	16	0.05	0.17
9	West LA State Waters	B-3	10	14	0.11	0.16	18	25	0.2	0.29
10	East LA State Waters	B-3	2	3	0.02	0.03	4	5	0.04	0.06
11	MS State Waters	B-3	n	1	0	0.01	1	1	0.01	0.01
12	AL State Waters	B-3	n	1	0	0.01	n	1	0	0.01
13	FL Panhandle State Waters	B-3	n	1	0	0.01	n	2	0	0.02
14	West FL State Waters	B-3	n	n	0	0	n	n	0	0
15	Tortugas State Waters	B-3	n	n	0	0	n	n	0	0
16	Southeast FL State Waters	B-3	n	n	0	0	n	n	0	0
17	Northeast FL State Waters	B-3	n	n	0	0	n	n	0	0
18	Mexican State Waters	B-3	n	n	0	0	n	n	0	0
19	Texas West Waters (0-200m) for EFH	B-24	n	4	0	0.04	1	7	0.01	0.07
20	Texas East Waters (0-200m) for EFH	B-24	6	13	0.07	0.13	12	22	0.13	0.25
21	Louisiana Waters West of Mississippi River (0-200m) for EFH	B-24	24	28	0.28	0.32	41	45	0.52	0.6
22	Louisiana Waters East of Mississippi River (0-200m) for EFH	B-24	4	5	0.04	0.05	8	9	0.08	0.1
23	Mississippi Waters (0-200m) for EFH	B-24	3	4	0.03	0.04	6	8	0.06	0.08
24	Alabama Waters (0-200m) for EFH	B-24	2	4	0.02	0.04	5	7	0.05	0.07
25	Florida Panhandle Waters (0-200m) for EFH	B-24	1	2	0.01	0.02	1	4	0.01	0.04
26	Florida Bend Waters (0-200m) for EFH	B-24	n	1	0	0.01	n	1	0	0.01
27	Florida Southwest Waters (0-200m) for EFH	B-24	n	1	0	0.01	n	1	0	0.01
28	Florida Keys Waters (0-200m) for EFH	B-24	n	n	0	0	n	n	0	0
29	Florida Southeast Waters (0-200m) for EFH	B-24	n	n	0	0	n	n	0	0
30	Florida Northeast Waters (0-200m) for EFH	B-24	n	n	0	0	n	n	0	0
31	Nearshore Seafloor (0-20m), "N1"	B-25	n	n	0	0	n	n	0	0
32	Nearshore Seafloor (0-20m), "N2"	B-25	n	2	0	0.02	n	4	0	0.05
33	Nearshore Seafloor (0-20m), "N3"	B-25	4	8	0.04	0.09	7	15	0.07	0.16
34	Nearshore Seafloor (0-20m), "N4"	B-25	6	9	0.06	0.1	11	17	0.12	0.19
35	Nearshore Seafloor (0-20m), "N5"	B-25	11	14	0.12	0.15	19	24	0.21	0.27
36	Nearshore Seafloor (0-20m), "N6"	B-25	2	3	0.02	0.03	4	6	0.04	0.06
37	Nearshore Seafloor (0-20m), "N7"	B-25	1	2	0.01	0.02	2	3	0.02	0.03
38	Nearshore Seafloor (0-20m), "N8"	B-25	n	1	0	0.01	1	2	0.01	0.02
39	Nearshore Seafloor (0-20m), "N9"	B-25	n	1	0	0.01	n	1	0	0.01

Table A-3. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Central GOM Planning Area and contacting certain offshore environmental resource locations within 10 and 30 days for low and high oil resource estimates (continued)

ID #	Offshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
40	Nearshore Seafloor (0-20m), "N10"	B-25	n	n	0	0	n	n	0	0
41	Nearshore Seafloor (0-20m), "N11"	B-25	n	n	0	0	n	n	0	0
42	Nearshore Seafloor (0-20m), "N12"	B-25	n	n	0	0	n	n	0	0
43	Nearshore Seafloor (0-20m), "N13"	B-25	n	n	0	0	n	n	0	0
44	Nearshore Seafloor (0-20m), "N14"	B-25	n	n	0	0	n	n	0	0
45	Nearshore Seafloor (0-20m), "N15" - Tortugas	B-25	n	n	0	0	n	n	0	0
46	Shelf Seafloor (20-300m), "S1"	B-25	n	3	0	0.04	1	6	0.01	0.07
47	Shelf Seafloor (20-300m), "S2"	B-25	6	11	0.06	0.12	11	20	0.11	0.23
48	Shelf Seafloor (20-300m), "S3"	B-25	13	17	0.13	0.18	23	29	0.26	0.34
49	Shelf Seafloor (20-300m), "S4"	B-25	17	19	0.18	0.22	28	32	0.33	0.39
50	Shelf Seafloor (20-300m), "S5"	B-25	4	5	0.04	0.05	7	9	0.07	0.09
51	Shelf Seafloor (20-300m), "S6"	B-25	3	4	0.03	0.04	6	8	0.07	0.08
52	Shelf Seafloor (20-300m), "S7"	B-25	3	4	0.03	0.04	5	7	0.05	0.07
53	Shelf Seafloor (20-300m), "S8"	B-25	1	2	0.01	0.02	1	4	0.02	0.04
54	Shelf Seafloor (20-300m), "S9"	B-25	n	1	0	0.01	n	2	0	0.02
55	Shelf Seafloor (20-300m), "S10"	B-25	n	1	0	0.01	n	1	0	0.01
56	Shelf Seafloor (20-300m), "S11"	B-25	n	n	0	0	n	1	0	0.01
57	Shelf Seafloor (20-300m), "S12"	B-25	n	n	0	0	n	n	0	0
58	Shelf Seafloor (20-300m), "S13"	B-25	n	n	0	0	n	n	0	0
59	Shelf Seafloor (20-300m), "S14"	B-25	n	n	0	0	n	n	0	0
60	Deepwater Seafloor (300m-Outer Jurisdiction), "D1"	B-25	1	4	0.01	0.04	1	6	0.01	0.07
61	Deepwater Seafloor (300m-Outer Jurisdiction), "D2"	B-25	1	3	0.01	0.03	1	6	0.01	0.06
62	Deepwater Seafloor (300m-Outer Jurisdiction), "D3"	B-25	2	6	0.02	0.06	4	11	0.04	0.11
63	Deepwater Seafloor (300m-Outer Jurisdiction), "D4"	B-25	2	6	0.02	0.06	3	11	0.03	0.11
64	Deepwater Seafloor (300m-Outer Jurisdiction), "D5"	B-25	1	4	0.01	0.04	1	6	0.01	0.07
65	Deepwater Seafloor (300m-Outer Jurisdiction), "D6"	B-25	6	10	0.06	0.1	11	17	0.11	0.19
66	Deepwater Seafloor (300m-Outer Jurisdiction), "D7"	B-25	5	9	0.05	0.09	9	15	0.1	0.16
67	Deepwater Seafloor (300m-Outer Jurisdiction), "D8"	B-25	3	6	0.03	0.06	5	11	0.05	0.11
68	Deepwater Seafloor (300m-Outer Jurisdiction), "D9"	B-25	7	10	0.07	0.1	13	17	0.13	0.19
69	Deepwater Seafloor (300m-Outer Jurisdiction), "D10"	B-25	7	11	0.08	0.11	13	18	0.14	0.2
70	Deepwater Seafloor (300m-Outer Jurisdiction), "D11"	B-25	4	8	0.05	0.08	8	14	0.08	0.15
71	Deepwater Seafloor (300m-Outer Jurisdiction), "D12"	B-25	13	15	0.13	0.16	21	25	0.24	0.29
72	Deepwater Seafloor (300m-Outer Jurisdiction), "D13"	B-25	10	12	0.1	0.13	16	21	0.18	0.23
73	Deepwater Seafloor (300m-Outer Jurisdiction), "D14"	B-25	6	9	0.06	0.09	10	15	0.11	0.16
74	Deepwater Seafloor (300m-Outer Jurisdiction), "D15"	B-25	7	9	0.07	0.09	13	15	0.14	0.16
75	Deepwater Seafloor (300m-Outer Jurisdiction), "D16"	B-25	11	13	0.12	0.14	19	22	0.22	0.25
76	Deepwater Seafloor (300m-Outer Jurisdiction), "D17"	B-25	10	12	0.1	0.13	17	21	0.19	0.23
77	Deepwater Seafloor (300m-Outer Jurisdiction), "D18"	B-25	6	8	0.06	0.08	11	14	0.12	0.15
78	Deepwater Seafloor (300m-Outer Jurisdiction), "D19"	B-25	4	5	0.04	0.06	7	10	0.07	0.1

Table A-3. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Central GOM Planning Area and contacting certain offshore environmental resource locations within 10 and 30 days for low and high oil resource estimates (continued)

ID #	Offshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
79	Deepwater Seafloor (300m-Outer Jurisdiction), "D20"	B-25	3	5	0.03	0.05	5	8	0.05	0.09
80	Deepwater Seafloor (300m-Outer Jurisdiction), "D21"	B-25	1	3	0.01	0.03	2	5	0.02	0.05
81	Deepwater Seafloor (300m-Outer Jurisdiction), "D22"	B-25	2	4	0.02	0.04	4	7	0.04	0.07
82	Deepwater Seafloor (300m-Outer Jurisdiction), "D23"	B-25	n	2	0	0.02	1	3	0.01	0.03
83	Deepwater Seafloor (300m-Outer Jurisdiction), "D24"	B-25	2	5	0.02	0.05	4	8	0.04	0.09
84	Deepwater Seafloor (300m-Outer Jurisdiction), "D25"	B-25	n	1	0	0.01	n	2	0	0.02
85	Deepwater Seafloor (300m-Outer Jurisdiction), "D26"	B-25	n	2	0	0.02	1	3	0.01	0.03
86	Deepwater Seafloor (300m-Outer Jurisdiction), "D27"	B-25	n	n	0	0	n	1	0	0.01
87	Deepwater Seafloor (300m-Outer Jurisdiction), "D28"	B-25	n	n	0	0	n	n	0	0
88	Deepwater Seafloor (300m-Outer Jurisdiction), "D29"	B-25	n	n	0	0	n	n	0	0
89	Deepwater Seafloor (300m-Outer Jurisdiction), "D30"	B-25	n	n	0	0	n	n	0	0
90	North Atlantic Right Whale Critical Habitat	B-26	n	n	0	0	n	n	0	0
91	North Atlantic Right Whale SE Seasonal Management Area (Nov 15-Apr 15)	B-26	n	n	0	0	n	n	0	0
92	Sargassum (March/April)	B-27	n	n	0	0	n	n	0	0
93	Sargassum (May/June)	B-27	1	1	0.01	0.01	1	2	0.01	0.02
94	Sargassum (July/August)	B-27	5	6	0.05	0.06	10	10	0.1	0.11
95	Seagrass-Wakulla County	B-27	n	n	0	0	n	n	0	0
96	Seagrass-Jefferson County	B-27	n	n	0	0	n	n	0	0
97	Seagrass-Taylor County	B-27	n	n	0	0	n	n	0	0
98	Seagrass-Dixie County	B-27	n	n	0	0	n	n	0	0
99	Seagrass-Levy County	B-27	n	n	0	0	n	n	0	0
100	Topographic Features (Mysterious Bank)	B-27	n	n	0	0	n	n	0	0
101	Topographic Features (Blackfish Ridge Bank)	B-28	n	n	0	0	n	n	0	0
102	Topographic Features (Dream Bank)	B-28	n	n	0	0	n	n	0	0
103	Topographic Features (Southern Bank)	B-28	n	n	0	0	n	n	0	0
104	Topographic Features (Hospital Bank)	B-28	n	n	0	0	n	n	0	0
105	Topographic Features (North Hospital Bank)	B-28	n	n	0	0	n	n	0	0
106	Topographic Features (Aransas Bank)	B-28	n	n	0	0	n	n	0	0
107	Topographic Features (South Baker Bank)	B-28	n	n	0	0	n	n	0	0
108	Topographic Features (Baker Bank)	B-28	n	n	0	0	n	n	0	0
109	Topographic Features (Big Dunn Bar Bank)	B-28	n	n	0	0	n	n	0	0
110	Topographic Features (Small Dunn Bar Bank)	B-28	n	n	0	0	n	n	0	0
113	Topographic Features (Claypile Bank)	B-28	n	n	0	0	n	1	0	0.01
114	Topographic Features (Applebaum Bank)	B-29	n	n	0	0	n	n	0	0
115	Topographic Features (Coffee Lump Bank)	B-28	n	1	0	0.01	n	1	0	0.01
116	East Flower Garden Bank	B-28	n	1	0	0.01	1	2	0.01	0.02
117	West Flower Garden Bank	B-28	n	1	0	0.01	1	2	0.01	0.02

Table A-3. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Central GOM Planning Area and contacting certain offshore environmental resource locations within 10 and 30 days for low and high oil resource estimates (continued)

ID #	Offshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
118	Topographic Features (MacNeil Bank)	B-29	n	n	0	0	n	1	0	0.01
119	Topographic Features (29 Fathom Bank)	B-29	n	n	0	0	n	1	0	0.01
120	Topographic Features (Rankin-1 Bank)	B-28	n	n	0	0	n	1	0	0.01
121	Topographic Features (Rankin-2 Bank)	B-28	n	n	0	0	n	1	0	0.01
122	Topographic Features (Bright Bank)	B-28	n	1	0	0.01	1	1	0.01	0.01
123	Topographic Features (Geyer Bank)	B-28	n	1	0	0.01	1	2	0.01	0.02
124	Topographic Features (Elvers Bank)	B-28	n	n	0	0	n	n	0	0
125	Topographic Features (McGrail Bank)	B-28	n	1	0	0.01	n	1	0	0.01
126	Sonnier Bank	B-28	n	1	0	0.01	n	1	0	0.01
127	Topographic Features (Bouma Bank)	B-28	n	1	0	0.01	1	1	0.01	0.01
128	Topographic Features (Rezak Bank)	B-29	n	1	0	0.01	1	1	0.01	0.01
129	Topographic Features (Sidner Bank)	B-28	n	1	0	0.01	1	1	0.01	0.01
130	Topographic Features (Parker Bank)	B-28	n	1	0	0.01	1	2	0.01	0.02
131	Topographic Features (Alderdice Bank)	B-28	n	1	0	0.01	1	1	0.01	0.01
132	Topographic Features (Fishnet Bank)	B-28	n	n	0	0	n	1	0	0.01
133	Topographic Features (Sweet Bank)	B-28	n	n	0	0	n	n	0	0
134	Topographic Features (Jakkula Bank)	B-28	n	n	0	0	n	1	0	0.01
135	Topographic Features (Ewing-1 Bank)	B-28	1	1	0.01	0.01	1	2	0.01	0.02
136	Topographic Features (Ewing-2 Bank)	B-28	n	n	0	0	n	1	0	0.01
137	Topographic Features (Diaphus Bank)	B-28	n	n	0	0	n	1	0	0.01
138	Topographic Features (Sackett Bank)	B-28	n	1	0	0.01	1	1	0.01	0.01
139	Pinnacle Trend	B-28	2	3	0.02	0.03	4	6	0.04	0.06
140	Chandeleur Islands	B-28	1	2	0.01	0.02	2	3	0.02	0.03
141	Florida Middle Ground	B-29	n	n	0	0	n	n	0	0
142	Pulley Ridge	B-29	n	n	0	0	n	1	0	0.01
143	Madison Swanson	B-29	n	n	0	0	n	n	0	0
144	Steamboat Lumps	B-29	n	n	0	0	n	n	0	0
145	Dry Tortugas	B-29	n	n	0	0	n	n	0	0
146	Tortugas Ecological Reserve (North)	B-29	n	n	0	0	n	n	0	0
147	Tortugas Ecological Reserve (South)	B-29	n	n	0	0	n	n	0	0
148	Florida Keys National Marine Sanctuary	B-29	n	n	0	0	n	1	0	0.01
149	FL State Waters (both East Coast and Gulf)	B-29	n	n	0	0	n	n	0	0
150	Key Biscayne National Park	B-29	n	n	0	0	n	n	0	0
151	Texas Clipper and South Texas Platform - Dive Area (Apr-Nov)	B-30	n	n	0	0	n	1	0	0.01
152	Port Lavaca/Liberty Ship Reef - Dive Area (Apr-Nov)	B-30	1	3	0.01	0.03	2	5	0.02	0.05
153	High Island - Dive Area (Apr-Nov)	B-30	1	2	0.01	0.02	2	5	0.02	0.05
154	West Cameron - Dive Area (Apr-Nov)	B-30	2	4	0.02	0.04	4	8	0.04	0.08
155	Galveston Area (Block GA 393) - Dive Area (Apr-Nov)	B-30	n	n	0	0	n	1	0	0.01

Table A-3. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Central GOM Planning Area and contacting certain offshore environmental resource locations within 10 and 30 days for low and high oil resource estimates (continued)

ID #	Offshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
156	Cognac Platform (Block MC 194) - Dive Area (Apr-Nov)	B-31	1	1	0.01	0.01	1	1	0.01	0.02
157	Horseshoe Rigs (Block MP 306) - Dive Area (Apr-Nov)	B-31	n	n	0	0	1	1	0.01	0.01
158	Vermilion Area - Dive Area (Apr-Nov)	B-30	3	5	0.03	0.06	6	10	0.06	0.11
159	Vermilion Area, South Addition - Dive Area (Apr-Nov)	B-30	3	4	0.03	0.05	5	8	0.05	0.09
160	Bay Marchand - Dive Area (Apr-Nov)	B-30	1	1	0.01	0.01	1	1	0.01	0.01
161	South Timbalier - Dive Area (Apr-Nov)	B-30	5	6	0.05	0.07	9	11	0.1	0.12
162	South Timbalier Area, South Addition - Dive Area (Apr-Nov)	B-30	3	4	0.03	0.04	6	8	0.06	0.08
163	Panhandle FL - Dive Area (Apr-Nov)	B-31	n	1	0	0.01	n	2	0	0.02
164	Tampa - Dive Area (Apr-Nov)	B-31	n	n	0	0	n	n	0	0
165	SE FL - Dive Area (Apr-Nov)	B-31	n	n	0	0	n	n	0	0
166	Daytona Beach - Dive Area (Apr-Nov)	B-31	n	n	0	0	n	n	0	0
167	Jacksonville - Dive Area (Apr-Nov)	B-31	n	n	0	0	n	n	0	0
168	Stetson Bank (Apr-Nov)	B-30	n	n	0	0	n	n	0	0
169	East Flower Garden Bank (Apr-Nov)	B-30	n	1	0	0.01	n	1	0	0.01
170	West Flower Garden Bank (Apr-Nov)	B-30	n	1	0	0.01	n	1	0	0.01
171	Chandeleur Islands (Apr-Nov)	B-29	1	1	0.01	0.01	2	2	0.02	0.02
172	Tortugas Ecological Reserve (North) (Apr-Nov)	B-29	n	n	0	0	n	n	0	0
173	Tortugas Ecological Reserve (South) (Apr-Nov)	B-29	n	n	0	0	n	n	0	0
174	Florida Keys National Marine Sanctuary (Apr-Nov)	B-29	n	n	0	0	n	n	0	0
175	TX State Waters (Nov-Apr)	B-29	1	4	0.01	0.05	2	8	0.02	0.09
176	West LA State Waters (Nov-Apr)	B-3	5	6	0.05	0.07	9	11	0.09	0.12
177	East LA State Waters (Nov-Apr)	B-3	1	1	0.01	0.01	2	2	0.02	0.02
178	MS State Waters (Nov-Apr)	B-3	n	n	0	0	n	n	0	0
179	AL State Waters (Nov-Apr)	B-3	n	n	0	0	n	n	0	0
180	FL Panhandle State Waters (Nov-Apr)	B-3	n	n	0	0	n	n	0	0
181	West FL State Waters (Nov-Apr)	B-3	n	n	0	0	n	n	0	0
182	Tortugas State Waters (Nov-Apr)	B-3	n	n	0	0	n	n	0	0
183	Southeast FL State Waters (Nov-Apr)	B-3	n	n	0	0	n	n	0	0
184	Northeast FL State Waters (Nov-Apr)	B-3	n	n	0	0	n	n	0	0

Notes: ** = Greater than 99.5%; n = less than 0.5%

Table A-4. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Central GOM Planning Area and contacting certain onshore environmental resource habitats, recreational beaches, or county shorelines within 10 and 30 days for low and high oil resource estimates

ID #	Onshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
1	Cameron, TX	B-4	n	n	0	0	n	n	0	0
2	Willacy, TX	B-5	n	n	0	0	n	n	0	0
3	Kenedy, TX	B-4	n	n	0	0	n	1	0	0.01
4	Kleberg, TX	B-5	n	n	0	0	n	n	0	0
5	Nueces, TX	B-4	n	n	0	0	n	n	0	0
6	Aransas, TX	B-5	n	n	0	0	n	1	0	0.01
7	Calhoun, TX	B-4	n	n	0	0	1	1	0.01	0.01
8	Matagorda, TX	B-5	n	1	0	0.01	2	3	0.02	0.03
9	Brazoria, TX	B-4	n	1	0	0.01	1	2	0.01	0.02
10	Galveston, TX	B-5	1	2	0.01	0.02	2	4	0.02	0.04
11	Chambers, TX	B-4	n	n	0	0	n	n	0	0
12	Jefferson, TX	B-5	n	1	0	0.01	1	2	0.01	0.02
13	Cameron, LA	B-4	1	2	0.01	0.02	2	4	0.02	0.04
14	Vermilion, LA	B-5	1	1	0.01	0.01	1	2	0.01	0.02
15	Iberia, LA	B-4	n	1	0	0.01	1	1	0.01	0.01
16	St. Mary, LA	B-5	n	n	0	0	n	n	0	0
17	Terrebonne, LA	B-4	2	3	0.02	0.03	3	5	0.03	0.05
18	Lafourche, LA	B-5	2	3	0.02	0.03	2	4	0.02	0.04
19	Jefferson, LA	B-4	1	2	0.01	0.02	1	2	0.01	0.02
20	Plaquemines, LA	B-5	3	6	0.03	0.06	4	8	0.05	0.08
21	St. Bernard, LA	B-4	n	1	0	0.01	1	1	0.01	0.01
22	Hancock, MS	B-5	n	n	0	0	n	n	0	0
23	Harrison, MS	B-4	n	n	0	0	n	n	0	0
24	Jackson, MS	B-4	n	n	0	0	n	n	0	0
25	Mobile, ALA	B-5	n	n	0	0	n	n	0	0
26	Baldwin, ALA	B-4	n	n	0	0	n	n	0	0
27	Escambia, FL	B-5	n	n	0	0	n	n	0	0

Table A-4. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Central GOM Planning Area and contacting certain onshore environmental resource habitats, recreational beaches, or county shorelines within 10 and 30 days for low and high oil resource estimates (continued)

ID #	Onshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
28	Santa Rosa, FL	B-4	n	n	0	0	n	n	0	0
29	Okaloosa, FL	B-5	n	n	0	0	n	n	0	0
30	Walton, FL	B-4	n	n	0	0	n	n	0	0
31	Bay, FL	B-5	n	n	0	0	n	n	0	0
32	Gulf, FL	B-4	n	n	0	0	n	n	0	0
33	Franklin, FL	B-5	n	n	0	0	n	n	0	0
34	Wakulla, FL	B-4	n	n	0	0	n	n	0	0
35	Jefferson, FL	B-5	n	n	0	0	n	n	0	0
36	Taylor, FL	B-4	n	n	0	0	n	n	0	0
37	Dixie, FL	B-5	n	n	0	0	n	n	0	0
38	Levy, FL	B-4	n	n	0	0	n	n	0	0
39	Citrus, FL	B-5	n	n	0	0	n	n	0	0
40	Hernando, FL	B-4	n	n	0	0	n	n	0	0
41	Pasco, FL	B-5	n	n	0	0	n	n	0	0
42	Pinellas, FL	B-4	n	n	0	0	n	n	0	0
43	Hillsborough, FL	B-5	n	n	0	0	n	n	0	0
44	Manatee, FL	B-4	n	n	0	0	n	n	0	0
45	Sarasota, FL	B-5	n	n	0	0	n	n	0	0
46	Charlotte, FL	B-4	n	n	0	0	n	n	0	0
47	Lee, FL	B-5	n	n	0	0	n	n	0	0
48	Collier, FL	B-4	n	n	0	0	n	n	0	0
49	Monroe, FL	B-5	n	n	0	0	n	n	0	0
50	Dade, FL	B-4	n	n	0	0	n	n	0	0
51	Broward, FL	B-5	n	n	0	0	n	n	0	0
52	Palm Beach, FL	B-4	n	n	0	0	n	n	0	0
53	Martin, FL	B-5	n	n	0	0	n	n	0	0
54	St. Lucie, FL	B-4	n	n	0	0	n	n	0	0
55	Indian River, FL	B-5	n	n	0	0	n	n	0	0

Table A-4. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Central GOM Planning Area and contacting certain onshore environmental resource habitats, recreational beaches, or county shorelines within 10 and 30 days for low and high oil resource estimates (continued)

ID #	Onshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
56	Brevard, FL	B-4	n	n	0	0	n	n	0	0
57	Volusia, FL	B-5	n	n	0	0	n	n	0	0
58	Flagler, FL	B-4	n	n	0	0	n	n	0	0
59	St. Johns, FL	B-5	n	n	0	0	n	n	0	0
60	Duval, FL	B-4	n	n	0	0	n	n	0	0
61	Nassau, FL	B-5	n	n	0	0	n	n	0	0
62	TX	B-1	2	4	0.02	0.04	8	14	0.08	0.16
63	LA	B-1	9	17	0.1	0.18	14	25	0.15	0.28
64	MS	B-1	n	n	0	0	n	1	0	0.01
65	AL	B-1	n	n	0	0	n	1	0	0.01
66	FL	B-1	n	n	0	0	1	1	0.01	0.01
67	Tamaulipas, Mexico	B-1	n	n	0	0	n	n	0	0
68	Veracruz-Llave, Mexico	B-1	n	n	0	0	n	n	0	0
69	Tabasco, Mexico	B-1	n	n	0	0	n	n	0	0
70	Campeche, Mexico	B-1	n	n	0	0	n	n	0	0
71	Yucatan, Mexico	B-1	n	n	0	0	n	n	0	0
72	Quintana Roo, Mexcio	B-1	n	n	0	0	n	n	0	0
73	Belize (country)	B-1	n	n	0	0	n	n	0	0
74	Cuba	B-1	n	n	0	0	n	n	0	0
75	Passerines Habitat	B-6	1	2	0.01	0.03	4	8	0.04	0.08
76	Raptors Habitat	B-7	1	3	0.01	0.03	6	11	0.06	0.11
77	Shorebirds Habitat	B-8	7	13	0.08	0.14	14	25	0.15	0.28
78	Wading Birds Habitat	B-9	n	1	0	0.01	1	2	0.01	0.02
79	Waterfowl Habitat	B-10	10	18	0.11	0.2	17	30	0.19	0.36
80	Diving Birds Habitat	B-11	11	20	0.12	0.22	20	34	0.22	0.41
81	Gulls and Terns Habitat	B-12	11	19	0.12	0.21	20	34	0.22	0.42
82	Piping Plover Habitat (Aug-Apr)	B-13	4	8	0.04	0.08	8	14	0.08	0.15
87	West Indian Manatee Habitat	B-15	n	n	0	0	1	1	0.01	0.01

Table A-4. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Central GOM Planning Area and contacting certain onshore environmental resource habitats, recreational beaches, or county shorelines within 10 and 30 days for low and high oil resource estimates (continued)

ID #	Onshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
88	West Indian Manatee Sporadic Habitat (Apr-Oct)	B-15	1	1	0.01	0.01	1	2	0.01	0.02
89	West Indian Manatee Rare Habitat (Apr-Oct)	B-15	8	14	0.08	0.15	15	26	0.16	0.29
90	Alabama Beach Mouse Habitat	B-16	n	n	0	0	n	n	0	0
91	Perdido Key Beach Mouse Habitat	B-16	n	n	0	0	n	1	0	0.01
92	Santa Rosa Beach Mouse Habitat	B-16	n	n	0	0	n	n	0	0
93	Choctawhatchee Beach Mouse Habitat	B-16	n	n	0	0	n	1	0	0.01
94	St. Andrews Beach Mouse Habitat	B-16	n	n	0	0	n	n	0	0
95	Southeastern Beach Mouse Habitat	B-16	n	n	0	0	n	n	0	0
96	Anastasia Island Beach Mouse Habitat	B-16	n	n	0	0	n	n	0	0
97	Smalltooth Sawfish Critical Habitat	B-17	n	n	0	0	n	n	0	0
98	Short Nose Sturgeon Habitat (Sep-Mar)	B-18	n	n	0	0	n	n	0	0
99	Gulf Sturgeon Critical Habitat	B-19	1	2	0.01	0.02	2	4	0.02	0.04
100	Gulf Sturgeon Habitat	B-18	2	4	0.02	0.04	4	7	0.04	0.08
101	TX Coastal Bend Beach Area	B-20	4	4	0.02	0.04	4	7	0.04	0.08
102	TX Matagorda Beach Area	B-20	n	1	0	0.01	2	4	0.02	0.04
103	TX Galveston Beach Area	B-20	1	2	0.01	0.02	3	6	0.03	0.07
104	TX Sea Rim State Park	B-20	n	1	0	0.01	1	2	0.01	0.02
105	LA Beach Areas	B-20	3	6	0.03	0.06	5	10	0.05	0.1
106	AL/MS Gulf Islands	B-20	n	1	0	0.01	1	1	0.01	0.01
107	AL Gulf Shores	B-20	n	n	0	0	n	n	0	0
108	FL Panhandle Beach Area	B-20	n	n	0	0	1	1	0.01	0.01
109	FL Big Bend Beach Area	B-20	n	n	0	0	n	n	0	0
110	FL Southwest Beach Area	B-20	n	n	0	0	n	n	0	0
111	FL Ten Thousand Islands Area	B-20	n	n	0	0	n	n	0	0
112	FL Southeast Beach Area	B-20	n	n	0	0	n	n	0	0
113	FL Centraleast Beach Area	B-20	n	n	0	0	n	n	0	0
114	FL Northeast Beach Area	B-20	n	n	0	0	n	n	0	0
115	Gulf Coast Jaguarondi and Ocelot Habitat	B-21	n	n	0	0	1	2	0.01	0.02

Table A-4. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Central GOM Planning Area and contacting certain onshore environmental resource habitats, recreational beaches, or county shorelines within 10 and 30 days for low and high oil resource estimates (continued)

ID #	Onshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
116	Louisiana Black Bear Habitat	B-21	n	1	0	0.01	1	1	0.01	0.01
117	Northern Aplomado Falcon Habitat	B-14	n	n	0	0	n	n	0	0
118	Whooping Crane Habitat (Sep-Apr)	B-14	n	n	0	0	1	2	0.01	0.02
119	Whooping Crane Habitat	B-14	1	1	0.01	0.01	1	2	0.01	0.02
120	Wood Stork Habitat	B-14	n	1	0	0.01	1	2	0.01	0.02
121	Alabama Red-Bellied Turtle Habitat	B-21	n	1	0	0.01	1	2	0.01	0.02
122	Gopher Tortoise and Louisiana Quillwort Habitat	B-22	n	n	0	0	n	1	0	0.01
123	Eastern Indigo Snake Habitat	B-22	n	n	0	0	1	1	0.01	0.01
124	Mississippi Gopher Frog Habitat	B-23	n	n	0	0	n	1	0	0.01
125	Flatwoods Salamander Habitat	B-23	n	n	0	0	n	n	0	0
126	Telephus Spurge Habitat	B-21	n	n	0	0	n	n	0	0

Notes: ** = Greater than 99.5%; n = less than 0.5%

Table A-5. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Western GOM Planning Area and contacting certain offshore environmental resource locations within 10 and 30 days for low and high oil resource estimates

ID #	Offshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
1	Cayman Islands	B-1	n	n	0	0	n	n	0	0
2	Northwest Bahamas	B-1	n	n	0	0	n	n	0	0
3	Northeast Bahamas	B-1	n	n	0	0	n	n	0	0
4	Midwest Bahamas	B-1	n	n	0	0	n	n	0	0
5	Mideast Bahamas	B-1	n	n	0	0	n	n	0	0
6	South Bahamas	B-1	n	n	0	0	n	n	0	0
7	Jamaica	B-1	n	n	0	0	n	n	0	0
8	TX State Waters	B-3	5	8	0.05	0.08	8	14	0.09	0.15
9	West LA State Waters	B-3	n	n	0	0	1	1	0.01	0.01
10	East LA State Waters	B-3	n	n	0	0	n	n	0	0
11	MS State Waters	B-3	n	n	0	0	n	n	0	0
12	AL State Waters	B-3	n	n	0	0	n	n	0	0
13	FL Panhandle State Waters	B-3	n	n	0	0	n	n	0	0
14	West FL State Waters	B-3	n	n	0	0	n	n	0	0
15	Tortugas State Waters	B-3	n	n	0	0	n	n	0	0
16	Southeast FL State Waters	B-3	n	n	0	0	n	n	0	0
17	Northeast FL State Waters	B-3	n	n	0	0	n	n	0	0
18	Mexican State Waters	B-3	n	n	0	0	n	1	0	0.01
19	Texas West Waters (0-200m) for EFH	B-24	3	5	0.03	0.05	5	8	0.05	0.08
20	Texas East Waters (0-200m) for EFH	B-24	8	14	0.08	0.15	9	15	0.09	0.16
21	Louisiana Waters West of Mississippi River (0-200m) for EFH	B-24	2	3	0.02	0.03	2	4	0.02	0.04
22	Louisiana Waters East of Mississippi River (0-200m) for EFH	B-24	n	n	0	0	n	n	0	0
23	Mississippi Waters (0-200m) for EFH	B-24	n	n	0	0	n	n	0	0
24	Alabama Waters (0-200m) for EFH	B-24	n	n	0	0	n	n	0	0
25	Florida Panhandle Waters (0-200m) for EFH	B-24	n	n	0	0	n	n	0	0
26	Florida Bend Waters (0-200m) for EFH	B-24	n	n	0	0	n	n	0	0
27	Florida Southwest Waters (0-200m) for EFH	B-24	n	n	0	0	n	n	0	0
28	Florida Keys Waters (0-200m) for EFH	B-24	n	n	0	0	n	n	0	0
29	Florida Southeast Waters (0-200m) for EFH	B-24	n	n	0	0	n	n	0	0
30	Florida Northeast Waters (0-200m) for EFH	B-24	n	n	0	0	n	n	0	0

Table A-5. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Western GOM Planning Area and contacting certain offshore environmental resource locations within 10 and 30 days for low and high oil resource estimates (continued)

ID #	Offshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
31	Nearshore Seafloor (0-20m), "N1"	B-25	n	n	0	0	n	1	0	0.01
32	Nearshore Seafloor (0-20m), "N2"	B-25	2	3	0.02	0.03	4	6	0.04	0.07
33	Nearshore Seafloor (0-20m), "N3"	B-25	4	7	0.04	0.07	6	10	0.06	0.1
34	Nearshore Seafloor (0-20m), "N4"	B-25	n	1	0	0.01	1	2	0.01	0.02
35	Nearshore Seafloor (0-20m), "N5"	B-25	n	n	0	0	n	n	0	0
36	Nearshore Seafloor (0-20m), "N6"	B-25	n	n	0	0	n	n	0	0
37	Nearshore Seafloor (0-20m), "N7"	B-25	n	n	0	0	n	n	0	0
38	Nearshore Seafloor (0-20m), "N8"	B-25	n	n	0	0	n	n	0	0
39	Nearshore Seafloor (0-20m), "N9"	B-25	n	n	0	0	n	n	0	0
40	Nearshore Seafloor (0-20m), "N10"	B-25	n	n	0	0	n	n	0	0
41	Nearshore Seafloor (0-20m), "N11"	B-25	n	n	0	0	n	n	0	0
42	Nearshore Seafloor (0-20m), "N12"	B-25	n	n	0	0	n	n	0	0
43	Nearshore Seafloor (0-20m), "N13"	B-25	n	n	0	0	n	n	0	0
44	Nearshore Seafloor (0-20m), "N14"	B-25	n	n	0	0	n	n	0	0
45	Nearshore Seafloor (0-20m), "N15" - Tortugas	B-25	n	n	0	0	n	n	0	0
46	Shelf Seafloor (20-300m), "S1"	B-25	3	5	0.03	0.05	5	8	0.05	0.08
47	Shelf Seafloor (20-300m), "S2"	B-25	8	14	0.09	0.15	9	15	0.09	0.16
48	Shelf Seafloor (20-300m), "S3"	B-25	2	3	0.02	0.03	2	4	0.02	0.04
49	Shelf Seafloor (20-300m), "S4"	B-25	n	n	0	0	n	n	0	0
50	Shelf Seafloor (20-300m), "S5"	B-25	n	n	0	0	n	n	0	0
51	Shelf Seafloor (20-300m), "S6"	B-25	n	n	0	0	n	n	0	0
52	Shelf Seafloor (20-300m), "S7"	B-25	n	n	0	0	n	n	0	0
53	Shelf Seafloor (20-300m), "S8"	B-25	n	n	0	0	n	n	0	0
54	Shelf Seafloor (20-300m), "S9"	B-25	n	n	0	0	n	n	0	0
55	Shelf Seafloor (20-300m), "S10"	B-25	n	n	0	0	n	n	0	0
56	Shelf Seafloor (20-300m), "S11"	B-25	n	n	0	0	n	n	0	0
57	Shelf Seafloor (20-300m), "S12"	B-25	n	n	0	0	n	n	0	0
58	Shelf Seafloor (20-300m), "S13"	B-25	n	n	0	0	n	n	0	0
59	Shelf Seafloor (20-300m), "S14"	B-25	n	n	0	0	n	n	0	0
60	Deepwater Seafloor (300m-Outer Jurisdiction), "D1"	B-25	4	6	0.04	0.07	5	8	0.05	0.09

Table A-5. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Western GOM Planning Area and contacting certain offshore environmental resource locations within 10 and 30 days for low and high oil resource estimates (continued)

ID #	Offshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
61	Deepwater Seafloor (300m-Outer Jurisdiction), "D2"	B-25	3	5	0.03	0.06	4	7	0.04	0.07
62	Deepwater Seafloor (300m-Outer Jurisdiction), "D3"	B-25	4	7	0.04	0.07	5	8	0.05	0.08
63	Deepwater Seafloor (300m-Outer Jurisdiction), "D4"	B-25	4	7	0.04	0.07	4	7	0.05	0.08
64	Deepwater Seafloor (300m-Outer Jurisdiction), "D5"	B-25	2	3	0.02	0.03	2	4	0.02	0.04
65	Deepwater Seafloor (300m-Outer Jurisdiction), "D6"	B-25	1	2	0.01	0.02	2	3	0.02	0.03
66	Deepwater Seafloor (300m-Outer Jurisdiction), "D7"	B-25	1	2	0.01	0.02	1	3	0.01	0.03
67	Deepwater Seafloor (300m-Outer Jurisdiction), "D8"	B-25	1	1	0.01	0.01	1	2	0.01	0.02
68	Deepwater Seafloor (300m-Outer Jurisdiction), "D9"	B-25	n	n	0	0	n	1	0	0.01
69	Deepwater Seafloor (300m-Outer Jurisdiction), "D10"	B-25	n	n	0	0	n	1	0	0.01
70	Deepwater Seafloor (300m-Outer Jurisdiction), "D11"	B-25	n	n	0	0	n	1	0	0.01
71	Deepwater Seafloor (300m-Outer Jurisdiction), "D12"	B-25	n	n	0	0	n	n	0	0
72	Deepwater Seafloor (300m-Outer Jurisdiction), "D13"	B-25	n	n	0	0	n	n	0	0
73	Deepwater Seafloor (300m-Outer Jurisdiction), "D14"	B-25	n	n	0	0	n	n	0	0
74	Deepwater Seafloor (300m-Outer Jurisdiction), "D15"	B-25	n	n	0	0	n	n	0	0
75	Deepwater Seafloor (300m-Outer Jurisdiction), "D16"	B-25	n	n	0	0	n	n	0	0
76	Deepwater Seafloor (300m-Outer Jurisdiction), "D17"	B-25	n	n	0	0	n	n	0	0
77	Deepwater Seafloor (300m-Outer Jurisdiction), "D18"	B-25	n	n	0	0	n	n	0	0
78	Deepwater Seafloor (300m-Outer Jurisdiction), "D19"	B-25	n	n	0	0	n	n	0	0
79	Deepwater Seafloor (300m–Outer Jurisdiction), "D20"	B-25	n	n	0	0	n	n	0	0
80	Deepwater Seafloor (300m-Outer Jurisdiction), "D21"	B-25	n	n	0	0	n	n	0	0
81	Deepwater Seafloor (300m-Outer Jurisdiction), "D22"	B-25	n	n	0	0	n	n	0	0
82	Deepwater Seafloor (300m-Outer Jurisdiction), "D23"	B-25	n	n	0	0	n	n	0	0
83	Deepwater Seafloor (300m-Outer Jurisdiction), "D24"	B-25	n	n	0	0	n	n	0	0
84	Deepwater Seafloor (300m-Outer Jurisdiction), "D25"	B-25	n	n	0	0	n	n	0	0
85	Deepwater Seafloor (300m-Outer Jurisdiction), "D26"	B-25	n	n	0	0	n	n	0	0
86	Deepwater Seafloor (300m-Outer Jurisdiction), "D27"	B-25	n	n	0	0	n	n	0	0
87	Deepwater Seafloor (300m-Outer Jurisdiction), "D28"	B-25	n	n	0	0	n	n	0	0
88	Deepwater Seafloor (300m-Outer Jurisdiction), "D29"	B-25	n	n	0	0	n	n	0	0
89	Deepwater Seafloor (300m-Outer Jurisdiction), "D30"	B-25	n	n	0	0	n	n	0	0
90	North Atlantic Right Whale Critical Habitat	B-26	n	n	0	0	n	n	0	0

Table A-5. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Western GOM Planning Area and contacting certain offshore environmental resource locations within 10 and 30 days for low and high oil resource estimates (continued)

ID #	Offshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
91	North Atlantic Right Whale SE Seasonal Management Area (Nov 15-Apr 15)	B-26	n	n	0	0	n	n	0	0
92	Sargassum (March/April)	B-27	n	n	0	0	n	1	0	0.01
93	Sargassum (May/June)	B-27	1	2	0.01	0.02	1	2	0.01	0.02
94	Sargassum (July/August)	B-27	2	3	0.02	0.03	2	3	0.02	0.03
95	Seagrass-Wakulla County	B-27	n	n	0	0	n	n	0	0
96	Seagrass-Jefferson County	B-27	n	n	0	0	n	n	0	0
97	Seagrass-Taylor County	B-27	n	n	0	0	n	n	0	0
98	Seagrass-Dixie County	B-27	n	n	0	0	n	n	0	0
99	Seagrass-Levy County	B-27	n	n	0	0	n	n	0	0
100	Topographic Features (Mysterious Bank)	B-27	n	n	0	0	n	n	0	0
101	Topographic Features (Blackfish Ridge Bank)	B-28	n	n	0	0	n	n	0	0
102	Topographic Features (Dream Bank)	B-28								
103	Topographic Features (Southern Bank)	B-28	n	n	0	0	n	n	0	0
104	Topographic Features (Hospital Bank)	B-28	n	n	0	0	n	n	0	0
105	Topographic Features (North Hospital Bank)	B-28	n	n	0	0	n	n	0	0
106	Topographic Features (Aransas Bank)	B-28	n	n	0	0	n	n	0	0
107	Topographic Features (South Baker Bank)	B-28	n	n	0	0	n	n	0	0
108	Topographic Features (Baker Bank)	B-28	n	n	0	0	n	n	0	0
109	Topographic Features (Big Dunn Bar Bank)	B-28	n	n	0	0	n	n	0	0
110	Topographic Features (Small Dunn Bar Bank)	B-28	n	n	0	0	n	n	0	0
111	Topographic Features (32 Fathom Bank)	B-28	n	n	0	0	n	n	0	0
112	Stetson Bank	B-29	n	n	0	0	n	n	0	0
113	Topographic Features (Claypile Bank)	B-28	n	n	0	0	n	1	0	0.01
114	Topographic Features (Applebaum Bank)	B-28	n	n	0	0	n	n	0	0
115	Topographic Features (Coffee Lump Bank)	B-28	n	1	0	0.01	n	1	0	0.01
116	East Flower Garden Bank	B-29	n	1	0	0.01	1	1	0.01	0.01
117	West Flower Garden Bank	B-29	n	1	0	0.01	n	1	0	0.01
118	Topographic Features (MacNeil Bank)	B-28	n	n	0	0	n	n	0	0
119	Topographic Features (29 Fathom Bank)	B-28	n	n	0	0	n	n	0	0

Table A-5. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Western GOM Planning Area and contacting certain offshore environmental resource locations within 10 and 30 days for low and high oil resource estimates (continued)

ID #	Offshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
120	Topographic Features (Rankin-1 Bank)	B-28	n	n	0	0	n	n	0	0
121	Topographic Features (Rankin-2 Bank)	B-28	n	n	0	0	n	n	0	0
122	Topographic Features (Bright Bank)	B-28	n	n	0	0	n	n	0	0
123	Topographic Features (Geyer Bank)	B-28	n	n	0	0	n	n	0	0
124	Topographic Features (Elvers Bank)	B-28	n	n	0	0	n	n	0	0
125	Topographic Features (McGrail Bank)	B-28	n	n	0	0	n	n	0	0
126	Sonnier Bank	B-28	n	n	0	0	n	n	0	0
127	Topographic Features (Bouma Bank)	B-28	n	n	0	0	n	n	0	0
128	Topographic Features (Rezak Bank)	B-29	n	n	0	0	n	n	0	0
129	Topographic Features (Sidner Bank)	B-28	n	n	0	0	n	n	0	0
130	Topographic Features (Parker Bank)	B-28	n	n	0	0	n	n	0	0
131	Topographic Features (Alderdice Bank)	B-28	n	n	0	0	n	n	0	0
132	Topographic Features (Fishnet Bank)	B-28	n	n	0	0	n	n	0	0
133	Topographic Features (Sweet Bank)	B-28	n	n	0	0	n	n	0	0
134	Topographic Features (Jakkula Bank)	B-28	n	n	0	0	n	n	0	0
135	Topographic Features (Ewing-1 Bank)	B-28	n	n	0	0	n	n	0	0
136	Topographic Features (Ewing-2 Bank)	B-28	n	n	0	0	n	n	0	0
137	Topographic Features (Diaphus Bank)	B-28	n	n	0	0	n	n	0	0
138	Topographic Features (Sackett Bank)	B-28	n	n	0	0	n	n	0	0
139	Pinnacle Trend	B-28	n	n	0	0	n	n	0	0
140	Chandeleur Islands	B-28	n	n	0	0	n	n	0	0
141	Florida Middle Ground	B-29	n	n	0	0	n	n	0	0
142	Pulley Ridge	B-29	n	n	0	0	n	n	0	0
143	Madison Swanson	B-29	n	n	0	0	n	n	0	0
144	Steamboat Lumps	B-29	n	n	0	0	n	n	0	0
145	Dry Tortugas	B-29	n	n	0	0	n	n	0	0
146	Tortugas Ecological Reserve (North)	B-29	n	n	0	0	n	n	0	0
147	Tortugas Ecological Reserve (South)	B-29	n	n	0	0	n	n	0	0
148	Florida Keys National Marine Sanctuary	B-29	n	n	0	0	n	n	0	0
149	FL State Waters (both East Coast and Gulf)	B-29	n	n	0	0	n	n	0	0

Table A-5. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Western GOM Planning Area and contacting certain offshore environmental resource locations within 10 and 30 days for low and high oil resource estimates (continued)

ID #	Offshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
150	Key Biscayne National Park	B-29	n	n	0	0	n	n	0	0
151	Texas Clipper and South Texas Platform - Dive Area (Apr-Nov)	B-30	n	n	0	0	n	1	0	0.01
152	Port Lavaca/Liberty Ship Reef - Dive Area (Apr-Nov)	B-30	2	3	0.02	0.03	2	4	0.02	0.04
153	High Island - Dive Area (Apr-Nov)	B-30	1	1	0.01	0.01	1	2	0.01	0.02
154	West Cameron - Dive Area (Apr-Nov)	B-30	1	1	0.01	0.01	1	2	0.01	0.02
155	Galveston Area (Block GA 393) - Dive Area (Apr-Nov)	B-30	n	n	0	0	n	n	0	0
156	Cognac Platform (Block MC 194) - Dive Area (Apr-Nov)	B-31	n	n	0	0	n	n	0	0
157	Horseshoe Rigs (Block MP 306) - Dive Area (Apr-Nov)	B-31	n	n	0	0	n	n	0	0
158	Vermilion Area - Dive Area (Apr-Nov)	B-30	n	n	0	0	n	1	0	0.01
159	Vermilion Area, South Addition - Dive Area (Apr-Nov)	B-30	n	n	0	0	n	1	0	0.01
160	Bay Marchand - Dive Area (Apr-Nov)	B-30	n	n	0	0	n	n	0	0
161	South Timbalier - Dive Area (Apr-Nov)	B-30	n	n	0	0	n	n	0	0
162	South Timbalier Area, South Addition - Dive Area (Apr-Nov)	B-30	n	n	0	0	n	n	0	0
163	Panhandle FL - Dive Area (Apr-Nov)	B-31	n	n	0	0	n	n	0	0
164	Tampa - Dive Area (Apr-Nov)	B-31	n	n	0	0	n	n	0	0
165	SE FL - Dive Area (Apr-Nov)	B-31	n	n	0	0	n	n	0	0
166	Daytona Beach - Dive Area (Apr-Nov)	B-31	n	n	0	0	n	n	0	0
167	Jacksonville - Dive Area (Apr-Nov)	B-31	n	n	0	0	n	n	0	0
168	Stetson Bank (Apr-Nov)	B-30	n	n	0	0	n	n	0	0
169	East Flower Garden Bank (Apr-Nov)	B-30	n	1	0	0.01	n	1	0	0.01
170	West Flower Garden Bank (Apr-Nov)	B-30	n	n	0	0	n	1	0	0.01
171	Chandeleur Islands (Apr-Nov)	B-29	n	n	0	0	n	n	0	0
172	Tortugas Ecological Reserve (North) (Apr-Nov)	B-29	n	n	0	0	n	n	0	0
173	Tortugas Ecological Reserve (South) (Apr-Nov)	B-29	n	n	0	0	n	n	0	0
174	Florida Keys National Marine Sanctuary (Apr-Nov)	B-29	n	n	0	0	n	n	0	0
175	TX State Waters (Nov-Apr)	B-3	2	3	0.02	0.03	4	7	0.04	0.07
176	West LA State Waters (Nov-Apr)	B-3	n	n	0	0	n	n	0	0
177	East LA State Waters (Nov-Apr)	B-3	n	n	0	0	n	n	0	0

Table A-5. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Western GOM Planning Area and contacting certain offshore environmental resource locations within 10 and 30 days for low and high oil resource estimates (continued)

ID #	Offshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
178	MS State Waters (Nov-Apr)	B-3	n	n	0	0	n	n	0	0
179	AL State Waters (Nov-Apr)	B-3	n	n	0	0	n	n	0	0
180	FL Panhandle State Waters (Nov-Apr)	B-3	n	n	0	0	n	n	0	0
181	West FL State Waters (Nov-Apr)	B-3	n	n	0	0	n	n	0	0
182	Tortugas State Waters (Nov-Apr)	B-3	n	n	0	0	n	n	0	0
183	Southeast FL State Waters (Nov-Apr)	B-3	n	n	0	0	n	n	0	0
184	Northeast FL State Waters (Nov-Apr)	B-3	n	n	0	0	n	n	0	0

Notes: ** = Greater than 99.5%; n = less than 0.5%

Table A-6. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Western GOM Planning Area and contacting certain onshore environmental resource habitats, recreational beaches, or county shorelines within 10 and 30 days for low and high oil resource estimates

ID #	Onshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
1	Cameron, TX	B-4	n	n	0	0	n	n	0	0
2	Willacy, TX	B-5	n	n	0	0	n	n	0	0
3	Kenedy, TX	B-4	n	n	0	0	1	1	0.01	0.01
4	Kleberg, TX	B-5	n	n	0	0	n	1	0	0.01
5	Nueces, TX	B-4	n	n	0	0	n	1	0	0.01
6	Aransas, TX	B-5	n	n	0	0	1	1	0.01	0.01
7	Calhoun, TX	B-4	n	1	0	0.01	1	2	0.01	0.02
8	Matagorda, TX	B-5	1	2	0.01	0.02	2	3	0.02	0.04
9	Brazoria, TX	B-4	1	1	0.01	0.01	1	2	0.01	0.02
10	Galveston, TX	B-5	1	1	0.01	0.01	1	2	0.01	0.02
11	Chambers, TX	B-4	n	n	0	0	n	n	0	0
12	Jefferson, TX	B-5	n	n	0	0	n	1	0	0.01
13	Cameron, LA	B-4	n	n	0	0	n	1	0	0.01
14	Vermilion, LA	B-5	n	n	0	0	n	n	0	0
15	Iberia, LA	B-4	n	n	0	0	n	n	0	0
16	St. Mary, LA	B-5	n	n	0	0	n	n	0	0
17	Terrebonne, LA	B-4	n	n	0	0	n	n	0	0
18	Lafourche, LA	B-5	n	n	0	0	n	n	0	0
19	Jefferson, LA	B-4	n	n	0	0	n	n	0	0
20	Plaquemines, LA	B-5	n	n	0	0	n	n	0	0
21	St. Bernard, LA	B-4	n	n	0	0	n	n	0	0
22	Hancock, MS	B-5	n	n	0	0	n	n	0	0
23	Harrison, MS	B-4	n	n	0	0	n	n	0	0
24	Jackson, MS	B-4	n	n	0	0	n	n	0	0
25	Mobile, ALA	B-5	n	n	0	0	n	n	0	0
26	Baldwin, ALA	B-4	n	n	0	0	n	n	0	0
27	Escambia, FL	B-5	n	n	0	0	n	n	0	0
28	Santa Rosa, FL	B-4	n	n	0	0	n	n	0	0
29	Okaloosa, FL	B-5	n	n	0	0	n	n	0	0
30	Walton, FL	B-4	n	n	0	0	n	n	0	0
31	Bay, FL	B-5	n	n	0	0	n	n	0	0
32	Gulf, FL	B-4	n	n	0	0	n	n	0	0

Table A-6. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Western GOM Planning Area and contacting certain onshore environmental resource habitats, recreational beaches, or county shorelines within 10 and 30 days for low and high oil resource estimates (continued)

ID #	Onshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
33	Franklin, FL	B-5	n	n	0	0	n	n	0	0
34	Wakulla, FL	B-4	n	n	0	0	n	n	0	0
35	Jefferson, FL	B-5	n	n	0	0	n	n	0	0
36	Taylor, FL	B-4	n	n	0	0	n	n	0	0
37	Dixie, FL	B-5	n	n	0	0	n	n	0	0
38	Levy, FL	B-4	n	n	0	0	n	n	0	0
39	Citrus, FL	B-5	n	n	0	0	n	n	0	0
40	Hernando, FL	B-4	n	n	0	0	n	n	0	0
41	Pasco, FL	B-5	n	n	0	0	n	n	0	0
42	Pinellas, FL	B-4	n	n	0	0	n	n	0	0
43	Hillsborough, FL	B-5	n	n	0	0	n	n	0	0
44	Manatee, FL	B-4	n	n	0	0	n	n	0	0
45	Sarasota, FL	B-5	n	n	0	0	n	n	0	0
46	Charlotte, FL	B-4	n	n	0	0	n	n	0	0
47	Lee, FL	B-5	n	n	0	0	n	n	0	0
48	Collier, FL	B-4	n	n	0	0	n	n	0	0
49	Monroe, FL	B-5	n	n	0	0	n	n	0	0
50	Dade, FL	B-4	n	n	0	0	n	n	0	0
51	Broward, FL	B-5	n	n	0	0	n	n	0	0
52	Palm Beach, FL	B-4	n	n	0	0	n	n	0	0
53	Martin, FL	B-5	n	n	0	0	n	n	0	0
54	St. Lucie, FL	B-4	n	n	0	0	n	n	0	0
55	Indian River, FL	B-5	n	n	0	0	n	n	0	0
56	Brevard, FL	B-4	n	n	0	0	n	n	0	0
57	Volusia, FL	B-5	n	n	0	0	n	n	0	0
58	Flagler, FL	B-4	n	n	0	0	n	n	0	0
59	St. Johns, FL	B-5	n	n	0	0	n	n	0	0
60	Duval, FL	B-4	n	n	0	0	n	n	0	0
61	Nassau, FL	B-5	n	n	0	0	n	n	0	0
62	TX	B-1	4	6	0.04	0.07	8	13	0.08	0.14
63	LA	B-1	n	n	0	0	1	1	0.01	0.01

Table A-6. Probabilities (expressed as percent chance) of one or more offshore spills greater than or equal to 1,000 barrels occurring from a proposed action in the Western GOM Planning Area and contacting certain onshore environmental resource habitats, recreational beaches, or county shorelines within 10 and 30 days for low and high oil resource estimates (continued)

ID #	Onshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
64	MS	B-1	n	n	0	0	n	n	0	0
65	AL	B-1	n	n	0	0	n	n	0	0
66	FL	B-1	n	n	0	0	n	n	0	0
67	Tamaulipas, Mexico	B-1	n	n	0	0	n	n	0	0
68	Veracruz-Llave, Mexico	B-1	n	n	0	0	n	n	0	0
69	Tabasco, Mexico	B-1	n	n	0	0	n	n	0	0
70	Campeche, Mexico	B-1	n	n	0	0	n	n	0	0
71	Yucatan, Mexico	B-1	n	n	0	0	n	n	0	0
72	Quintana Roo, Mexcio	B-1	n	n	0	0	n	n	0	0
73	Belize (country)	B-1	n	n	0	0	n	n	0	0
74	Cuba	B-1	n	n	0	0	n	n	0	0
75	Passerines Habitat	B-6	1	2	0.01	0.03	4	7	0.04	0.07
76	Raptors Habitat	B-7	2	4	0.02	0.04	5	9	0.05	0.09
77	Shorebirds Habitat	B-8	3	5	0.03	0.05	6	10	0.06	0.11
78	Wading Birds Habitat	B-9	n	n	0	0	n	n	0	0
79	Waterfowl Habitat	B-10	2	4	0.02	0.04	5	9	0.05	0.09
80	Diving Birds Habitat	B-11	3	5	0.03	0.05	7	11	0.07	0.12
81	Gulls and Terns Habitat	B-12	3	5	0.03	0.06	7	12	0.07	0.13
82	Piping Plover Habitat (Aug-Apr)	B-13	1	1	0.01	0.01	2	3	0.02	0.03
87	West Indian Manatee Habitat	B-15	n	n	0	0	n	n	0	0
88	West Indian Manatee Sporadic Habitat (Apr-Oct)	B-15	n	n	0	0	n	n	0	0
89	West Indian Manatee Rare Habitat (Apr-Oct)	B-15	3	5	0.03	0.05	6	10	0.06	0.1
90	Alabama Beach Mouse Habitat	B-16	n	n	0	0	n	n	0	0
91	Perdido Key Beach Mouse Habitat	B-16	n	n	0	0	n	n	0	0
92	Santa Rosa Beach Mouse Habitat	B-16	n	n	0	0	n	n	0	0
93	Choctawhatchee Beach Mouse Habitat	B-16	n	n	0	0	n	n	0	0
94	St. Andrews Beach Mouse Habitat	B-16	n	n	0	0	n	n	0	0

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ID #	Onshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
95	Southeastern Beach Mouse Habitat	B-16	n	n	0	0	n	n	0	0
96	Anastasia Island Beach Mouse Habitat	B-16	n	n	0	0	n	n	0	0
97	Smalltooth Sawfish Critical Habitat	B-17	n	n	0	0	n	n	0	0
98	Short Nose Sturgeon Habitat (Sep-Mar)	B-18	n	n	0	0	n	n	0	0
99	Gulf Sturgeon Critical Habitat	B-19	n	n	0	0	n	n	0	0
100	Gulf Sturgeon Habitat	B-18	n	n	0	0	n	n	0	0
101	TX Coastal Bend Beach Area	B-20	1	1	0.01	0.01	2	4	0.02	0.04
102	TX Matagorda Beach Area	B-20	2	3	0.02	0.03	3	5	0.03	0.05
103	TX Galveston Beach Area	B-20	1	2	0.01	0.02	2	4	0.02	0.04
104	TX Sea Rim State Park	B-20	n	n	0	0	n	1	0	0.01
105	LA Beach Areas	B-20	n	n	0	0	n	1	0	0.01
106	AL/MS Gulf Islands	B-20	n	n	0	0	n	n	0	0
107	AL Gulf Shores	B-20	n	n	0	0	n	n	0	0
108	FL Panhandle Beach Area	B-20	n	n	0	0	n	n	0	0
109	FL Big Bend Beach Area	B-20	n	n	0	0	n	n	0	0
110	FL Southwest Beach Area	B-20	n	n	0	0	n	n	0	0
111	FL Ten Thousand Islands Area	B-20	n	n	0	0	n	n	0	0
112	FL Southeast Beach Area	B-20	n	n	0	0	n	n	0	0
113	FL Centraleast Beach Area	B-20	n	n	0	0	n	n	0	0
114	FL Northeast Beach Area	B-20	n	n	0	0	n	n	0	0
115	Gulf Coast Jaguarondi and Ocelot Habitat	B-21	1	1	0.01	0.01	2	4	0.02	0.04
116	Louisiana Black Bear Habitat	B-21	n	n	0	0	n	n	0	0
117	Northern Aplomado Falcon Habitat	B-14	n	n	0	0	n	1	0	0.01

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ID #	Onshore Environmental Resource Locations	Figure Showing Resource Location	Low Estimates				High Estimates			
			Probability		Mean		Probability		Mean	
			10 days	30 days	10 days	30 days	10 days	30 days	10 days	30 days
118	Whooping Crane Habitat (Sep-Apr)	B-14	n	1	0	0.01	1	2	0.01	0.02
119	Whooping Crane Habitat	B-14	n	n	0	0	n	n	0	0
120	Wood Stork Habitat	B-14	n	n	0	0	n	n	0	0
121	Alabama Red-Bellied Turtle Habitat	B-21	n	n	0	0	n	n	0	0
122	Gopher Tortoise and Louisiana Quillwort Habitat	B-22	n	n	0	0	n	n	0	0
123	Eastern Indigo Snake Habitat	B-22	n	n	0	0	n	n	0	0
124	Mississippi Gopher Frog Habitat	B-23	n	n	0	0	n	n	0	0
125	Flatwoods Salamander Habitat	B-23	n	n	0	0	n	n	0	0
126	Telephus Spurge Habitat	B-21	n	n	0	0	n	n	0	0

Notes: ** = Greater than 99.5%; n = less than 0.5%