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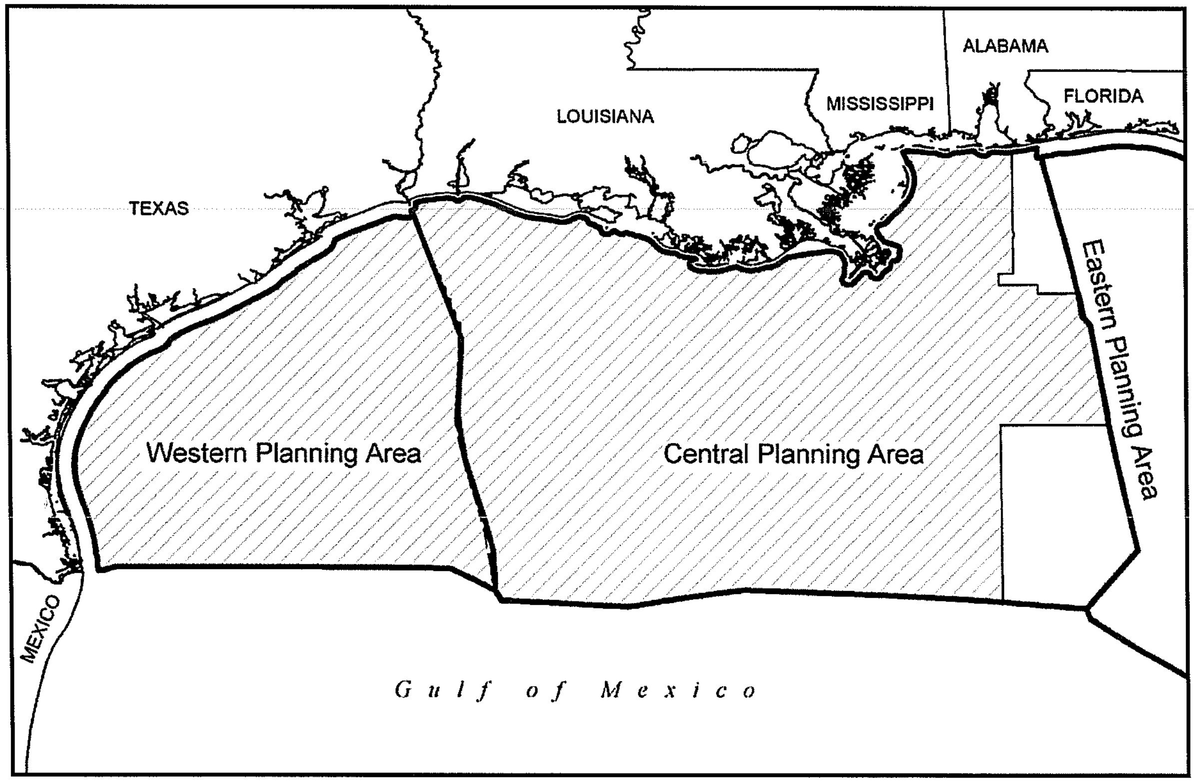
Gulf of Mexico OCS Oil and Gas Lease Sales: 2007-2012

Western Planning Area Sales 204, 207, 210, 215, and 218
Central Planning Area Sales 205, 206, 208, 213, 216, and 222

Final Environmental Impact Statement

Volume I: Chapters 1-8 and Appendices



U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region

Should an oil spill occur during a storm, *in-situ* burning would occur following the storm. *In-situ* burning would not be possible while storm conditions continued.

Natural Dispersion

In some instances, the best response to a spill may be to allow the natural dispersion of a slick to occur. Natural dispersion may be a preferred option for smaller spills of lighter nonpersistent oils and condensates that form slicks that are too thin to be removed by conventional methods and are expected to dissipate rapidly, particularly if there are no identified potential impacts to offshore resources and a potential for shoreline impact is not indicated. In addition, natural dispersion may also be a preferred option in some nearshore environments when the potential damage caused by a cleanup effort could cause more damage than the spill itself.

4.3.5.3. Oil-Spill Response Assumptions Used in the Analysis of a Most Likely Spill ≥1,000 bbl Incident Related to a Proposed Action

Refer to **Tables 4-36 and 4-37** for the estimated amounts of oil that will either be removed by the application of dispersants or mechanically recovered for 4,600-bbl pipeline spill scenarios analyzed in this EIS. These tables reflect recovery and removal estimates for different scenarios:

- a 4,600-bbl spill of 35° API oil lost over 12 hours as a result of a potential pipeline break during winter conditions at High Island Area; and
- a 4,600-bbl spill of 30° API oil lost over 12 hours as result of a potential pipeline break during summer conditions at Ship Shoal Area;

The assumptions used in calculating the amounts removed as a result of dispersant use and mechanical recovery efforts for the two 4,600-bbl spill scenarios are listed below.

- The spills occurred and were reported at 6 a.m.
- The 35° API oil did not emulsify; the 30° API oil did emulsify.
- Spill-response efforts were conducted during daylight hours only. A 12-hr operational window was assumed for both the winter and summer season.
- Mechanical response equipment (i.e., fast-response units having a USCG de-rated skimming capacity of 3,400 bbl/day) owned by the oil-spill-response cooperative, Clean Gulf Associates, was procured from Galveston, Texas and Lake Charles, Louisiana, for response to the High Island Area Block A-425 scenario.
- Mechanical response equipment (i.e., fast-response units having a USCG de-rated skimming capacity of 3,400 bbl/day) owned by the oil-spill-response cooperative, Clean Gulf Associates, was procured from Houma and Venice Louisiana, for response to the Ship Shoal Area Block 281 scenario.
- Dispersant application aircraft was deployed for all of the scenarios from Houma, Louisiana. This location also served as the staging location for loading dispersants. Three aircraft from this location were deployed for dispersant application—two DC3's and one DC4.
- Sea-state conditions: during the summer waves were 2 ft; during the winter waves were 4 ft (USDOC, NOAA, NDBC, 2007).
- A dispersant effectiveness rate of 30 percent was assumed for the treated oil. (S.L. Ross Environmental Research Ltd., 2000).
- Because of the projected stable emulsion formation of the 30° API, it was assumed that dispersant application would no longer be effective after 48 hr in this scenario.

4.3.5.4. Onshore Response and Cleanup

Offshore response and cleanup is preferable to shoreline cleanup; however, if an oil slick reaches the coastline it is expected that the specific shoreline cleanup countermeasures identified and prioritized in the appropriate Area Contingency Plans (ACP's) for various habitat types would be used. The sensitivity of the contaminated shoreline is the most important factor in the development of cleanup recommendations. Shorelines of low productivity and biomass can withstand more intrusive cleanup methods such as pressure washing. Shorelines of high productivity and biomass are very sensitive to intrusive cleanup methods, and in many cases, the cleanup is more damaging than allowing natural recovery.

Oil-spill response planning in the United States is accomplished through a mandated set of interrelated plans. The ACP represents the third tier of the National Response Planning System and was mandated by OPA 90. The ACP's cover subregional geographic areas. The ACP's are a focal point of response planning, providing detailed information on response procedures, priorities, and appropriate countermeasures. The Gulf coastal area that falls within USCG District 8 is covered by the One Gulf Plan ACP, which includes separate Geographic Response Plans for areas covered by USCG Sector Corpus Christi, Sector Houston/Galveston, Sector Port Arthur, Sector Morgan City, Sector New Orleans, and Sector Mobile. The Miami ACP covers the remaining Gulf coastal area. The ACP's are written and maintained by Area Committees assembled from Federal, State, and local governmental agencies that have pollution response authority; nongovernmental participants may attend meetings and provide input. The coastal Area Committees are chaired by respective Federal On-Scene Coordinators from the appropriate USCG Office and are comprised of members from local or area-specific jurisdictions. Response procedures identified within an ACP or its Geographic Response Plan(s) reflect the priorities and procedures agreed to by members of the Area Committees.

The single most frequently recommended spill-response strategy for the areas identified for protection in all of the applicable ACP's or it's Geographic Response Plans is the use of a shoreline boom to deflect oil away from coastal resources such as seagrass beds, marinas, resting areas for migratory birds, bird and turtle nesting areas, etc. If a shoreline is oiled, the selection of the type of shoreline remediation to be used will depend on the following: (1) the type and amount of oil on the shore; (2) the nature of the affected coastline; (3) the depth of oil penetration into the sediments; (4) the accessibility and the ability of vehicles to travel along the shoreline; (5) the possible ecological damage of the treatment to the shoreline environment; (6) weather conditions; (7) the current state of the oil; and (8) jurisdictional considerations.

Shoreline Cleanup Countermeasures

The following assumptions regarding the cleanup of spills that contact coastal resources in the area of consideration reflect a generalization of the site-specific guidance provided in the ACP's or its Geographic Response Plans applicable to the GOM. As stated in **Chapter 4.3.1.4**, for this analysis it is expected that a typical oil spilled as a result of an accident associated with a proposed action would be within the range of 30-35 degrees API. Since the following discussion is intended to address the most likely spill scenario discussed in **Chapter 4.3.5.3**, cleanup countermeasures for a medium-weight oil are all that are included in the following discussion. The ACP's applicable to the Gulf coastal area cover a vast geographical area. The differences in the response priorities and procedures among the various ACP's or its Geographic Response Plans reflect the differences in the identified resources needing spill protection in the area covered by each ACP or its Geographic Response Plans:

- *Barrier Island/Fine Sand Beaches Cleanup*: After the oiling of a barrier island/fine sand beach with a medium-weight oil, applicable cleanup options are manual removal, trenching (recovery wells), sediment removal, cold-water deluge flooding, shore removal/replacement, and warm-water washing. Other possible shoreline countermeasures include low-pressure cold-water washing, burning, and nutrient enhancement. Responders are requested to avoid the following countermeasures: no action; passive collection (sorbents); high-pressure, cold-water washing; hot-water washing; slurry sand blasting; vacuum; and vegetation cutting.

- *Fresh or Salt Marsh Cleanup*: In all cases, cleanup options that avoid causing additional damage to the marshes will be selected. After the oiling of a fresh or salt marsh with a medium-weight oil, the preferred cleanup option would be to take no action. Another applicable alternative would be trenching (recovery wells). Shore removal/replacement, vegetation cutting, or nutrient enhancement could be used. The option of using vegetation cutting as a shoreline countermeasure will depend upon the time of the year and will be considered generally only if re-oiling of birds is possible. Chemical treatment, burning, and bacterial addition as countermeasures under consideration. Responders are advised to avoid manual removal, passive collection, debris removal/heavy equipment, sediment removal, cold-water flooding, high- or low-pressure cold-water washing, warm-water washing, hot-water washing, slurry sand blasting, and shore removal/replacement.
- *Coarse Sand/Gravel Beaches Cleanup:* After the oiling of a coarse sand/gravel beach with a medium-weight oil applicable cleanup options are manual removal, trenching (recovery wells), sediment removal, cold-water deluge flooding, and shore removal/replacement. Other possible shoreline countermeasures include low-pressure, cold-water washing; burning; warm-water washing; and nutrient enhancement. Responders are requested to avoid the following countermeasures: no action; passive collection (sorbents); high-pressure, cold-water washing; hot-water washing; slurry sand blasting; vacuum; and vegetation cutting.
- *Exposed or Sheltered Tidal Flats Cleanup:* After the oiling of an exposed or sheltered tidal flat with a medium-weight oil, the preferred cleanup option is no action. Other applicable shoreline countermeasures for this resource include trenching (recovery wells) and cold-water deluge flooding. Other possible shoreline countermeasures listed include low-pressure, cold-water washing; vacuum; vegetation cutting; and nutrient enhancement. Responders are requested to avoid manual removal; passive collection; debris removal/heavy equipment; sediment removal; high-pressure, cold-water washing; warm-water washing; hot-water washing; slurry sand blasting; and shore removal replacement.
- *Seawall/Pier Cleanup:* After the oiling of a seawall or pier with a medium-weight oil, the applicable cleanup options include manual removal; cold-water flooding; low- and high-pressure, cold-water washing; warm-water washing; hot-water washing; slurry sand blasting; vacuum; and shore removal replacement. Other possible shoreline countermeasures listed include burning and nutrient enhancement. Responders are requested to avoid no action, passive collection (sorbents), trenching, sediment removal, and vegetation cutting.

4.4. Environmental and Socioeconomic Impacts of the Proposed Gulf Sales and Alternatives—Accidental Events

4.4.1. Impacts on Air Quality

The accidental release of hydrocarbons or chemicals from a proposed action in the WPA or CPA would cause the emission of air pollutants. Some of these pollutants are precursors to ozone, which is formed by complex photochemical reactions in the atmosphere. Accidents, such as oil spills and blowouts, are a source of emissions related to OCS operations. Typical emissions from OCS accidents consist of hydrocarbons; only fires produce a broad array of pollutants, including all NAAQS-regulated primary pollutants. The criteria pollutants considered here are NO_2, CO, sulphur oxides (SO_x), VOC, PM_{10}, and $PM_{2.5}$.

An oil spill (assumed size of 4,600 bbl) from a pipeline break during the summer at a location 50 mi off Louisiana was modeled for a period of 10 days (**Table 4-36**). An oil spill (assumed size of 4,600 bbl) from a pipeline break during the winter at a location 65 mi off Texas was modeled for a period of 10 days (**Table 4-37**). At the end of 10 days, 30 percent of the CPA slick and 31 percent of the WPA slick were lost because of evaporation. The contribution of oil-spill emissions to the total VOC emission is small, about 0.5 percent.

In-situ burning of a spill results in emissions of NO_2, SO_2, CO, and PM_{10}, and would generate a plume of black smoke. Fingas et al. (1995) describes the results of a monitoring program of a burn experiment at sea. The program involved extensive ambient measurements during two experiments in which approximately 300 bbl of crude oil were burned. It found that during the burn, CO, SO_2, and NO_2 were measured only at background levels and were frequently below detection levels. Ambient levels of VOC were high within about 100 m (328 ft) of the fire but were significantly lower than those associated with a nonburning spill. Measured concentrations of PAH were low. It appeared that a major portion of these compounds was consumed in the burn.

McGrattan et al. (1995) modeled smoke plumes associated with in-situ burning. The results showed that the surface concentrations of particulate matter did not exceed the health criterion of 150 $\mu g/m^3$ beyond about 5 km (3 mi) downwind of an in-situ burn. This is quite conservative as this health standard is based on a 24-hr average concentration rather than a 1-hr average concentration. This appears to be supported by field experiments conducted off of Newfoundland and in Alaska.

In summary, the impacts from in-situ burning are temporary. Pollutant concentrations would be expected to be within the NAAQS. The air quality impacts from in-situ burning would therefore be minor.

Blowouts are accidents related to OCS oil and gas activities and are defined as an uncontrolled flow of fluids from a wellhead or wellbore. The air pollutant emissions from blowouts depend on the amount of oil and gas released, the duration of the accident, and the occurrence or not of fire during the blowout. The duration of most blowouts is short duration, and half of blowouts lasted less than half a day. Blowouts may result in the release of synthetic drilling fluid or loss of oil. From 1992 to 2005, less than 10 percent of blowouts have resulted in spilled oil, which ranged from 1.5 to 200 bbl. An estimated 2-3 blowouts could occur from activities resulting from a proposed action in the CPA and 1-2 blowouts from a proposed action in the WPA.

The presence of hydrogen sulfide (H_2S) within formation fluids occurs sporadically throughout the GOM OCS, which may be released during an accident. There has been some evidence that petroleum from deepwater plays contain significant amounts of sulfur. Encounters with H_2S in oil and gas operations have caused injury and death throughout the U.S., but none, to date, in the GOM region. H_2S concentrations in OCS vary from as low as a fraction ppm to as high as 650,000 ppm. The concentrations of H_2S found to date are generally greatest in the eastern portion of the CPA. The Occupational Safety and Health Administration's permissible exposure limit for H_2S is 20 ppm, which is 30 times lower than the "immediately dangerous to life and health" of 100 ppm set by the National Institute for Occupational Safety and Health. At about 500-700 ppm loss of consciousness and possible death can occur in 30-50 minutes. H_2S is a toxic gas; at lower concentrations, it is readily recognized by the "rotten egg" smell. Accidents involving high concentrations of H_2S could result in deaths as well as environmental damage.

Summary and Conclusion

Accidents involving high concentrations of H_2S could result in deaths as well as environmental damage. Other emissions of pollutants into the atmosphere from accidental events as a result of a proposed action in the WPA or CPA are not projected to have significant impacts on onshore air quality because of the prevailing atmospheric conditions, emissions height, emission rates, and the distance of these emissions from the coastline. These emissions are not expected to have concentrations that would change onshore air quality classifications.

4.4.2. Impacts on Water Quality

Accidental events associated with a proposed action in the WPA or CPA that could impact water quality include spills of oil and refined hydrocarbons, spills of chemicals or drilling fluids, and collisions and LWC that result in spills. Water quality is altered and degraded by oil spills through the increase of petroleum hydrocarbons and their various transformation/degradation products in the water. The extent of impact from a spill depends on the behavior and fate of oil in the water column (e.g., movement of oil and rate and nature of weathering), which, in turn, depends on oceanographic and meteorological conditions at the time. The various fractions within the crude behave differently in water. The lighter ends are more water soluble and would contribute to acute toxicity. As the spill weathers, the aromatic components are more likely to exit the water. The heavier fractions are less water soluble and would partition to organic matter. This fraction is more likely to persist in sediments and would contribute to longer-term impacts.

The National Academy of Sciences (NRC, 2003) and Boesch and Rabalais (1987) have reviewed the fate and effects of spilled oil. In general, the impacts to water quality are greatest when a spill occurs in a confined area where it persists for a long period of time. In an environment where the oil can be dispersed or diluted, the impacts are reduced. Spills of opportunity are few and difficult to sample on short notice. The evaluation of impacts from a large spill on water quality is based on qualitative and speculative information.

4.4.2.1. Coastal Waters

The ability of coastal waters to assimilate spilled oil is affected by the shallowness of the environment. Large volumes of water are not available to dilute suspended oil droplets and dissolved constituents. Since oil does not mix with water and is usually less dense, most of the oil forms a slick at the surface. Small droplets in the water may adhere to suspended sediment and be removed from the water column. Oil contains toxic aromatic compounds such as benzene, toluene, xylenes, naphthalenes, and polynuclear aromatic hydrocarbons, which are soluble to some extent in water. The effect of these compounds on water quality depends on the circulation in the coastal environment, the composition of the spilled oil, and the length of time the oil is in contact with the water. Oil may also penetrate sand on the beach or be trapped in wetlands, where it can be re-released into the water some time after the initial spill.

4.4.2.2. Marine Waters

Oil Spills

The Gulf of Mexico has numerous natural hydrocarbon seeps as discussed in **Chapters 3.1.2.2 and 4.1.3.4**. The marine environment can be considered adapted to handling small amounts of oil released over time. Most of the oil spills that may occur as a result of a proposed action are expected to be ≤1 bbl **(Table 4-35)**.

An oil spill ≥1,000 bbl at the water surface may result from a platform accident. Subsurface spills would occur from pipeline failure or a loss of well control. Most of the oil from a subsurface spill would likely rise to the surface and would weather and behave similarly to a surface spill, dependent upon a number of factors, particularly the characteristics of the released oil and oceanographic conditions. However, some of the subsurface oil may also get dispersed within the water column, as in the case of the *Ixtoc I* seafloor blowout. Evidence from a recent experiment in the North Sea indicates that oil released during a deepwater blowout would quickly rise to the surface and form a slick (Johansen et al., 2001). Impacts from a deepwater oil spill would occur at the surface where the oil would be mixed into the water and dispersed by wind waves.

Once the oil enters the ocean, a variety of physical, chemical, and biological processes act to disperse the oil slick, such as spreading, evaporation of the more volatile constituents, dissolution into the water column, emulsification of small droplets, agglomeration sinking, microbial modification, photochemical modification, and biological ingestion and excretion. The water quality of marine waters would be temporarily affected by the dissolved components and small oil droplets that do not rise to the surface or are mixed down by surface turbulence. Dispersion by currents and microbial degradation remove the oil from the water column or dilute the constituents to background levels.

The most likely oil-spill scenario for spills ≥1,000 bbl is a 4,600-bbl spill from a pipeline break that leaks for 12 hr. For a likely spill in the CPA, after three days, approximately 1 percent of the oil is expected to naturally disperse and about 45 percent is expected to be chemically dispersed. For the WPA, by two days, approximately 42 percent would be dispersed and 1,040 bbl chemically dispersed. The volume of oil is small relative to the amount of oil that enters the Gulf of Mexico through natural seeps; however, this represents a large quantity over a short period of time. Because the Gulf is a large body of water, the toxic constituents, such as benzene, toluene, xylene, and naphthalene, are expected to rapidly disperse to sublethal concentrations.

Chemical Spills

A recent study of chemical spills from OCS activities determined that accidental releases of zinc bromide and ammonium chloride could potentially impact the marine environment (Boehm et al., 2001). Both of these chemicals are used for well treatment or completion and are not in continuous use; thus, the risk of a spill is small. Most other chemicals are either nontoxic or used in such small quantities that a spill would not result in measurable impacts. Zinc bromide is of particular concern because of the toxic nature of zinc. Close to the release point of an ammonium chloride spill, the ammonia concentrations could exceed toxic levels for time scales of hours to days.

Accidental Releases of Drilling Fluids

As a result of the specific gravity of SBF, an accidental release of synthetic-based drilling fluids would be expected to sink to the seafloor in the area immediately at and adjacent to the release site. Localized anoxic conditions at the seafloor would be expected to occur. This would be short term, lasting until the SBF decomposed.

Collisions

A collision may result in the spillage of crude oil, refined products such as diesel, or chemicals. Diesel is the type of refined hydrocarbon spilled most frequently as the result of a collision. Minimal impacts result from a spill since diesel is light and will evaporate and biodegrade within a few days. Since collisions occur infrequently, the potential impacts to marine water quality are not expected to be significant.

Loss of Well Control

A loss of well control includes events with no surface expression or impact on water quality to events with a release of oil or drilling fluids. A LWC event may result in localized suspension of sediments, thus affecting water quality temporarily. Results from a recent simulated experiment of a deepwater blowout indicated that the oil rose from 850 m to the surface in approximately one hour.

Since LWC events and blowouts are rare events and of short duration, potential impacts to marine water quality are not expected to be significant.

Summary and Conclusion

Smaller spills (<1,000 bbl) are not expected to significantly impact water quality in marine and coastal waters. Larger spills, however, could impact water quality especially in coastal waters. Chemical spills, the accidental release of SBF, and blowouts are expected to have temporary localized impacts on water quality.

4.4.3. Impacts on Sensitive Coastal Environments

Impacts to the general vegetation and physical aspects of coastal environments by oil spills and cleanup response activities resulting from a proposed action in the WPA or CPA are considered in **Chapters 4.4.3.1, 4.4.3.2, and 4.4.3.3**. Potential impacts from oil spills to barrier islands seaward of the barrier-dune system are considered in the coastal barrier beaches and associated dunes analysis. Potential impacts to barrier islands landward of the barrier-dune system are considered in the wetlands analysis. Impacts to animals that use these environments, the recreational value of beaches, and archaeological resources found there are described in impact analysis sections for those specific resources.

The types and sources of spills that may occur, their dissipation prior to contacting coastal resources, spill-response activities, and mitigation are described in **Chapter 4.3**.

4.4.3.1. Coastal Barrier Beaches and Associated Dunes

The level of impacts from oil spills depends on many factors, including the type, rate, and volume of oil spilled and the weather and oceanographic conditions at the time of the spill, geographic location and