Site Selection For The Expansion Of The Strategic Petroleum Reserve Draft Environmental Impact Statement

VOLUME 2

Appendices A - M

May 2006

U.S. Department of Energy
Office of Petroleum Reserves (FE-47)
Washington, DC

DOE/EIS-0385

Appendix A
Air Quality

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Appendix A
Air Quality

A.1 SITE PREPARATION AND CONSTRUCTION

Air emissions will result from the construction at new SPR sites, the expansion of existing SPR sites, the construction of pipelines in pipeline rights-of-way (ROWs), and the construction of other associated facilities. Air emissions will also result from the operation and maintenance of the SPR sites. The greatest potential for air quality impacts is associated with construction when emission of fugitive particulate matter (PM) results from large-scale cut-and-fill operations. Other potential impacts resulting from air emissions are related to evaporative non-methane hydrocarbon (NMHC) emissions from the brine ponds associated with cavern development and filling. In addition, construction equipment is generally powered by onsite internal combustion engines, which emit additional air pollutants, including nitrogen oxides (NOx), PM, carbon monoxide (CO), and NMHC. Emissions during the site preparation and construction phases are best described in four areas: emissions from off-road equipment used by the work crews, emissions from on-road utility trucks used by the work crews, fugitive dust from construction activity at new buildings, and NMHC emitted during cavern development and filling. This appendix describes how emission estimates in these four areas were developed for this assessment.

In addition to the criteria air pollutants, the construction and operation of the SPR will generate greenhouse gas emissions. Details appear at the end of this appendix on how such emissions were determined for the analysis.

A.2 OFF-ROAD EQUIPMENT EMISSIONS

The NONROAD model (EPA 2002) is the EPA standard method for preparing emissions inventories for mobile sources that are not classified as being related to on-road traffic, railroads, air traffic, or water-going vessels. As such, it is the starting place for quantifying emissions from construction-related equipment. The NONROAD model uses the following general equation to estimate emissions separately for CO, NOx, PM (essentially all of which is PM2.5 from construction sources), and total hydrocarbons (THC), nearly all of which are NMHC[1]:

$$EMS = EF * HP * LF * Act * DF$$

Where:

EMS = estimated emissions
EF = emissions factor in grams per horsepower hours
HP = peak horsepower
LF = load factor (assumed percentage of peak horsepower)
Act = activity in hours of operation per period of operation
DF = deterioration factor

The emissions factor is specific to the equipment type, engine size, and technology type. The technology type for diesel equipment can be “base” (before 1988), “tier 0” (1988 to 1999), or “tier 1” (2000 to 2005). Tier 2 emissions factors could be applied to equipment that satisfies 2006 national standards (or slightly earlier California standards). The technology type for two-stroke gasoline equipment can be “base” (before 1997), “phase 1” (1997 to 2001), or “phase 2” (2002 to 2007). Equipment for phases 1 and 2 can

[1] A factor of 0.991 was used for 2-stroke and 0.984 was used for diesel to convert from THC to NMHC.

have catalytic converters. For this study, all diesel equipment was assumed to be tier 1 and all two-stroke diesel equipment was assumed to be phase 2 without catalytic converters.

The load factor is specific to the equipment type in the NONROAD model regardless of engine size or technology type, and it represents the average fraction of peak horsepower at which the engine is assumed to operate. NONROAD model default values were used in all cases. The deterioration factor was used to estimate increased emissions due to engine age. Conservatively, all equipment was assumed to be fully aged, which can represent different numbers of hours of operation for different equipment types, and the maximum deterioration factor was used.

Using this methodology, it is possible to make a conservative estimate of emissions from off-road equipment if the types of equipment and durations of use are known (see section A.5).

A.3 ON-ROAD UTILITY TRUCKS

Each work crew was assumed to have one truck for every four people. Emissions were estimated assuming that each crew had a gasoline-fueled truck similar to a Ford F-150 Supercab meeting tier 1 emission standards with at least 50,000 miles (80,000 kilometers) of use (between 5 and 10 years old). Such a truck fits into the heavy light-duty truck classification in the heaviest weight category. Table A.3-1 gives the emissions standards for such a truck. Each truck was assumed to be in use for a full 8-hour day traveling a total of 40 miles (64 kilometers) during this period.

Table A.3-1: Emissions from a Single, Fully-Aged (50,000 miles) Crew Truck

	THC	NMHC	CO	NOx	PM
Grams/mile	0.8	0.56	7.3	1.53	0.12
Grams/day	32	22.4	292	61.2	4.8

Source: EPA MOBILE6 Model (EPA, 2003)

A.4 FUGITIVE DUST

Emission rates for fugitive dust were estimated using guidelines outlined in the Western Regional Air Partnership (WRAP) fugitive dust handbook (WRAP 2004). Although these guidelines were developed for use in western states, they assume standard dust mitigation best practices activities of 50% from wetting; therefore, they were deemed applicable but conservative for the Gulf Coast. The WRAP handbook offers several options for selecting factors for PM10 (coarse PM) depending on what information is known. Table A.4-1 shows the possible emission factors and basis for choosing them. However, in addition all roads and earth movement activities are subject to some natural mitigation because of rainfall and other precipitation. To estimate the additional factor for natural mitigation EPA's AP-42 (EPA 2003a) suggests that the PM10 emission factor is multiplied by (365-D)/365, where D is the number of days per year with measurable[2] precipitation. In cities like Jackson, MS, the average value for D is 108 and the additional natural mitigation reduction is 30%. Thus, additional emission reduction through natural mitigation was included specifically for each facility location to account for the more moist Gulf Coast setting.

After PM10 is estimated, the fraction of fugitive dust emitted as PM2.5 is estimated, the most recent WRAP study (MRI 2005) recommends the use of a fractional factor of 0.10 to estimate the PM2.5 portion of the PM10.

[2] Daily precipitation of 0.01 inch or more.

For site preparation activities, only the areas of disturbance and approximate durations were known; therefore, the first factor with average conditions was used in the analysis. After completion of soil stabilization and compaction analysis, fugitive dust emissions were estimated for activities involving major earth moving (road building and pipeline construction). In the case of pipeline construction, the second set of factors was used on a per-month basis. The work area was calculated using the easement width multiplied by the length of pipeline laid in a month. The volume of onsite cut-and-fill was calculated assuming a trench 10 feet (3 meters) wide by 5 feet (1.5 meters) deep multiplied by the length of pipeline laid in a month. The volume of earth hauled offsite was assumed to be zero because all earth would be used to refill the trench and cover the pipeline. A pipeline crew with two backhoes was assumed to be capable of digging about 30,000 cubic yards (23,000 cubic meters) of earth per month, and then of refilling the trench after pipe was laid. At this rate, a single crew could be expected to prepare 3 miles (4.8 kilometers) of pipeline trench per month.

Table A.4-1: PM10 Emissions Factors Recommended by the WRAP Handbook

Basis for Emission Factor	Recommended PM10 Emission Factor
Only area and duration known	0.11 ton/acre/month (average conditions) or 0.22 ton/acre/month (average, no mitigation) or 0.43 ton/acre/month (worst-case conditions)
Volume of earth moved known	0.011 ton/acre/month for general construction plus 0.059 ton/1000 yard^3 for onsite cut-fill plus 0.22 ton/1000 yard^3 for offsite cut-fill
Equipment usage known	0.13 pounds/acre/work-hour for general construction plus 49 pounds/scraper-hour for onsite haulage plus 94 pounds/hour for offsite haulage

Source: WRAP, 2004

1 ton/acre = 0.5999 kilograms/meter^2
1 ton/1000 yard^3 = 1.1865 metric tons/1000 meter^3
1 pound/acre = 112 kilograms/kilometers^2
1 pound = 0.45359 kilograms

A.5 SITE DEVELOPMENT

Site preparation can be divided into four sequential phases: clearing and grubbing, rough grading, soil (lime) stabilization, and embankment placement and compaction. Likely equipment needs for these activities are listed in Table A.5-1. All of these activities will be necessary to develop new sites (DOE 1992a, 2-18) and clearing and grubbing activities will be necessary for the entire facility to enable operational surveillance. Existing sites will need elements from each of these activities depending upon existing conditions. Additionally, sites such as Bayou Choctaw, Chacahoula, and Clovelly will only require clearing as they are located in wetlands, but will require other activity phases associated with walkway construction. Results for each of these activities for each facility are given in the body of the report.

Table A.5-1: Typical Equipment Used for Site Preparation at a New SPR Site

Phase	Equipment	Type	HP	Number	% Use
Clearing and grubbing	Chain saw	2-stroke	5	26	50
	Brush cutter	2-stroke	5	26	50
	Chipper	2-stroke	10	4	50
	Backhoe	Diesel	100	8	25
Rough grading	Dozer	Diesel	300	2	100
	Scraper	Diesel	200	2	100
Soil stabilization	Dozer	Diesel	150	4	100
	Grader	Diesel	150	4	100
Embankment compaction	Scraper	Diesel	200	2	100
	Plate compactor	Diesel	5	12	100

HP = Horsepower
% use = the average fraction of time that the equipment is operating during a work day
Source: Clovelly and Chacahoula Cost Estimate (DOE, 2004c; DOE 2004e)

Facility construction consists of five phases: foundation pouring, building construction, electrical installation, pipe installation, and road construction. These phases can overlap somewhat. Of these activities, only road construction is expected to result in significant fugitive particulate emissions while they all will produce fuel combustion related emissions. Some of these activities will be unnecessary or relatively brief for expansion sites depending upon existing infrastructure, but all will be necessary at new sites. The equipment that may be used in each phase of facility construction is given in Table A.5-2. Results for each of these activities for each facility are given in the body of the report.

Table A.5-2: Equipment Used for Proposed New SPR Facility Construction

Phase	Equipment	Type	HP	Number	% Use
Foundation pouring	Cement mixer	Diesel	350	2	100
	Roller compactor	Diesel	100	4	50
	Spreader	Diesel	100	4	50
Building construction	50 ton crane	Diesel	170	1	50
	Welder	Diesel	50	12	100
Electrical installation	50 ton crane	Diesel	170	1	25
	12 ton crane	Diesel	40	1	25
	Bucket truck	Diesel	200	1	100
Pipe installation	Excavator	Diesel	240	1	100
Road construction	Dozer	Diesel	200	1	100
	Spreader	Diesel	100	1	100
	Steel roller	Diesel	100	1	30
	Wheel roller	Diesel	100	1	30

HP = Horsepower
% use = the average fraction of time that the equipment is operating during a work day
Source: Clovelly and Chacahoula Cost Estimate (DOE, 2004c; DOE 2004e)

Cavern drilling will require using up to four 500 horsepower diesel-powered boring drills working 24 hours per day. All lead holes (initial holes for cavern development) are expected to be drilled during facility construction, even if solution mining for some of the caverns will begin at a later date.

New and existing SPR facilities may require extensive pipeline construction for both oil and brine transport. These pipes range in diameter from 16 to 48 inches (0.4 to 1.2 meters) and are assumed to be buried using a conventional land lay method whereby ditches are excavated with backhoes with the trench dug 5 feet (1.5 meters) deep and 10 feet (3.0 meters) across and then backfilled. This land lay method is conservative for air quality analysis as it requires the most construction equipment and activity, except at locations that are swampy or underwater. Because the majority of pipeline construction occurs offsite, pipeline construction can begin at the start of site preparation and can continue for up to three years, depending upon the site. Equipment likely to be used in pipeline construction is listed in Table A.5-3

Table A.5-3: Equipment Used by a Single Pipeline Construction Crew

Phase	Equipment	Type	HP	Number	% use
Pipeline Construction	Backhoe	Diesel	100	2	100
	12 Ton Mobile Crane	Diesel	40	1	30
	Grader	Diesel	150	1	30

HP = Horsepower
% use = the average fraction of time that the equipment is operating during a work day
Source: Clovelly and Chacahoula Cost Estimate (DOE, 2004c; DOE 2004e)

A.6 CAVERN DEVELOPMENT AND FILLING

During the cavern solution mining process, small amounts of hydrocarbons are present in the brine pumped out of the caverns and subsequently released into the atmosphere. If it is assumed that these hydrocarbons are completely volatilized to the atmosphere during the solution mining process, the following equation can be used to estimate atmospheric emissions of NMHC (DOE 1981, appendix C.2):

$$\text{NMHC Emissions} = \text{NMHC in Brine (parts per million} \times 10^{-6}) \times \text{Pumping Rate (barrels per day)} \times (42 \text{ gallons per barrel}) \times \text{Brine Density (pounds per gallon)}$$

Using the assumption that the brine density as measured at the Bryan Mound caverns is fairly constant at the value of 10.0 pounds/gallon (1.2 kilograms/liter) and representative of all SPR caverns, table A.5-1 gives an example NMHC emission rate estimate for 10 cavern facilities each with 10-million barrel (MMB) storage capacity where all caverns are developed simultaneously.

For each new cavern development project, the values in this table were used to predict durations and annual emissions associated with these activities. Durations for solution mining and solution mining/fill activities were estimated by scaling with the peak brine-production rate and maximum added capacity for each site. Annual emissions for these two activities were scaled using only the peak brine-production rate. For the final fill, durations and emissions were scaled using the maximum added capacity only.

Table A.6-1: NMHC Emissions Associated with Cavern Development (100 MMB)

Activity	Duration	Brine Production	Brine NMHC Concentration	Short-Term Emissions (grams/second)	Annual Emissions (tons)
Solution Mining	638 days	1.0 MMBD	0.26 ppm	0.57	19.9
Solution Mining/Fill	539 days	1.0 MMBD	1.0 ppm[a]	2.25	78.2
Final Fill[b]	200 days	0.3 MMBD	2.6 ppm	1.72	32.8

Source: DOE, 1992b

[a] Based on average solubility during solution mining and fill (midpoint) starting from zero based on current cavern development approach; for endpoint used measured data from appendix C.2 (table C.2-1) (DOE, 1981), four of the five measurements >90% full (end of process) and vapor partial fraction of 0.85.
[b] The original tables (table 7.1-1, pg 7-18) in DOE (1992b) reported emission rates of 1.15 g/s and 21.9 ton per year for final fill, but these were found to be in error, and corrected values are shown in this table.

ppm = parts per million
MMBD = million barrels per day

A.7 GREENHOUSE GAS EMISSIONS CALCULATIONS

The most important greenhouse gases (GHG) that result from activities at the SPR expansion are carbon dioxide (CO_2) and methane (CH_4). The most significant source of GHG emissions are CO_2 emissions associated with combustion sources and CH_4 during cavern solution mining. All combustion engines, including gasoline and diesel, emit large quantities of CO_2. Emissions of nitrous oxide (N_2O) and CH_4 from gasoline and diesel engines are much smaller, and therefore, only CO_2 was considered from combustion sources. Solution mining of salt from cavern development emits trapped CH_4 in addition to the other NMHC discussed in section 3.4. The brine pumped from the caverns also contains some CO_2; however, because CO_2 is soluble in water and the concentrations of CO_2 in the brine are well below equilibrium concentrations found in sea water, the CO_2 will remain in the sea water. Thus, this analysis considers only the CH_4 emissions from cavern solution mining.

Emissions of CO_2 from both spark-ignition and compression-ignition off-road construction equipment was estimated based on assumed fuel consumption rates. EPA's NONROAD model provides a fleet-average fuel consumption rate for diesel as well as two-stroke and four-stroke spark-ignition engines based on technology level and engine size (EPA 2004a, all; EPA 2004b, all). Given these data, the following equation was used to calculate CO_2 emissions:

$$CO_2 = (BSFC*453.6 - HC) *0.87*(44/12)$$

Where:

CO_2 is the CO_2 emission rate for off-road equipment in grams per horsepower hour;

BSFC is the in-use brake-specific adjusted-fleet-average fuel consumption in pounds per horsepower hour;

453.6 is the conversion from pounds (mass) to grams;

HC is hydrocarbon emissions in grams per horsepower hour;

0.87 is the carbon mass fraction of fossil fuels; and

44/12 is the ratio of CO_2 mass-to-carbon mass.

Emission from motor vehicles can be determined in an analogous manner to those from off-road equipment using an assumed fuel consumption rate for gasoline. The CO_2 vehicle emission rate for commuter vehicles can be determined by the following equation:

$$CO_2V = (FUELD*453.6/FE-THC)*0.87*(44/12)$$

Where:

CO_2V is the CO_2 vehicle emission rate in grams per mile;

FUELD is the fuel density of 6.1 pounds per gallon (0.73 kilograms per liter) of gasoline;

FE is the fuel economy of 21 miles per gallon (8.9 kilometers per liter);

THC is the total hydrocarbon emission in grams per mile (from MOBILE6.2);

0.87 is the carbon mass fraction of fossil fuels; and

44/12 is the ratio of CO_2 mass-to-carbon mass.

Total emissions of CO_2 were then calculated based on miles traveled determined from mean driving distance. Local population centers within 50 miles (80 kilometers) of each proposed site were assumed to contribute a share of the workforce proportional to their populations, yielding a population-weighted average commute distance. Conservatively, each worker was assumed to make 250 round trips per year (50 weeks, 5 days per week, no carpooling). Then, using employment information on the total number of workers for each facility, a total CO_2 emission rate was estimated for each facility.

Solution mining of the salt domes causes emissions of CH_4 to be pumped out with the concentrated brine. A methodology based on several cavern development studies prepared for the 1981 Environmental Impact Statement (DOE 1981), similar to that previously used to determine NMHC emissions, was used to estimate CH_4 emission rates. Equilibrium brine concentrations of CH_4 were calculated based on measurements taken at different stages of cavern development. The vapor partition factor (the ratio of solution escaping to the atmosphere over total solution dissolved from the cavern along with the brine) was assumed to be the same as NMHC as most NMHC emissions were light hydrocarbons (C2–C5 paraffins) (ethane through n-pentane). Throughout all phases emissions were calculated based on the brine removal rate, the concentration of CH_4 in brine, and the vapor partition factor.

Emissions during the initial solution mining were computed from the data of seven Bryan Mound samples studied in 1981 during early stages of cavern and roof development. During the solution mining/fill phase, it was assumed that the concentration of CH_4 in brine varied linearly between the late stages of cavern roof development and the maximum equilibrium concentration in brine. During the final fill, CH_4 was assumed to be at the maximum equilibrium (DOE 1981 p. C.2-9 – C.2-18).

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Appendix B
Floodplains and Wetlands Assessment

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Appendix B
Floodplains and Wetlands Assessment

B.1 I NTRODUCTION

The Department of Energy's (DOE) proposed action is to develop one or two new strategic petroleum reserve (SPR) sites and to expand petroleum storage capacity at two or three existing SPR sites in accordance with section 303 of the Energy Policy Act (EPACT). Under the proposed action, DOE would develop one new site at either Clovelly or Chacahoula in Louisiana; Richton or Bruinsburg in Mississippi; Stratton Ridge in Texas; or a combination of both Clovelly and Bruinsburg. In addition to developing a new site or a combination of two new sites, DOE would expand two or three of the existing SPR sites at West Hackberry and Bayou Choctaw in Louisiana and Big Hill in Texas. For a more detailed discussion of the proposed action and candidate alternatives, see chapter 2 of the Draft Environmental Impact Statement (EIS).

DOE has prepared this floodplain and wetlands assessment in compliance with DOE requirements as codified in 10 CFR Part 1022. Executive Order (E.O.) 11988—Floodplain Management (May 24, 1977; 10 CFR Part 1022[1])—requires Federal agencies to ensure that the potential effects of any action that may be taken in a floodplain are evaluated and that agency planning programs and budget requests reflect consideration of flood hazards and floodplain management. The E.O. further requires Federal agencies to "consider alternatives to avoid adverse effects and incompatible development in the floodplain." If no "practicable alternative" exists to locating a project in a floodplain, an agency must "design or modify its action in order to minimize potential harm to or within the floodplain..." Similarly, E.O. 11990 (May 24, 1977) requires Federal agencies to avoid construction in wetlands unless "there is no practicable alternative" and "all practicable measures to minimize harm" are included. Thus, both Executive Orders require that the Federal agency proposing an action go through a process of selection that compares the proposed action's potential impact on floodplains and wetlands to other practicable alternatives that may exist. It is important to note that the term "floodplain action" "…means any DOE action that takes place in a floodplain, including any DOE action in a wetland that is also within the floodplain…" (DOE 2003). Conversely, "wetland action means any DOE action related to new construction that takes place in a wetland not located in a floodplain…"

This Draft EIS considers impacts at eight sites—five sites where new facilities would be developed and three sites where existing capacity would be expanded.

B.2 DEFINITIONS

In 10 CFR 1022.4, a floodplain is defined as "lowlands adjoining inland or coastal waters…and relatively flat areas and floodprone areas of offshore islands." The "base floodplain" means "the 100-year floodplain, that is, a floodplain with a 1.0 percent chance of flooding in any given year." The "critical action floodplain" means, "at a minimum, the 500-year, that is, a floodplain with a 0.2 percent chance of flooding in any given year." A "critical action" means a "DOE action for which even a slight chance of flooding would be too great. Such actions may include, but are not limited to, the storage of highly volatile, toxic, or water reactive materials." Because petroleum, lubricants, and hazardous materials would be used during the construction phase of this proposed project, both the base floodplain and the critical action floodplain are considered in this assessment.

[1] See http://www.eh.doe.gov/nepa/

Natural and beneficial floodplain values to be protected include moderation of floods, groundwater recharge, water quality maintenance, support of biological resources (marshes, fish, and wildlife), cultural richness (archeological, historical, recreational, and scientific), and agricultural and forestry production.

A wetland is defined in 10 CFR 1022.4 as "an area that is inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted to life in saturated soil conditions, including swamps, marshes, bogs, and other similar areas." Wetlands serve a variety of functions in an ecosystem, such as water quality preservation, flood protection, erosion control, biological productivity, and wildlife habitat, including nesting, spawning, and rearing sites for many sensitive and other species. The primary functions and values of wetlands are summarized below:

- **Water Quality.** Wetlands help maintain and improve the water quality of rivers, lakes, and estuaries. Because wetlands are located between uplands and water resources, many wetlands can intercept runoff from the land before it reaches open water. Wetlands remove or transform pollutants through physical, chemical, and biological processes associated with stormwater runoff.

- **Flood Protection.** Wetlands help protect adjacent and downstream properties from potential flood damage by receiving and temporarily storing water during periods of high runoff or high flows in adjacent streams. Wetlands within and upstream of urban areas are particularly valuable for flood protection because the impervious surface in urban areas greatly increases the rate and volume of runoff, thereby increasing the risk of flood damage on human safety, health, and welfare. In addition, wetlands provide protection from ocean wave and tidal surges associated with strong storms and hurricanes.

- **Erosion Control.** Riparian wetlands, salt marshes, and marshes located at the margin of oceans, lakes, and rivers protect shorelines and streambanks against erosion. Wetland plants hold the soil in place with their roots, absorb wave energy, and reduce the velocity of stream or river currents.

- **Biological Productivity.** The dynamic nature of many wetlands produces a great diversity of habitat that, in turn, supports a great diversity of plant and animal species. Numerous species of microorganisms, plants, insects, amphibians, reptiles, birds, fish, and other wildlife depend in some way on wetlands for at least part of their life cycles. Wetland plants play an integral role in the ecology of the watershed by providing breeding and nursery sites, resting areas for migratory species, and refuge from predators.

- **Fish and Wildlife Habitat.** Diverse species of plants, insects, amphibians, reptiles, birds, fish, and mammals depend on wetlands for food, habitat, or temporary shelter. Many bird species use wetlands as a source of food, water, nesting material, or shelter. Migratory waterbirds rely on wetlands for staging areas, resting, feeding, breeding, or nesting grounds.

- **Cultural Value.** Wetlands often have diverse archaeological, historical, and cultural values. Societies have traditionally formed along bodies of water, and artifacts found in wetlands provide information about these societies.

- **Aesthetic Value.** Many people enjoy the scenic, pastoral, and aesthetically pleasing properties of wetlands. Historically, painters and writers have used wetlands as subject matter.

- **Economic Value.** More than half of all adults in the United States hunt, fish, birdwatch, or photograph wildlife in wetlands.

Floodplain and wetland protection is of particular concern in the Gulf Coast region because of recent hurricane activity and the resulting devastation caused by flooding.

B.3 METHODOLOGY

Several information sources were used in this assessment to identify the floodplains and wetlands in the project area and characterize the existing environmental conditions, including the U.S. Geological Survey (USGS) topographic maps, Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps, National Wetlands Inventory (NWI) data, aerial photographs, limited field investigations, and consultations with several state and Federal agencies.

Based on conceptual designs, DOE identified the wetland areas and floodplains within the proposed footprint of the development or expansion of storage sites and their associated infrastructure. These are wetlands and floodplains that could be temporarily disturbed or permanently removed by proposed construction activities. The areas examined for this analysis include all construction-related areas, including the proposed storage sites and associated facilities, such as terminals, raw water intake (RWI), brine injection well fields, pipeline and power line rights-of-way (ROWs), equipment laydown, staging areas, and access roads.

Wetlands were identified initially by NWI data. DOE performed a site walk-over for each proposed new storage site to verify and directly observe the wetland and floodplain conditions. DOE consulted with Federal and state agencies to identify unique or sensitive wetlands. Once DOE selects an alternative, other than the no-action alternative, DOE would conduct a field delineation of jurisdictional wetlands and waters of the United States as part of the Section 404/401 permit application of the Clean Water Act. DOE would conduct the delineation in accordance with the U.S. Army Corps of Engineers (USACE) 1987 Wetland Delineation Manual (USACE 1987) and would submit the wetland delineation to the appropriate USACE District (New Orleans, LA; Galveston, TX; Mobile, AL; and Vicksburg, MS) for review and jurisdictional determination.

For this assessment, DOE calculated the area of each wetland type and the 100-year and 500-year floodplain area that would be affected by construction activities and operations and maintenance after the proposed new or expansion storage site and associated infrastructure are built. For ROWs, DOE estimated the permanent and temporary wetland impacts by distinguishing between the permanent easement and the temporary construction easement. The type and nature of the impact to plant communities and wetlands would depend on whether the affected area is located within a permanently maintained easement (about 50 feet [13 meters] wide per pipeline) or within a temporary construction easement. Additional detail on the width and purpose of the permanently maintained easements and temporary construction easements is provided in section 2.3.9. Section 3.7.2.1.2 provides further information on how construction would be completed in the different types of wetlands.

Three types of wetland impacts were calculated for this assessment. First, the filling of wetlands for storage site or other associated facilities during construction would constitute a permanent removal of wetlands, which would destroy the functions and values of the wetland. Second, forested and scrub-shrub wetlands within the permanently maintained ROW easements and storage site security buffers would be permanently converted to emergent wetlands. This type of impact would destroy some wetland functions and values, but others such as flood attenuation, groundwater recharge, and erosion control would not be lost. The last category of wetland impact is the temporary impact to wetlands within the construction easement portion of the ROW and security buffer impacts to emergent wetlands. Preconstruction contours within the ROWs and security buffers would be re-established to restore hydrology and allow emergent wetlands to revegetate within the permanent and temporary construction easements within the ROW and the site security buffers. Forested and scrub-shrub wetlands would be allowed to revegetate within the temporary construction easements; however, re-establishment of the plant community would take at least 5 to 25 years depending on the type of community affected.

For floodplain impacts from the proposed ROWs, DOE calculated the total length of the impact in miles (kilometers) because there would be no permanent impact area. The area would be regraded and no aboveground structures would exist; therefore, floodplain storage capacity and floodplain benefits would not be permanently impacted.

The 100-year and 500-year floodplain impacts were evaluated. The placement of fill or construction of structures in a floodplain would potentially affect the flood storage capacity and destroy most of the benefits of floodplains.

Acreage calculations for the wetland and floodplain acreages were based primarily on NWI data and FEMA Flood Insurance Rate Maps. Wetland acreages for each proposed storage sites were modified based on DOE's site walk-over. Acreages presented in this assessment are estimates only as no formal wetland delineations of these areas have been conducted. For each site, DOE used the construction footprint and ROW for the pipelines, power lines, and access roads presented in chapter 2 to calculate the acreage of wetland types and floodplains associated with each proposed SPR alternative. Five hundred year floodplain areas are reported as the area outside the 100-year floodplain per the Flood Insurance Rate Maps. A 500-year flood event would flood both the 100-year and 500-year floodplain.

This process may have overestimated the impacts on wetlands and floodplains from the pipeline and power line corridors because specific construction measures that would be used to avoid wetlands were not addressed by this approach. For example, as described in section 2.3.9, DOE would use directional drilling for pipeline installation under larger streams and wetlands, which would avoid surface disturbance to the resources. In addition, many proposed ROWs would follow existing utility and road corridors and canals to minimize the impact to high quality, undisturbed wetlands. NWI data, used for the Geographic Information System (GIS) analysis, may have also overestimated wetlands in some areas and underestimated wetlands in other areas. The best NWI data available are over 20 years old for some regions. Wetlands accounted for in these regions may no longer exist or may have been misidentified. Alternatively, because NWI data are created from satellite images, some forested wetlands may have been misidentified as upland forests and therefore not accounted for in this analysis. These data, however, do provide a good general estimate and a basis for comparing the construction and operations and maintenance impacts associated with the proposed alternatives.

To summarize the major types of wetland systems, DOE consolidated the categories of the NWI data into the categories presented in table B.3-1 below.

Table B.3-1: Wetland Types and Description

Wetlands Type	Description
Palustrine – forested	Tidal and nontidal wetlands dominated by woody vegetation greater than or equal to 16 feet in height, and wetlands that occur in tidal areas in which salinity due to ocean-derived salts is below 5 parts per thousand. Total vegetation coverage is greater than 20 percent. This wetland category includes fresh-water swamps and bottomland hardwood forest.
Palustrine – scrub-shrub	Tidal and nontidal wetlands dominated by woody vegetation less than 16 feet in height, and wetlands that occur in tidal areas in which salinity due to ocean-derived salts is below 5 parts per thousand. Total vegetation coverage is greater than 20 percent. The species present could be true shrubs, young trees and shrubs, or trees that are small or stunted due to environmental conditions.

Table B.3-1: Wetland Types and Description

Wetlands Type	Description
Palustrine – emergent	Tidal and nontidal wetlands dominated by persistent emergent vascular plants, emergent mosses or lichens, and wetlands that occur in tidal areas in which salinity due to ocean-derived salts is below 5 parts per thousand. Plants generally remain standing until the next growing season. Total vegetation cover is greater than 80 percent. This category is also referred to as fresh-water marsh.
Estuarine – forested	Tidal wetlands dominated by woody vegetation greater than or equal to 16 feet in height, and wetlands that occur in tidal areas in which salinity due to ocean-derived salts is equal to or greater than 5 parts per thousand. Total vegetation coverage is greater than 20 percent.
Estuarine – scrub-shrub	Tidal wetlands dominated by woody vegetation less than 16 feet in height, and wetlands that occur in tidal areas in which salinity due to ocean-derived salts is equal to or greater than 5 parts per thousand. Total vegetation coverage is greater than 20 percent.
Estuarine – emergent	Tidal wetlands dominated by erect and rooted plants that can live in water, excluding mosses and lichens. Wetlands that occur in tidal areas where salinity due to ocean-derived salts is equal to or greater than 5 parts per thousand and that are present for most of the growing season in most years. Perennial plants usually dominate these wetlands. Total vegetation cover is greater than 80 percent. This wetland category includes saltwater marsh.
Palustrine – aquatic bed	Tidal and nontidal wetlands and deepwater habitats in which salinity due to ocean-derived salts is below 5 parts per thousand and that are dominated by plants that grow and form a continuous cover principally on or at the surface of the water. These include algal mats, detached floating mats, and rooted vascular plant assemblages. Total vegetation cover is greater than 80 percent.
Lacustrine	These include wetlands and deepwater habitats with all of the following characteristics: (1) situated in a topographic depression or a dammed river channel; (2) lacking trees, shrubs, persistent emergents, emergent mosses, or lichens with greater than 30 percent areal coverage; and (3) total area exceeds 20 acres.
Riverine	These include all wetlands and deepwater habitats contained in natural or artificial channels periodically or continuously containing flowing water or water that forms a connecting link between the two bodies of standing water. Upland islands or palustrine wetlands may occur in the channel, but they are not part of the riverine system.
Marine	Open ocean and high energy coastlines with salinities exceeding 30 parts per thousand and little or no dilution except outside the mouths of estuaries.
Palustrine – unconsolidated bottom	These include wetlands and deepwater habitats with at least 25 percent cover of substrate particles smaller than stones and a vegetative cover less than 30 percent. Water regimes are restricted to permanently flooded, intermittently exposed, and semi-permanently flooded. Characterized by the lack of large stable surfaces for plant and animal attachment. Salinity is below 5 parts per thousand.
Palustrine – open water	Small, shallow bodies of open fresh water lacking significant emergent vegetative cover.

1 foot = 0.305 meters; 1 acre = 0.405 hectares

B.4 REGULATORY AND PERMITTING REQUIREMENTS

For the selected alternative, other than the no-action alternative, DOE would conduct a delineation of waters of the United States, including wetlands in accordance with the USACE Wetland Delineation Manual (1987) and subsequent regulatory guidance. A wetland delineation is a survey conducted by a qualified person to determine the extent of a jurisdictional wetland and the types of wetland that would be affected by a project. A jurisdictional wetland must exhibit water tolerant vegetation, hydric soils, and wetland hydrology. Wetlands would be delineated on the selected new and expansion sites, along all ROWs, and at all locations for proposed ancillary facilities such as storage terminals and brine disposal well fields. Only wetlands that are regulated under Sections 404 and 401 of the Clean Water Act would be delineated. Isolated wetlands are generally not considered within the jurisdiction of the USACE. DOE would coordinate with the appropriate USACE District to secure a jurisdictional determination (or confirmation) of the delineation.

DOE would prepare the appropriate permit application for a Section 404 Permit from the USACE and the 401 Water Quality Certificate from the relevant state agency. This permit process requires a comprehensive analysis of alternatives to avoid impacts to jurisdictional wetlands and waters of the United States, an analysis of measures taken to minimize impacts, and a compensation plan to mitigate for unavoidable impacts to jurisdictional waters of the United States, including wetlands. Avoidance and minimization strategies could include measures such as refinement or modification of facility footprints to avoid wetlands, minimization of slopes in fill areas, use of geotechnical fabric under wetland fills to minimize mudwave potential, and restoration of the disturbed wetlands outside the permanent footprint of the SPR facility. DOE would prepare the compensation plan and submit it with the permit application. Compensation for unavoidable impacts to jurisdictional wetlands could take the form of preservation, restoration, or creation of wetlands in the project area or within the affected watersheds. DOE could also use payment of an lieu-of fee where the USACE and state would allow such payment or the purchase of mitigation credits from an approved wetland mitigation bank in the appropriate service area (region or watershed). The compensation plan would include provisions for protecting the mitigation site through a conservation easement or similar mechanism and postconstruction mitigation monitoring to evaluate the success of the mitigation. Additional detail on the compensation plan is included in section 3.7.2.1.3.

The USACE and state agency would review and approve the wetland compensation plan through the Section 404/401 permit process. DOE's mitigation plan would be consistent with the EPA and USACE proposed rulemaking on wetland mitigation entitled *Compensatory Mitigation for Losses of Aquatic Resources, Proposed Rule* (33 CFR Parts 325 and 332). DOE's mitigation actions would partially fulfill the compliance requirements of E.O. 11990 on Wetlands Protection and 10 CFR Part 1022, which are DOE's implementing regulations for the E.O. Dredge spoils, if generated, would be disposed of in a manner approved by the USACE. DOE would identify beneficial uses for the dredge spoil, (such as wetland restoration) as appropriate. In addition, DOE would secure Section 10 permits wherever required for proposed obstructions in navigable waterways that are regulated by the U.S. Coast Guard and USACE under the Rivers and Harbors Act.

For the selected alternative, DOE would comply with all Federal, state, and local regulations for floodplain protection. In most cases, floodplain regulations have been delegated to the local government through adoption of an ordinance that is consistent with the National Flood Insurance Program (NFIP). In most cases, the floodplain regulations apply only to the 100-year floodplain. The floodplain protection compliance requirements would be initiated during the design process for the selected alternative. DOE would prepare a site plan or engineering drawings that would be submitted to the appropriate state agency (e.g., Mississippi Floodplain Management Bureau of the Mississippi Emergency Management Agency) responsible for the NFIP. The floodplain protection requirements typically require floodproofing of buildings or raising the base of the building above the base flood elevation. In most cases, DOE would have to complete hydrologic modeling or calculations to demonstrate that fill or aboveground structures would not increase the base flood elevation downstream.

B.5 PROJECT DESCRIPTION

This section is an overview of the proposed project development in floodplains and wetlands. It assesses several elements that are common to developing each proposed new and expansion site, including the following:

- Storage caverns, each of which involves construction of a well pad on the ground surface above the cavern site, short onsite pipelines from the wellhead to onsite pumping facilities, onsite pumping capacity for water and brine management during cavern excavation, and oil management during facility operation;
- RWI facilities, including pumps located near the raw water source (generally offsite), and pipelines running from the source location to the storage facility;
- Crude oil intake and distribution facilities, including a series of onsite pipelines and pumps and offsite pipelines connecting to an existing oil distribution network;
- Brine disposal facilities, including onsite brine pumps, brine pipelines from the storage facilities to offsite brine disposal points, and offsite brine disposal facilities (either offshore diffusers in the Gulf of Mexico or underground injection wells);
- Support facilities including offices, control facilities, roads, platforms, and other related infrastructure, which typically would occupy a 35,000 square foot (3,300 square meter) area;
- Storage site and RWI access roads;
- Onsite package wastewater treatment plant; and
- Power lines.

B.6 SITE-SPECIFIC PROJECT DESCRIPTIONS AND FLOODPLAIN AND WETLAND IMPACTS

This section describes the effects to floodplains and wetlands at each proposed new site and expansion site.

B.6.1 Bruinsburg Storage Site and Associated Infrastructure

The Bruinsburg site would be located 10 miles (16 kilometers) east of Port Gibson, MS (40 miles [64 kilometers] southwest of Vicksburg) in Claiborne County, MS (see figure B.6.1-1). This proposed new site would consist of 16 new caverns with a total capacity of 160 MMB. A security buffer would be cleared extending 300 feet (91 meters) from the perimeter fence. The first six maps in an attachment to this appendix, which is a separate volume, show the NWI mapped wetlands for the proposed Bruinsburg storage site and associated infrastructure.

The Bruinsburg site and associated facilities would consist of the following:

- Sixteen new caverns and associated storage site infrastructure,
- New RWI structure and associated pipeline,
- Two new terminals at Peetsville, MS, and Anchorage, LA,

- 60 injection wells spaced at 1,000 feet intervals and an associated pipeline parallel to the ROW to Anchorage,
- Power lines, and
- New access roads to the facility and to the brine injection wells.

B.6.1.1 Floodplain Impacts

The extent of 100-year and 500-year floodplain was determined based on the FEMA Flood Insurance Rate Maps covering the project area. The Bruinsburg site would be located in a predominantly undeveloped area that has numerous floodplains associated with the Mississippi River and Bayou Pierre and their tributaries. Drainage is generally to the west toward the Mississippi River. Table B.6.1-1 summarizes the floodplain area that would be affected by this site and its associated facilities.

Table B.6.1-1: Floodplain Impacts for the Proposed Bruinsburg 160 MMB Storage Site and Associated Facilities

Description	100-Year Floodplain (acres)	500-Year Floodplain (acres)
Storage site/access road	158	17
RWI structure/access road	1	0
Anchorage terminal	0	0
Peetsville terminal	0	0
Brine injection well pads/access road	82	4
Total	**241**	**21**

1 acre = 0.405 hectares

The Bruinsburg 160 MMB site storage area and associated facilities would affect approximately 241 acres (98 hectares) of 100-year floodplain and 21 acres (9 hectares) of 500-year floodplain and would include fill and construction of some aboveground structures (figure B.6.1-2). The Peetsville and Anchorage terminals would not affect 100-year or 500-year floodplains (figures B.6.1-3 and B.6.1-4).

The Bruinsburg 160 MMB storage site and associated facilities would have the potential to increase future downstream flooding due to proposed fill and construction of aboveground structures within the floodplain including well pads, roads, and wellheads. DOE placed most of the proposed onsite buildings, including administrative buildings and other onsite facilities, to the east and located them out of the floodplain (figure B.6.1-2). The structures in the floodplain may have the potential to increase downstream flooding; however, the impacts would be minimal due to the overall size of the floodplain system and compliance with the flood protection requirements of local, state, and Federal floodplain regulations. After selection of an alternative other than no-action and prior to construction, hydrological modeling would be conducted to ensure that base flood elevations would not increase from the proposed fill/structures. No floodplains would be affected by the Peetsville or Anchorage terminals (figures B.6.1-3 and B.6.1-4).

Any structures located within the floodplain would be designed in accordance with the NFIP requirements for nonresidential buildings and structures located in special flood hazard areas. The NFIP regulations require vulnerable structures to be elevated above the 100-year flood elevation or to be watertight. DOE would coordinate with and secure approval from the Mississippi Floodplain Management Bureau of the Mississippi Emergency Management Agency or the local government, if it has adopted the NFIP program, during the design stage/site plan process.

The Bruinsburg 160 MMB pipeline and power line ROWs would cross and temporarily affect about 30 miles (48 kilometers) of 100-year floodplain and 4 miles (6 kilometers) of 500-year floodplain. The impacts to floodplains associated with the construction of the ROWs would be temporary because the preconstruction contours would be re-established and no aboveground fill or structures would exist following the completion of the construction activities. Therefore, no significant increased risk of flooding or change in base flood elevation would be expected from ROW construction because there would be no net loss of flood attenuation capacity compared to the existing conditions. There would be a minor increase in flood stage during the construction activities because some staging materials and construction equipment may be located in the floodplain. Power poles and other associated fill would be located outside of floodplain areas to the maximum extent practical. These structures would not be expected to significantly increase base flood elevations.

Due to the unique geology and location of the salt dome, the water dependency of the RWI, and the long ROWs for the site, floodplains could not be completely avoided. DOE has considered the practicable alternatives to siting in a floodplain and has prepared a conceptual design to minimize the impact to floodplains. DOE shifted the administrative buildings and other vulnerable structures where practicable to a location outside of the floodplain at the proposed Bruinsburg storage site. Proper design and compliance with the required regulatory programs would reduce the impacts of the structures on floodplains to a level where they would not significantly change the base flood elevation. Section B.7 discusses in more detail the avoidance and minimization measures that DOE would use to reduce the effects to floodplains located in the project area.

B.6.1.2 Wetland Impacts

The construction and operations and maintenance associated with the proposed Bruinsburg 160 MMB storage site and related facilities would have temporary and permanent impacts on wetlands as described in the methodology. Table B.6.1-2 identifies the wetlands that would be affected by the proposed ROWs and table B.6.1-3 summarizes the wetlands that would be affected by the new storage site, ROWs, and ancillary facilities.

The wetlands at the Bruinsburg storage site are predominantly palustrine forested wetlands comprised of mature cypress trees (see figure B.6.1-5). Although the forested wetlands are adjacent to actively managed cotton fields, they contain large cypress trees that indicate that the wetlands have been relatively undisturbed for several decades. This important type of fresh-water ecosystem generally provides functions that include nutrient transformation, flood storage, wildlife habitat, and timber production. Construction of the permanent structures such as the storage site and brine injection wells would permanently fill approximately 102 acres (41 hectares) of palustrine forested wetlands. The NWI data did not identify wetlands at the proposed Peetsville terminal, the Anchorage terminal, or the RWI. The maintenance of the security buffer around the 300-foot (91-meter) storage facility would permanently convert 18 acres (7 hectares) forested and scrub-shrub wetlands to emergent wetlands or open water. The security buffer would require the clearing of woody vegetation and periodic maintenance to suppress or clear woody species.

The power line and pipeline ROWs associated with the Bruinsburg 160 MMB storage site would cross and permanently or temporarily affect 335 acres (136 hectares) of wetlands. Table B.6.1-2 summarizes the wetland impacts per ROW that would result from this proposed development. Construction of all the ROWs would affect 151 acres (61 hectares) of wetlands within the permanent easement and 184 acres (75 hectares) of wetlands within the temporary easement (see table B.6.1-3). Pre-existing hydrology and elevations would be restored and the affected plant communities would be allowed to re-establish depending on location within the temporary and permanent easement. DOE would promote the growth of

Table B.6.1-2: Wetland Impacts for the Proposed Bruinsburg 160 MMB Storage Site ROWs[a]

Cowardin Wetland Classification	ROW from Site to Anchorage (acres)		ROW from Anchorage ROW to RWI (acres)		ROW from Site to Peetsville (acres)		Power Line ROWs (acres)	
	Temporary easement	Permanent easement	Temporary easement	Permanent easement	Temporary easement	Permanent easement	Temporary easement	Permanent easement
Palustrine – forested[b]	100	63	3	2	6	3	NA	39
Palustrine – scrub-shrub[b]	25	15	0	0	0	0	NA	4
Palustrine – unconsolidated bottom[c]	2	1	0	0	2	1	NA	0
Riverine[c]	45	22	1	1	0	0	NA	0
Totals	**172**	**101**	**4**	**3**	**8**	**4**	**NA**	**43**

Notes:

[a] This table presents only the wetland types that are present within the ROW according to NWI data.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area (where practical), and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected.

[c] Impacts to these wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares; NA means no temporary easement

Table B.6.1-3: Summary of Wetland Impacts for the Proposed Bruinsburg 160 MMB Storage Site and Associated Facilities[a]

Cowardin Wetland Classification	Storage Site (acres)		ROWs[b] (acres)		Brine Injection Wells (acres)	Totals (acres)
	Filled wetlands	**Permanent conversion**	**Temporary easement**	**Permanent easement**	**Filled wetlands**	**All affected wetlands**
Palustrine – forested	85	18	109	107	17	**336**
Palustrine – scrub-shrub	0	0	25	19	9	**53**
Palustrine – unconsolidated bottom	0	0	4	2	0	**6**
Riverine	0	0	46	23	0	**69**
Total	**85**	**18**	**184**	**151**	**26**	**464**

Notes:

[a] This table presents only the wetland types that are present within the proposed footprint according to NWI data. Facilities were omitted if no wetlands were present within the footprint.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area (where practical), and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected. Impacts to all other wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares

emergent or forested vegetation in the temporary construction easement. The impacts to wetlands within the temporary easement would last between 2 to 3 years for emergent wetlands and at least 10 to 25 years for forested wetlands. DOE would prohibit the regrowth of woody vegetation within the permanent easement to protect pipelines and to allow overflight inspections. Therefore, forested and scrub-shrub wetlands in the permanent easement would be permanently converted to emergent wetlands. Although the converted wetlands would provide different habitat than before construction, other important wetland functions, such as flood storage and nutrient filtration, would be maintained within the emergent wetlands.

According to available NWI data, the proposed Peetsville tank farm and Anchorage terminal would not affect wetlands (figures B.6.1-6 and B.6.1-7).

The entire Bruinsburg 160 MMB development, which includes the site, the associated facilities, and ROWs, would affect approximately 464 acres (187 hectares) of wetlands associated with the filling activities required for new structures and facilities and temporary and permanent clearing for new power lines and pipelines. The construction activities would permanently fill approximately 111 acres (45 hectares) of forested wetlands associated with the storage site and brine injection wells (see table B.6.1-3). The storage site would permanently destroy about 85 acres (34 hectares) of palustrine forested wetlands characterized as bald cypress forest. The impact to this relatively rare and important type of forested wetland would be a potential adverse effect, which would be mitigated by the compensation plan for jurisdictional wetland impacts.

Due to the geology and location of the salt dome, the water dependency of the RWI, and the long ROWs, impacts to wetlands and waters of the United States could not be avoided by this site development. All filling of and discharges to jurisdictional wetlands would require a Section 404/401 permit from the USACE and the Mississippi Department of Environmental Quality. The permit application would require a comprehensive alternatives analysis that demonstrates avoidance and minimization of wetland impacts. The permit would contain conditions to minimize the impact on wetlands during construction and would require compensation for unavoidable impacts to jurisdictional wetlands. Section B.7 discusses in more detail the avoidance, minimization, and mitigation measures that would be used to reduce, avoid, and compensate for the impacts to wetlands.

B.6.2 Chacahoula Storage Site and Associated Infrastructure

The Chacahoula salt dome site is located in Lafourche Parish, southwest of Thibodaux, LA, as illustrated in figure B.6.2-1. This proposed new site would consist of 16 new caverns with a total capacity of 160 MMB. A security buffer zone would be cleared extending 300 feet (91 meters) from the perimeter fence. Five maps in the attachment to this appendix show the NWI mapped wetlands and the proposed Chacahoula site storage, ROWs, and associated facilities.

The Chacahoula site and associated facilities would consist of the following:

- Sixteen new caverns and associated storage site infrastructure,
- New RWI structure and associated pipeline,
- Crude oil pipelines to Clovelly, LA, and to St. James Terminal, LA,
- Brine disposal pipeline to the Gulf of Mexico,
- Power lines, and
- New access roads to the facility and to the RWI structure.

B.6.2.1 Floodplain Impacts

The extent of 100-year and 500-year floodplain was determined based on the FEMA Flood Insurance Rate Maps covering the project area. The Chacahoula storage site would be located in a predominantly undeveloped, flooded wetland. The entire site is within the 100-year floodplain (see figures B.6.2-2 and B.6.2-3). Table B.6.2-1 summarizes the floodplain area that would be affected at this site.

Table B.6.2-1: Floodplain Impacts for the Proposed Chacahoula and Associated Facilities

Description	100-Year Floodplain (acres)	500-Year Floodplain (acres)
Storage site/access road	126	0
RWI structure/access road	10	0
Total	**136**	**0**

1 acre = 0.405 hectares

The floodplain where the proposed Chacahoula storage site would be located extends over hundreds of square miles (square kilometers) and is part of the Louisiana Western Gulf Coastal Plain Province. The Chacahoula storage site and RWI would disturb about 136 acres (55 hectares) of 100-year floodplain, which would include fill and construction of aboveground structures such as well pads, roads, administrative buildings, and the RWI structure itself.

Because the proposed Chacahoula storage site is located entirely within the 100-year floodplain, it would have the potential to increase future flooding due to the proposed fill and construction of aboveground structures within the floodplain, including buildings, well pads, roads, and wellheads. Portions of inundated forested wetlands would be filled for administrative buildings, pump stations, and other structures. A berm would be placed around the facility boundary to support a security fence and road. Although the proposed site is 227 acres (92 hectares), only 126 acres (51 hectares) would be filled. The berm would contain culverts to maintain hydrological functions and reduce flooding in nearby upland areas. The floodplain impacts are expected to be moderate due to the overall size of the floodplain system and compliance with the flood protection requirements of local, state, and Federal floodplain regulations. After selection of an alternative other than no-action and prior to construction, hydrological modeling would be conducted to ensure that base flood elevations would not be increased by the proposed fill/structures.

All structures would be designed in accordance with the NFIP requirements for nonresidential buildings and structures located in special flood hazard areas. The NFIP regulations are designed to require vulnerable structures to be constructed above the 100-year flood elevation or to be as watertight. DOE would coordinate with and secure approval from the floodplain coordinator at the Louisiana Department of Transportation and Development or the local government, if it has adopted the NFIP program, during the design stage/site plan process.

The associated power line and pipeline ROW would temporarily affect approximately 91 miles (147 km) of 100-year floodplain and less than 1 mile (2 kilometers) of 500-year floodplain (see figure B.6.2-2). The impacts on floodplains associated with the pipeline and power line ROWs would be temporary because no aboveground fill or structures would be built, the preconstruction contours would be re-established, and all disturbed areas would be allowed to revegetate following the completion of the construction activities. Therefore, no significant increased risk of flooding or change in base flood elevation would be expected from the pipeline and power line ROWs because there would be no net loss of floodplain attenuation capacity compared to the existing conditions. There would be a minor increase in flood stage during the construction activities because some staging materials and construction equipment may be located in the floodplain. Power poles and other associated fill would be located outside of floodplain areas to the maximum extent practical. These structures would not be expected to significantly increase flood stage levels.

Due to the area geology and location of the salt dome, water dependency of the RWI, and the long ROWs, floodplains could not be avoided by this site development. DOE has considered the practicable alternatives to placing the storage site in a floodplain and has prepared a conceptual design to minimize the impact to floodplains. Proper design and compliance with the required regulatory programs would reduce the impacts of these structures on floodplains to such an extent that there would be no significant change in the base flood elevation. Section B.7 discusses in more detail the avoidance and minimization measures that would be used to reduce the effects to floodplains located in the project area.

B.6.2.2 Wetland Impacts

The construction and operations and maintenance associated with the proposed Chacahoula storage site and associated facilities would have temporary and permanent impacts on wetlands as described in the methodology. Table B.6.2-2 presents the wetlands that would be affected by ROW and table B.6.2-3 summarizes the wetlands that would be affected by this alternative.

The proposed Chacahoula storage site would be located in a relatively large contiguous patch of inundated palustrine forested wetlands comprised of cypress and tupelo trees (figure B.6.2-4). This swamp has areas of oil and gas development, but it is largely undisturbed. This important type of fresh-water ecosystem generally provides functions that include nutrient transformation, flood storage, wildlife habitat, and timber production.

Construction of the Chacahoula storage site and RWI would affect about 349 acres (142 hectares) of palustrine forested and emergent wetlands. The permanent fill and conversion of wetlands would be associated with the construction of the storage site and RWI and the clearing and maintenance of a 300-foot (91-meter) security buffer around the new storage site (see figure B.6.2-4). Approximately 126 acres (50 hectares) of the proposed storage site would be filled for administrative buildings, well heads, pumps, and other facilities. The remaining portion of the enclosed site and the 300-foot (91-meter) security buffer would be cleared of woody vegetation and converted into emergent wetlands or open-water. Periodic maintenance would take place to suppress or clear woody vegetation regrowth within these areas.

The power line and pipeline ROWs associated with the Chacahoula storage site would cross and permanently or temporarily affect approximately 1,907 acres (770 hectares) of wetlands. Table B.6.2-3 provides a summary of the wetland impacts per ROW that would result from this alternative. Construction of the ROWs would affect 1,100 acres (445 hectares) of wetlands within the permanent easement and 807 acres (327 hectares) within the temporary easement. Pre-existing hydrology and elevations would be restored and the affected plant communities would be allowed to re-establish depending on location within the temporary and permanent easement. DOE would promote the growth of emergent or forested vegetation in the temporary construction easement. The impacts to wetlands within the temporary easement would last between 2 to 3 years for emergent wetlands and at least 10 to 25 years for forested wetlands. DOE would prohibit the regrowth of woody vegetation within the permanent easement to protect pipelines and to allow weekly overflight inspections. Therefore, forested and scrub-shrub wetlands in these areas would be permanently converted to emergent wetlands.

Table B.6.2-2: Wetland Impacts for the Proposed Chacahoula Storage Site ROWs[a]

Cowardin Wetland Classification	ROW from Site to Clovelly (acres)		ROW from Clovelly ROW to St. James (acres)		ROW from Site to Gulf of Mexico (acres)		ROW from Gulf of Mexico ROW to RWI Structure (acres)		Power Line ROWs (acres)	
	Temporary easement	Permanent easement	Temporary easement	Permanent easement	Temporary easement	Permanent easement	Temporary easement	Permanent easement	Temporary easement	Permanent easement
Estuarine	104	51	0	0	171	84	0	0	NA	0
Lacustrine[c]	6	3	0	0	33	17	0	0	NA	0
Marine[c]	0	0	0	0	2	1	0	0	NA	0
Palustrine – aquatic bed	2	1	0	0	2	1	0	0	NA	0
Palustrine – emergent	69	34	1	1	157	78	10	5	NA	16
Palustrine – forested[b]	178	91	152	75	148	94	18	9	NA	213
Palustrine – scrub-shrub[b]	24	12	0	0	7	3	0	0	NA	0
Palustrine – unconsolidated bottom[c]	0	0	0	0	3	2	0	0	NA	8
Riverine[c]	4	2	0	0	6	3	0	0	NA	0
Other	0	0	0	0	3	1	0	0	NA	2
Totals	**387**	**194**	**153**	**76**	**532**	**284**	**28**	**14**	**NA**	**239**

Notes:

[a] This table presents only the wetland types that are present within the ROW according to NWI data.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area, and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected.

[c] Impacts to these wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares; NA means no temporary easement

Table B.6.2-3: Summary of Wetland Impacts for the Proposed Chacahoula Storage Site[a]

Cowardin Wetland Classification	Storage Site/Access Road (acres)		ROWs[b] (acres)		RWI Structure/ Access Road (acres)	Totals (acres)
	Filled wetlands	Permanent conversion	Temporary easement	Permanent easement	Filled wetlands	All affected wetlands
Estuarine	0	0	275	135	0	**410**
Lacustrine	0	0	39	20	0	**59**
Marine	0	0	2	1	0	**3**
Palustrine – aquatic bed	0	0	4	2	0	**6**
Palustrine - emergent	0	0	237	134	3	**374**
Palustrine – forested	126	213	496	482	6	**1,323**
Palustrine – scrub-shrub	0	0	31	15	0	**46**
Palustrine – unconsolidated bottom	0	0	3	10	0	**13**
Riverine	0	0	10	5	0	**15**
Other	0	0	3	3	1	**7**
Totals	**126**	**213**	**1,100**	**807**	**10**	**2,256**

Notes:

[a] This table presents only the wetland types that are present within the proposed footprint according to NWI data. Facilities were omitted if no wetlands were present within the footprint.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area, and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected. Impacts to these wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares

Although the converted wetlands would provide different habitat than before construction, other important wetland functions, such as flood storage and nutrient filtration, would be maintained within the emergent wetland. DOE would compensate for the permanent impacts on jurisdictional wetlands that are unavoidable by this alternative. DOE would monitor the ROW areas of temporary and permanently impacts to wetlands to ensure that wetland hydrology and plants are re-established.

The entire Chacahoula storage site and associated facilities, which includes the site, RWI, and ROWs, would affect approximately 2,256 acres (914 hectares) of wetlands associated with the filling activities required for new structures and facilities and temporary and permanent clearing for new power lines and pipelines (see table B.6.2-3). The construction activities would permanently fill approximately 136 acres (55 hectares) of forested wetlands, including cypress-tupelo dominated wetlands, associated with the storage site, RWI, and access roads. The impact to this relatively rare and important type of forested wetlands would be a potential adverse effect, which would be mitigated by the compensation plan for jurisdictional wetland impacts.

Due to the geology and location of the salt dome, the water dependency of the RWI, and the long ROWs, impacts to wetlands and waters of the United States could not be avoided by this site and its infrastructure. All filling of and discharge to jurisdictional wetlands would require a Section 404/401 permit from the USACE and the Louisiana Coastal Management Division of the Department of Natural Resources. The permit application would require a comprehensive alternatives analysis that demonstrates avoidance and minimization of wetland impacts. The permit would contain conditions to minimize the impact to wetlands during construction and would require compensation for unavoidable impacts on jurisdictional wetlands. Section B.7 discusses in more detail the avoidance, minimization, and mitigation measures that would be used to reduce, avoid, and compensate for the potential impacts to jurisdictional wetlands and waters of the United States.

B.6.3 Clovelly Storage Site and Associated Infrastructure

The Clovelly salt dome is located east of Galliano, LA, in Lafourche Parish at the site of Louisiana Offshore Oil Port's (LOOP's) Clovelly Dome Storage Facility,[2] as illustrated in figure B.6.3-1. Co-located with LOOP's existing storage caverns, DOE would construct a 16-cavern, 120 MMB storage site that would use most of LOOP's existing infrastructure for cavern solution mining, brine disposal, and electrical power distribution.

The proposed Clovelly storage site and associated facilities would consist of the following:

- Sixteen new caverns,
- New RWI,
- Use of existing onsite infrastructure and offsite pipelines and power lines, and
- One new administrative building located 4 miles (6 kilometers) from the storage facility.

B.6.3.1 Floodplain Impacts

The extent of 100-year and 500-year floodplain was determined based on the FEMA Flood Insurance Rate Maps covering the project area. The Clovelly storage site would be located in a previously developed area associated with the existing LOOP Clovelly Dome Storage Terminal. The proposed site encompasses portions of the Barataria Bay estuary between the Mississippi River and Bayou Lafourche. The proposed storage site is entirely within the 100-year floodplain and consists of maintained open water canals and estuaries (figure B.6.3-2). DOE also would construct an off-dome administrative facility 4 miles (6 kilometers) to the west of the storage site that would also be located in a 100-year floodplain (see figure B.6.3-2). Table B.6.3-1 summarizes the floodplain area that would be affected by this development.

Table B.6.3-1: Floodplain Impacts for the Clovelly Storage Site

Description	100-Year Floodplain (acres)	500-Year Floodplain (acres)
Storage Site/RWI Structure/Access Roads	2	0
Dredge Area [a]	15	0
Off Site Administrative Building	4	0
Total	**21**	**0**

Notes:

[a] Dredging would not cause a permanent impact on the base flood elevation because no fill would be placed in the floodplain.

1 acre = 0.405 hectares

[2] LOOP is a private deepwater port operating off the coast of Louisiana. It is operated by Louisiana Offshore Oil Port, Inc., a consortium of oil and gas producers.

No new pipelines or power lines would be needed; therefore, no impacts to floodplains would occur from development of ROWs.

The Clovelly storage site would take advantage of most of the existing infrastructure at the LOOP storage facility, reducing the area required for new construction and operations. DOE would construct 16 new caverns as well as a new RWI on a canal within the existing LOOP property boundary. The Clovelly storage site, RWI, and offsite administrative building would affect approximately 21 acres (9 hectares) of 100-year floodplain, including the area required for developing the new caverns and associated infrastructure.

The Clovelly storage site and associated facilities would have a small potential to increase future downstream flooding due to the proposed fill and construction of aboveground structures within the floodplain. The impacts from the storage site are expected to be minimal due to the overall size of the floodplain system, the small amount of aboveground construction, the use of elevated platforms to support most infrastructure, and compliance with local, state, and Federal floodplain regulations. After the selection of an alternative other than no-action and prior to construction, hydrological modeling would be conducted to ensure that base flood elevations would not be increased from the proposed fill/structures.

Any structures located within the floodplain would be designed in accordance with the NFIP requirements for nonresidential buildings and structures located in special flood hazard areas. The NFIP regulations are designed to require vulnerable structures to be constructed above the 100-year flood elevation or to be watertight. DOE would coordinate with the floodplain coordinator at the Louisiana Department of Transportation and Development or the local government, if it has adopted the NFIP program, during the design stage/site plan process.

Due to the location and geology of the salt dome, floodplains could not be avoided by this site development. Proper design and compliance with the required regulatory programs would ensure that floodplain impacts would be minor. DOE has considered the practicable alternatives to placing the storage site in a floodplain and has prepared a conceptual design to minimize the impact on floodplains. Proper design and compliance with the required regulatory programs would reduce the impacts of these structures on floodplains to a level where there would be no significant change in the base flood elevation. Section B.7 discusses in more detail the avoidance and minimization measures that DOE would use to reduce the effects to floodplains located in the project area.

B.6.3.2 Wetland Impacts

The construction and operations and maintenance activities associated with the proposed Clovelly storage site would have temporary and permanent impacts on wetlands as described in the methodology. The entire Clovelly site is located within an area classified as estuarine wetlands by the Cowardin wetland classification. The site consists of maintained open water canals among vegetated dredge spoil piles, which renders the wetland habitat of marginal quality. Most of the wetlands that would be affected have been disturbed by past dredging and have been invaded by exotic species such as the Chinese tallow tree. The aquatic environment is tidally influenced by about one foot. Table B.6.3-2 summarizes the wetlands that would be affected by this site development.

Because existing infrastructure for distribution pipelines, power lines, and brine discharge would be used, construction impacts would be limited to those associated with cavern development and RWI construction.

Table B.6.3-2: Summary of Wetland Impacts for the Proposed Clovelly Storage Site[a]

Cowardin Wetland Classification	Storage Site (acres)		RWI Structure/Access Road (acres)		Totals (acres)
	Filled wetlands	Dredged wetlands	Conversion (platform)	Filled wetlands	All affected wetlands
Estuarine	0	8	0	0	**8**
Other	1	0	1	0	**12**
Totals	**1**	**8**	**1**	**0**	**10**

Notes:

[a] This table presents only the wetland types that are present within the proposed footprint according to NWI data. Facilities were omitted if no wetlands were present within the footprint.

1 acre = 0.405 hectares

The Clovelly area has a long history of oil and gas related activity, which has affected the existing wetlands and open water. DOE would dredge and fill and thereby permanently remove, approximately 10 acres (4 hectares) of estuarine and other wetlands associated with the construction of the 16 new storage caverns and the new RWI structure (see figure B.6.3-3). The RWI structure would be built on a platform over approximately 1 acre (0.4 hectares) of wetlands, which would convert the area to open water. The proposed off-dome administrative facilities would not affect wetlands (see figure B.6.3-4).

Due to the geology and location of the salt dome and the water dependency of the RWI, impacts to wetlands could not be avoided by this site development. All filling of jurisdictional wetlands would require a Section 404/401 permit from the USACE and the Louisiana Coastal Maintenance Division of the Department of Natural Resources. The permit application would require a comprehensive alternatives analysis that demonstrates avoidance and minimization of wetland impacts. The permit would contain conditions to minimize the impact to wetlands during construction and would require compensation for unavoidable impacts to jurisdictional wetlands. Section B.7 discusses in more detail the avoidance, minimization, and mitigation measures that DOE would use to reduce, avoid, and compensate for the potential impacts to jurisdictional wetlands and waters of the United States.

B.6.4 Clovelly and Bruinsburg Storage Sites

Under the Clovelly 80 MMB and Bruinsburg 80 MMB or the Clovelly 90 MMB and Bruinsburg 80 MMB alternatives, the development of the Clovelly site would be similar to the 120 MMB option, except that 12 caverns would be constructed instead of 16 caverns. The 80 or 90 MMB facility layout at Clovelly would have the same construction and operational impacts to wetlands and floodplains and is therefore not discussed separately. The development of the 80 MMB Bruinsburg site would be similar to the 160 MMB site, but 8 not 16 caverns would be constructed. Therefore, fewer brine injection wells and a smaller RWI would be required. Crude oil would be distributed by a new crude oil pipeline to the Vicksburg Entergy plant and a new crude oil pipeline to a terminal in Jackson, MS, rather than to Anchorage, LA, and Peetsville, MS (see figure B.6.4-1). Three maps in an attachment to this appendix show detailed NWI mapped wetlands and the proposed storage sites, ROWs, and associated facilities.

The Clovelly and Bruinsburg sites and infrastructure would consist of the following:

- 12 new caverns at Clovelly and 8 new caverns at Bruinsburg,
- RWI structures at Clovelly and Bruinsburg and associated pipeline,
- Offsite administrative building at Clovelly,
- Crude oil pipeline from Bruinsburg to Vicksburg Entergy plant and a new terminal in Jackson, MS,

- 30 brine injection wells and associated pipeline extending southwest from Bruinsburg storage site,
- Power lines associated with the Bruinsburg storage site, and
- A Bruinsburg facility access road and brine well access road.

B.6.4.1 Floodplain Impacts

The extent of 100-year and 500-year floodplain impacts was determined based on the FEMA Flood Insurance Rate Maps covering the project areas. As described under the Bruinsburg 160MMB option, the proposed Bruinsburg storage site is located in a predominantly undeveloped area that has numerous floodplains associated with the Mississippi River and Bayou Pierre and their tributaries (see figure B.5.4-2). Drainage is generally to the west toward the Mississippi River. The proposed Clovelly 80 MMB (or 90 MMB) storage site is located within the developed LOOP storage facility and encompasses portions of the Barataria Bay estuary between the Mississippi River and Bayou Lafourche. Table B.6.4-1 summarizes the floodplains that would be affected by this site development.

Table B.6.4-1: Floodplain Impacts for the Clovelly and Bruinsburg Storage Sites and Associated Facilities

Description	100-Year Floodplain (acres)	500-Year Floodplain (acres)
Bruinsburg storage site/access roads/RWI	62	17
Bruinsburg brine injection wells/access road	27	4
Jackson terminal	1	0
Clovelly	6	0
Total	**101**	**21**

1 acre = 0.405 hectares

The Clovelly and Bruinsburg sites, the terminals, the brine injection wells, access roads, and RWI structures would disturb approximately 101 acres (41 hectares) of 100-year floodplain and 21 acres (9 hectares) of 500-year floodplain.

The Bruinsburg 80 MMB storage site and associated facilities would have the potential to increase future downstream flooding due to proposed fill and construction of aboveground structures within the floodplain. DOE placed most the proposed onsite buildings, including administrative buildings and parking lots, to the east and located them out of the floodplain (figure B.6.4-2). The remaining structures in the floodplain might have the potential to increase downstream flooding; however, the impacts would be expected to be minimal due to the overall size of the floodplain system and compliance with local, state, and Federal floodplain regulations. The proposed Jackson tank farm would affect about 6 acres (2 hectares) of 100-year floodplain (figure B.6.4-3). After selection of an alternative other than no-action and prior to construction, hydrological modeling would be conducted to ensure that base flood elevations would not be increased from the proposed fill/structures.

The Clovelly storage site and associated facilities would have a small potential to increase future downstream flooding due to the proposed construction of aboveground structures within the floodplain. The impacts would be minimal due to the overall size of the floodplain system, the use of elevated platforms for most infrastructure, the small amount of above ground construction, and compliance with local, state, and Federal floodplain regulations. As with the Bruinsburg site, hydrological modeling would be conducted to ensure that base flood elevations are not increased from the proposed fill/structures.

Any structures located within the floodplain would be designed in accordance with the NFIP requirements for nonresidential buildings and structures located in special flood hazard areas. The NFIP regulations are designed to require vulnerable structures to be constructed above the 100-year flood elevation or to be watertight. DOE would coordinate with the state floodplain coordinators or local governments, if they have adopted the NFIP program, during the design state/site plan process.

Pipeline and power line ROWs associated with the Bruinsburg site would cross and potentially affect about 37 miles (60 kilometers) of 100-year floodplain and 4 miles (6 kilometers) of 500-year floodplain. The impacts on floodplains associated with the construction of the Bruinsburg ROWs would be temporary in nature because the preconstruction contours would be re-established and no aboveground fill or structures would exist following the completion of the construction activities. Therefore, no significant increased risk of flooding would be expected from ROW construction because there would be no net loss of flood attenuation capacity compared to the existing conditions. There would be a minor increase in flood stage during the construction activities because some staging materials and construction equipment may be located in the floodplain. Power poles and other associated fill would be located outside of floodplain areas to the maximum extent practical. These structures would not be expected to significantly increase flood stage levels.

Due to the area geology and location of the salt dome, water dependency of the RWI, and the long ROWs, floodplains could not be avoided by this site development. DOE has considered the practicable alternatives to placing the storage sites in floodplains and has prepared a conceptual design to minimize the impact to floodplains. Proper design and compliance with the required regulatory programs would reduce the impacts of these structures on floodplains to a level where there would be no significant change in the base flood elevation. Section B.7 discusses in more detail the avoidance and minimization measures that DOE would use to reduce the effects to floodplains located in the project area.

B.6.4.2 Wetland Impacts

The construction and operations and maintenance of the Clovelly 80 or 90 MMB and Bruinsburg 80 MMB storage sites and associated facilities would have temporary and permanent impacts on wetlands as described in the methodology. Table B.6.4-2 identifies the types of wetlands that would be affected by ROWs and table B.6.4-3 summarizes the wetlands that would be affected by these sites and their infrastructure.

Construction of the Clovelly and Bruinsburg storage sites and associated facilities would affect a total of approximately 534 acres (215 hectares) of wetlands, including 47 acres (19 hectares) of permanent wetland impact due to filling or dredging at the storage sites, Jackson terminal, brine injection field at Bruinsburg, and the RWI. About 16 acres (6 hectares) of palustrine forested wetlands would be converted to emergent wetlands due to the clearing for the security buffer. The permanent fill and conversion of wetlands are associated with the construction of the storage sites, RWIs, terminals, brine injection well pads, and the clearing and maintenance of a 300-foot (91-meter) security buffer around the new Bruinsburg storage site (see figure B.6.4-4). The security buffer would be cleared of woody vegetation and any forested or scrub-shrub wetlands would be converted into emergent wetlands. Periodic maintenance would take place to suppress or clear woody vegetation.

Figure B.6.4-5 shows the NWI mapped wetlands at the proposed Jackson tank farm. Figure B.6.4-6 shows the NWI mapped wetlands at the proposed Clovelly 80 MMB site storage area.

Table B.6.4-2: Wetland Impacts for the Proposed Bruinsburg 80 MMB Storage Site ROWs[a]

Cowardin Wetland Classification	ROW from Site to RWI (acres)		ROW between Brine Injection Wells (acres)		ROW from Site to Vicksburg (acres)		ROW from Vicksburg ROW to Jackson (acres)		Power Line ROWs (acres)	
	Temporary easement	**Permanent easement**	**Temporary easement**	**Permanent easement**	**Temporary easement**	**Permanent easement**	**Temporary easement**	**Permanent easement**	**Temporary easement**	**Permanent easement**
Lacustrine[c]	0	0	0	0	8	4	0	0	NA	0
Palustrine – aquatic bed[c]	0	0	0	0	1	0	0	0	NA	0
Palustrine – emergent	0	0	0	0	3	1	1	0	NA	0
Palustrine – forested[b]	40	26	20	10	68	42	110	54	NA	38
Palustrine – scrub-shrub[b]	2	1	0	0	0	0	0	0	NA	1
Palustrine – open water[c]	0	0	0	0	0	0	2	1	NA	0
Palustrine – unconsolidated bottom[c]	0	0	0	0	1	1	3	1	NA	0
Riverine[c]	1	1	0	0	2	1	2	1	NA	0
Other	0	0	1	0	11	7	0	0	NA	1
Totals	**43**	**28**	**21**	**10**	**94**	**56**	**118**	**57**	**NA**	**40**

Notes:

[a] This table presents only the wetland types that are present within the ROW according to NWI data. No new ROW would be needed at the Clovelly site.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area, and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected.

[c] Impacts to these wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares; NA means no temporary easement

Table B.6.4-3: Summary of Wetland Impacts for the Proposed Clovelly and Bruinsburg Storage Sites[a]

Cowardin Wetland Classification	Storage Sites (acres)		ROWs[b] (acres)		RWI Structures (acres)	Jackson Terminal (acres)	Brine Injection Wells (acres)	Totals (acres)
	Filled/dredged wetlands	Permanent conversion	Temporary easement	Permanent easement	Filled wetlands	Filled wetlands	Filled wetlands	All affected wetlands
Estuarine	3	0	0	0	0	**0**	**0**	**3**
Lacustrine	0	0	8	4	0	**0**	**0**	**12**
Palustrine – aquatic bed	0	0	1	0	0	**0**	**0**	**1**
Palustrine - emergent	0	0	4	1	0	**0**	**0**	**5**
Palustrine – forested	20	16	238	170	0	**10**	**12**	**466**
Palustrine – scrub-shrub	0	0	2	2	0	**0**	**0**	**4**
Palustrine – open water	0	0	2	1	0	**0**	**0**	**3**
Palustrine – unconsolidated bottom	0	0	4	2	0	**1**	**0**	**7**
Riverine	0	0	5	3	0	**0**	**0**	**8**
Other	0	0	12	8	1	**0**	**0**	**21**
Totals	**23**	**16**	**276**	**191**	**1**	**11**	**12**	**530**

Notes:

[a] This table presents only the wetland types that are present within the proposed footprint according to NWI data. Facilities were omitted if no wetlands were present within the footprint.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area, and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected. Impacts to these wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares

The power line and pipeline ROWs associated with the Bruinsburg 80 MMB storage site would cross and permanently or temporarily affect a total of approximately 467 acres (189 hectares) of wetlands. No new ROWs would be needed for the Clovelly site. Table B.6.4-2 provides a summary of the wetland impacts per ROW that would result from this alternative. Construction of the ROWs would affect 276 acres (112 hectares) of wetland within the permanent easement and 191 acres (78 hectares) within the temporary easement. Pre-existing contours would be restored and the some affected vegetative communities would be allowed to re-establish depending on location within the temporary and permanent easement. DOE would promote the growth of emergent or forested vegetation in the temporary construction easement. The impacts to wetlands within the temporary easement would last between 2 to 3 years for emergent wetlands and at least 10 to 25 years for forested wetlands. DOE would suppress regrowth of woody vegetation within the permanent easement to protect pipelines and to allow overflight inspections. Therefore, forested and scrub-shrub wetlands in these areas would be permanently converted to emergent wetlands. Although the converted wetlands would provide different habitat than before construction, other important wetland functions, such as flood storage and nutrient filtration, would be maintained within the emergent wetland. DOE would compensate for the permanent impacts on jurisdictional wetlands that are unavoidable by this alternative and would monitor the areas of temporary and permanently converted wetlands to ensure that wetland hydrology and wetland plants are re-established.

The Clovelly and Bruinsburg option, which includes the storage sites, the associated facilities, and ROWs, would affect a total of approximately 530 acres (215 hectares) of wetlands associated with the filling activities required for new structures and facilities and temporary and permanent clearing for new power lines and pipelines. The construction activities would permanently fill approximately 47 acres (19 hectares) of wetlands associated with the storage sites, RWI, access road and brine injection wells, including ecologically important bald cypress forest. The impact on this relatively rare and important type of forested wetlands at the proposed Bruinsburg storage site would be a potential adverse effect, which would be mitigated by the compensation plan for jurisdictional wetland impacts.

Due to the geology and location of the salt dome, the water dependency of the RWI, and the long ROWs, impacts on wetlands and waters of the United States could not be avoided by this side development. All filling of and discharge to jurisdictional wetlands would require a Section 404/401 permit from the USACE and the Mississippi Department of Environmental Quality and the Louisiana Department of Environmental Quality. The permit application would require a comprehensive alternatives analysis that demonstrates avoidance and minimization of wetland impacts. The permit would contain conditions to minimize the impact on wetlands during construction and would require compensation for unavoidable impacts to jurisdictional wetlands. Section B.7 discusses in more detail the avoidance, minimization, and mitigation measures that DOE would use to reduce, avoid, and compensate for the potential impacts to jurisdictional wetlands and waters of the United States.

B.6.5 Richton Storage Site and Associated Infrastructure

The Richton salt dome is located in Perry County, MS, 18 miles (29 kilometers) east of Hattiesburg and 3 miles (4.8 kilometers) northwest of the town of Richton (figure B.6.5-1). This proposed new site would consist of 16 new caverns with a combined capacity of 160 MMB. The Richton storage site and associated facilities would consist of the following:

- Sixteen new caverns,
- New RWI on the Leaf River,
- RWI pipeline from the Richton site to the RWI,
- Crude oil pipeline to Liberty, MS,
- Two, dual-purpose crude oil/brine pipelines to Pascagoula, MS,

- Pascagoula and Liberty terminals,
- Power lines,
- New site access roads and RWI access road, and
- Brine disposal pipeline from Pascagoula to the Gulf of Mexico.

Eight maps for the Richton 160 MMB storage site and infrastructure are included in an attachment to this appendix. They show detailed NWI mapped wetlands.

B.6.5.1 Floodplain Impacts

The extent of 100-year and 500-year floodplain was determined based on the FEMA Flood Insurance Rate Maps covering the project area. The proposed Richton storage site is currently an active pine plantation. It has an intermittent stream that drains the site and runs south to Pine Branch. The proposed storage site is not located within the 100-year or 500-year floodplain (see figure B.6.5-2). All 63 acres (26 hectares) of the Pascagoula terminal would be located within a 100-year floodplain (figure B.6.5-3).

Some of the proposed pipeline ROWs would be located within floodplains. The associated power line and pipeline ROWs would cross and temporarily affect approximately 27 miles (43 kilometers) of 100-year floodplain and 3 miles (5 kilometers) of 500-year floodplain. The pipelines would intersect several floodplains associated with various streams mostly in the Pascagoula or Pearl River drainage system. The impacts on floodplains associated with the construction of the ROWs would be temporary because the preconstruction contours would be re-established and no aboveground fill or structures would exist following the completion of the construction activities. No significant increased risk of flooding would be expected from ROW construction because no net loss of flood attenuation capacity would occur compared to the existing conditions. There would be a potential minor increase in flood stage during the construction activities because some staging materials and construction equipment may be located in floodplains. Power poles and other associated fill would be located outside of floodplain areas to the maximum extent practical. These structures would not be expected to significantly increase flood stage levels.

Due to the geology and location of the salt dome, the water dependency of the RWI, and the long ROWs, floodplains could not be completely avoided with this site development. Proper design and compliance with the local, state, and Federal regulatory programs would reduce the impacts to floodplains to a level where there would be no significant change in the base flood elevation. All disturbed areas within the floodplains would be restored to preconstruction contours. Section B.7 discusses in more detail the avoidance and minimization measures that DOE would use to reduce the effects to floodplains in the project area.

B.6.5.2 Wetland Impacts

The wetlands at the proposed Richton storage site are palustrine forested wetlands comprised of 15 to 20 year-old deciduous hardwoods, and are associated with a small intermittent stream originating on the site. In addition, a small area of palustrine forested wetlands is located adjacent to a small manmade pond along the western edge of the proposed site. Because the proposed Richton storage site is a managed pine plantation, harvesting of the pine trees continuously disturbs the small wetland area. These wetlands provide limited wildlife habitat and assist in filtering nutrients and runoff from the harvested/cleared areas.

Construction of the Richton storage site and associated facilities would affect about 53 acres (21 hectares) of wetlands. The permanent fill and conversion of wetlands are associated with the construction of the storage site, terminal, RWI, and maintenance of security buffers around the new facilities (see figure B.6.5-4). Most of the wetland impacts (35 acres [14 hectares]) are associated with the proposed terminal in Pascagoula, which is located on an island created by USACE dredging activities (figure B.6.5-5). The maintenance of the security buffer around the storage facility would permanently convert about 2 acres (0.8 hectares) of forested wetlands to emergent wetlands. The security buffer would require the clearing of woody vegetation and periodic maintenance to suppress or clear woody species. The proposed Liberty terminal would affect 2 acres (0.8 hectares) of wetlands (figure B.6.5-6).

The power line and pipeline ROW associated with the Richton storage site would cross and permanently or temporarily affect 1,252 acres (507 hectares) of wetlands. Table B.6.5-1 summarizes the wetland impacts per ROW that would result from this alternative. Construction of the ROWs would affect 467 acres (189 hectares) of wetland within the permanent easement and 785 acres (318 hectares) of wetland within the temporary easement. Pre-existing contours would be restored and some affected vegetative communities would be allowed to re-establish depending on the location within the temporary and permanent easement. The impacts to wetlands within the temporary easement would last between 2 to 3 years for emergent wetlands and 10 to 25 years for forested wetlands. DOE would suppress the growth of woody vegetation within the permanent easement to protect pipelines and to allow weekly overflight inspections. Therefore, forested and scrub-shrub wetlands in these areas would be permanently converted to emergent wetlands. Although, the converted wetlands would provide different habitat than before construction, other important wetland functions, such as flood storage and nutrient filtration, would be maintained within the emergent wetland.

The entire Richton storage site and associated facilities, which include the site, the terminals, RWI, and ROWs, would affect approximately 1,305 acres (529 hectares) of wetlands associated with the filling activities required for new structures and facilities and temporary and permanent clearing for new power lines and pipelines. The construction activities would permanently fill approximately 49 acres (20 hectares) of wetlands associated with the construction the storage site, RWI, and terminals. The proposed ROW would result in the clearing of about 786 acres (318 hectares) of palustrine forested wetlands, including 467 acres (189 hectares) within the permanent easement. This would be a potential adverse effect because of the regional and ecological importance of this wetland type (see table B.6.5-2).

Due to the geology and the location of the salt domes, the long ROWs, and the water dependency of the RWI structure, impacts to wetlands and waters of the United States would be unavoidable for this site development. All filling of and discharge to jurisdictional wetlands would require a Section 404/401 permit from the USACE and the Mississippi Department of Environmental Quality. The permit application would require a comprehensive alternatives analysis that demonstrates avoidance and minimization of wetland impacts. The permit would contain conditions to minimize the impact on wetlands during construction and would require compensation for unavoidable impacts to jurisdictional wetlands. Section B.7 discusses in more detail the avoidance, minimization, and mitigation measures that DOE would use to reduce, avoid, and compensate for the potential impacts to jurisdictional wetlands and waters of the United States.

Table B.6.5-1: Wetland Impacts for the Proposed Richton Storage Site ROWs[a]

Cowardin Wetland Classification	ROW from site to RWI (acres)		ROW from RWI ROW to Pascagoula terminal (acres)		ROW from RWI ROW to Liberty terminal (acres)		Power Line ROWs (acres)	
	Temporary easement	Permanent easement	Temporary easement	Permanent easement	Temporary easement	Permanent easement	Temporary easement	Permanent easement
Estuarine	0	0	94	62	0	0	NA	0
Estuarine – scrub-shrub	0	0	2	1	0	0	NA	0
Lacustrine	0	0	11	8	0	0	NA	0
Palustrine – aquatic bed	0	0	1	1	0	0	NA	0
Palustrine – emergent	0	0	24	16	0	0	NA	0
Palustrine – forested[b]	18	12	392	191	87	43	NA	43
Palustrine – scrub-shrub[b]	0	0	109	71	2	1	NA	0
Palustrine – open water	1	1	6	1	4	2	NA	0
Palustrine – unconsolidated bottom	0	0	13	3	9	4	NA	3
Riverine	0	0	5	1	4	2	NA	0
Other	1	0	1	0	1	0	NA	1
Totals	**20**	**13**	**658**	**355**	**107**	**52**	**NA**	**47**

Notes:

[a] This table presents only the wetland types that are present within the ROW according to NWI data.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area (where practical), and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected.

[c] Impacts to these wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares; NA means no temporary easement

Table B.6.5-2: Summary of Wetland Impacts for the Proposed Richton Storage Site[a]

Cowardin Wetland Classification	Storage Site (acres)		ROWs[b] (acres)		RWI Structure (acres)	Liberty Terminal	Pascagoula Terminal (acres)	Totals (acres)
	Filled wetlands	Permanent conversion	Temporary easement	Permanent easement	Filled wetlands	Filled wetlands	Filled wetlands	All affected wetlands
Estuarine	0	0	94	62	0	0	34	**190**
Estuarine – scrub-shrub	0	0	2	1	0	0	1	**4**
Lacustrine	0	0	11	8	0	0	0	**19**
Palustrine – aquatic bed	0	0	1	1	0	0	0	**2**
Palustrine - emergent	3	0	24	16	0	0	0	**43**
Palustrine – forested	6	2	497	289	5	0	0	**799**
Palustrine – scrub-shrub	0	0	111	72	0	0	0	**183**
Palustrine – open water	0	0	11	4	0	2	0	**16**
Palustrine – unconsolidated bottom	0	0	22	10	0	0	0	**32**
Riverine	0	0	9	3	0	0	0	**12**
Other	0	0	3	2	0	0	0	**5**
Totals	**9**	**2**	**785**	**467**	**5**	**2**	**35**	**1,305**

Notes:

[a] This table presents only the wetland types that are present within the ROW according to NWI data.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area, and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected. Impacts to these wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares

B.6.6 Stratton Ridge Storage Site and Associated Infrastructure

The Stratton Ridge salt dome is located in Brazoria County, TX, 3.0 miles (4.8 kilometers) east of Clute and Lake Jackson and 6.0 miles (9.7 kilometers) north of Freeport (figure B.6.6-1). This proposed site would consist of 16 new caverns with a combined storage capacity of 160 MMB. Two maps of the Stratton Ridge 160 MMB storage site and infrastructure, included as an attachment to this appendix, show the NWI mapped wetlands.

The Stratton Ridge storage would consist of the following:

- Sixteen new caverns and associated storage site infrastructure,
- New RWI structure and associated pipeline,
- One new terminal at Texas City,
- New crude oil pipeline to the Texas City terminal,
- Brine disposal pipeline to offshore diffuser in Gulf of Mexico,
- Power lines, and
- New access roads to the facility and to the brine injection wells.

B.6.6.1 Floodplain Impacts

The extent of 100-year and 500-year floodplain was determined based on the FEMA Flood Insurance Rate Maps covering the project area. The new storage facilities are located entirely within the 100-year and 500-year floodplains (see figure B.6.6-2 and B.6.6-3). The proposed Texas City tank farm would be located entirely in a 100-year floodplain (figure B.6.6-4). Table B.6.6-1 summarizes the floodplains that would be affected by this storage site and associates facilities.

Table B.6.6-1: Floodplain Impacts for the Stratton Ridge Storage Site and Associated Facilities

Description	100-Year Floodplain (acres)	500-Year Floodplain (acres)
Storage site/access road	86	186
RWI structure	1	0
Texas City tank farm	37	0
Total	**124**	**186**

1 acre = 0.405 hectares

The proposed Stratton Ridge storage site lies completely within the 100-year and 500-year floodplains. All onsite construction, therefore, would be within either a 100-year or a 500-year floodplain. This floodplain is large, extending over hundreds of square miles (square kilometers) and is part of the San Jacinto-Brazos Coastal Basin. Construction of the storage site would disturb approximately 124 acres (50 hectares) of 100-year floodplain and 186 acres (75 hectares) of 500-year floodplain associated with the site infrastructure.

The Stratton Ridge storage site and associated facilities would have the potential to increase future downstream flooding due to proposed fill and construction of aboveground structures within the floodplain, including administrative buildings, a tank farm, RWI, well pads, roads, and wellheads. The impacts would be minimal due to the overall size of the floodplain system and compliance with local, state, and Federal floodplain regulations. After selection of an preferred alternative other than no action prior to construction, hydrological modeling would be conducted to ensure that base flood elevations would not be increased by the proposed fill structures.

Any structures located within the floodplain would be designed in accordance with the NFIP requirements for non-residential buildings and structures located in special flood hazard areas. The NFIP regulations are designed to require vulnerable structures to be elevated above the 100-year flood elevation or to be watertight. DOE would coordinate with and secure approval from the floodplain coordinator at the Texas Commission on Environmental Quality or the local government, if it has adopted the NFIP, during the design stage/site plan process.

The proposed Stratton Ridge power line and pipeline ROWs would cross and temporarily affect approximately 41 miles (66 kilometers) of 100-year floodplain and 8 miles (13 kilometers) of 500-year floodplain. The impacts on floodplains associated with the construction of the ROWs would be temporary because the preconstruction contours would be re-established and no aboveground fill or structures would exist following the completion of the construction activities. Therefore, no significant increased risk of flooding would be expected from ROW construction because there would be no net loss of flood attenuation capacity compared to the existing conditions. There would be a potential minor increase in flood stage during the construction activities because some staging materials and construction equipment may be located in a floodplain. Power poles and other associated fill would be located outside of floodplain areas to the maximum extent practical. These structures would not be expected to significantly increase flood stage levels.

Due to the geology and location of the salt dome, the water dependency of the RWI, and the long ROWs, floodplains could not be avoided with this site development. DOE has considered the practicable alternatives to siting in a floodplain and has evaluated the proposed design and modifications to minimize the impact to floodplains. Proper design and compliance with the required regulatory programs would reduce the impacts of these structures on floodplains to a level where there would be no significant change in the base flood elevation. Section B.7 discusses in more detail the avoidance and minimization measures that would be used to reduce the effects to floodplains located in the project area.

B.6.6.2 Wetland Impacts

The construction and operations and maintenance activities associated with the proposed Stratton Ridge site development would have temporary and permanent impacts on wetlands as described in the methodology. Tables B.6.6-2 and B.6.6-3 summarize the wetlands that would be affected by the new storage site, ROWs, and associated facilities.

The Stratton Ridge site is comprised predominantly of palustrine forested wetlands with areas of palustrine emergent wetlands and upland deciduous forest. Construction of the storage site and related facilities would fill 225 acres (91 hectares) of wetlands. The 192 acres (78 hectares) of palustrine forested wetlands on the Stratton Ridge site are also known as a bottomland hardwood forest, which is an ecologically diverse and greatly threatened ecosystem in the United States (see figure B.6.6-5). These ecosystems provide wildlife habitat and play important roles in maintaining water quality and retaining flooding waters. The Stratton Ridge site has been disturbed and fragmented by human activities and introduced animals and plants. The maintenance of the security buffer around the storage facility would convert 73 acres (30 hectares) of wetlands to emergent or open water. The security buffer would require the clearing of woody vegetation and periodic maintenance to suppress or clear woody species. The proposed Texas City tank farm would permanently impact 11 acres (4 hectares) of palustrine wetlands (see figure B.6.6-6).

Table B.6.6-2: Wetland Impacts for the Proposed Stratton Ridge Storage Site ROWs[a]

Cowardin Wetland Classification	ROW from Site to Gulf of Mexico (acres)		ROW from Site to Texas City (acres)		Power Line ROWs (acres)	
	Temporary easement	Permanent easement	Temporary easement	Permanent easement	Temporary easement	Permanent easement
Estuarine	35	22	6	3	NA	19
Lacustrine	0	0	2	1	NA	0
Palustrine – emergent	19	13	84	41	NA	12
Palustrine – scrub-shrub[b]	0	0	1	1	NA	0
Palustrine – unconsolidated bottom[c]	0	0	17	8	NA	0
Riverine[c]	0	0	2	1	NA	0
Other	0	0	0	0	NA	0
Totals	**54**	**35**	**112**	**55**	NA	**31**

Notes:

[a] This table presents only the wetland types that are present within the ROW according to NWI data.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area, and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected.

[c] Impacts to these wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares; NA means no temporary easement

Table B.6.6-3: Summary of Wetland Impacts for the Proposed Stratton Ridge Storage Site[a]

Cowardin Wetland Classification	Storage Site (acres)		ROWs[b] (acres)		RWI Structure (acres)	Texas City Terminal (acres)	Totals (acres)
	Filled wetlands	Permanent conversion	Temporary easement	Permanent easement	Filled wetlands	Filled wetlands	All affected wetlands
Estuarine	0	0	41	44	2	0	**87**
Lacustrine	0	0	2	1	0	0	**68**
Palustrine – emergent	20	3	103	66	0	4	**196**
Palustrine – forested	192	66	0	0	0	2	**260**
Palustrine – scrub-shrub	12	0	1	1	0	4	**18**
Palustrine – unconsolidated bottom	0	2	17	8	0	1	**28**
Riverine	0	0	2	1	0	0	**3**
Other	1	2	0	0	0	0	**3**
Totals	**225**	**73**	**166**	**121**	**2**	**11**	**598**

Notes:

[a] This table presents only the wetland types that are present within the proposed footprint according to NWI data. Facilities were omitted if no wetlands were present within the footprint.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area, and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected. Impacts to these wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares

The power line and pipeline ROWs associated with the Stratton Ridge storage site and associated facilities would cross and permanently or temporarily affect 287 acres (116 hectares) of wetlands. Table B.6.6-2 provides a summary of the wetland impacts per ROW that would result from this site development. Construction of the ROWs would affect 121 acres (49 hectares) of wetlands within the permanent easement and 166 acres (67 hectares) within the temporary easement. Pre-existing contours would be restored and the affected plant communities would be allowed to re-establish depending on location within the temporary and permanent easement. DOE would promote the growth of the emergent or forested vegetation in the temporary construction easement. The impacts on wetlands within the temporary easement would last between 2 to 3 years for emergent wetlands and 10 to 25 years for forested wetlands. DOE would suppress the growth of woody vegetation within the permanent easement to protect pipelines and to allow weekly overflight inspections. Therefore, forested and scrub-shrub wetlands in these areas would be permanently converted to emergent wetlands. Although the converted wetlands would provide different habitat than before construction, other important wetland functions such as flood storage and nutrient filtration would be maintained with the emergent wetlands.

The Stratton Ridge alternative, which includes the site, the ancillary facilities, and ROWs, would affect approximately 598 acres (242 hectares) of wetlands associated with the filling activities required for new structures and facilities and permanent and temporary clearing for new power lines and pipelines. The construction activities would permanently fill approximately 238 acres (96 hectares) of wetlands associated with the storage site, Texas City terminal, and RWI (see table 6.6-3). About 260 acres (105 hectares) of palustrine forested wetland would be temporarily or permanently cleared. The impact on this relatively rare and important type of forested wetland would be a potential adverse effect, which would be mitigated by the compensation plan for jurisdictional wetland impacts.

Due to the geology and location of the salt dome, the water dependency of the RWI, and the long ROWs, impacts to wetlands and waters of the United States could not be avoided by this site development. All filling of and discharge to jurisdictional wetlands would require a Section 404/401 permit from the USACE and the Texas Commission of Environmental Quality. The permit application would require a comprehensive alternatives analysis that demonstrates avoidance and minimization on wetland impacts. The permit would contain conditions to minimize the impact to wetlands during construction and would require compensation for unavoidable impacts to jurisdictional wetlands. Section B.7 discusses in more detail the avoidance, minimization, and mitigation measures that DOE would use to reduce, avoid, and compensate for the potential impacts to jurisdictional wetlands and waters of the United States.

B.6.7 Bayou Choctaw Expansion Site and Associated Infrastructure

The Bayou Choctaw expansion site occupies a 360-acre (140-hectare) site in Iberville Parish, LA, located about 12 miles (19 kilometers) southwest of Baton Rouge (figure B.6.7-1). The Mississippi River is located about 4 miles (6 kilometers) east of the dome and the Port Allen Canal, an extension of the ICW, is located about one quarter of a mile (0.4 kilometers) to the west.

The existing storage facility consists of 6, approximately 12.5 MMB capacity caverns with a combined storage capacity of 76 MMB. Raw water is supplied from an intake facility on Cavern Lake located north of the site. Brine is disposed of via underground injection wells south of the storage site. The disposal wells are connected to the site by a 2.3-mile (3.7-kilometer) pipeline. Oil is moved to and from the site through the St. James terminal on the Mississippi River or through the Placid Refinery pipeline.

The expansion of Bayou Choctaw storage site and associated facilities would consist of the following:

- Development of two new 10 MMB caverns and possible acquisition of one existing 10 MMB cavern,
- Minor upgrades to existing infrastructure,
- New offsite brine pipeline, and
- Six new offsite brine injection wells.

B.6.7.1 Floodplain Impacts

The Bayou Choctaw expansion site is located in the east-central portion of Iberville Parish and the Louisiana portion of the Western Gulf Coastal Plain Province. This low-lying area, approximately 5 feet (1.5 meters) above mean sea level, is composed of the Mississippi River floodplain, coastal marshes, and a series of Pleistocene terraces and low hills.

Bayou Bourbeaux and several small canals drain surface water from the site into Bull Bay and wetlands in the southern portion of the site that extend to the south. These water bodies drain into the ICW (also called Bayou Choctaw) to the west and to the marsh to the south via drainage streams.

The Bayou Choctaw expansion site would use the existing property and would require no new land acquisition for construction of additional storage caverns. DOE would purchase and use approximately 20 acres (8 hectares) of land south of the storage site for 6 new brine injection wells. A 3,000-foot (914-meter) brine disposal pipeline ROW would be required to connect the existing brine injection wells to the new disposal area. Because the entire site is located within the 100-year floodplain (figure B.6.7-2), all new construction would occur within floodplains. The expansion site would affect approximately 187 acres (76 hectares) of 100-year floodplain associated with the site storage facility expansion and the expansion of the brine disposal area. The site expansion would use existing onsite and offsite infrastructure to the maximum extent practicable. Table B.6.7-1 summarizes the floodplain area that would be affected by this expansion.

Table B.6.7-1: Floodplain Impacts for Bayou Choctaw Expansion Site

Description	100-Year Floodplain (acres)	500-Year Floodplain (acres)
Caverns/road	4	0
Brine Disposal Expansion	20	0
Total	**24**	**0**

1 acre = 0.405 hectares

The Bayou Choctaw storage site expansion would have a small potential to increase future downstream flooding due to proposed construction of aboveground structures within the floodplain, including well pads, access roads, and wellheads. The impacts are expected to be minimal due to the overall size of the floodplain system, small amount of construction, and compliance with local, state, and Federal floodplain regulations. After selection of an alternative other than no-action and prior to construction, hydrological modeling would be conducted to ensure that base flood elevations would not be increased from the proposed fill structures.

Any structures located within the floodplain would be designed in accordance with the NFIP requirements for nonresidential buildings and structures located in special flood hazard areas. The NFIP regulations are designed to require vulnerable structures to be constructed above the 100-year flood elevation or to be watertight. DOE would coordinate with and secure approval from the floodplain coordinator at the

Louisiana Department of Transportation and Development or the local government, if it has adopted the NFIP program, during the design stage/site plan process.

The brine pipeline would cross and temporarily affect 0.5 miles (0.8 kilometers) of 100-year floodplain during its construction. The impacts to floodplains associated with construction of the brine disposal pipeline ROW would be temporary because the preconstruction contours would be re-established and no aboveground fill or structures would exist following the completion of the construction activities. Therefore, no significant increased risk of flooding would be expected from ROW construction because there would be no net loss of flood attenuation capacity compared to the existing conditions. There would be a potential minor increase in flood stage during the construction activities because some staging materials and construction equipment might be located in a floodplain.

B.6.7.2 Wetland Impacts

The construction and operations and maintenance associated with the expansion of the Bayou Choctaw storage site would have temporary and permanent impacts on wetlands as described in the methodology. Table B.6.7-2 summarizes the wetlands that would be affected by the expansion site, ROWs, and brine injection wells.

Table B.6.7-2: Summary of Wetland Impacts for the Proposed Bayou Choctaw Storage Site and Associated Facilities[a]

Cowardin Wetland Types	Storage Site (acres)		Brine Pipeline ROW (acres)		Brine Injection Wells (acres)	Totals (acres)
	Filled wetlands	Permanent conversion	Temporary easement	Permanent easement	Filled wetlands	All affected wetlands
Palustrine – Forested[b]	4	0	7	3	20	**34**

Notes:

[a] This table presents only the wetland types that are present within the proposed footprint according to NWI data. Facilities were omitted if no wetlands were present within the footprint.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area, and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected.

The wetlands at the Bayou Choctaw storage site and brine disposal expansion area are palustrine forested (figure B.6.7-3 and figure B.6.7-4). This important type of fresh-water ecosystem generally provides functions that include nutrient transformation, flood storage, wildlife habitat, and timber production. The wetlands at the site have been disturbed by past facility construction and operations and maintenance. Expansion of the Bayou Choctaw storage site and associated facilities would affect approximately 24 acres (10 hectares) of wetlands. The permanent fill and conversion of wetlands are associated with the construction of the storage facility and brine injection well pads.

The brine pipeline ROW associated with the Bayou Choctaw expansion site would cross and permanently or temporarily affect 10 acres (4 hectares) of wetlands. Table B.6.7-2 summarizes the potential wetland impacts from the proposed ROW. Pre-existing contours would be restored within the ROW and the affected plant communities would be allowed to re-establish depending on location within the temporary and permanent easement. DOE would promote the growth of emergent or forested vegetation in the temporary construction easement. The impacts to wetlands within the temporary easement would last between 10 to 25 years for forested wetlands. DOE would suppress the growth of woody vegetation within the permanent easement to protect the pipeline and to allow weekly overflight inspections. Therefore, forested wetlands in these areas would be permanently converted to emergent wetlands. Although the converted wetlands would provide different habitat than before construction, other important wetland functions, such as flood storage and nutrient filtration, would be maintained within the emergent wetlands.

The entire Bayou Choctaw site development, which includes the expansion site, the brine disposal expansion area, and the ROWs, would affect approximately 34 acres (14 hectares) of wetlands associated with the filling activities required for new structures and temporary and permanent clearing for new power lines and pipelines. The construction activities would permanently fill approximately 24 acres (10 hectares) of wetlands associated with the expansion area and brine injection wells. The clearing of palustrine forested wetlands for the brine injection would affect an important ecological resource. These impacts would be mitigated by the compensation plan for jurisdictional wetland impacts.

Due to the location and geology of the salt domes and the long ROW, impacts to wetlands and waters of the United States could not be avoided by this site development. All filling of and discharge to jurisdictional wetlands would require a Section 404/401 permit from the USACE and the Louisiana Coastal Management Division of the Department of Natural Resources. The permit application would require a comprehensive alternatives analysis that demonstrates avoidance and minimization of wetland impacts. The permit would contain conditions to minimize the impact to wetlands during construction and would require compensation for unavoidable impacts to jurisdictional wetlands. Section B.7 discusses in more detail the avoidance, minimization, and mitigation measures that would be used to reduce, avoid, and compensate for the potential impact to jurisdictional wetlands and waters of the United States.

B.6.8 Big Hill Expansion Site and Associated Infrastructure

The Big Hill storage site is located in Jefferson County, TX, 17 miles (27 kilometers) southwest of Port Arthur and 70 miles (113 kilometers) east of Houston.

The existing Big Hill storage site consists of 14 crude oil storage caverns with a combined capacity of 170 MMB, a brine disposal system, an RWI system, and a crude oil distribution system (figure B.6.8-1). The site also has various support facilities, including a heliport, diesel oil storage, and several administration buildings. The caverns are located in the central portion of the salt dome and are arranged in two rows of five caverns and one row of four caverns.

The Big Hill expansion would consist of the following:

- Up to nine new caverns with a capacity of up to 108 MMB,
- Crude oil pipeline to the Sun terminal,
- Refurbishment of the 7,000 feet (2,134 meters) brine disposal pipeline, and
- New fencing, roads, onsite pipelines, and new anhydrite settling pond.

A map for the Big Hill Expansion storage site and associated facilities, included as an attachment to this appendix, shows detailed NWI mapped wetlands.

B.6.8.1 Floodplain Impacts

The extent of 100-year and 500-year floodplain was determined based on the FEMA Flood Insurance Rate Maps covering the project area. The proposed Big Hill expansion site is located in a predominantly undeveloped, extensive floodplain system (see figures B.6.8-2 and B.6.8-3).

The Big Hill expansion site would take advantage of the existing infrastructure, reducing the area required for new construction and operations. The proposed expansion would consist of the construction of up to nine new caverns immediately north of the existing facility. A large percentage of this expansion site (about 73 percent) would be located outside of the 100-year and the 500-year floodplain. The expansion site would affect 11 acres (5 hectares) of 100-year floodplain and approximately 27 (11 hectares) of 500-year floodplain.

The Big Hill expansion site would have some potential to increase future downstream flooding due to the proposed fill construction of aboveground structures within the floodplain including well pads, roads, and ponds. The impacts would be minimal due to the overall size of the floodplain system, the small impact area, and compliance with local, state, and Federal floodplain regulations. After selection of an alternative other than no-action and prior to construction, hydrological modeling would be conducted to ensure that base flood elevations would not be increased from the proposed fill structures.

Any structures located within the floodplain would be designed in accordance with the NFIP requirements for nonresidential buildings and structures located in special flood hazard areas. The NFIP regulations require vulnerable structures to be constructed above the 100-year flood elevation or to be watertight. DOE would coordinate with and secure approval from the floodplain coordinate at the Texas Commission on Environmental Quality or the local government, if it has adopted the NFIP, during the design stage/site plan process.

The proposed crude oil pipeline ROWs would cross and affect 18 miles (29 kilometers) of 100-year floodplain and 3 miles (4.8 kilometers) of 500-year floodplain. The impacts on floodplains associated with the pipeline ROWs would be temporary because the preconstruction contours would be re-established and no fill or aboveground structure would exist following the completion of the construction activities. Therefore, no significant increased risk of flooding would be expected from the pipeline ROWs because there would be net loss of floodplain storage capacity compared to the existing conditions. There would be a potential minor increase in flood stage during the construction activities because some staging materials and construction equipment may be located in the floodplain.

Due to the geology and location of the salt dome and the long ROWs, floodplains could not be avoided with this site development. DOE has considered the practicable alternatives to siting in a floodplain and has evaluated the proposed design and modifications to minimize the impact to floodplains. Proper design and compliance with the required regulatory programs would reduce the impacts of these structures on floodplains to a level where there would be no significant change in the base flood elevation. Section B.7 discusses in more detail the avoidance and minimization measures that DOE would use to reduce the effects to floodplains located in the project area.

B.6.8.2 Wetland Impacts

The construction and operations and maintenance activities associated with the proposed Big Hill expansion site would have temporary and permanent impacts on wetlands as described in the methodology. Table B.6.8-1 summarizes the wetlands that would be affected by expansion of capacity at the site.

Table B.6.8-1: Summary of Wetland Impacts for the Proposed Big Hill Expansion Site[a]

Cowardin Wetland Types	Storage Site (acres)		ROW to Sun Terminal[b] (acres)		Brine Pipeline to be Replaced[b] (acres)		Totals
	Filled wetlands	Permanent conversion	Temporary easement	Permanent easement	Temporary easement	Permanent easement	All affected wetlands
Lacustrine	0	0	5	3	3	1	**12**
Palustrine – emergent	6	0	92	45	4	2	**149**
Palustrine – forested	9	0	2	1	0	0	**12**
Palustrine – scrub-shrub	0	0	0	0	3	2	**5**
Palustrine – unconsolidated bottom	0	2	3	2	0	0	**7**
Riverine	0	0	2	1	0	0	**3**
Other	0	0	1	0	0	0	**1**
Totals	**15**	**2**	**105**	**52**	**10**	**5**	**189**

Notes:

[a] This table presents only the wetland types that are present within the proposed footprint according to NWI data. Facilities were omitted if no wetlands were present within the footprint.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the permanent easement of all ROWs. Within the temporary construction easement, woody vegetation would be cleared but would be allowed to re-establish within the easement. DOE would follow any required wetland compensation for these temporary impacts that is required by the Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area, and seed with native species. Re-establishment of the scrub-shrub or forested wetland may take 5-25 years depending on the type of community affected. Impacts to these wetlands would be temporary and they would return to the pre-existing conditions shortly after construction is completed.

1 acre = 0.405 hectares

The expansion area is located immediately north of the existing Big Hill SPR facility. Much of the area proposed for expansion has been disturbed from past construction activities associated with the existing storage site and other oil development in the region. Construction of the Big Hill expansion site would fill approximately 15 acres (6 hectares) of wetlands. The permanent fill and conversion of wetlands would be associated with construction of the expansion site and the maintenance of a security buffer around the new facilities (see figure B.6.8.4). Wetlands within the security buffer would be permanently converted from forested and scrub-shrub wetlands to emergent wetlands or open water. The security buffer would require the clearing of woody vegetation and periodic maintenance to suppress or clear woody species.

The replacement of 7,000 feet (2,134 meters) of the brine pipeline and new crude oil pipeline associated with the Big Hill expansion site would cross and permanently or temporarily affect 172 acres (70 hectares) of wetlands. Construction of the ROWs would affect 115 acres (47 hectares) of wetlands within the temporary easement and 57 acres (23 hectares) of wetlands within the permanent easement. Pre-existing contours would be restored and the affected plant communities would be allowed to re-establish depending on the location within the temporary and permanent easement. DOE would promote the regrowth of emergent vegetation or forested vegetation within the temporary construction easement. The impacts on wetlands within the temporary easement would last between 2 to 3 years for emergent wetlands and 10 to 25 years for forested wetlands. DOE would suppress the regrowth of woody vegetation within the permanent easement to protect the pipeline and to allow weekly overflight inspections. Therefore, forested wetlands in these areas would be permanently converted to emergent wetlands. Although the converted wetlands would provide different habitat than before construction, other important wetland functions, such as flood storage and nutrient filtration, would be maintained within the emergent wetlands.

The entire Big Hill expansion site alternative, which includes the expansion area and the ROWs, would affect approximately 189 acres (76 hectares) of wetlands associated with the filling activities required for new structures and facilities and permanent and temporary clearing new pipelines. The construction would permanently fill approximately 15 acres (6 hectares) of wetland associated with the expansion site (table B.6.8-1). The impact to wetlands would not be adverse because the wetlands have been disturbed in the past. The impact would be mitigated by the compensation plan for jurisdictional wetland impacts.

Due to the geology and location of the salt dome, the water dependency of the RWI, and the long ROWs, impacts to wetlands and waters of the United States could not be avoided by this site development. All filling of and discharge to jurisdictional wetlands would require a Section 404/401 permit from the USACE and the Texas Commission of Environmental Quality. The permit application would require a comprehensive alternatives analysis that demonstrates avoidance and minimization of wetland impacts. The permit would contain conditions to minimize the impact to wetlands during construction and would require compensation for unavoidable impacts to jurisdictional wetlands. Section B.7 discusses in more detail the avoidance, minimization, and mitigation measures that DOE would use to reduce, avoid, and compensate for the potential impacts to jurisdictional wetlands and waters of the United States.

B.6.9 West Hackberry Expansion Site and Associated Infrastructure

The West Hackberry site occupies approximately 570 acres (230 hectares) in Cameron and Calcasieu Parishes in southwestern Louisiana (figure B.6.9-1). The site is located approximately 20 miles (32 kilometers) southwest of the City of Lake Charles and 16 miles (26 kilometers) north of the Gulf of Mexico.

The existing SPR storage facility consists of 22 caverns with a combined capacity of 227 MMB. DOE would use the existing oil distribution pipelines, RWI, and brine disposal for the proposed expansion.

The West Hackberry expansion site consists of the following:

- Acquisition of three existing caverns with a total of 15 MMB of capacity,
- Use of existing infrastructure, and
- New access road, fencing, and onsite pipelines connecting acquired caverns to the existing DOE site.

B.6.9.1 Floodplain Impacts

The proposed expansion at West Hackberry would involve the acquisition of three existing storage caverns adjacent to the existing SPR site. DOE would acquire, but not develop, a large property containing the storage caverns. Only a small portion of the acquired land would be located within a floodplain. The proposed construction area that contains the three existing storage caverns would be outside of this floodplain; therefore, the West Hackberry expansion site would not affect floodplains (see figure B.6.9-2).

B.6.9.2 Wetland Impacts

The construction and operations and maintenance associated with the proposed West Hackberry expansion would have temporary and permanent impacts on wetlands as described in the methodology. Table B.6.9-1 summarizes the wetlands that would be affected by this expansion. Figure B.6.9-3 shows the wetlands located at the expansion site.

Table B.6.9-1: Summary of Wetland Impacts for the Proposed West Hackberry Expansion Site[a]

Cowardin Wetland Types	Storage Site (acres)		Totals (acres)
	Filled wetlands	Permanent conversion	All affected wetlands
Palustrine – scrub-shrub[b]	0	5	**5**

Notes:

[a] This table presents only the wetland types that are present within the proposed facility footprint according to NWI data. Facilities were omitted if no wetland were present within the footprint.

[b] Forested and scrub-shrub wetlands would be cleared of woody vegetation and permanently converted to and maintained as emergent wetlands within the security buffer. DOE would follow any required wetland compensation for these temporary impacts that is required by Section 404/401 permit. At a minimum, DOE would restore original contours, replace the original hydric topsoil back in the disturbed area, and seed with native species

Numerous canals and natural waterways bisect the area where the West Hackberry storage site is located. This region consists of estuaries associated with the Louisiana coast. Natural ridges in the area typically support grass and trees and affect water flow through the marshes. Construction and operations and maintenance of the West Hackberry expansion site would permanently convert approximately 5 acres (2 hectares) of scrub-shrub wetlands to emergent wetlands. These wetland impacts are associated with the expansion area 300-foot (91-meter) site security buffer. This area would be permanently maintained for security purposes, converting the existing scrub-shrub wetlands to emergent wetlands. No additional wetland impacts are anticipated to result from the West Hackberry expansion.

Due to the location and geology of the salt domes, impacts to wetlands could not be avoided by this alternative. All impacts of jurisdictional wetlands would require a Section 404/401 permit from the USACE and from the Louisiana Coastal Management Division of the Department of Natural Resources. The permit application would require a comprehensive alternatives analysis that demonstrates avoidance and minimization of wetland impacts. The permit would contain conditions to minimize the impact to wetlands during construction and would require compensation for unavoidable impacts to jurisdictional wetlands. Section B.7 below discusses in more detail the avoidance, minimization, and mitigation measures that DOE would use to reduce, avoid, and compensate for the jurisdictional wetland impacts.

B.7 ALTERNATIVES, MINIMIZATION, AND MITIGATION

This discussion is not site-specific because alternatives, avoidance, minimization, and mitigation efforts that DOE pursues would be similar regardless of which site is chosen. Once DOE has selected an alternative other than the no-action alternative, a more detailed analysis of avoidance and minimization would be conducted as part of the design and Section 404/401 permit process. In addition, a compensation plan for all unavoidable impacts to jurisdictional wetlands would be prepared. If required by the USACE, the compensation plan would include a functional assessment of affected jurisdictional wetlands in order to establish appropriate compensation ratios.

B.7.1 Alternatives Consideration for Floodplains and Wetlands

DOE has taken into consideration alternatives to avoid adverse effects and incompatible development within floodplains and wetlands, to the maximum extent practicable. DOE has concluded there are no practicable alternatives to construction within floodplains or wetlands for the individual proposed SPR sites. Site locations, the location of onsite facilities, and site access roads are dictated by the location and configuration of the salt domes, which constitute a unique geologic setting. In addition, DOE needs a raw water source that is adequate for solution mining of storage caverns. Similarly, because the salt dome sites are largely located in lowland areas surrounded by wide expanses of floodplain and/or wetlands, there are no practicable alternatives to the location of the pipelines running to and from these sites within floodplains and wetlands. RWI structures and their pipeline ROWs also are water dependent because of their function and therefore cannot be located outside of the floodplain associated with the water source. Pipelines, power lines, and roads are long by nature and cannot avoid crossing waterways, wetlands, and the associated floodplains.

As discussed in the foregoing sections, the facilities to be constructed for the SPR expansion are not expected to significantly impact floodplain values or the base flood elevation—particularly in view of the impact minimization and mitigation measures that would be employed. The project would avoid "adverse effects and incompatible development within the floodplain," regardless of the alternative selected.

From the standpoint of the overall SPR expansion program, DOE considered alternatives for minimizing the impact of pipeline and power line ROWs in floodplains and wetlands. Selecting pipeline and power line ROWs along existing ROWs was the primary approach that DOE employed in selecting pipeline ROWs. The Gulf Coast consists of a large number of gas and oil fields and associated facilities, which offer a network of existing pipeline and power line ROWs. This network of utilities enabled DOE to minimize the potential impacts to floodplains and wetlands. Table B.7-1 summarizes the percentage of the length of proposed SPR pipeline ROWs that would follow existing ROWs for each proposed new or expanded storage site.

Table B.7-1: Percentage of Proposed ROW Located In Existing ROWs

Storage Site	Total ROW Required (miles)	Total Proposed ROW Following Existing ROW (miles)	Percent in Existing ROW
Bruinsburg	206	77	37
Chacahoula	146	77	55
Clovelly	No pipelines or power lines	No pipelines or power lines	No pipelines or power lines
Clovelly-Bruinsburg	122	37	30
Richton	222	92	41
Stratton Ridge	48	37	78
Bayou Choctaw	1	N/A	0
Big Hill	24	24	100
West Hackberry	No pipelines	No pipelines	No pipelines

1 mile = 1.61 kilometers; N/A = not applicable

As shown in table B.7.1, a significant portion of the length of the proposed ROWs would use existing ROWs. The use of the existing ROWs would minimize the floodplain and wetland impacts associated with project construction and operation and would help prevent fragmentation of the natural environment.

B.7.2 Mitigation of Site Construction Impacts on Floodplains

To comply with E.O. 11988 and existing regulations, DOE would follow the U.S. Water Resources Council's (1978) *Floodplain Management Guidelines for Implementing Executive Order 11988* and FEMA's *Unified National Program for Floodplain Management* (FEMA 1986, 1994) while planning its mitigation strategy for the selected SPR site. Those actions would include the following:

- The use of minimum grading requirements to save as much of the site from compaction as possible;
- Returning the site and ROWs to original contours where feasible;
- Preserving free natural drainage when designing and constructing roads, fills, and large built-up centers;
- Maintaining wetland and floodplain vegetation buffers to reduce sedimentation and discharge of pollutants to nearby water bodies where feasible;
- Constructing stormwater management facilities (where appropriate) to minimize any alteration in natural drainage and flood storage capacity;
- Limiting the practice of clear-cutting and amount of fill placed within wetlands where feasible;
- Directional drilling of larger wetland and stream crossings where feasible;
- Locating buildings above the base flood elevation or flood proofing;
- Complying with the floodplain ordinance/regulations for the jurisdiction where the selected alternative is located; and
- Performing a hydrological demonstration (using the Hydrologic Engineering Center Hydrologic Modeling System or an approved floodplain model) that proposed fill and structures within the floodplain would not increase the base flood elevation. The proposed facility would be designed and constructed to avoid increasing the base flood elevation.

B.7.2.1 Additional Alternatives Considered for Wetlands

DOE would follow established practices to avoid dredging and filling in wetlands, or where there is no practicable alternative, to minimize the wetland and compensating for unavoidable wetland losses. DOE has initiated actions to identify the least environmentally damaging practicable alternative (LEDPA) for the routing of the ROWs and the storage sites and associated facilities. DOE would further refine the conceptual design for the selected alternative to minimize the construction and operations impacts, and finally mitigate for unavoidable impacts to jurisdictional wetlands. Suggested best practices to limit or avoid pipeline construction and operation impacts in wetlands are presented in section B.7.3.

DOE used geospatial data to identify the LEDPA route for ROWs where possible. DOE used a GIS software tool to assign weights to data features in order to compute a cost-weighted distance between two points, which represents the ease of movement between two points (Theobald 2003). For example, one often thinks of the distance to an object in terms of both measured distance and the time it will take to travel through obstacles such as steep slopes. A cost-weighted distance takes into consideration the obstacles as well as the distance. This geospatial tool is often used to locate a new road or hiking trail (Theobald 2003). DOE used this approach to identify alternative routes for proposed ROWs that would use existing corridors and would avoid high value wetlands to the extent possible.

To find potential ROWs, DOE used data on existing pipeline and power line ROWs along with wetland data acquired from USFWS NWI. Existing ROWs and non-wetland areas were assigned the lowest weights, open water and emergent wetlands were moderately weighted, while forested wetland areas not along an existing ROW were heavily weighted. In this way, DOE identified the shortest path between two points that would avoid wetlands or certain wetland types and would maximize distance along existing ROWs.

DOE was able to apply this tool to the proposed sites at Stratton Ridge and Chacahoula. At Stratton Ridge, the tool did not find a practicable alternative to the refined proposed ROWs. The cost-weighted shortest path went through heavily developed areas or was longer than what was considered practicable. Before application of the cost-weighted path, DOE had already adjusted the ROWs at Stratton Ridge to maximize distance along existing ROWs and shorten distance through wetland areas, particularly Brazoria National Wildlife Refuge. These proposed alignments are shown on figure B.7.2-1.

The tool also did identify practicable alternatives to the ROWs at Chacahoula. After application of the tool, the ROWs were moved to follow existing pipeline ROWs that reduced the distance through wetlands and reduced the overall distance between points. Figure B.6.7.2-2 shows the proposed ROWs before and after application of the cost-weighted shortest path tool.

Due to limited availability of digital wetland data in Mississippi, DOE was not able to use this tool for the Richton or Bruinsburg sites and their infrastructure. Instead, DOE used USGS maps to align proposed ROWs along existing pipeline or power line ROWs. Aligning ROWs with existing ROWs was more challenging in Mississippi due to the relative lack of pipeline or power line infrastructure as compared to the coastal areas in Louisiana and Texas. Additionally, the Bruinsburg pipeline ROWs were limited by the rolling terrain in the area.

Wetland impacts would be unavoidable for any alternative other than no action. Site selection for the oil storage caverns depends on the location of the salt domes designated by EPACT. Therefore, in cases where wetlands exist above the salt domes designated by EPACT criteria, development could not avoid impacts to wetlands. In addition, all of the proposed new sites would require a new source of raw water for solution mining. Therefore, the impacts to wetlands would be unavoidable, except under the no-action alternative, due to the water dependency of the project.

B.7.3 Mitigation of Site Construction Impacts on Wetlands

DOE will comply with Section 404/401 of the Clean Water Act, E.O. 11990, the National No Net Loss Policy, and 10 CFR Part 1022 when planning its mitigation strategy for the wetland impacts from the selected alternative. Although some impacts to wetlands cannot be avoided (e.g., removal of vegetation during site or pipeline construction), the impacts would be partially mitigated through the use of appropriate engineering designs and good operating procedures. In addition to selecting the LEDPA, DOE would mitigate impacts throughout construction by using the following:

- Impact avoidance and minimization, which in addition to the LEDPA approach described above, includes ongoing infrastructure siting refinements and low-impact construction methods and containment measures.

- Restoration, which includes replanting, restoration, and other postconstruction compensation. Mitigation of impacts to wetlands would be specified in the Clean Water Act Section 404/401 Water Quality Certificate for the selected alternative.

B.7.4 Impact Avoidance and Minimization

DOE's primary mitigation measure for wetland impacts would be avoidance and minimization. As described in chapter 2 and in the preceding text of this appendix, DOE would locate temporary access roads and staging areas in upland areas or would use temporary floating staging areas, as appropriate. Larger wetlands (about 100 feet [30 meters] or wider) would be directionally drilled wherever practicable. DOE would continue to refine the concept plans for the site storage areas and terminals to avoid placing aboveground structures and fill in wetlands as much as practicable. Where the security buffers around the storage areas or permanent ROW easements extend into wetlands, DOE would preserve emergent wetlands and would allow herbaceous species to re-establish themselves within the forested and scrub-shrub wetlands that would be cleared.

Within the temporary construction easements of the ROWs, DOE would promote the restoration and re-establishment of the existing plant community by stockpiling and reusing the hydric soils (and their diverse seed bank) from the disturbed wetlands. In this way, some wetland functions and values would be preserved and wetlands would be restored more quickly if there was a temporary impact to wetlands or permanent conversion from forested to emergent wetlands. For wetland impacts that cannot be avoided, DOE would implement one or more of the following mitigation measures:

- As described in chapter 2, DOE would install trench plugs (using low-permeability clay placed around the pipe) at intervals to prevent the unintentional draining of water from the wetlands or mixing of fresh-water and marine wetland systems.

- Excess dredged material would be disposed of in consultation and in accordance with permits issued by USACE and the state. Dredge spoils would be used for wetland creation or restoration activities wherever possible.

- Where possible, power line poles would not be placed in wetlands.

- If the wetlands are forested, tree stumps and root mass from all plants would be left intact, except where this would interfere with excavation of the pipeline trench.

- For wetlands that are not inundated or that have shallow standing water, equipment would be supported on timber mats or on prefabricated equipment mats. Spoil from the trench would be stored within the ROW on the nonworking side of the pipeline ROW. Topsoil would be stored separately, where appropriate. Stockpiling of soil would be interrupted at appropriate intervals to prevent change of surface water flow (sheet flow). If the bottom of the pipeline trench would be at a lower elevation than the wetlands, a permanent trench plug of impervious clay would be placed into the trench at the wetland boundaries. If a fresh-water marsh (palustrine emergent wetlands) would likely be exposed to brackish or marine water by connection with these water sources via the pipeline trench, then temporary trench plugs would be used during construction and permanent trench plugs would be installed after the pipe is lowered into the trench. The trench plugs would be installed between the fresh-water marsh (palustrine emergent wetlands) and any adjacent body of water with a higher salinity.

- Excavated wetlands would be backfilled with either the same hydric topsoil removed or a comparable material capable of supporting similar wetlands vegetation. Original wetland elevations would be restored and adequate material would be used so that following settling and compaction of the material, the proper preconstruction elevation would be attained. After backfilling, DOE would implement erosion protection measures to stabilize and revegetate the site and prevent further wetland degradation.

- DOE would remove all construction-related materials, such as timber mats, rip rap, silt fence, prefabricated equipment mats, and geotextile fabric, upon completing construction. Where the pipeline trench may drain wetlands, DOE would construct trench breakers and/or seal the trench bottom as necessary to maintain the original wetland hydrology. For each wetland area crossed, DOE would install a permanent slope breaker and a trench breaker at the base of the slopes near the boundary between the wetlands and the adjacent upland areas. The trench breaker would be located immediately upslope of the slope breaker. DOE would not use fertilizer, lime, or mulch along the ROW within wetlands, nor immediately upslope from wetlands. Reseeding efforts would use a seed mix of native wetland species. For ongoing ROW maintenance, DOE would limit vegetation in a narrow corridor over the pipeline and to either side to facilitate periodic pipeline corrosion and leak surveys. DOE would not use herbicides or pesticides in or within 100 feet (30 meters) of wetlands. DOE would conduct a postconstruction monitoring program of the disturbed wetlands within the ROWs to ensure that the hydrology and wetland plant community is re-establishing. The monitoring would follow approved procedures contained in the USACE Section 404 permit. If the monitoring showed that wetland plants and hydrology were not successfully re-established, DOE would implement corrective action.

- Other potential mitigation measures or best management practices that DOE would consider during permit application and design include the following:
  - Other than the construction ROW, only use pre-existing roads within wetlands. Do not construct new access roads through wetlands.
  - Assemble the pipeline in an upland area and use the push technique to place the pipe in the trench where water and other site conditions allow.
  - Minimize the duration of construction-related disturbance within wetlands.
  - Schedule the construction-related disturbance during the dry season.
  - Limit construction equipment operating in wetland areas to equipment needed to clear the ROW, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the ROW.
  - Cut vegetation off at ground level, leaving existing root systems in place, except within the path of the pipe trench.
  - Do not pile woody vegetation within wetlands.
  - Do not store hazardous materials, chemicals, fuels, or lubrication oils, or perform concrete coating activities in wetlands or within 30 yards (9 meters) of any wetland boundary.
  - Attempt to refuel all construction equipment in an upland area at least 30 yards (9 meters) outside a wetland boundary. If construction equipment must be refueled within wetlands, follow fueling procedures outlined in project-specific spill prevention or contingency plans.
  - Do not use rock, soil imported from outside the wetlands, tree stumps, or brush rip rap to stabilize the ROW.
  - If standing water or saturated soils are present, use low-ground-weight construction equipment or operate normal equipment on timber mats or prefabricated equipment mats.
  - Do not cut trees outside the construction ROW to obtain timber for equipment mats.
  - Do not discharge hydrostatic test water into wetlands.

B.7.5 Wetland Compensation

DOE would compensate for unavoidable wetland impacts by creating, restoring, and/or preserving wetlands, paying an in-lieu of fee, or buying credits from an approved mitigation bank. DOE would develop and submit the compensation plan as part of the Section 404/401 permit process. Wetland creation would typically involve alteration of an upland (generally though excavation) to create the proper hydrology for wetlands and planting of wetland species at the site. Restoration typically involves the modification of a previously disturbed wetland that may no longer function as a wetland because it has been ditched or drained. The wetland hydrology is restored and wetland species are planted at the site. Wetland preservation typically involves the purchase and preservation of existing wetlands in perpetuity.

Compensation credits and a compensation ratio would be established based on the functions and values of the affected wetland, the acreage of wetland impacts, and the type of compensation offered. Because the compensation ratio would be based on the functions and values of the wetlands and the type of mitigation proposed, one compensation credit does not necessarily equate to one acre of wetlands. Thus, the type of mitigation is important in determining how many acres would need to be preserved, created, or restored to equal one compensation credit. For example, the compensation required for preservation of wetlands would be much higher than that for wetland restoration to reach one compensation credit.

The type of wetland affected and its rarity would be important in determining the compensation ratio. The filling of palustrine forested wetlands would cause a complete loss of functions and values of a relatively rare and ecologically important resource. This type of impact would require the highest compensation ratio, such as 5:1 or 7:1. On the other hand, impacts to emergent wetlands within the permanent easement for pipeline corridors would cause only a temporary loss of the wetland functions and values and would probably require compensation at the lowest ratio.

Representative mitigation ratios for unavoidable impacts to jurisdictional wetlands are presented in table B.7-2 Wetland Mitigation Ratios. If required by the USACE, the compensation ratios would be determined through a formal assessment of wetland functions and values, which would be completed during the permit application stage. The Vicksburg, Mobile, and New Orleans Districts of USACE indicated that they would probably require DOE to use the USACE Charleston District methodology for determining wetland compensation credits (USACE Charleston District 2002).

Table B.7-2: Approximate Wetland Mitigation Ratios

State	Approximate Compensation Requirements		
	High Wetland Functions and Values	Moderate Wetland Functions and Values	Low Wetland Functions and Values
Louisiana	5:1	3:1	2 to 1:1
Mississippi	5:1	3:1	2 to 1:1
Texas	7:1	5:1	3 to 1:1

Notes:

These are estimates of the compensation ratios that may be required by regulatory agencies. The actual requirements would depend on several factors, including existing wetland conditions and their functions and values. If required for the selected alternative, a formal assessment of affected wetland functions and values would be completed to determine appropriate compensation ratios.

Source: U.S. Army Corps of Engineers, New Orleans, Vicksburg, Galveston, and Mobile Districts

B.8 SUMMARY

Table B.8-1 summarizes and compares the floodplain and wetland impacts associated with each proposed new and expansion site; table B.8-2 summarizes and compares the floodplain and wetland impacts by alternative.

Table B.8-1: Summary of Floodplain and Wetland Impacts for Each Proposed New and Expansion Site

Storage Site	Storage Site and Associated Facilities Floodplain Impacts (acres)		ROW Floodplain Impacts (miles)		Storage Site, Associated Facilities, and ROW Wetland Impacts (acres)
	100-year	500-year	100-year	500-year	
Bruinsburg	241	21	30	4	464
Chacahoula	136	0	91	<1	2,256
Clovelly	21	0	0	0	10
Clovelly and Bruinsburg	101	21	37	4	530
Richton	63	0	27	3	1,305
Stratton Ridge	124	186	41	8	598
Bayou Choctaw	24	0	<1	0	34
Big Hill	11	27	18	3	189
West Hackberry	0	0	0	0	5

1 acre = 0.405 hectares; 1 mile = 1.61 kilometers

Table B.8-2: Summary of Floodplain and Wetland Impacts by Alternative with Three Expansion Sites

Alternative	Storage Site and Associated Facilities Floodplain Impacts (acres)		ROW Floodplain Impacts (miles)		Storage Site, Associated Facilities, and ROW Wetland Impacts (acres)
	100-year	500-year	100-year	500-year	
Bruinsburg	276	48	48	7	692
Chacahoula	171	27	109	3	2,484
Clovelly	56	27	18	3	238
Clovelly 80 MMB and Bruinsburg 80 MMB	136	48	55	7	758
Clovelly 90 MMB and Bruinsburg 80 MMB	136	48	55	7	758
Richton	98	27	45	6	1,533
Stratton Ridge	159	213	59	11	826
No-action	0	0	0	0	0

1 acre = 0.405 hectares; 1 mile = 1.61 kilometers

All of the alternatives presented in table B.8-2, with the exception of Clovelly and no-action, could be developed with the expansion of two sites (Big Hill and Bayou Choctaw) or the expansion of three sites (Big Hill, Bayou Choctaw, and West Hackberry). With only two expansion sites developed, the total acres of wetlands impacted under each alternative would be reduced by five acres (2 hectares) because West Hackberry would not be expanded.

A substantial portion of the proposed storage sites and associated infrastructure would be located in the 100-year and 500-year floodplain. The amount of onsite construction would vary by site, with the greatest amount of floodplain disturbance at Stratton Ridge and Bruinsburg. Richton would have no floodplain disturbance due to onsite construction activities. Offsite pipeline construction would affect floodplains only during construction, and areas would be brought back to grade following construction. Pipeline construction associated with the Chacahoula project crosses the largest area of floodplains. There would be no impact to floodplains from pipeline construction at Clovelly.

Because most of the infrastructure on the affected floodplains would be built below ground, the impacts would be lessened. The main impacts on flood storage and flooding attenuation would result from constructing some aboveground structures and placing fill at the new cavern facilities at Chacahoula, Bayou Choctaw, Stratton Ridge, and Big Hill. These fill areas, however, would be insignificant in comparison the total areas of the floodplains in which where they are located. The Bruinsburg, Chacahoula, Richton, Stratton Ridge, and Big Hill sites are located in floodplains that extend over hundreds of acres (hectares) in coastal basins. The Bayou Choctaw site also is located in an extensive floodplain area. Thus, fill areas developed as part of the proposed action at these sites would have insignificant impact on the flood storage capacity or hydraulic function of the related floodplains.

DOE would comply fully with applicable local and state guidelines, regulations, and permit requirements regarding floodplain construction. In general, DOE would be required to evaluate the impact of placing fill or structures in the 100-year floodplain and to demonstrate that the proposed fill/structures would not increase the base flood elevation. Based on these factors, DOE expects that overall impacts to floodplain hydraulic function, and therefore to lives and property, would not be significant.

As shown in table B.8-2, the relative order of impacts on wetlands from least to most by alternative would be as follows:

- Clovelly alternative,
- Bruinsburg, Clovelly 80 or 90 MMB and Bruinsburg 80 MMB alternatives,
- Stratton Ridge alternative,
- Richton alternative, and
- Chacahoula alternative.

The Clovelly alternative would result in the least impacts on wetlands because the new site would be developed at an existing crude oil storage and distribution facility and no new offsite infrastructure or pipelines would be required. The relative impacts on wetlands (fill, conversion, and temporary disturbance) associated with the Clovelly 80 MMB and Bruinsburg 80 MMB, Clovelly 90 MMB and Bruinsburg 80 MMB, and Bruinsburg alternatives would be approximately the same. Relatively rare and ecologically important bald cypress forested wetlands would be filled or converted at Bruinsburg under the Clovelly 80 MMB and Bruinsburg 80 MMB, the Clovelly 90 MMB and Bruinsburg 80 MMB, and the Bruinsburg alternatives. The impacts on wetlands under the Stratton Ridge alternative would involve filling and converting relatively rare and ecologically important bottomland hardwood forest at the Stratton Ridge site.

The Richton alternative would affect almost double the amount of wetland (over 600 acres [243 hectares]), in terms of permanent impacts, compared to the Bruinsburg alternative. The majority of the wetland impacts associated with the Richton alternative result from the long ROWs (over 200 miles [322 kilometers]). The Chacahoula alternative has the most impacts on wetlands (over 1,000 acres [405 hectares]). Relatively rare and ecologically important bald cypress forested wetlands would be filled and converted at Chacahoula, and the majority of each ROW would pass through the extensive wetlands located throughout southern Louisiana.

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Appendix C:
Brine Plume Modeling of Strategic Petroleum Reserve Expansion Sites

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Appendix C
Brine Plume Modeling of Strategic Petroleum Reserve Expansion Sites

C.1 INTRODUCTION

The Department of Energy (DOE) is evaluating development of new Strategic Petroleum Reserve (SPR) sites and expansion of existing sites to increase the overall SPR capacity. At each of the sites, brine would be generated from cavern formation and during oil drawdown events over the operational life of the facility. Brine from three of these sites (Bruinsburg, Bayou Choctaw, and West Hackberry) would be injected into the deep subsurface through injection wells. At the remaining five sites in the following list, brine would be discharged into the Gulf of Mexico through diffusers. Brine discharge to the Gulf of Mexico would occur at the following proposed sites:

- Richton, MS (new site);
- Chacahoula, LA (new site);
- Clovelly, LA (new site, but brine would be discharged through an existing diffuser at the LOOP facility);
- Big Hill, TX (expansion of existing SPR site; brine would be discharged through an existing diffuser); and
- Stratton Ridge, TX (new site).

The impacts of brine discharge into the Gulf of Mexico have been studied at operating sites including Bryan Mound, TX, and West Hackberry, LA. Based on field measurements of elevated salinity around these diffuser sites, DOE developed an empirical model. The model was run for the five above-listed proposed brine diffuser sites to estimate the impacts of brine discharge to the Gulf of Mexico for each of the proposed sites. Take note that West Hackberry is an existing SPR facility that in the past discharged brine to the Gulf of Mexico, but the diffuser is no longer being used; the proposed plan for expansion would use injection wells to dispose of brine. In addition to this modeling effort, EPA will require use of the CORMIX model to further predict the extent of the brine plume as part of the permitting process prior to operation of a brine diffuser.

C.1.1 Objectives

The objective of this study is to predict the areal extent of the brine plumes, the above-ambient salinity contours, and the vertical extent of the brine jets emanating from the proposed diffuser locations at the proposed new and expansion sites. The empirical brine plume model developed by Randall and Price (1985a, 1985d), which is described later, was used to estimate potential impacts of the proposed sites. Figure C.1.1-1 shows the proposed locations of the brine diffuser sites for the new and expansion sites.

C.1.2 Description of Proposed Diffusers

Brine from the SPR sites would be pumped to the Gulf of Mexico through a buried pipeline to a multiport diffuser. A schematic of the diffuser system is provided in figure C.1.2-1. The brine lines would range up to 4.0 inches (10 centimeters) with up to 75 proposed diffuser ports, 3.0 inches (7.6 centimeters) in diameter, spaced 60 feet (18 meters) apart at each diffuser location. A flexible hose extending 4.0 feet (1.2 meters) above the mudline would be attached to each port. The water depths at the proposed diffuser locations range from 30 feet (9.1 meters) to 47 feet (14 meters). As the brine exits from the diffuser ports, it is diluted as a result of jet mixing. Subsequently, it sinks to the bottom as a result of its greater density,

Figure C.1.1-1: Proposed Locations of SPR Brine Diffusers in the Gulf of Mexico

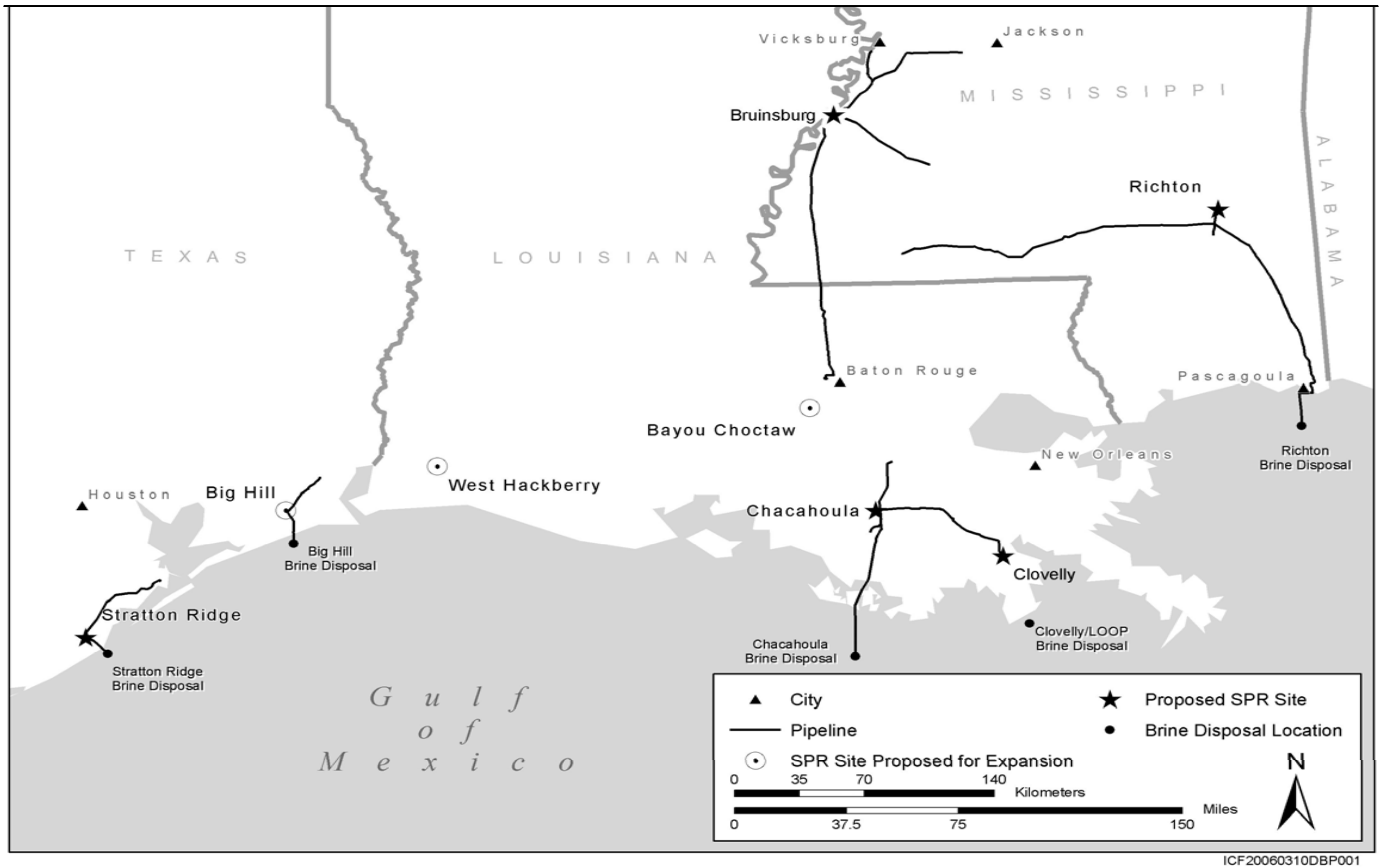
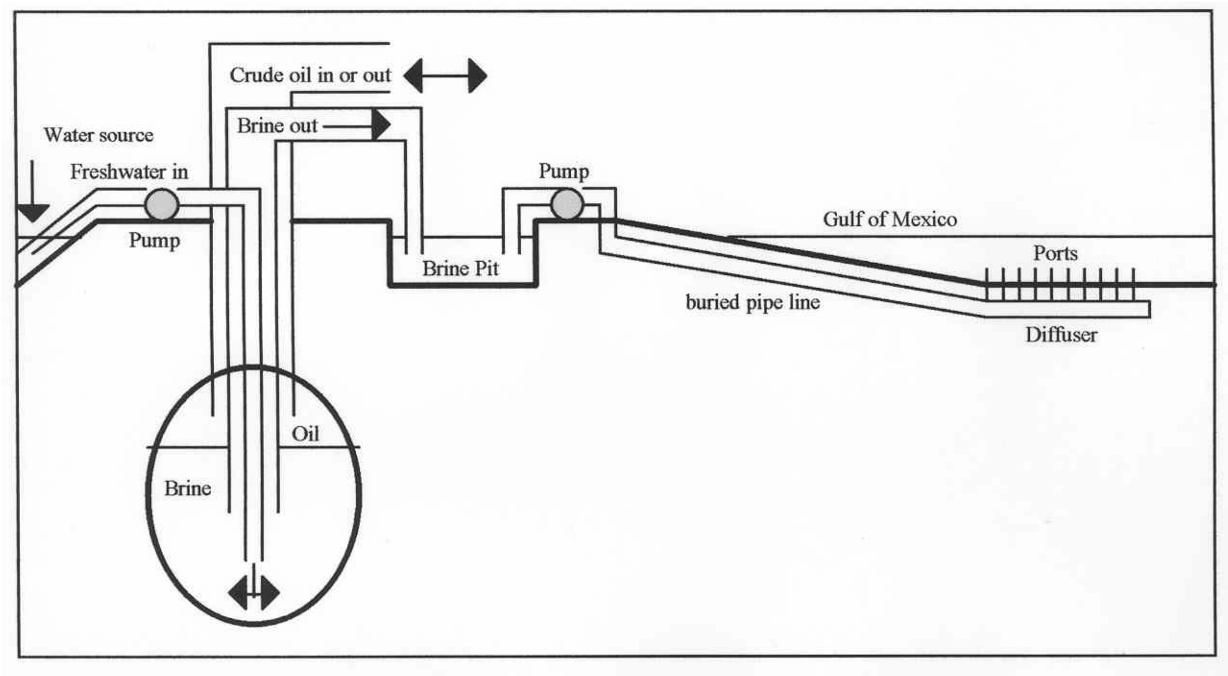


Figure C.1.2-1: Example Brine Diffuser Site and Schematic of the Brine Discharge Operation



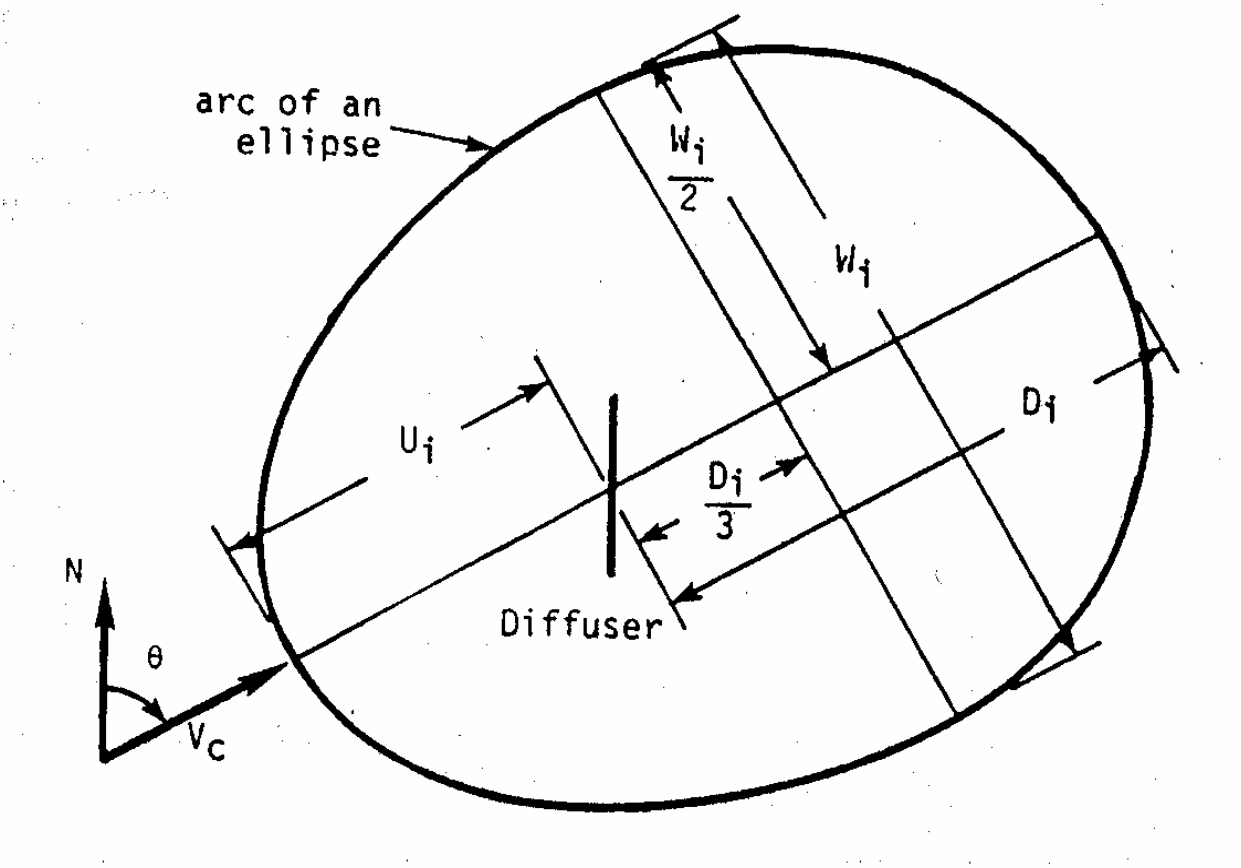
and it simultaneously spreads laterally. The plume is then dispersed by advection due to currents and diffusion due to turbulence.

C.2 DESCRIPTION OF BRINE PLUME MODEL

Experimental results of Tong and Stolzenbach (1979), a numerical model by Adams et al. (1975), and field measurements at Bryan Mound and West Hackberry diffuser sites, indicated there were certain parameters that are important in describing the plume behavior. These parameters are bottom-current speed (V_c) and direction, brine salinity (S_b), ambient bottom salinity (S_a), brine exit velocity (V_e), and brine discharge rate (Q). Empirical equations using dimensionless groupings of the above parameters were developed to estimate the brine plume areal extent, general dimensions (downstream length, width, and upstream length), maximum above-ambient bottom salinity, and the number of above-ambient salinity contours.

During field investigations at operating SPR brine diffusers, the brine plume was measured using a conductivity sensor mounted 10 inches (25 centimeters) above the sea floor in a towed sled. The measured brine plume data indicated that an ellipse was a reasonable estimate of the above-ambient bottom salinity contours. Therefore, empirical equations were determined to relate the upstream length (U_i), downstream length (D_i), and maximum width (W_i) of the plume to the dimensionless groups of physical parameters affecting the plume formation. The two lengths and the width define the axes of an ellipse as illustrated in figure C.2-1. The upstream length (U_i) is measured from the center of the diffuser in the opposite direction of the average bottom current to the desired above-ambient bottom salinity contour. The downstream length (D_i) is the distance measured in the direction of the bottom current from the center of the diffuser to the desired above-ambient bottom salinity contour. The width (W_i) is measured normal to the direction of the bottom current, and it is bisected by the line extending through the center of the diffuser in the direction of the bottom current. Plume measurements indicate that the

Figure C.2-1: Schematic of the Ellipse Used to Predict the Areal Extent of the Brine Plume



maximum width of the plume is usually located approximately one-third of the distance downstream of the diffuser, and therefore, the width is displaced a distance $D_i/3$ from the diffuser center. The ends of the lines U_i, D_i, and W_i are then connected with arcs of an ellipse that define the estimated above-ambient bottom salinity contour.

Note: Where U_i is the upstream length, D_i is downstream length, and W_i is the maximum width. The empirical relationship that fits the data best is

$$D_i, U_i \text{ or } W_i = M\,(Q/V_c)^{1/2}(S_b/S_a) + B \tag{1}$$

where Q, V_c, S_b and S_a are the brine discharge rate in units of cubic feet per second (cubic meters per second), average bottom current in units of cubic feet per second (meters per second), and brine salinity and ambient bottom salinity in units of parts per thousand, respectively. An empirical equation of similar form,

$$A_i = (1/M)(Q/V_c)(S_b/S_a) + B \tag{2}$$

is the best fit for predicting the areal extent. The units of the plume dimensions (D_i, U_i, and W_i) are feet (meters) and acres (hectares) for the area (A_i).

DOE began discharging brine at the Bryan Mound SPR site through a multiport diffuser in 71 feet (22 meters) of water located 11 nautical miles (20 kilometers) offshore of Freeport, TX, in March 1980. Field measurements of the resulting brine plumes are described in several reports (Randall, 1981; Randall, 1982; Randall and McLellan, 1983; Randall and Price, 1984a, 1985b).

Brine discharge began in May 1981 through the West Hackberry multiport diffuser located in 32 feet (9.8 meters) of water and 5.4 nautical miles (10 kilometers) offshore of Holly Beach, LA (the West Hackberry brine diffuser is no longer operated). The West Hackberry brine plume was also measured and the results were reported (Randall, 1983; Randall and Price, 1984b, 1985c).

The brine plume field measurements from the Bryan Mound and West Hackberry sites were used to develop empirical models for predicting the brine plume areal extent, brine jet vertical extent, and the above-ambient salinity contours. The models are described in the reports mentioned earlier and by Randall and Price (1985a, 1985d).

The measured brine plume data and bottom-current data from the West Hackberry diffuser site location, and the West Hackberry brine diffuser site operating data for the period May 1981 through November 1983 were used to determine the coefficients (*M* and *B*) for equations 1 and 2. The resulting coefficients and the correlation coefficients for the resulting equations are tabulated in table C.2-1. The scatter of the data about the regression line as discussed by Randall and Price (1985a, 1985d), and the low correlation coefficients indicate that the predictive equations are a reasonable estimate. The natural variation of salinity in the vicinity of the brine discharge contributes to the scatter. Also, the bottom currents change in magnitude and direction over the approximate 8-hour period of the plume measurement. Variations in the brine discharge rate and salinity during the measurement period are also factors contributing to the data scatter. Randall and Price (1985a, 1985d) conclude that the empirical equations are a best estimate of the plume characteristics in a variable ocean environment.

In addition to the plume dimensions and areal extent, the number of above-ambient bottom salinity contours must be determined. The maximum above-ambient bottom salinity is a function of the brine salinity, ambient bottom salinity, bottom current, port exit velocity, port diameter, brine density, and ambient bottom water density. Laboratory experiments conducted by Tong and Stolzenbach (1979) showed the maximum above-ambient bottom salinity could be estimated by

$$\Delta S = 0.5\, \Delta S_m\, V_r\, (F^2)^{-0.67} \qquad (3)$$

where ΔS is the bottom salinity minus the ambient salinity in units of parts per thousand, ΔS_m is the brine salinity minus the ambient salinity in units of parts per thousand, $V_r = V_c/V_e$, V_c is the bottom current in units of feet per second (meters per second), V_e is the jet exit velocity in units of feet per second (meters per second), $F = V_c/[g((\rho_b - \rho_a)/\rho_a)D]^{0.5}$, g is 9.81 feet per second (meters per second), ρ_b is the brine density in units of pounds per cubic feet (grams per cubic centimeters), ρ_a is the ambient sea water density in units of pounds per cubic feet (grams per cubic centimeters), and D is the port inside diameter in units of feet (meters).

The brine plume, brine discharge, and physical oceanography current meter data collected from the Bryan Mound and West Hackberry brine disposal operations were used to determine an empirical relationship similar to equation 3 using linear regression techniques (Randall and McLellan, 1983). The result has a correlation coefficient of 0.89, indicating a good fit to the data. Equation 4 is used to estimate the

Table C.2-1: Coefficients for Brine Plume Prediction Equations Based on Data for West Hackberry Brine Diffuser Site

Equation Type	Coefficient M	Coefficient B	Correlation Coefficient
Area			
A_1	10.3	3.02	0.20
A_2	17.9	1.04	0.20
A_3	34.0	0.21	0.22
A_4	56.2	0	0.17
A_5	127.4	0	0.06
A_6	196.3	0	0.01
Width			
W_1	71.1	1804	0.47
W_2	59.9	1045	0.53
W_3	41.0	629	0.52
W_4	34.7	186	0.54
W_5	18.7	55	0.28
W_6	13.8	52	0.33
Downstream Length			
D_1	56.5	1051	0.26
D_2	41.3	683	0.16
D_3	32.5	406	0.1
D_4	27.0	332	0.42
D_5	22.3	289	0.36
D_6	19.7	177	0.62
Upstream Length			
U_1	39.7	0	0.66
U_2	28.0	0	0.75
U_3	20.5	0	0.74
U_4	15.1	0	0.74
U_5	13.0	0	0.52
U_6	12.4	0	0.82

Note: Subscripts indicate the above-ambient salinity contour.
Source note: Randall and Price 1985a, 1985d.

maximum above-ambient bottom salinity, and this value is truncated to the nearest part per thousand to determine the number of above-ambient bottom salinity contours for the plume prediction.

$$\Delta S = 0.444\ \Delta S_m\ V_r\ (F^2)^{-0.533} \qquad (4)$$

The prediction of the plume is for an 8-hour period because this is the approximate time required to measure the plumes. The prediction model does not account for a sloping bottom, but the West Hackberry data used to evaluate the coefficients for the plume prediction equations were taken from a site that has a small cross-shelf slope (1 to 2,500). A computer program has been developed that inputs the necessary physical data and uses these data to compute the plume physical dimensions, areal extent, and above-ambient bottom salinity contours for each 8-hour period. Comparisons of predicted and measured results are described by Randall and Price (1985a, 1985d).

The plume prediction model in equations 1 and 2 and the maximum above-ambient bottom salinity prediction in equation 4 assume the vertical salinity distribution is constant. Stable stratification (increasing salinity with increasing depth) frequently is observed at water depths ranging from 30 to 40 feet (9.1 to 12 meters) in this area of the Gulf of Mexico; however, vertical salinity gradients in the range of 5 to 10 parts per thousand have been observed (Kelly et al., 1982, Randall and Kelly, 1982). When these vertical salinity gradients are present, the dilution of the brine is greater, and consequently, the maximum above-ambient bottom salinity is less than that predicted by equation 4. There are also fewer above-ambient salinity contours and smaller areal extent, and consequently, the model is conservative when salinity stratification is present.

The vertical extent of negatively buoyant jets has been investigated using laboratory and field experiments as reported by Tong and Stolzenbach (l979), Turner (1966), and Randall and McLellan (1983). The vertical extent of the brine jets depends on the exit velocity, port diameter, brine density, and ambient density of the receiving waters. A relationship has been determined by experimental procedures as reported by previously mentioned researchers. The general form of the equation developed is

$$Z/D = C\ V_e/[g((\rho_b - \rho_a) / \rho_a)D]^{1/2} \tag{5}$$

where Z is maximum height of brine jet above the port , D is inside port diameter, V_e is port exit velocity, g is gravitational acceleration constant, ρ_b is the brine density, ρ_a is the ambient sea water density, and C is a proportional constant. Randall and McLellan (1983) determine a value of C equal to 2.2.

C.3 MODEL APPROACH

The empirical brine plume prediction model described earlier was used to predict the negatively buoyant brine plumes for the proposed new and expansion diffuser locations. Input parameters representative of baseline oceanographic conditions at each of the proposed brine diffuser sites were estimated based on available data from various field studies at similar depths and distances from shore in the Gulf of Mexico.

The direction and magnitude of bottom currents at the diffuser sites are primary determinants of the extent of the resultant brine plumes. The resultant high salinity plume is largest at low bottom-current velocities; thus, analyses are limited to the low bottom-current velocity of 1.2 inches per second (3.0 centimeters per second) (identified as the “maximum plume” scenario) and moderate bottom-current velocity 3.5 inches per second (9.0 centimeters per second) (identified as the “typical plume” scenario). These bottom-current velocities were chosen based on review of monitoring data from the operating Big Hill and West Hackberry SPR sites and other available data from the proposed Richton diffuser location area.

For each site, analyses and maps represent the following three scenarios:

1. The first map depicts the maximum potential impact area showing the plume extent resulting from the low bottom-current velocity of 1.2 inches per second (3.0 centimeters per second), and it shows the predominant current direction along the shoreline.

2. The second map depicts the area of impact assuming a “typical” bottom-current velocity of 3.5 inches per second (9.0 centimeters per second), and it shows the predominant current direction.

3. The third map depicts the area of impact also assuming a “typical” bottom-current velocity of 3.5 inches per second (9.0 centimeters per second), but it shows the second most predominant current direction.

Probable bottom-current velocities and directions are based on available oceanographic data for the diffuser sites and surrounding areas. This background information is summarized as follows.

Representative data from the Big Hill site is provided in tables C.3.1-1 and C.3.1-2. Table C.3.1-1 shows that bottom-current velocities may range from below 1.2 inches per second (3.0 centimeters per second) up to greater than 15.7 inches per second (40 centimeters per second) over the course of a 9-month monitoring program at the Big Hill diffuser location. At Big Hill, bottom-current velocities between 2.4 and 4.7 inches per second (6.0 and 12 centimeters per second) were most prevalent (table C.3.1-1). For the modeling effort, 3.5 inches per second (9.0 centimeters per second) was identified as typical bottom-current velocity. Table C.3.1-2 shows bottom-current direction in terms of percentage of time over a 9-month period. The direction of bottom currents in these areas has been recorded in all directions, but the predominant direction is along and parallel to the coastline.

Table C.3-1: Summary of Percentage of Occurrence of Bottom-Current Magnitudes at Big Hill Site

Month	Bottom-Current Magnitude Range (cm/s)								
	0–3	3–6	6–12	12–15	15–20	20–25	25–30	30–40	40+
DEC 77	3.8	14.4	25.9	12.8	18.6	13.4	5.4	5.7	0.0
JAN 78	2.6	7.7	25.6	13.8	19.4	12.5	9.3	6.9	2.3
FEB 78	1.0	8.9	24.0	13.8	20.8	15.0	9.2	5.1	2.1
MAR 78	7.1	16.9	42.4	13.6	11.0	5.5	3.1	0.4	0.0
APR 78	4.6	10.6	25.2	15.6	23.9	10.3	4.9	4.7	0.4
MAY 78	15.3	16.7	23.3	12.0	14.9	9.9	5.8	1.9	0.1
JUN 78	10.1	18.2	36.7	13.3	12.5	5.6	2.2	1.4	0.0
JUL 78	15.1	20.8	41.5	12.4	7.9	2.0	0.3	0.0	0.0
AUG 78	14.5	22.3	42.7	7.3	6.6	1.5	1.2	1.2	2.7
AVERAGE	8.2	15.2	31.9	12.7	15.1	8.4	4.6	3.0	0.8

Note: Based on current joint frequency distribution of Big Hill secondary site bottom-current data for December 1977 through August 1978.

cm/s = centimeter/second

Source note: Randall and Kelly (1982).

Table C.3-2: Summary of Percentage of Occurrence of Bottom-Current Directions at Big Hill Site

Month	N	NE	E	SE	S	SW	W	NW
DEC 77	1.8	22.5	8.8	2.6	8.4	30.4	21.6	3.9
JAN 78	4.8	16.8	5.5	1.7	11.0	16.1	38.4	5.5
FEB 78	6.4	20.8	9.2	3.9	11.3	16.2	24.7	7.4
MAR 78	9.0	21.6	7.0	6.2	7.4	18.1	21.8	8.9
APR 78	3.1	11.7	8.3	5.8	11.9	34.2	18.2	6.8
MAY 78	2.8	19.0	15.9	2.7	4.7	26.6	25.5	2.7
JUN 78	6.8	15.6	23.6	9.6	12.8	18.1	8.69	5.0
JUL 78	12.8	25.0	15.7	7.5	8.9	9.9	10.9	9.3
AUG 78	5.9	18.4	16.4	6.9	9.8	16.8	18.3	7.5
AVERAGE	5.9	19.0	12.3	5.2	9.6	20.7	20.9	6.3

Note: Based on current joint frequency distribution of Big Hill secondary site bottom-current data for December 1977 through August 1978.

Source note: Randall and Kelly (1982).

Data for the West Hackberry diffuser site (Kelly et al., 1982) show that the predominant bottom-current velocity during the year is 2.0 to 5.9 inches (5.0 to 15 centimeters) per second, representing the modeled “typical plume.” The low velocities resulting in the modeled “maximum plume” occur only 10.4 percent of the year. The bottom-current direction is in all directions, and the preferred bottom-current direction is to the west (parallel to the coastline) 26 percent of the time.

Oceanographic data from the area of the proposed Richton diffuser location are available in Dinnel (1988), Eleuterius (1973), Kjerfve and Sneed (1984), and Vittor and Associates (1985). In addition, an environmental impact statement by the U.S. Army Corps of Engineers and the U.S. Navy (1991), a feasibility report (USACE, 1984) for a nearby dredged material disposal area offshore Horn Island, and a U.S. Army Corps of Engineers study of the Mississippi Sound (USACE, 1980) were used to evaluate values for ambient bottom salinity, ambient bottom temperature and bottom-current velocities.

Table C.3.1-3 shows bottom-current magnitudes for the typical and maximum case plumes and the preferred bottom-current direction, based on data from Kjerfve and Sneed (1984). The data show that bottom currents representing the maximum plume extent, in the range of 0 to 1.6 inches per second (0 to 4 centimeters per second), occurred 34 percent of the time. Bottom currents representing typical plumes, in the range of 3.2 to 5.5 inches per second (8.0 to 14 centimeters per second), occurred 22 percent of the time. Bottom currents in the north-northeast direction occurred 19 percent of the time, and those in the northeast-east direction occurred 26 percent of the time.

Table C.3-3: Summary of Percentage of Occurrence of Bottom-Current Magnitudes and Directions at Richton Area

	Bottom-Current Magnitude (cm/s)							
Range	0–4	4–8	8–14	14–22				
Percentage of Time	34	34	22	10				
	Bottom-Current Direction							
Range	N-NE	NE-E	E-SE	SE-S	S-SW	SW-W	W-NW	NW-N
Percentage of Time	19	26	13	6	6	7	9	14

Note: Based on joint frequency distribution of offshore Mississippi sound site bottom-current data.

cm/s = centimeters/second

Source note: Kjerfve and Sneed, 1984.

C.4 DEFINITION OF MODEL INPUT PARAMETERS

Ambient conditions for the "typical" and "maximum" oceanographic conditions were determined to be similar at each of the proposed brine diffuser locations, based on review of the existing body of oceanographic data for this area, as described earlier. These conditions are summarized in table C.4-1. Salinity and water temperature are expected to be similar for typical and maximum conditions because the diffusers will be placed at similar water depths. The resultant plumes for a "typical" scenario and a low bottom-current velocity "maximum" scenario were evaluated for each diffuser location. The potential impacts of all current directions, in addition to just the two most prevalent current directions, were evaluated.

Table C.4-1: Environmental Conditions for SPR Expansion Sites

Parameter	**Big Hill, TX**		**Stratton Ridge, TX**		**Clovelly, LA**		**Chacahoula, LA**		**Richton, MS**	
	Typical	**Max.**	**Typical**	**Max.**	**Typical**	**Max.**	**Typical**	**Max.**	**Typical**	**Max.**
Ambient Bottom Salinity (ppt)	31	25	31	25	31	25	31	25	31	25
Ambient Surface Salinity (ppt)	31	25	31	25	31	25	31	25	31	25
Ambient Bottom Temperature (°C)	20	15	20	15	20	15	20	15	20	15
Ambient Surface Temperature (°C)	20	15	20	15	20	15	20	15	20	15
Water Depth (ft)	33	33	30	30	36	36	30	30	47	47
Ambient Bottom Current (m/s)	0.09	0.03	0.09	0.03	0.09	0.03	0.09	0.03	0.09	0.03

ppt = parts per thousand; °C = degrees Celsius; ft = feet; m/s = meters/second
1 foot = 0.3048 meters

Table C.4-2 summarizes the input parameters including specific characteristics of the brine diffuser and discharge volume. The number of open diffuser ports is determined by assuming an exit velocity of 30 feet per second (9.1 meters per second) and the maximum brine discharge rate. The maximum brine salinity is chosen as 263 parts per thousand that corresponds to a saturated condition for 68 °Fahrenheit (20 °Celsius).

Table C.4-2: Characteristics of Brine and Brine Diffuser for SPR Expansion Sites

Parameter	Big Hill, TX	Stratton Ridge, TX	Clovelly, LA	Chacahoula, LA	Richton, MS
Brine Salinity (ppt)	263	263	263	263	263
Brine Temperature (^oC)	20	20	20	20	20
Maximum Number of Ports	75	75	75	75	75
Number of Open Ports resulting in maximum brine discharge rate	57	53	22	45	45
Port Height above Bottom (ft)	4	4	4	4	4
Port Exit Velocity (ft/s)	30	30	30	30	30
Maximum Brine Discharge Rate (MMBD)	1.3	1.2	0.5	1.0	1.0
Port Diameter (inches)	3	3	3	3	3
Port Spacing (ft)	60	60	60	60	60

ppt = parts per thousand; °C = degrees Celsius; ft = feet; ft/s = feet/second; MMBD = million barrels per day
1 foot = 0.3048 meters; 1 inch = 2.54 centimeters

C.5 DISCUSSION

Table C.5-1 summarizes model results for each existing (Clovelly, Big Hill) and proposed (Chacahoula, Richton, Stratton Ridge) brine diffuser location. Additional data appear in attachment C-1.

Table C.5-1: Results of Brine Plume Prediction for SPR Expansion Sites

Parameter	Big Hill, TX	Stratton Ridge, TX	Clovelly, LA	Chacahoula, LA	Richton, MS
Brine Salinity (ppt)	263	263	263	263	263
Brine Temperature (^oC)	20	20	20	20	20
Maximum Number of Ports	75	75	75	75	75
Number of Open Ports needed to reach maximum brine discharge rate	57	53	22	45	45
Port Height above Bottom (ft)	4	4	4	4	4
Port Exit Velocity (ft/s)	30	30	30	30	30
Maximum Brine Discharge Rate (MMBD)	1.3	1.2	0.5	1.0	1.0
Port Diameter (inch)	3	3	3	3	3
Port Spacing (ft)	60	60	60	60	60
Maximum Above-ambient Salinity (ppt)	4.3 (Typical) 4.7 (Maximum)	4.3 (Typical) 4.7 (Maximum)	4.3 (Typical) 4.7 (Maximum)	4.3 (Typical) 4.7 (Maximum)	4.3 (Typical) 4.7 (Maximum)
Maximum Vertical Extent of Brine Jets (ft)	18.5 (Typical) 18.4 (Maximum)	18.5 (Typical) 18.4 (Maximum)	18.5 (Typical) 18.4 (Maximum)	18.5 (Typical) 18.4 (Maximum)	18.5 (Typical) 18.4 (Maximum)
Water Depth	33	30	36	30	47
Downstream Length (nm) T – typical plume M – maximum plume	+1 – 1.9 T 3.4 M +2 – 1.3 T 2.5 M +3 – 1.0 T 1.9 M +4 – 0.8 T 1.5 M	+1 – 1.8 T 3.3 M +2 – 1.3 T 2.4 M +3 – 1.0 T 1.8 M +4 – 0.8 T 1.5 M	+1 – 1.4 T 2.3 M +2 – 1.0 T 1.75M +3 – 0.7 T 1.2 M +4 – 0.6 T 1.0 M	+1 – 1.7 T 3.1 M +2 – 1.2 T 2.2 M +3 – 0.9 T 1.7 M +4 – 0.7 T 1.4 M	+1 – 1.7 T 3.1 M +2 – 1.2 T 2.2 M +3 – 0.9 T 1.7 M +4 – 0.7 T 1.4 M

ppt = parts per thousand; °C = degrees Celsius; ft = feet; ft/s = feet/second; MMBD = million barrels per day; nm = nautical miles
1 foot = 0.3048 meters; 1 inch = 2.54 centimeters; 1 nautical mile = 1.85 kilometers

The typical plume assumes a moderate bottom-current velocity, resulting in the highest salinity, which would be 4.3 parts per thousand above ambient conditions. The typical plume would extend 0.8 nautical miles (1.5 kilometers) out from the diffuser, and the salinity rate would increase to 1.0 part per thousand for 1.9 nautical miles (3.5 kilometers) out from the diffuser.

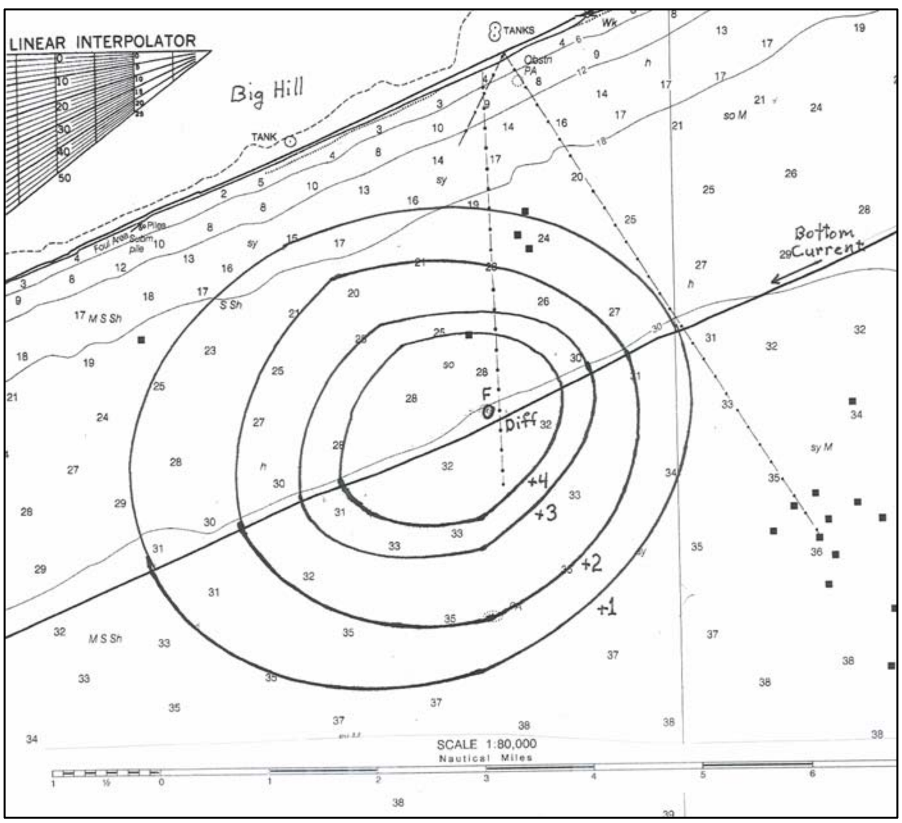
The maximum-plume scenario, which assumes a low bottom-current velocity, would have the highest increase of salinity above ambient conditions. The result would be 4.7 parts per thousand extending 1.5 nautical miles (2.8 kilometers) out from the diffuser. There would be an increase in salinity of 1.0 part per thousand extending out 3.4 nautical miles (6.3 kilometers) from the diffuser.

The maximum vertical extent of the brine jet would be approximately 19 feet (5.8 meters) for the typical plume and 18 feet (5.5 meters) for the large plume. For the Big Hill site, the maximum downstream length of the plume would be 3.4 nautical miles (6.3 kilometers) for the maximum plume scenario and 1.9 nautical miles (3.5 kilometers) for the typical plume scenario, which is the result of the largest brine maximum discharge rate of 1.3. The Clovelly site would have the smallest plume contours because the maximum brine discharge rate is the smallest (0.5 maximum brine discharge rate).

C.5.1   Big Hill

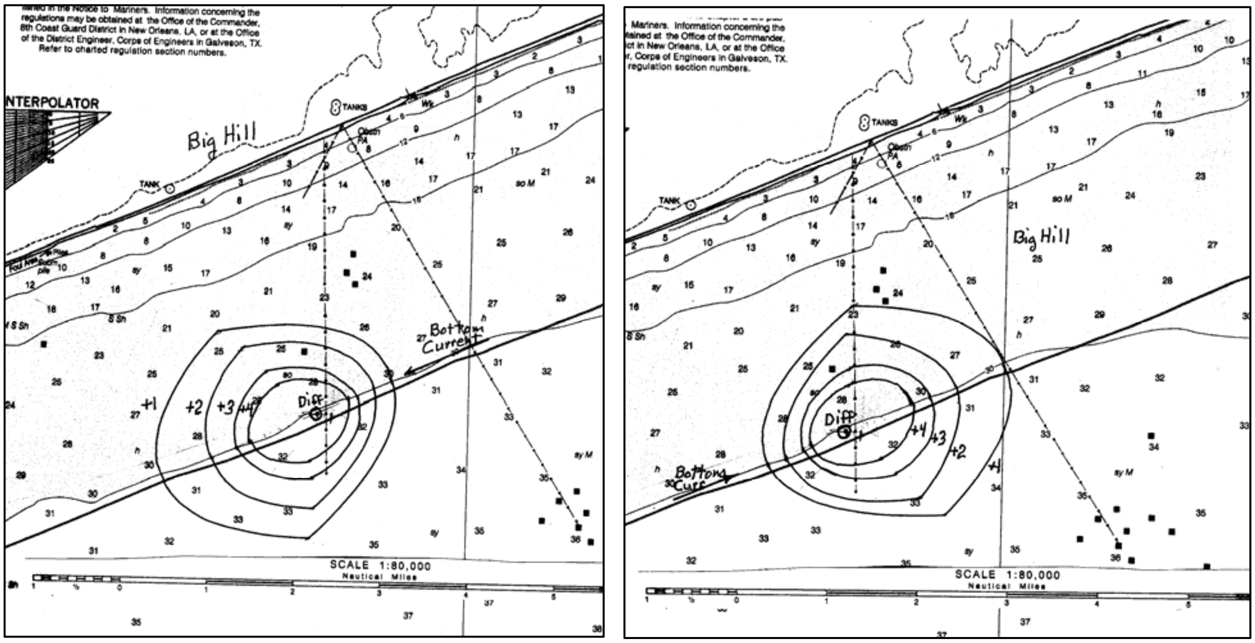
Figure C.5.1-1 shows the extent of the maximum elevated salinity plume showing the +1 through +4 parts per thousand contours for the proposed Big Hill site. Based on a review of the data presented in table C.3.1-2, this figure shows maximum plume conditions and assumes a low bottom-current velocity of 1.2 inches per second (3 centimeters per second) along the shore to the southwest.

Figure C.5.1-1: Big Hill - Empirical Brine Plume Prediction for Maximum Plume



The elliptical above-ambient salinity contours for the typical plume scenario assumes a bottom-current velocity of 3.5 inches per second (9 centimeters per second), shown on figure C.5.1-2 for the two most predominant current directions.

Figure C.5.1-2: Big Hill - Empirical Brine Plume Prediction for Typical Case Conditions for Bottom Currents Downcoast (left) and Upcoast (right)



The brine plume model estimates that the area inside the typical elliptical contour plumes is 7.2 square nautical miles (13 square kilometers) for the +1 parts per thousand contour, 4.0 square nautical miles (7.4 square kilometers) for the +2 parts per thousand contour, 2.0 square nautical miles (3.7 square kilometers) for the +3 parts per thousand, and 1.2 square nautical miles (2.2 square kilometers) for the +4 parts per thousand contour. For the maximum plume, estimated to occur on the average of 8 percent of the year, the model predicts the area inside the elliptical contours as 24, 14, 7.2, and 4.3 square nautical miles (45, 26, 13, and 8.0 square kilometers) for the +1, +2, +3, and +4 parts per thousand contours, respectively.

C.5.2 Stratton Ridge

The above-ambient salinity contours for +1 to +4 parts per thousand are shown on figure C.5.2-1 for the maximum plume scenario, which assumes a bottom-current velocity of 1.2 inches per second (3.0 centimeters per second) for the Stratton Ridge site. The bottom current is shown propagating down and parallel to the coast, which is the predominant current direction. The +1 part per thousand above-ambient contour overlaps the Freeport ship channel and thus some of the brine plume is predicted to enter the ship channel. The typical brine plume contours, which assume a bottom current of 3.5 inches per second (9.0 centimeters per second), are shown in figure C.5.2-2. Resultant plumes for the two most prevalent bottom currents are shown parallel to the shoreline. The predicted area inside the elliptical maximum plume contours are 22.8 square nautical miles (42 square kilometers) for the +1 parts per thousand contour, 14 square nautical miles (26 square kilometers) for the +2 contour, 6.7 square nautical miles (12 square kilometers) for the +3 parts per thousand, and 4.0 square nautical miles (7.4 square kilometers) for the +4 parts per thousand contour. The typical plume scenario predicts areas of 6.8, 3.7, 1.8, and 1.1 square nautical miles (13, 6.9, 3.3, and 2.0 square kilometers) respectively. The depth of the diffuser is 30 feet (9.14 meters) on the navigation chart. The diffuser for this proposed SPR expansion site is parallel to the brine line and nearly perpendicular to the coastline.

Figure C.5.2-1: Stratton Ridge - Empirical Brine Plume Prediction for Maximum Case Conditions for Downcoast Bottom Currents

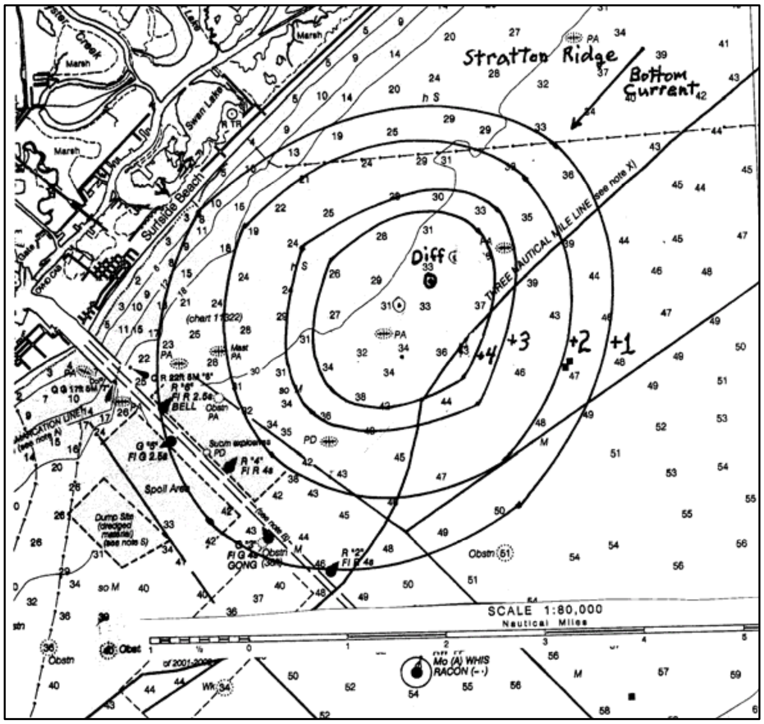
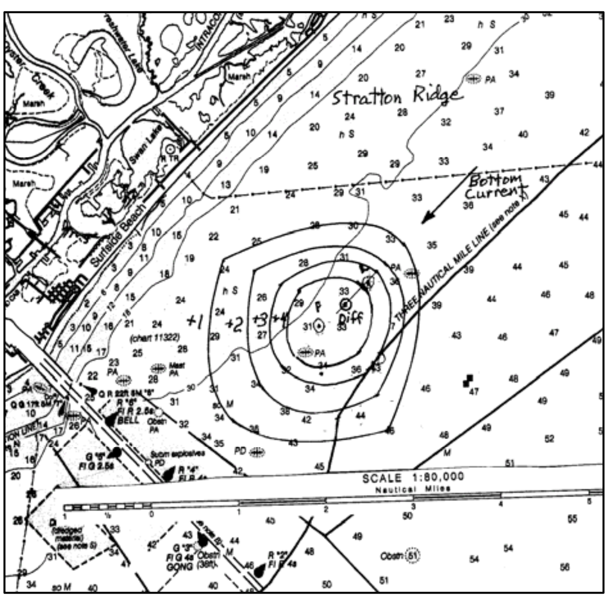
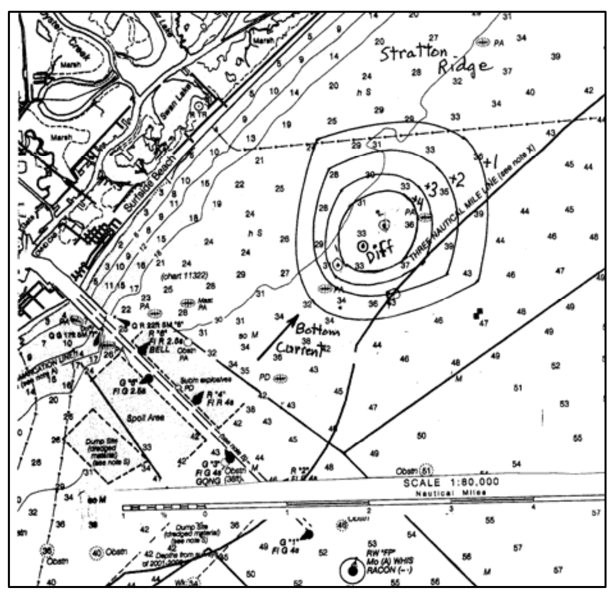


Figure C.5.2-2: Stratton Ridge - Empirical Brine Plume Prediction for Typical Case Conditions for Bottom Currents Downcoast (left) and Upcoast (right)





C.5.3 Clovelly

At the existing Clovelly diffuser site, the above-ambient salinity contours for +1 to +4 parts per thousand for the maximum plume case assume a bottom-current velocity of 1.2 inches per second (3.0 centimeters per second). The above-ambient plume contours for the typical case plume at the existing site assume a bottom-current velocity of 3.5 inches per second (9.0 centimeters per second).

The predicted area extent of the elliptical plumes for the typical plume would be 3.3, 1.7, 0.8, and 0.4 square nautical miles (6.1, 3.2, 1.5, and .75 square kilometers), respectively, for the +1 through +4 parts per thousand contours and 10, 5.5, 2.8, and 1.7 square nautical miles (19, 10.2, 5.2, and 3.2 square kilometers) for the maximum plume contours.

C.5.4 Chacahoula

The Chacahoula site's maximum plume, which assumes a bottom-current velocity of 1.2 inches per second (3 centimeters per second) above-ambient salinity contours for +1 to +4 parts per thousand, are illustrated in figure C.5.4-1. The diffuser for this expansion site is perpendicular to the brine line. Figure C.5.4-2 shows the typical plume, which assumes a bottom-current velocity of 3.5 inches per second (9 centimeters per second).

Figure C.5.4-1: Chacahoula - Empirical Brine Plume Prediction for Maximum Case Conditions for Westerly Bottom Currents

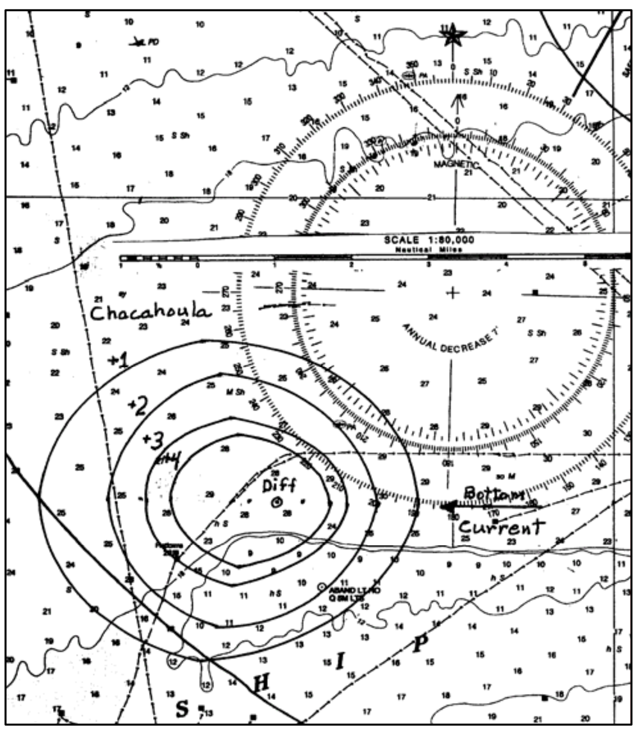
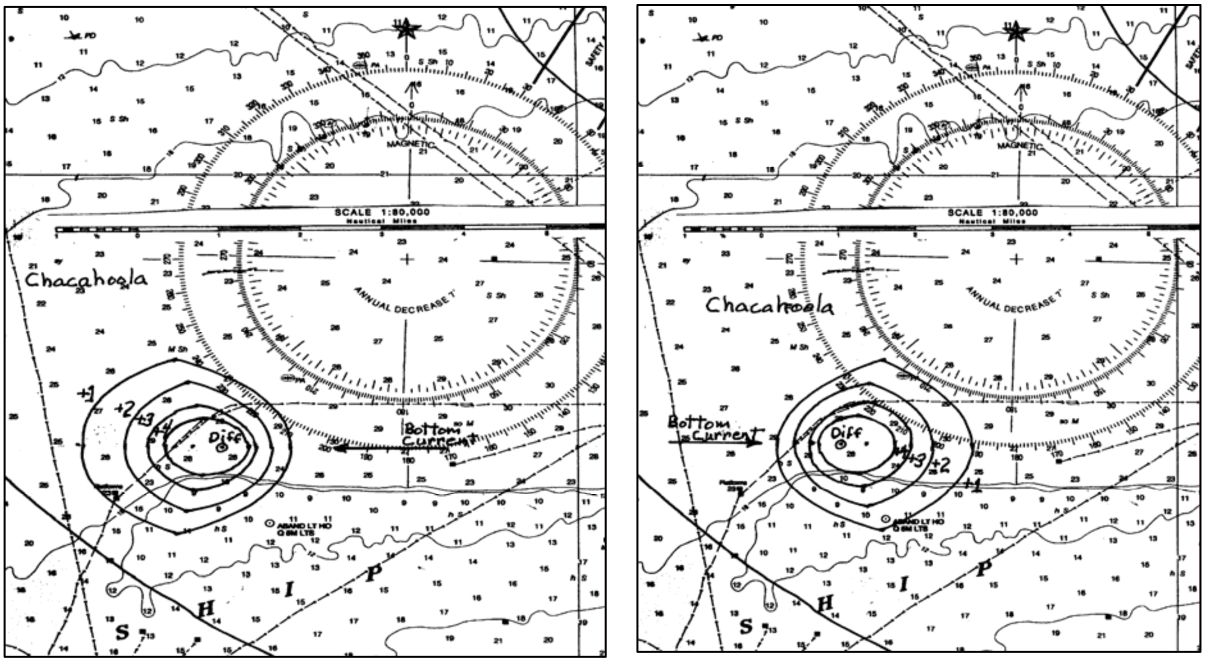


Figure C.5.4-2: Chacahoula - Empirical Brine Plume Prediction for Typical Case Conditions for Bottom Currents to the West (left) and East (right)



The diffuser is located at a depth of approximately 30 feet (9.1 meters), very close to Ship Shoal, which rises vertically from a depth of 20 feet (6.1 meters) to a depth of 10 feet (3.1 meters). Although the predicted above-ambient salinity contours for the maximum plume are shown to move onto Ship Shoal, the model is based on a nearly flat bottom, which cannot account for the bathymetry encounter at Ship Shoal. At Chacahoula, the brine plume movement is restricted by the increasing depth to the north (shoreward), west, and south (Ship Shoal). Flow along the bottom contours to the east is possible; however, the depth increases slightly in the easterly direction along Ship Shoal. The bottom bathymetry at the Chacahoula diffuser could lead to pooling of above-ambient salinity water near the bottom (approximately 2.0 feet (0.6 meters) thick), and inhibit dilution of brine. The bottom currents may not be strong enough to move the brine up the slopes shown on the chart.

C.5.5 Richton

The above-ambient salinity contours for +1 to +4 parts per thousand for the maximum plume case, which assumes a bottom-current velocity of 1.2 inches per second (3 centimeters per second) at the proposed Richton diffuser site, are shown in figure C.5.5-1. Figure C.5.5-2 shows the above-ambient plume contours for the typical case plume, which assumes an upshore and downshore direction bottom-current velocity of 3.5 inches per second (9 centimeters per second).

In the maximum case scenario, the model predicts the area inside the contours would be 19.5 square nautical miles (36 square kilometers) for the +1 parts per thousand contour, 11 square nautical miles (20.4 square kilometers) for the +2 contour, 5.7 square nautical miles (11 square kilometers) for the +3 parts per thousand, and 3.4 square nautical miles (6.3 square kilometers) for the +4 parts per thousand contour. The typical case scenario is predicted to have areas of 5.9, 3.2, 1.6, and 0.9 square nautical miles (11, 5.9, 3.0, and 1.7 square kilometers) respectively.

Figure C.5.5-1: Richton - Empirical Brine Plume Prediction for Maximum Case Conditions for North-Northeast Bottom Currents

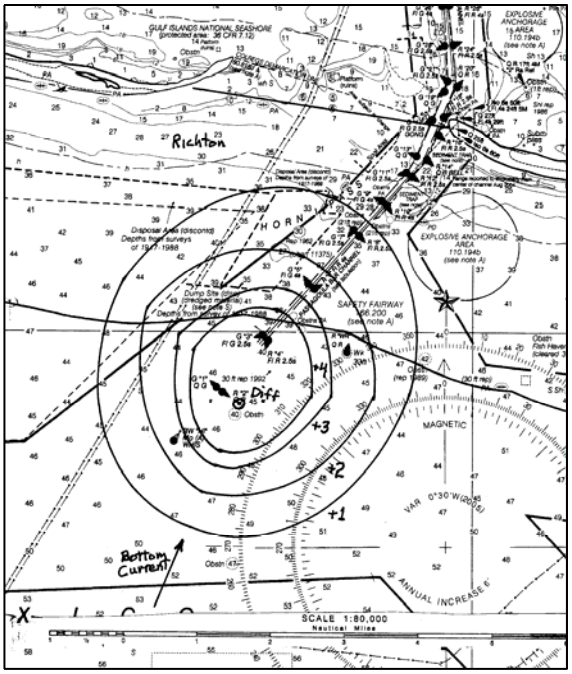
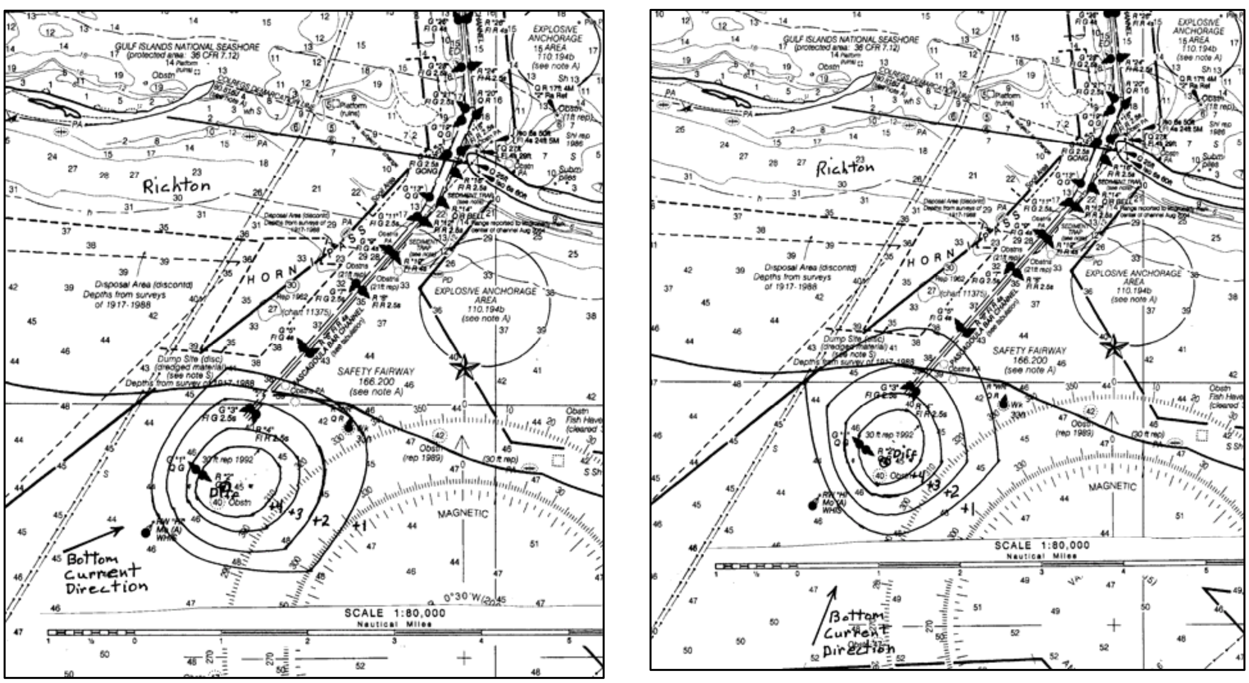


Figure C.5.5-2: Richton - Empirical Brine Plume Prediction for Typical Case Conditions



The diffuser location is approximately 1.0 nautical mile (1.9 kilometers) south of the entrance to the Pascagoula ship channel. The diffuser for this expansion site is parallel to the brine line and nearly perpendicular to the coastline. The maximum case plume, depicted in figure C.5.5-1, shows all of the above-ambient salinity contours located inside the ship channel. Figure C.5.5-2 shows the typical case contours of +1 and +2 parts per thousand entering the ship channel for two predominant bottom-current directions.

C.6 CONCLUSIONS

DOE used the empirical brine plume prediction model developed from the measured brine plume data from operating SPR brine diffuser sites to predict the plume characteristics for the SPR expansion diffuser sites at Big Hill, Stratton Ridge, Clovelly, Chacahoula, and Richton. The model was applied to five selected scenarios representing a range of expected environmental and disposal operational conditions. This report includes the results for typical and maximum case conditions.

Results show the maximum above-ambient salinity would be 4.3 parts per thousand and 4.7 parts per thousand for the typical and maximum case conditions. These above ambient salinity values are the same for all expansion sites because they all have the same brine salinity (263 parts per thousand) exit velocity of 30 feet (9.1 meters) per second, port diameter (3.0 inches [7.6 centimeters]), and ambient salinity and temperature profiles. The maximum vertical extent of the brine jets is approximately 19 and 18 feet (5.8 and 5.5 meters) for the typical and maximum case scenarios, respectively, and these are the same for all sites for the same reason described for the maximum above-ambient salinities. The maximum areal extent of the above-ambient contours is affected by the brine discharge rate, and the maximum areas occur for the Big Hill site, which has the largest brine discharge rate (1.3 maximum brine discharge rate). The Big Hill site appears to provide the best dilution and dispersion area for the brine discharge. The smallest brine plume areas occur at the Clovelly site where the brine discharge rate is the smallest (0.5 maximum brine discharge rate). The Stratton Ridge site plume predictions show portions of the brine plume entering the Freeport ship channel when the bottom current is downcoast, which is a common occurrence. The Chacahoula site shows the diffuser within 0.5 nautical miles (0.93 kilometers) of Ship Shoal. This bathymetry feature is not modeled by the empirical plume model, but it is expected that the brine plume dilution will be reduced due to shallower water depths to the south, west, and north of Ship Shoal. The proposed location of the Richton diffuser is approximately 1.0 nautical mile (1.9 kilometers) south of the entrance of the Pascagoula ship channel, and the model predicts the typical and maximum brine plumes would enter the ship channel.

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ATTACHMENT C-1:
Model Predictions for Brine Discharge Scenarios for the Strategic Petroleum Reserve Expansion Sites

Table C-1-1: Predicted Characteristics of Typical and Large Scenario Brine Plume at Big Hill Expansion Diffuser Site

Big Hill (typical)	
Amb. Bottom Sal.(o/oo)	31.00
Amb. Bottom Temp.(oC)	22.00
Depth(ft.)	33.00
Amb. Bottom Cur.(m/s)	.09
Amb. Top of Sal.(o/oo)	31.00
Brine Sal.(o/oo)	263.00
Brine Temp.(oC)	20.00
Num. open ports	57.00
Jet Exit Vel.(ft/s)	30.00
Port Dia(in)	3.00
Brine discharge rate(m3/s) =	2.4
Brine discharge rate(barrel/day x 10-6)=	1.3
Maximum above ambient bottom salinity (o/oo)=	4.3
Vertical extent(m) =	5.7
Vertical extent(ft) =	18.5

Plume Areal Extent	(km2)	(nm2)	(acresx10e-3)
+1o/oo contour	24.8	7.2	6.1
+2o/oo contour	13.6	3.9	3.4
+3o/oo contour	6.8	2.0	1.7
+4o/oo contour	4.0	1.2	1.0

Plume Width	(km)	(nm)
+1o/oo contour	4.9	2.6
+2o/oo contour	3.7	2.0
+3o/oo contour	2.4	1.3
+4o/oo contour	1.7	.9

Plume Downstream Length	(km)	(nm)
+1o/oo contour	3.5	1.9
+2o/oo contour	2.5	1.3
+3o/oo contour	1.8	1.0
+4o/oo contour	1.5	.8

Plume Upstream Length	(km)	(nm)
+1o/oo contour	1.7	.9
+2o/oo contour	1.2	.7
+3o/oo contour	.9	.5
+4o/oo contour	.7	.4

Big Hill (Maximum)	
Amb. Bottom Sal.(o/oo)	25.00
Amb. Bottom Temp.(oC)	15.00
Depth(ft.)	33.00
Amb. Bottom Cur.(m/s)	.03
Amb. Top of Sal.(o/oo)	23.00
Brine Sal.(o/oo)	263.00
Brine Temp.(oC)	20.00
Num. open ports	57.00
Jet Exit Vel.(ft/s)	30.00
Port Dia(in)	3.00
Brine discharge rate(m3/s) =	2.4
Brine discharge rate(barrel/day x 10-6)=	1.3
Maximum above ambient bottom salinity (o/oo)=	4.7
Vertical extent(m) =	5.6
Vertical extent(ft) =	18.4

Plume Areal Extent	(km2)	(nm2)	(acresx10e-3)
+1o/oo contour	83.9	24.4	20.7
+2o/oo contour	47.6	13.9	11.8
+3o/oo contour	24.7	7.2	6.1
+4o/oo contour	14.8	4.3	3.7

Plume Width	(km)	(nm)
+1o/oo contour	8.5	4.6
+2o/oo contour	6.7	3.6
+3o/oo contour	4.5	2.4
+4o/oo contour	3.4	1.9

Plume Downstream Length	(km)	(nm)
+1o/oo contour	6.3	3.4
+2o/oo contour	4.6	2.5
+3o/oo contour	3.4	1.9
+4o/oo contour	2.9	1.5

Plume Upstream Length	(km)	(nm)
+1o/oo contour	3.7	2.0
+2o/oo contour	2.6	1.4
+3o/oo contour	1.9	1.0
+4o/oo contour	1.4	.8

°C = degrees Celsius; ft = feet; m/s = meters/second; ft/s = feet/second; in = inches; m^3/s = cubic meters/second; m = meters; km = kilometer; km^2 = square kilometers; o/oo = parts per thousand; nm = nautical miles; nm^2 = square nautical miles

Table C-1-2: Predicted Characteristics of Typical Scenario Brine Plume at Stratton Ridge Expansion Diffuser Site

Strattom Ridge (typical)

Amb. Bottom Sal.(o/oo)	31.00
Amb. Bottom Temp.(oC)	22.00
Depth(ft.)	30.00
Amb. Bottom Cur.(m/s)	.09
Amb. Top of Sal.(o/oo)	31.00
Brine Sal.(o/oo)	263.00
Brine Temp.(oC)	20.00
Num. open ports	53.00
Jet Exit Vel.(ft/s)	30.00
Port Dia(in)	3.00
Brine discharge rate(m3/s) =	2.2
Brine discharge rate(barrel/day x 10-6)=	1.2
Maximum above ambient bottom salinity (o/oo)=	4.3
Vertical extent(m) =	5.7
Vertical extent(ft) =	18.5

Plume Areal Extent	(km2)	(nm2)	(acresx10e-3)
+1o/oo contour	23.2	6.8	5.7
+2o/oo contour	12.7	3.7	3.1
+3o/oo contour	6.3	1.8	1.6
+4o/oo contour	3.7	1.1	.9

Plume Width	(km)	(nm)
+1o/oo contour	4.8	2.6
+2o/oo contour	3.6	1.9
+3o/oo contour	2.4	1.3
+4o/oo contour	1.6	.9

Plume Downstream Length	(km)	(nm)
+1o/oo contour	3.4	1.8
+2o/oo contour	2.4	1.3
+3o/oo contour	1.8	1.0
+4o/oo contour	1.5	.8

Plume Upstream Length	(km)	(nm)
+1o/oo contour	1.7	.9
+2o/oo contour	1.2	.6
+3o/oo contour	.9	.5
+4o/oo contour	.6	.3

Strattom Ridge (Maximum)

Amb. Bottom Sal.(o/oo)	25.00
Amb. Bottom Temp.(oC)	15.00
Depth(ft.)	30.00
Amb. Bottom Cur.(m/s)	.03
Amb. Top of Sal.(o/oo)	25.00
Brine Sal.(o/oo)	263.00
Brine Temp.(oC)	20.00
Num. open ports	53.00
Jet Exit Vel.(ft/s)	30.00
Port Dia(in)	3.00
Brine discharge rate(m3/s) =	2.2
Brine discharge rate(barrel/day x 10-6)=	1.2
Maximum above ambient bottom salinity (o/oo)=	4.7
Vertical extent(m) =	5.6
Vertical extent(ft) =	18.4

Plume Areal Extent	(km2)	(nm2)	(acresx10e-3)
+1o/oo contour	78.3	22.8	19.3
+2o/oo contour	44.4	12.9	11.0
+3o/oo contour	23.0	6.7	5.7
+4o/oo contour	13.8	4.0	3.4

Plume Width	(km)	(nm)
+1o/oo contour	8.2	4.4
+2o/oo contour	6.5	3.5
+3o/oo contour	4.3	2.3
+4o/oo contour	3.3	1.8

Plume Downstream Length	(km)	(nm)
+1o/oo contour	6.2	3.3
+2o/oo contour	4.4	2.4
+3o/oo contour	3.3	1.8
+4o/oo contour	2.8	1.5

Plume Upstream Length	(km)	(nm)
+1o/oo contour	3.6	1.9
+2o/oo contour	2.5	1.4
+3o/oo contour	1.9	1.0
+4o/oo contour	1.4	.7

°C = degrees Celsius; ft = feet; m/s = meters/second; ft/s = feet/second; in = inches; m^3/s = cubic meters/second; m = meters; km = kilometer; km^2 = square kilometers; o/oo = parts per thousand; nm = nautical miles; nm^2 = square nautical miles

Table C-1-3: Predicted Characteristics of Typical and Large Case Brine Plume Contours at Clovelly Expansion Diffuser Site

```
Chovelly (typical)
Amb. Bottom Sal.(o/oo)      31.00
Amb. Bottom Temp.(oC)       22.00
Depth(ft.)                  36.00
Amb. Bottom Cur.(m/s)         .09
Amb. Top of Sal.(o/oo)      31.00
Brine Sal.(o/oo)           263.00
Brine Temp.(oC)             20.00
Num. open ports             22.00
Jet Exit Vel.(ft/s)         30.00
Port Dia(in)                 3.00
Brine discharge rate(m3/s) =          .9
Brine discharge rate(barrel/day x 10-6)=      .5
Maximum above ambient bottom salinity (o/oo)=        4.3
Vertical extent(m) =             5.7
Vertical extent(ft) =            18.5
```

Plume Areal Extent	(km2)	(nm2)	(acresx10e-3)
+1o/oo contour	11.4	3.3	2.8
+2o/oo contour	5.9	1.7	1.5
+3o/oo contour	2.8	.8	.7
+4o/oo contour	1.5	.4	.4

Plume Width	(km)	(nm)
+1o/oo contour	3.7	2.0
+2o/oo contour	2.7	1.4
+3o/oo contour	1.7	.9
+4o/oo contour	1.1	.6

Plume Downstream Length	(km)	(nm)
+1o/oo contour	2.6	1.4
+2o/oo contour	1.8	1.0
+3o/oo contour	1.3	.7
+4o/oo contour	1.1	.6

Plume Upstream Length	(km)	(nm)
+1o/oo contour	1.1	.6
+2o/oo contour	.8	.4
+3o/oo contour	.6	.3
+4o/oo contour	.4	.2

```
Chovelly
Amb. Bottom Sal.(o/oo)      25.00
Amb. Bottom Temp.(oC)       15.00
Depth(ft.)                  36.00
Amb. Bottom Cur.(m/s)         .03
Amb. Top of Sal.(o/oo)      25.00
Brine Sal.(o/oo)           263.00
Brine Temp.(oC)             20.00
Num. open ports             22.00
Jet Exit Vel.(ft/s)         30.00
Port Dia(in)                 3.00
Brine discharge rate(m3/s) =          .9
Brine discharge rate(barrel/day x 10-6)=      .5
Maximum above ambient bottom salinity (o/oo)=        4.7
Vertical extent(m) =             5.6
Vertical extent(ft) =            18.4
```

Plume Areal Extent	(km2)	(nm2)	(acresx10e-3)
+1o/oo contour	34.3	10.0	8.5
+2o/oo contour	19.0	5.5	4.7
+3o/oo contour	9.7	2.8	2.4
+4o/oo contour	5.7	1.7	1.4

Plume Width	(km)	(nm)
+1o/oo contour	5.9	3.2
+2o/oo contour	4.5	2.4
+3o/oo contour	3.0	1.6
+4o/oo contour	2.2	1.2

Plume Downstream Length	(km)	(nm)
+1o/oo contour	4.3	2.3
+2o/oo contour	3.1	1.7
+3o/oo contour	2.3	1.2
+4o/oo contour	1.9	1.0

Plume Upstream Length	(km)	(nm)
+1o/oo contour	2.3	1.2
+2o/oo contour	1.6	.9
+3o/oo contour	1.2	.6
+4o/oo contour	.9	.5

°C = degrees Celsius; ft = feet; m/s = meters/second; ft/s = feet/second; in = inches; m^3/s = cubic meters/second; m = meters; km = kilometer; km^2 = square kilometers; o/oo = parts per thousand; nm = nautical miles; nm^2 = square nautical miles

Table C-1-4: Predicted Characteristics of Typical and Large Case Scenarios of Brine Plume Contours at Chacahoula Expansion Diffuser Site

Chacahoula (typical)	
Amb. Bottom Sal.(o/oo)	31.00
Amb. Bottom Temp.(oC)	22.00
Depth(ft.)	30.00
Amb. Bottom Cur.(m/s)	.09
Amb. Top of Sal.(o/oo)	31.00
Brine Sal.(o/oo)	263.00
Brine Temp.(oC)	20.00
Num. open ports	45.00
Jet Exit Vel.(ft/s)	30.00
Port Dia(in)	3.00
Brine discharge rate(m3/s) =	1.9
Brine discharge rate(barrel/day x 10-6)=	1.0
Maximum above ambient bottom salinity (o/oo)=	4.3
Vertical extent(m) =	5.7
Vertical extent(ft) =	18.5

Plume Areal Extent	(km2)	(nm2)	(acresx10e-3)
+1o/oo contour	20.2	5.9	5.0
+2o/oo contour	10.9	3.2	2.7
+3o/oo contour	5.4	1.6	1.3
+4o/oo contour	3.1	.9	.8

Plume Width	(km)	(nm)
+1o/oo contour	4.6	2.5
+2o/oo contour	3.4	1.8
+3o/oo contour	2.2	1.2
+4o/oo contour	1.5	.8

Plume Downstream Length	(km)	(nm)
+1o/oo contour	3.2	1.7
+2o/oo contour	2.3	1.2
+3o/oo contour	1.7	.9
+4o/oo contour	1.4	.7

Plume Upstream Length	(km)	(nm)
+1o/oo contour	1.5	.8
+2o/oo contour	1.1	.6
+3o/oo contour	.8	.4
+4o/oo contour	.6	.3

Chacahoula	
Amb. Bottom Sal.(o/oo)	25.00
Amb. Bottom Temp.(oC)	15.00
Depth(ft.)	30.00
Amb. Bottom Cur.(m/s)	.03
Amb. Top of Sal.(o/oo)	25.00
Brine Sal.(o/oo)	263.00
Brine Temp.(oC)	20.00
Num. open ports	45.00
Jet Exit Vel.(ft/s)	30.00
Port Dia(in)	3.00
Brine discharge rate(m3/s) =	1.9
Brine discharge rate(barrel/day x 10-6)=	1.0
Maximum above ambient bottom salinity (o/oo)=	4.7
Vertical extent(m) =	5.6
Vertical extent(ft) =	18.4

Plume Areal Extent	(km2)	(nm2)	(acresx10e-3)
+1o/oo contour	66.9	19.5	16.5
+2o/oo contour	37.8	11.0	9.3
+3o/oo contour	19.6	5.7	4.8
+4o/oo contour	11.7	3.4	2.9

Plume Width	(km)	(nm)
+1o/oo contour	7.7	4.2
+2o/oo contour	6.0	3.3
+3o/oo contour	4.0	2.2
+4o/oo contour	3.1	1.7

Plume Downstream Length	(km)	(nm)
+1o/oo contour	5.8	3.1
+2o/oo contour	4.1	2.2
+3o/oo contour	3.1	1.7
+4o/oo contour	2.6	1.4

Plume Upstream Length	(km)	(nm)
+1o/oo contour	3.3	1.8
+2o/oo contour	2.3	1.3
+3o/oo contour	1.7	.9
+4o/oo contour	1.3	.7

°C = degrees Celsius; ft = feet; m/s = meters/second; ft/s = feet/second; in = inches; m^3/s = cubic meters/second; m = meters; km = kilometer; km^2 = square kilometers; o/oo = parts per thousand; nm = nautical miles; nm^2 = square nautical miles

Table C-1-5: Predicted Characteristics of Typical Scenario Brine Plume Contours at Richton Expansion Diffuser Site

Richton Dome (typical)	
Amb. Bottom Sal.(o/oo)	31.00
Amb. Bottom Temp.(oC)	22.00
Depth(ft.)	47.00
Amb. Bottom Cur.(m/s)	.09
Amb. Top of Sal.(o/oo)	31.00
Brine Sal.(o/oo)	263.00
Brine Temp.(oC)	20.00
Num. open ports	45.00
Jet Exit Vel.(ft/s)	30.00
Port Dia(in)	3.00
Brine discharge rate(m3/s) =	1.9
Brine discharge rate(barrel/day x 10-6)=	1.0
Maximum above ambient bottom salinity (o/oo)=	4.3
Vertical extent(m) =	5.7
Vertical extent(ft) =	18.5

Plume Areal Extent	(km2)	(nm2)	(acresx10e-3)
+1o/oo contour	20.2	5.9	5.0
+2o/oo contour	10.9	3.2	2.7
+3o/oo contour	5.4	1.6	1.3
+4o/oo contour	3.1	.9	.8

Plume Width	(km)	(nm)
+1o/oo contour	4.6	2.5
+2o/oo contour	3.4	1.8
+3o/oo contour	2.2	1.2
+4o/oo contour	1.5	.8

Plume Downstream Length	(km)	(nm)
+1o/oo contour	3.2	1.7
+2o/oo contour	2.3	1.2
+3o/oo contour	1.7	.9
+4o/oo contour	1.4	.7

Plume Upstream Length	(km)	(nm)
+1o/oo contour	1.5	.8
+2o/oo contour	1.1	.6
+3o/oo contour	.8	.4
+4o/oo contour	.6	.3

Richton Dome	
Amb. Bottom Sal.(o/oo)	25.00
Amb. Bottom Temp.(oC)	15.00
Depth(ft.)	47.00
Amb. Bottom Cur.(m/s)	.03
Amb. Top of Sal.(o/oo)	25.00
Brine Sal.(o/oo)	263.00
Brine Temp.(oC)	20.00
Num. open ports	45.00
Jet Exit Vel.(ft/s)	30.00
Port Dia(in)	3.00
Brine discharge rate(m3/s) =	1.9
Brine discharge rate(barrel/day x 10-6)=	1.0
Maximum above ambient bottom salinity (o/oo)=	4.7
Vertical extent(m) =	5.6
Vertical extent(ft) =	18.4

Plume Areal Extent	(km2)	(nm2)	(acresx10e-3)
+1o/oo contour	66.9	19.5	16.5
+2o/oo contour	37.8	11.0	9.3
+3o/oo contour	19.6	5.7	4.8
+4o/oo contour	11.7	3.4	2.9

Plume Width	(km)	(nm)
+1o/oo contour	7.7	4.2
+2o/oo contour	6.0	3.3
+3o/oo contour	4.0	2.2
+4o/oo contour	3.1	1.7

Plume Downstream Length	(km)	(nm)
+1o/oo contour	5.8	3.1
+2o/oo contour	4.1	2.2
+3o/oo contour	3.1	1.7
+4o/oo contour	2.6	1.4

Plume Upstream Length	(km)	(nm)
+1o/oo contour	3.3	1.8
+2o/oo contour	2.3	1.3
+3o/oo contour	1.7	.9
+4o/oo contour	1.3	.7

°C = degrees Celsius; ft = feet; m/s = meters/second; ft/s = feet/second; in = inches; m^3/s = cubic meters/second; m = meters; km = kilometer; km^2 = square kilometers; o/oo = parts per thousand; nm = nautical miles; nm^2 = square nautical miles

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Appendix D
Common and Scientific Names of Species

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Appendix D
Common and Scientific Names of Species

Appendix D identifies the scientific names for all common species described in section 3.7 Biological Resources. All the scientific names for special status species, such as threatened or endangered species, are provided in appendices F, G, and H on the biological screening for Louisiana, Mississippi, and Texas, respectively.

The lists are organized by common name and divided into separate lists for plants and wildlife. The scientific names were verified using the following reference sources:

NatureServe. 2005. *NatureServe Explorer: An online encyclopedia of life [web application]*. 3-Version 4.6. Arlington, Virginia. NatureServe. Accessed March 28, 2006 at http://www.natureserve.org/explorer

Smithsonian National Museum of Natural History: Mammal Species of the World (MSW). Accessed March 28, 2006 at http://nmnhgoph.si.edu/cgi-bin/wdb/msw/names/form

Rodnreel.com. Gulf Fish Database. Accessed March 28, 2006 at http://www.rodnreel.com/gulffish/gulffish.asp?cmd=LIST&mode=CN

Native Trees of Texas. Accessed March 28, 2006 at http://aggie-horticulture.tamu.edu/ornamentals/natives/ indexcommon.htm

Little, E.I. 1980. National Audubon Society Field Guide to North American Trees. Knopf, New York.

Thieret, J.W., W.A. Niering, and N.C. Olmstead. 2001. National Audubon Society Field Guide to North American Wildflowers Eastern Region. Knopf, New York.

Table D-1: Plant Names

Common Name	**Scientific Name**
Arrowhead	*Sagittaria spp.*
Ash	*Fraxinus spp.*
Bald Cypress	*Taxodium distichum*
Black Willow	*Salix nigra*
Blackberry	*Rubus spp.*
Blackjack Oak	*Quercus marilandica*
Box Elder	*Acer negundo*
Bulrush	*Scirpus spp.*
Chinese Tallowtree	*Sapium sebiferum*
Clearweed	*Pilea pumila*
Deer Pea Vetch	*Vicia ludoviclana Nutt.*
Goldenrod	*Solidago spp.*
Grape	*Vitis spp.*
Greenbriar	*Smilax spp.*
Hackberry	*Celtis occidentalis L.*
Hickory	*Carya spp.*
Holly	*Ilex spp.*
Horsetail	*Equisetum arvense L.*
Kudzu	*Pueraria lobata*
Live Oak	*Quercus virginiana*
Oak	*Quercus spp.*
Palmetto	*Serenoa repens*
Pigweed	*Amaranthus spp.*
Pitcher Plant	*Sarracenia spp.*
Post Oak	*Quercus stellata*
Pumpkin Ash	*Fraxinus profunda*
Rattlebush	*Sesbania spp.*
Red Maple	*Acer rubrum*
Roseau Cane	*Phragmites communis*
Salt Grass	*Distichlis spicata*
Salt Meadow Cordgrass	*Spartina patens*
Sedge	*Carex spp.*
Slash Pine	*Pinus elliotii*
Smartweed	*Polygonum coccineum*
Southern Arrowwood	*Viburnum dentatum*
Spanish Moss	*Tillandsia usneoides*
Spike-rush	*Eleocharis quadrangulata*
Sweet Gum	*Liquidambar styraciflua*
Thistle	*Cardous spp.*
Trumpet Creeper	*Campsis radicans*
Trumpet Vine	*Campsis radicans*
Tupelo	*Nyssa spp.*

Table D-1: Plant Names

Common Name	**Scientific Name**
Virginia Creeper	*Parthenocissus quinquefolia*
Virginia Glasswort	*Salicornia virginica*
Water Ash	*Fraxinus spp.*
Water Hyacinth	*Eichhornia crassipes*
Water Hyssop	*Bacopa rotundifolia*
Water Oak	*Quercus nigra*
Water Tupelo	*Nyssa aquatica*
Winged Elm	*Ulmus alata*
Wiregrass	*Aristida spp.*
Yaupon	*Ilex vomitoria*

Table D-2: Animal Names

Common Name	***Scientific Name***
Alligator	*Alligator mississippiensis*
American Beaver	*Castor Canadensis*
American Crow	*Corvus brachyrhynchos*
American Woodcock	*Scolopax minor*
Armadillo	Family: Dasypodidae
Bass	Family: Sea Basses (*Serranidae)* and Temperate Basses *(Percichthyidae)*
Black Vulture	*Coragyps atratus*
Blue Crab	*Callinectes sapidus*
Bluegill	*Lepomis macrochirus*
Blue-winged Teal	*Anas discors*
Bobcat	*Felis rufus*
Brown Shrimp	*Penaeus aztecus*
Bullfrog	*Rana catesbeiana*
Common Possum	*Didelphis virginiana*
Coyote	*Canis latrans*
Crayfish	Family: Cambaridae
Atlantic Croaker	*Micropogonias undulatus*
Darter	Family: Percidae
Drum	Family: Sciaenidae
Egret	Family: Ardeidae
Feral Pig	*Sus scrofa*
Flounder	Family: Bothidae
Freshwater Catfish	Family: Ictaluridae
Freshwater Eel	Family: Anguillidae
Garter Snake	*Thamnophis sirtalis*
Gizzard Shad	*Dorosoma cepedianum*
Gray Squirrel	*Sciurus carolinensis*
Great Blue Heron	*Ardea herodias*
Heron	Family: Ardeidae
Ibis	Family: Threskiornithidae
Jack	Family: Carangidae
Killifish	Family: Fundulidae
Mink	*Mustela spp.*
Minnow	Family: Cyprinidae
Mottled Duck	*Anas fulvigula*
Mullet	Family: Mugilidae
Muskrat	*Ondatra zibethicus*
Nine Band Armadillo	*Dasypus novemcinctus*
Nutria	*Myocastor coypus*
Owl	Family: Strigidae
Oyster	Family: Ostreidae

Table D-2: Animal Names

Common Name	***Scientific Name***
Perch	Family: Aphredoderidae
Pocket Gopher	Family: Geomyidae
Pugnose Minnow	*Notropis emiliae*
Quail	Family: Odontophoridae
Rabbit	Family: Leporidae
Raccoon	*Procyon lotor*
Red-Eared Slider	*Trachemys scripta*
Red Drum	*Scianenops ocellata*
Red-Tailed Hawk	*Buteo jamaicensis*
River Otter	*Lutra canadensis*
Saltwater Catfish	Family: Ariidae
Slider Turtle	*Chrysemys scripta*
Snapper	*Lutjanus spp.*
Snapping Turtle	*Chelydra serpentina*
Snow Goose	*Chen caerulescens*
Southern Leopard Frog	*Rana sphenocephala*
Stone Crab	*Menippe merceuaria*
Sucker	Family: Catostomidae
Sunfish	Family: Centrarchidae
Swamp Rabbit	*Sylvilagus aquaticus*
Thrush	Family: Turdidae
Trout	Family: Salmonidae
Warbler	Family: Sylviidae
Water Moccasin	*Ancistrodon piscivorus*
Western Diamondback Rattlesnake	Crotalus atrox
White Shrimp	*Penaeus setiferus*
White Tailed Deer	*Odocoileus virginianus*
Wood Duck	*Aix sponsa*
Woodcock	*Philohela minor*
Woodpecker	Family: Picidae

Appendix E
Essential Fish Habitat Assessment

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Essential Fish Habitat Assessment for the Proposed Expansion of the Strategic Petroleum Reserve

Mississippi, Louisiana, and Texas

Prepared for:
NOAA Fisheries

Prepared by:
U.S. Department of Energy
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Appendix E
Essential Fish Habitat Assessment

E.1 INTRODUCTION

This document presents the assessment of the Essential Fish Habitat (EFH) survey conducted by the Department of Energy (DOE) for the proposed expansion of the Strategic Petroleum Reserve (SPR). The assessment fulfills a requirement of the Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended through 1996 (Magnuson-Stevens Act).

This EFH assessment was prepared in conjunction with the Draft Environmental Impact Statement prepared for consideration of the proposed expansion of the SPR.

The objectives of this EFH assessment are to describe how the actions proposed by DOE may affect EFHs designated by the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) and Gulf of Mexico Fisheries Management Council (GMFMC) in the area of proposed project sites. According to the GMFMC, EFHs in the Gulf of Mexico include all estuarine and marine waters and substrates from the shoreline to the seaward limit of the Exclusive Economic Zone. The Exclusive Economic Zone is the area under national jurisdiction (up to 200-nautical miles [370 kilometers] wide) declared in line with the provisions of 1982 United Nations Convention of the Law of the Sea, within which the coastal nation has the right to explore and exploit, and the responsibility to conserve and manage, the living and non-living resources.

This assessment describes the proposed action and analyzes the direct and indirect effects on EFHs for the managed fish species and their major food sources. This assessment also presents the conclusions regarding the effects of the proposed action and alternatives and proposed mitigation measures.

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E.2 PROJECT DESCRIPTION

The Strategic Petroleum Reserve (SPR) was created in the 1970s to protect the United States from interruptions in petroleum supplies that could be detrimental to our energy security, National security, and economy. Congress mandated creation of the SPR in the Energy Policy and Conservation Act (EPCA) of 1975, and established as a national goal the storage of up to 1 billion barrels of crude oil and petroleum products. The current storage capacity of the SPR is 727 million barrels (MMB). Section 301(e) of the Energy Policy Act (EPACT), Public Law 109-58, enacted on August 8, 2005, directs the Secretary of Energy to:

> "… acquire petroleum in quantities sufficient to fill the Strategic Petroleum Reserve to the 1,000,000,000 barrel capacity authorized under Section 154(a) of the Energy Policy and Conservation Act …"

and Section 303 directs:

> "Not later than 1 year after the date of enactment of this Act, the Secretary shall complete a proceeding to select, from sites that the Secretary has previously studied, sites necessary to enable acquisition by the Secretary of the full authorized volume of the Strategic Petroleum Reserve. In such proceeding, the Secretary shall first consider and give preference to the five sites which the Secretary previously assessed in the Draft Environmental Impact Statement, DOE/EIS–0165–D. However, the Secretary in his discretion may select other sites as proposed by a State where a site has been previously studied by the Secretary to meet the full authorized volume of the Strategic Petroleum Reserve."

In response to these directives the purpose and need for agency action is to fill the SPR to the full authorized 1,000,000,000-barrel capacity (1,000-MMB) and by selecting sites to expand the current 727 MMB storage capacity.

The SPR, which is operated by DOE, currently consists of four underground oil storage facilities along the Gulf Coast: two in Louisiana (Bayou Choctaw and West Hackberry) and two in Texas (Big Hill and Bryan Mound). In addition, an administrative facility is located in New Orleans, LA. At the storage facilities, crude oil is stored in caverns constructed by the solution mining of rock salt formations (salt domes). The four SPR facilities have a current storage capacity of 727 MMB.

E.2.1 Proposed Action and Alternatives

The proposed action is to expand SPR storage capacity from its existing storage capacity of 727 MMB to 1 billion barrels (1,000 MMB). To obtain the additional 273 MMB of storage capacity, DOE would develop one of the following new sites:

- Bruinsburg, MS (160 MMB);
- Chacahoula, LA ((160 MMB);
- Clovelly, LA (120 MMB);
- Clovelly (80 or 90 MMB) and Bruinsburg (80 MMB);
- Richton, MS (160 MMB); or
- Stratton Ridge, TX (160 MMB)

In addition to developing a new site or a combination of two new sites, DOE would expand capacity at existing DOE SPR sites, namely Big Hill, TX, and possibly at Bayou Choctaw, LA, and/or West

Hackberry, LA. DOE will consider a 72, 80, 84, 96, or 108 million barrel capacity expansion at Big Hill, a 20 or 30 million barrel capacity expansion at Bayou Choctaw, and no expansion or a 15 million barrel capacity expansion at West Hackberry.

These combinations of potential new and expansion sites will allow DOE to assess a wide range of alternative configurations to achieve the 1 billion barrel storage capacity, as mandated by the Energy Policy Act of 2005. The assessment of each site will include consideration of ancillary offsite facilities including pipelines to crude oil transportation and distribution complexes.

For the proposed new and expansion sites, DOE would create oil storage caverns in underground rock salt formations, except for West Hackberry where DOE would buy existing caverns. Caverns would be constructed through a technique known as solution mining using fresh or salt water. Leaching generates approximately 80 million barrels of concentrated brine wastewater per 10 million barrels in cavern space created. This wastewater would be disposed of either by pipeline to diffusers in the Gulf of Mexico or to an array of underground injection wells.

To supply the water to a new site, a raw water intake structure would be constructed offsite in a surface water body (a canal, the Intracoastal Waterway, the Mississippi River, or the Leaf River). The water and brine systems for leaching caverns would be sized to supply up to 1.2 million barrels per day and the crude oil distribution system would be designed for drawdown up to one million barrels per day. The proposed expansions of existing SPR facilities would, in general, use the existing infrastructure and pipelines of the oil storage site. The location of the existing and proposed offshore pipelines and diffusers are shown in figures E.5-1 through E.5-5.

Brine from three of the sites (Bruinsburg, Bayou Choctaw, and West Hackberry) would be injected into the deep subsurface aquifer via injection wells. At the remaining sites listed below, brine would be discharged into the Gulf of Mexico through diffusers. Brine discharge via pipeline rights-of-way (ROWs) to the Gulf of Mexico would occur at the following proposed sites (see figure E.2-1: Proposed Locations of SPR Brine Diffusers in the Gulf of Mexico).

- Chacahoula, LA (new site, brine pipeline, and diffuser);
- Clovelly, LA (new site with brine discharged through an existing diffuser at the LOOP facility);
- Clovelly-Bruinsburg (new sites with brine from Clovelly discharged through an existing diffuser at the LOOP facility);
- Richton, MS (new site, brine pipeline, and diffuser);
- Stratton Ridge, TX (new site, brine pipeline, and diffuser); and
- Big Hill, TX (expansion of existing SPR brine would discharge through an existing diffuser).

E.3 ESSENTIAL FISH HABITAT

Essential fish habitat is defined in the Sustainable Fisheries Act (1996) as those “waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” The identification of the different habitat types in the Gulf of Mexico region has several different types of EFH that are necessary for one commercially important species or another during different stages of their life cycle.

The different types of EFH identified in the proposed project areas would be affected by construction of the brine disposal pipelines. The daily operation of the facility, including periodic maintenance of pipeline ROWs and the discharge of brine and brine diffusion, would have much less potential to affect these habitats. The project does not propose to construct RWI structures in EFH areas.

E.3.1 Estuarine Emergent Wetlands

An estuary is a semi-enclosed coastal body of water which has a free connection with the open sea and within which sea water mixes with fresh water. The key feature of an estuary is that it is a mixing place for sea water and a stream or river to supply fresh water. A tide is a necessary component to maintain a dynamic relationship between the two waters. Estuaries occur on submerged coasts where the sea level has risen in relation to the land.

Emergent wetlands are wetlands that are defined by erect, rooted, herbaceous hydrophytic plants. The estuarine environment is defined by the presence of ocean-derived salt with salinity greater than 0.5 percent, and the area is partially or wholly enclosed by land, but it is influenced by oceanic and freshwater sources. Estuarine emergent wetlands are defined in a similar way to estuarine environment, characterized by erect, rooted, herbaceous hydrophytes, but are dominated by halophytic plants such as smooth cord grass (*Spartina alterniflora*).

The estuarine emergent wetlands are a prevalent habitat type along the Gulf Coast. The estuarine emergent wetlands go through periods during low tides when most of the water has receded from the vegetated area, leaving the plants and substrate exposed. These areas are important nurseries for juvenile species of fish and invertebrates. The vegetation provides protection and shelter from larger predators and offers a small habitat for the species to mature (Cowardin, 1979).

E.3.2 Mud, Sand, and Shell Substrates

The different commercially important species found in the Gulf Coast region show preferences to different types of substrates. Species such as shrimp would prefer the muddy substrate because it allows them to forage for food that lives in the substrate. Aside from the commercially important species that can be found in the area, many species of mollusks, polychaetes, oligochaetes, and annelids can be found in or on the muddy or sandy substrate.

The shell substrate is created by oysters that form large reefs, creating an entirely different substrate type. Similar to the sand and mud substrate, many other non-commercially important species can be found in this habitat. Some juvenile fish use these areas for feeding and protection from predators.

E.3.3 Submerged Aquatic Vegetation

Submerged aquatic vegetation, as defined by the Gulf of Mexico Fishery Management Council, is “rooted vascular plants that, except for some flowering structures, live and grow below the water surface.” Submerged aquatic vegetation is a sensitive type of EFH, and often accommodates many managed species in the Gulf during some life stage. The offshore brine pipelines associated with Stratton Ridge and Richton may encounter submerged aquatic vegetation during the construction process. DOE would attempt during the more detailed design stage to avoid these areas during the formal pipeline survey and alignment.

Near Stratton Ridge, there are several different species of submerged aquatic vegetation that occur in the Galveston Bay ecosystem. The different types of submerged aquatic vegetation are shoalgrass (*Halodule wrightii*), wigeongrass (*Ruppia maritima*), and turtle grass (*Thalassia testudinum*). These grasses occur mostly to the northeast in Christmas Bay and Drum Lake, away from the brine pipeline ROW.

The brine pipeline associated with the proposed Richton site would pass near the areas of seagrasses in the Gulf Islands National Shoreline. The species of seagrasses that exist in the proposed project site are shoalgrass (*Halodule wrightii*), wigeongrass (*Ruppia maritima*), and manatee grass (*Syringodium filiforme*). The seagrass beds are sporadically located throughout the system along the barrier islands. Shoalgrass and manatee grass are found on the northern side of the barrier islands in the Gulf Islands National Shoreline where they are protected from the higher wave energy of the open Gulf.

E.3.4 Estuarine and Marine Water Columns

The water column makes up the largest portion of the habitat types in the aquatic environment. The pelagic ecosystem can be home to many species of commercially important fishes. Species such as greater amberjack, tunas, dolphinfish, and cobia are all pelagic species that are found in the Gulf of Mexico. The water column is equally important in the estuarine environment; many of the top tier predators and commercially important species can be found in the pelagic environment. The pelagic environment is home to phytoplankton, the primary producers of the water column, and the start of the food web.

E.3.5 Artificial Reefs

Artificial reefs are manmade structures that create habitat for marine life. These structures can include concrete rubble, sunken ships, and oil rigs (active and decommissioned). Objects used for creation of artificial reefs depend on the water depth. Shallow waters (72-102 feet, 21-31 meters) use concrete rubble, old bridges, and concrete scrap, and beyond 102 feet (31 meters) use decommissioned oil rigs, and even deeper waters that can be home to sunken ships (Texas Parks and Wildlife, 2006). Each of the states along the Gulf has created artificial reef programs that aim to aid operating companies in ecologically sound disposal of decommissioned oil rigs and ships for the conversion to artificial reefs. These artificial reefs provide new, artificial habitat for marine life in areas that may otherwise be devoid of benthic structure. Many fishes can be found associated with the artificial reefs, including snappers, groupers, jacks, sharks, and some reef species.

The larger artificial reefs, for the most part, are located in deeper waters than the proposed brine pipelines or diffusers—beyond 17 fathoms (102 feet, 31 meters). It is not expected that the brine disposal system, would adversely affect the artificial reefs of the Gulf of Mexico. The maximum depth at the terminus of the brine diffusers for any of the sites would be 47 feet (14 meters) for the proposed Richton site. This depth is within the limits of the use of concrete rubble for artificial reefs but not within the depth acceptable for the use of oil rigs and ships.

E.4 MANAGED SPECIES

Many species found in the Gulf of Mexico are highly valued for commercial purposes. Whether taken to market, processed for meal, or used for supplement extraction, these species require management for the prevention of over-harvesting. NOAA Fisheries and the equivalent state agencies are the two main bodies that work to manage fisheries in the United States. Under the guidance of the Magnuson-Stevens Fisheries Conservation and Management Act and the Sustainable Fisheries Act, NOAA Fisheries and the respective state agencies have created their own guidelines with limits and quotas for the management of the fisheries within their waters.

The species assessed in this document are those most likely to occur within the project areas. Other managed species were considered and determined to be unaffected by the proposed project because of two main factors: (1) they do not occur in shallow waters; or (2) they do not occur in the geographic project area.

E.4.1 Shrimp Fishery

The shrimp fishery is an economically important fishery in the Gulf of Mexico. The shrimp fishery is composed of three different species, which are harvested in commercial quantities throughout the Gulf Coast region. The three main species harvested are the brown, pink, and white shrimp. Each of these species has commercial importance throughout the different proposed project areas.

E.4.1.1 Brown Shrimp

Although they are most abundant in the central and western part of the Gulf of Mexico, brown shrimp (*Farfantepenaeus aztecus*) occur throughout the coastal Gulf region and its associated inshore estuarine environments. Brown shrimp larvae are found offshore, but migrate to inshore estuaries as postlarvae, with the height of migration occurring in late winter and early spring. The silt and mud substrate common to Gulf estuaries provides the juvenile brown shrimp diet, which includes detritus, algae, polychaetes, amphipods, nematodes, ostracods, chironomid larvae, and mysids (Lassuy, 1983). As adults, brown shrimp move from estuaries to areas further offshore, and they can be found at water depths of up to 360 feet (109 meters). Adults will reach maturity within a year of moving offshore. Typically, fluctuations in temperature or salinity levels do not cause direct mortality. Postlarvae and juveniles have been collected in salinity levels up to 70 parts per thousand (GMFMC, 1998a), but that level may reduce vigor and increase vulnerability to predation. In addition, juveniles may leave estuaries early if large freshwater inflows occur and lower the salinity concentration (Larson, et al., 1989).

E.4.1.2 Pink Shrimp

Pink shrimp (*Farfantepanaeus duorarum*) larvae begin life offshore, but juveniles move to estuarine and coastal bay nursery areas with soft sand or mud substrate mixture containing sea grasses. Recruitment of the postlarvae most often occurs in the spring and late fall during flood tides. The juveniles, which remain in nursery areas for 2 to 6 months, forage at night or in turbid conditions during the day. During this time, juvenile pink shrimp prey on a wide variety of organisms including foraminifera, diatoms, dinoflagellates, nematodes, polychaetes, and others (Bielsa, et al., 1983). Potential prey species for juvenile pink shrimp are vulnerable to dredging activities, such as would be required for laying and burying the brine pipelines, but they would recover quickly (Culter and Mahadevan, 1982). After the juveniles reach a certain length, they move offshore, with the principal peak of emigration from nurseries occurring in the fall. Adult pink shrimp are most commonly found at a depth of between 29 and 144 feet (9 and 44 meters), but have been found as deep as 361 feet (110 meters). Spawning for adult pink shrimp most often occurs in the spring, but they can spawn at any time year-round, usually at depths between 12 and 156 feet (4 and 48 meters).

Pink shrimp prefer different salinity levels at various life stages. Post-larval and juvenile shrimp are generally found at lower salinities in their estuarine environments, and they have been collected at salinities as low as between 12 and 5 parts per thousand, respectively. Adult pink shrimp prefer saltier oceanic water; they have been collected from seawater ranging in salinity from 25 to 45 parts per thousand (Bielsa et al., 1983).

E.4.1.3 White Shrimp

Like pink and brown shrimp, white shrimp (*Litopenaeus setiferus*) are offshore and estuarine dwellers that are pelagic as larvae and become demersal depending on their life stage. Two to three weeks after they hatch offshore, postlarval white shrimp travel to estuaries that serve as nursery areas (Williams, et al., 1990). Juvenile white shrimp seek shallow water with muddy-sand bottoms, and they are invaluable for coastal food chains because they recycle organic matter by feeding on organic matter and detritus in the sediment (Williams, et al., 1990). As juveniles mature, they move to nearshore, demersal habitats that are less than 100 feet (30 meters) deep and generally prefer muddy substrates. Like the brown shrimp, white shrimp prefer higher salinity waters as they mature from the juvenile to adult life stage. Spawning will only occur in waters where salinity is at least 27 parts per thousand, and the depth is between 26 and 101 feet (8 and 31 meters).

E.4.2 Red Drum Fishery

The red drum (*Sciaenops ocellatus*) is one of the most economically important fish in the Gulf of Mexico. Although commercial harvest is not permitted, recreational capture is allowed. The red drum is common throughout the Gulf Coast system, most prevalent in the bays and estuaries, but it can be found along the beachfronts in areas with elevated salinities. The majority of the life cycle is spent in bays and estuaries, and red drum only venture offshore for spawning. The eggs and early larval stage follow the currents and migrate back into the bays and estuaries.

Red drums are found in both marine nearshore habitats and estuarine waters, most commonly over sandy bottoms where they prey on fish, crabs, shrimp, sand dollars, and other invertebrates (Manooch, 1984). Larvae are found in vegetated or unvegetated bottoms in estuaries, tidal flats, and open bays at temperatures ranging from 64 to 87 ^{o}F (18 to 31 ^{o}C), and salinities ranging from 16 to 36 parts per thousand. Optimal conditions are considered to be 77 ^{o}F (25 ^{o}C) and 30 parts per thousand for this species (Buckley, 1984; Holt, et al., 1981; Pattillo, et al., 1997; Peters and McMichaels, 1987). Early juveniles are found in backwaters, tidal flats, primary and secondary bays, and open water mud bottoms at depths up to 9.8 feet (3 meters) and temperatures ranging from 54 to 90 ^{o}F (12 to 32 ^{o}C), and salinities from 0 to 45 parts per thousand (20 to 40 parts per thousand optimal) (Buckley, 1984; Holt, et al., 1981; Pattillo, et al., 1997; Peters and McMichaels, 1987; GMFMC, 1998b).

Juveniles cannot survive in ponds with less than 0.6 to 1.8 parts per million dissolved oxygen. Late juveniles are found in continental shelf and inshore waters at depths slightly greater than those of early juveniles, with temperatures ranging from 71 to 84 ^{o}F (22 to 29 ^{o}C) and salinities ranging from 25 to 45 parts per thousand (Buckley, 1984; Holt, et al., 1981; Pattillo, et al., 1997; Peters and McMichaels, 1987). Adult red drums are found in continental shelf and inshore waters at depths from 131 to 229 feet (40 to 70 meters), temperatures ranging from 35 to 91 ^{o}F (2 to 33 ^{o}C), and typical salinities of 30 to 35 parts per thousand, although the species can tolerate up to 50 parts per thousand (Lyczkowski-Shultz, et al., 1987; Holt, et al., 1981; Pattillo, et al., 1997; Peters and McMichaels, 1987).

E.4.3 Reef Fishery

In 1984, the Gulf of Mexico Reef Fishery Management Plan was one of the first to be developed by the Gulf Fishery Management Council. The goal outlined in the plan was to, “manage the reef fish fishery of the United States waters of the Gulf of Mexico to attain the greatest overall benefit to the nation with particular reference to food production and recreational opportunities on the basis of maximum sustainable yield as modified by relevant economic, social or ecological factors." A series of amendments to the initial Reef Fishery Management Plan have provided updated policies for 42 species of reef fish that are of commercial or recreational importance in the Gulf of Mexico. Five families of fish—grouper, snapper, tilefish, triggerfish, and jack—account for approximately 95 percent of the reef fish landings in the Gulf. The vast majority of that (about 95 percent by weight) is made up of groupers and snappers (GMFMC, 2004).

The EFHs for reef fish species range from estuarine environments to offshore waters with depths of up to 1,640 feet (500 meters). Many of the species managed under the Reef Fish Management Plan occupy both benthic and pelagic environments depending on life-cycle phase. Larval reef fishes are planktonic, and they occupy the water column feeding on phytoplankton and smaller zooplankton. Some species of reef fish spend their larval phases in estuaries and inland seagrass beds before moving offshore as adults. Mature reef fish are generally demersal, and they are associated with high-relief bottom topographies (e.g., reefs, cliffs and outcroppings) on the continental shelf (GMFMC, 1998c).

Reef fish are also attracted to artificial reefs that may be intentionally constructed to encourage growth of fish stocks, or they may occur incidentally when a structure is constructed for different purposes but doubles as a reef environment. Petroleum operations, particularly in the northwest corner of the Gulf, have led to the construction of several artificial structures that are currently inhabited by Fishery Management Council-regulated species (GMFMC, 1998c).

E.4.3.1 Red Grouper

Red Grouper *(Epinephelus morio)* is the most widely distributed species of grouper and ranges throughout the Gulf of Mexico (Jory and Iversen, 1989). The larval stage for the red grouper lasts from 30 to 40 days, and the species is planktonic in the pelagic zone during that time (Moe, 1969). When the grouper matures to the juvenile phase of the life cycle, it is generally associated with inshore hard-bottom habitat, grassbeds, and rock formations where it preys on demersal crustaceans (Jory and Iversen, 1989). Adult groupers move farther offshore as they grow. They are most often found at depths of 100 to 400 feet (30 to 121 meters) (NOAA Fisheries, 2004). Groupers are most common in areas with average ocean salinities (30 to 35 parts per thousand), although young juveniles may move into waters where salinity is as low as 20 parts per thousand. Spawning adult groupers must inhabit water with salinity of at least 32 parts per thousand for the eggs to float (Hardy, 1978; Roe, 1976).

E.4.3.2 Greater Amberjack

Greater amberjacks (*Seriola dumerili*) are abundant in the Gulf of Mexico and are frequently encountered near structures such as reefs, sargassum patches, and oil rigs in waters ranging in depth from 65 to 1,099 feet (20 to 335 meters) (Duedero, et al., 1999; Massuti, et al., 1999). Greater amberjacks are top-level predators that feed on a variety of fishes, crustaceans, and cephalopods (Berry and Smith-Vaniz, 1977). Larvae are found in offshore open waters, most likely in warm, summer temperatures, and typical open Gulf salinity levels of 30 to 35 parts per thousand (Fahay, 1975; Thompson, 2005). Juveniles are pelagic, often associated with rip lines and floating structures, in waters with typical open Gulf salinity levels of 30 parts per thousand and above (Thompson, 2005). Adult greater amberjacks are also pelagic, but have been observed at depths ranging from surface to several hundred feet (meters) deep. Adults prefer waters with typical salinity levels of 30 parts per thousand and above, but become more scarce in waters with temperatures under 64 to 68 °F (18 to 20 °C) (Thompson, 2005; Berry and Smith-Vaniz, 1977; Fahay, 1975; Burch, 1979).

E.4.3.3 Tilefish

Tilefish (*Lopholatilus chamaeleonticeps*) are benthic and inhabit the outer continental shelf in the Gulf of Mexico at depths typically greater than 820 feet (250 meters) and temperatures ranging from 48 to 57 $^{\circ}$F (9 to 14.4 ^{o}C) (Able, et al., 1987; Freeman and Turner, 1977). They are found in and around submarine canyons where they dig burrows in the sedimentary substrate (Nitschke, 2000). They predominately feed on crustaceans, fishes, and other benthic organisms (Freeman and Turner, 1977).

E.4.4 Coastal Migratory Pelagic Fishery

The coastal migratory pelagic fishery comprises many different species. Many top-tier predators such as cobia, dolphinfish, and mackerel are commercially and recreationally sought in the Gulf of Mexico. In addition to the top-tier predators, some primary consumers are important to many commercial fishermen (e.g., gulf menhaden).

E.4.4.1 Cobia

Cobia (*Rachycentron canadum*) are large pelagic fish that are distributed globally in tropical and subtropical waters including the coastal Gulf of Mexico. Cobia larvae occur in estuarine, nearshore and offshore locations, and they can be found near the surface or at depths of up to 984 feet (300 meters). The larvae are known to sustain greater salinity variation than more developed fish, and they can be reared at salinities as low as 19 parts per thousand (Ditty and Shaw, 1992; Hardy, 1978; Hassler and Rainville, 1975). Juvenile nursery and adult habitat overlap and include coastal areas, bays, and river mouths. Adult cobia, surviving on benthic invertebrates, follow general migration patterns—spring and summer in the northern Gulf, winter and fall in the southern Gulf. Spawning for cobia occurs in April through September in the northern Gulf of Mexico (Shaffer, et al., 1989; Boschung, 1957; Meyer and Franks, 1996; Knapp, 1951; Miles, 1949; Reid, 1954; Springer and Woodburn, 1960; Christmas and Waller, 1974). In addition to living in a narrow range of salinities, cobia are attracted to underwater structures such as pilings and wrecks, and they follow floating debris (Mills, 2000).

E.4.4.2 Dolphinfish

Dolphinfish (*Coryphaena hippurus*) are predatory oceanic fish that are limited to waters with high salinities (32 to 35 parts per thousand). They rarely travel to coastal waters (Oceanic Institute, 1993). Spawning of the species is poorly documented, but it is thought to occur nearly year-round in the Gulf, with a peak in the early fall. Dolphinfish larvae grow rapidly and reach maturity within one year of hatching. As with the adults, larvae and juveniles thrive in higher salinities and do not often occur in estuarine or coastal waters (GMFMC, 1998d). Young dolphinfish are most common at depths greater than 590 feet (180 meters), and adults can occur as deep as 5,900 feet (1,800 meters), although they are most common between 131 and 656 feet (40 and 200 meters) (Powles, 1981; Gibbs and Collette, 1959; Schuck, 1951; Ditty, et al., 1994). As with cobia, dolphinfish are attracted to floating objects and often aggregate around floating debris (Palko, et al., 1982). Dolphinfish also thrive in the Mississippi River plume, and they are particularly abundant in waters around the mouth of the Mississippi.

E.4.4.3 Gulf Menhaden

Gulf Menhaden (*Brevoortia patronus*) occur mostly inshore in the Mississippi Delta area in summer and largely move into deeper water in the fall. They feed in dense schools, filtering phytoplankton, but possibly also feed at the bottom. Spawning occurs from October to February, with a peak in January. Salinity tolerance ranges from 0.1 to 60 points per thousand, but the commercial catch is taken mostly from salinity from 5 to 24 parts per thousand. Larvae stay in offshore waters for 3 to 5 weeks before moving into estuaries where they grow into adults (Patillo et al, 1997).

Commercial fisheries target this species because of the versatility they offer with products, from meal, to oils, to foodstuffs. Gulf menhaden are marketed fresh, salted, or canned, but mainly they are used as a source of fish oil and fishmeal. Construction of the SPR facilities and associated pipelines is not expected to have an impact on the commercial fishery.

E.4.4.4 King Mackerel

King mackerel (*Scomberomorus cavalla*) are found throughout the Gulf of Mexico, and they range throughout the neritic zone from close to shore to depths of 656 feet (200 meters). Spawning of king mackerel occurs throughout its range and peaks from May to October. Eggs and larvae are pelagic over depths of 98 to 590 feet (30 to 180 meters); optimally they grow in salinities more than 30 parts per thousand (Dwinell and Futch, 1973; Godcharles and Murphy, 1986; Nakamura, 1987). Although juveniles may occasionally use estuaries as nurseries, they generally live in nearshore shelf waters at depths of less than 29 feet (9 meters). As king mackerel grow, they prey on larger species of pelagic fish and squid, moving farther offshore to the edge of the continental shelf (Godcharles and Murphy, 1986).

E.4.4.5 Spanish Mackerel

Spanish Mackerel (*Scomberomorus maculates*) are primarily a neritic species, but in rare cases they inhabit inshore and estuarine waters (GMFMC, 1998d). Spanish mackerel larvae are most successful in inner continental shelf environments with salinity ranging from 28 to 37 parts per thousand, and at depths greater than 164 feet (50 meters) (Dwinell and Futch, 1973). Spanish mackerel is very similar to king mackerel in diet, and they prey primarily on pelagic fish, especially clupeids, engraulids, and carangids (GMFMC, 1998d).

E.4.5 Spiny Lobster Fishery

Although adult spiny lobsters (*Panulirus argus*) inhabit bays, lagoons, salty estuaries, and shallow banks, spawning for the spiny lobster takes place along the deeper reef fringes. After the larvae hatch, they live in the epipelagic for 6 to 12 months and exist in an offshore environment marked by relatively constant temperature and salinity, low levels of suspended sediments, and few pollutants (GMFMC, 1998f). Recruitment begins when the larval spiny lobsters adopt a secondary morphology with specialized abdominal pleopods that allow the lobsters to migrate to the nearshore. These migrations correspond with new and first quarter lunar phases (Marx and Herrnkind, 1986). The juvenile initially settle in macroalgae beds along rocky shorelines and feed on mollusks and other crustaceans. As the spiny lobster continues to grow and molt, it settles on larger biotic and abiotic structures. Adults eventually inhabit crevices in coral reefs and rock formations. Both the juveniles and adults are stenohaline, and optimally survive in water with a salinity of 32 to 36 parts per thousand (NOAA Panama City Laboratory, 2005; Buesa, 1979; Fields and Butler, 1994).

E.4.6 Highly Migratory Species

According the Fishery Conservation Amendments of 1990, (Public Law 101-627) highly migratory species (HMS) found in the deep waters of the Atlantic Ocean and Gulf of Mexico include: albacore tuna (*Thunnus alalunga*), bigeye tuna (*Thunnus obesus*), bluefin tuna (*Thunnus thynnus*), skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), marlin (*Tetrapturus* spp. and *Makaira* spp.), oceanic sharks, sailfishes (*Istiophorus* spp.), and swordfish (*Xiphias gladius*). These HMS usually feed in deep water.

E.4.6.1 Albacore Tuna

Albacore tuna (*Thunnus alalunga*) are epipelagic and mesopelagic, and are found in oceanic surface waters between 60 to 67 °F (15 to 19 °C); deeper swimming, large albacore are found in waters of 56 to 78 °F (13 to 25 °C); temperatures as low as 49.1 °F (9.5 °C) may be tolerated for short periods. The species is known to concentrate along thermal discontinuities. It forms mixed schools with skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), and bluefin tuna (*T. maccoyii*). Schools may be associated with floating objects including sargassum weeds. Primary prey includes fishes, crustaceans, and squids. Sexual maturity is reached at 35 inches (90 centimeters). Albacore tuna has high market demand.

E.4.6.2 Bigeye Tuna

Bigeye tuna (*Thunnus obesus*) occur in areas where water temperatures range from 55 to 84 °F (13 to 29 °C), but the optimum temperature for the species is between 62 and 71 °F (17 and 22 °C). Variation in occurrence is closely related to seasonal and climatic changes in surface temperature and thermocline. Juveniles and small adults collect in schools at the surface in monospecies groups or mixed with other tunas, and the schools may be associated with floating objects. Adults stay in deeper waters. Eggs and larvae are pelagic. Bigeyes feed on a wide variety of fishes, cephalopods, and crustaceans during the day and at night.

E.4.6.3 Blue Marlin

Blue Marlin (*Makaira nigricans*) is an oceanic species. Water color affects its occurrence, at least in the northern Gulf of Mexico, where the fish show preference for blue water. The species rarely gathers in schools, and it usually occurs as scattered individuals. Blue marlin feed mainly on fishes, but they also prey on octopods and squids. Feeding takes place during daytime. Sexual maturity in males is reached at about 32 inches (82 centimeters) in length and 90 pounds (40 kilograms) and for females 20 inches in length (50 centimeters) and 60 pounds (27 kilograms).

E.4.6.4 Bluefin Tuna

Bluefin Tuna (*Thunnus thynnus*) is primarily an oceanic species, but it can tolerate a wide range of temperatures, and seasonally it comes close to shore. It gathers in schools by size, and sometimes together with albacore, yellowfin, bigeye, skipjack tunas. It preys on small schooling fishes (anchovies, sauries, hakes) or on squids and red crabs. The species is pelagic and oceanodromous, and it is found in brackish to marine waters at a depth range 0 to 9,840 feet (0 to 3,000 meters). Bluefin tuna have become rare because of massive overfishing.

E.4.6.5 Skipjack Tuna

Skipjack tunas (*Katsuwonus pelamis*) are found in offshore waters. The larvae are restricted to waters with surface temperatures of 59 to 86 °F (15 to 30 °C). They exhibit a strong tendency to school in surface waters with birds, drifting objects, sharks, and whales and may show a characteristic behavior like jumping, feeding, foaming, etc. Skipjacks feed on fishes, crustaceans, cephalopods, and mollusks; cannibalism is common. They are preyed upon by large pelagic fishes. Skipjack tunas are marketed fresh, frozen or canned, dried-salted, and smoked. They spawn throughout the year in the tropics.

E.4.6.6 Swordfish

Swordfish are an oceanic species but sometimes are found in coastal waters. They generally live above the thermocline, preferring temperatures of 64 to 71 °F (18 °C to 22 °C). Larvae are frequently encountered at temperatures above 75 °F (24 °C). The larvae migrate toward temperate or cold waters in the summer, and then back to warm waters in the fall. Larger individuals may accumulate high concentrations of mercury in their flesh. In the Atlantic, spawning, which occurs in spring, takes place in the southern Sargasso Sea. The females grow faster than males. Age determination is difficult because the otoliths are very small and scales are missing in adults. Eggs are pelagic and measure 0.06 to 0.07 inches (1.6 to 1.8 millimeters). Newly hatched larvae are 0.16 inches (4 millimeters) long. The sword is well developed at a length of 0.37 inches (10 millimeters), and the young live pelagically in the upper water layers, where they quickly develop into voracious predators. The adults are opportunistic feeders, known to forage for their food from the surface to the bottom over a wide depth range. They use their sword to kill their prey, and feed mainly on fishes, crustaceans, and squids.

E.4.6.7 White Marlin

White Marlin (*Tetrapturus albidus*) are usually found above the thermocline. Its distribution varies seasonally, reaching higher latitudes in both the northern and southern hemispheres only during the respective warm seasons. The species is usually found in deep blue water (328 feet, 100 meters) with surface temperatures higher than 71 °F (22 °C) and salinities of 35 to 37 parts per thousand. Currents of 0.5 to 2 nautical miles per hour (0.9 to 3.7 kilometers per hour) occur over much of its habitat. White marlin feed on fishes and squids.

E.4.6.8 Yellowfin Tuna

Yellowfin Tuna (*Thunnus albacares*) are an oceanic species occurring above and below the thermoclines. They school primarily by size, either in monospecific or multispecies groups. Larger fish frequently gather in schools with porpoises, and they are associated with floating debris and other objects. Yellowfins feed on fishes, crustaceans, and squids. They are sensitive to low concentrations of oxygen, and therefore, they are not usually caught in waters deeper than 820 feet (250 meters) in the tropics. Peak spawning occurs in batches during the summer. Encircling nets are used to catch schools near the surface.

E.4.7 Stone Crab Fishery

The stone crab (*Menippe mercenaria*) fishery is a fairly small market in the northern Gulf of Mexico. The majority of the stone crab market comes from areas in southern Florida or southern Texas. The majority of the fishery is not located within the proposed project areas. Stone crabs do exist within the project area, but not in the larger numbers that exist in the southern Gulf of Mexico.

Stone crab larvae are hatched in the spring and fall in nearshore Gulf environments. The growth of the planktonic larvae depends on salinity and temperature, but stone crabs will usually progress through the larval stage in 14 to 27 days (Lindberg and Marshall, 1994). Juveniles settle in nearshore waters, and they can tolerate a broad range of temperature 46 to 100 ^{0}F (8 to 38 ^{0}C), and salinity (5 to 40 parts per thousand) (Brown, et al., 1992; Ong and Costlow, 1970). Both juveniles and adults are opportunistic carnivores. Adults dig and burrow to hide during hunting. Post-settlement juveniles hide in naturally occurring features such as shell hash habitat, sponges, and mats of seagrass (Culter and Mahadevan, 1982). Although they are occasionally found in the intertidal, adult stone crabs generally inhabit the shallow shelf seagrass flats and are specifically abundant in turtle grass (*Thalassia testudinum*). Adults are euryhaline and can survive in a wide range of salinities; however, they are most common in water with salinity of at least 15 parts per thousand (NOAA Panama City Laboratory, 2005; GMFMC, 1998e).

E.4.8 Snapper Fishery

The snapper fishery comprises many different species, but the primary species sought is the red snapper. The red snapper fishery is strictly regulated because of the sensitivity of the species, and annual bag limits are set based on previous years' landings. The commercial fishing season for red snapper is during the summer, but recreational fishing can take place year round. Other snapper species are also sought, including the gray snapper.

E.4.8.1 Gray Snapper

Gray snappers (*Lutjanus griseus*) are found in coastal and offshore waters associated with seagrass, mangroves, estuaries, lagoons, deep channels, and reefs (NatureServe, 2005). Adults of the species tend to remain in the same area. Juvenile gray snapper prefer inshore areas such as seagrass beds (especially *Thalassia* seagrass), soft- and sand-bottom areas, and mangrove roots (Starck and Schroeder, 1971). Both adults and juveniles have been found in freshwater lakes and rivers in south Florida, which indicates a tolerance of a broad range of salinity levels. Juveniles are typically found in temperatures ranging from 55 to 97 ^{o}F (12 ^{o}C to 36 ^{o}C) and low salinities ranging from 0 to 66 parts per thousand (Rutherford, et al., 1989; Rutherford, et al., 1983). Adults occur in waters with depths of 0 to 591 feet (0 to 180 meters), temperatures from 56 to 90 ^{o}F (13 ^{o}C to 32 ^{o}C), and salinities ranging from 0 to 47 parts per thousand (NatureServe, 2005; Wang and Raney, 1971).

E.4.8.2 Lane Snapper

Adult lane snappers (*Lutjanus synagris*) are found in a variety of habitats throughout its range, but are most commonly observed over reefs and vegetated sandy bottoms in shallow inshore waters (Bester and Murray, 2005). Lane snappers also occur in seagrass beds associated with shrimping areas and offshore waters to depths of 1,300 feet (400 meters) (Bester and Murray, 2005). After they are established, adult lane snappers remain in the same area for their entire lives. Because the lane snapper lives in a wide range of habitats, they are opportunistic predators, feeding on a variety of prey such as smaller fishes, shrimp, cephalopods, gastropods, and crabs. Juveniles prefer protected inshore areas and are often found in waters of low salinity - 15 parts per thousand or less (Bester and Murray, 2005; Erhardt, 1976). Adults are typically found in waters at depths of 13 to 433 feet (4 to 132 meters), temperatures between 60 to 82 ^{o}C (16 ^{o}C and 29 ^{o}C), and high salinities of 30 parts per thousand or greater (Bullis and Jones, 1976; Erhardt,1976).

E.4.8.3 Red Snapper

Red snapper (*Lutjanus campechanus*) larvae and juveniles are found in offshore continental shelf waters at depths ranging from 56 to 600 feet (17 to 183 meters), temperatures ranging from 63 to 85 ^{o}F (17 to 29 ^{o}C), and salinities ranging from 32 to 37 parts per thousand. Juveniles are most often observed in association with structures, objects, or small burrows and they are less likely to be observed over barren bottoms (Collins, et al., 1980; Moseley, 1966). Adults are found in large abundance off the Yucatan, Texas, and Louisiana coasts over areas of hard limestone or gravel bottoms and irregular bottom formations including deep reefs. Adult red snappers are found in waters at depths from 132 to 361 feet (40 to 110 meters), temperatures ranging from 57 to 86 ^{o}F (14 to 30 ^{o}C), and salinities ranging from 33 to 37 parts per thousand. The red snapper is a carnivorous fish, feeding primarily on a variety of smaller fishes, squid, octopus, crustaceans, and mollusks (Bester, 2005b).

E.4.8.4 Yellowtail Snapper

Adult yellowtail snappers (*Ocyurus chrysurus*) are semipelagic, and, typically are found over sandy or hard bottom areas near deep reefs at depths of 32 to 230 feet (10 to 70 meters) (Bester, 2005a). After they are established, adult yellowtail snappers tend to remain in the same area for long periods of time (Bester, 2005a). They feed predominately on benthic and pelagic reef fishes, crustaceans, and mollusks (Randall, 1967; GMFMC, 1980). Juveniles are found in and around shallow seagrass beds (especially *Thalassia* grass), shallow reef areas, mangrove roots, and jetties and pilings in preferred water temperatures of 63 to 85 ^{o}F (24 to 30 ^{o}C) (Thompson and Munro, 1974; Wallace, 1977). Adults are found on deeper reefs, and they tolerate temperatures ranging from 64 to 93 ^{o}F (18 to 34 ^{o}C) (GMFMC, 1980; Thompson and Munro, 1974; Roe, 1976).

E.5 ASSESSMENT OF IMPACTS AND MITIGATIVE MEASURES

As described in section E.2, only five of the proposed new and expansion sites would affect EFH. The locations of the brine disposal pipelines and the modeled brine plumes have been overlain on the designated EFH areas in the figures below for the Richton (figure E.5-1), Big Hill (figure E.5- 2), Stratton Ridge (figure E.5-3), Chacahoula (figure E.5-4), and Clovelly (figure E.5-5) sites. The brine plumes in these figures represent one of the two prevalent current directions. The depiction of the other prevalent current direction can be found in the draft EIS Appendix C on the brine discharge modeling. Based on the designated EFH areas and the species' life histories presented in section E.4, DOE has identified the species of concern in table E.5-1. This table presents the overlap between both estuarine and offshore EFH areas at each of the proposed expansion sites and the species that potentially would be affected.

The potential impacts to the EFH and managed fish species are common across all of the sites that have brine disposal pipelines and brine diffusers. In an effort to consolidate the discussion of impacts, the sites are grouped together as a general category of common impacts. The sites with potentially unique impacts are listed separately.

E.5.1 Common Impacts to the EFH

This section discusses potential impacts to the EFH that are common across multiple locations and are not dependent upon whether the object is an estuarine or marine component of the EFH. Water quality impacts and disruption of the habitat are two examples of the common impacts.

Water quality impacts to the water column would be caused by increased suspension of sediments generated from construction activities. The suspension of sediment in the water column may lead to an increase in heavy metal concentration in suspension and solution, but the effect would be temporary and very localized. The disturbance of the sediments during construction also may cause nutrients to become re-suspended and thereby trigger growth of plankton populations. Table E.5.1-1 shows the approximate footprint of disturbance for each of the alternatives that would occur to the estuarine and marine bottom from the installation of the brine pipeline. The area of disturbance is a very small fraction of the amount of similar habitat within the region.

The main impact on the water column would come from constructing the proposed brine pipelines, which would increase turbidity within the water column. The significance of this impact would depend on the type of substrate located along the ROW, the resettlement rate of the sediment, and the duration of the construction activities. For example, sediment particles of sand size or larger would settle quickly (in a matter of seconds) in the vicinity of the construction activity. On the other hand, smaller silt and clay particles would be transported greater distances by the currents before settling back down to the bottom. If the current velocity is 1 foot per second (0.3 meters per second) and the silt particles take 60 seconds to settle, they might be transported 60 feet (18 meters) from the construction area. There is some probability that the construction could disturb sediments that are contaminated, which would cause potential for contaminants to be released into the water column. DOE is not aware of different conditions among the alternatives that would make it more likely to encounter contaminated sediments.

Offshore pipelines would be strung together on barges and lowered to the floor of the Gulf of Mexico. After the entire offshore pipeline and diffuser had been strung together and placed on the floor of the Gulf of Mexico, a jet-sled would be used to bury the pipeline below the substrate. The jet-sled would direct high velocity water streams below the pipeline, thus removing the sediment below the pipeline and allowing it to sink.

Table E.5-1: Managed Species Potentially Effected By The Candidate Alternatives

	Richton		Big Hill		Stratton Ridge		Chacahoula		Clovelly*	
	Estuary	Offshore	Estuary	Offshore	Estuary	Offshore	Estuary	Offshore	Estuary	Offshore
Cobia	--	X	--	X	--	X	--	X	--	X
Dolphinfish	--	X	--	X	--	X	--	X	--	X
Greater Amberjack	--	X	--	X	--	X	--	X	--	X
King Mackerel	--	X	--	X	X	X	--	X	--	X
Red Drum	X	X	X	X	X	X	X	X	X	X
Red Grouper	--	X	--	X	--	X	--	X	--	X
Spanish Mackerel	--	X	X	X	X	X	--	X	--	X
Tilefish	--	--	--	--	--	--	--	X	--	X
Snapper										
Gray	X	--	X	X	X	X	X	--	X	--
Lane	--	X	--	X	--	X	--	X	--	X
Red	--	--	--	--	--	--	--	X	--	X
Vermillion	--	X	--	--	--	--	--	X	--	X
Yellowtail	--	X	--	X	--	X	--	X	--	X
Gulf Stone Crab	X	--	X	--	X	--	X	--	X	--
Stone Crab	X	X	X	X	X	X	X	X	X	X
Spiny Lobster	--	X	X	X	X	X	X	X	X	X
Shrimp										
Brown	X	X	X	X	X	X	X	X	X	X
Pink	X	X	X	X	X	X	X	X	X	X
White	X	X	X	X	X	X	X	X	X	X

* Note: The Clovelly-Bruinsburg alternative would potentially affect the same species since it would utilize the existing LOOP diffuser.

The other potential impact on the water column would be increased salinity from the brine discharge. The operation of the brine diffuser system would cause some changes to the physiochemical makeup of the water column. The brine discharge would be relatively constant for the duration of cavern solution mining (up to 5 years) and then would occur sporadically for drawdown or cavern maintenance. In the case of the Clovelly-Bruinsburg alternative, the period of brine discharge would only last about 3 to 4 years because of the smaller cavern capacity needed. The brine water would leave the diffusers at a rate of 30 feet per second (9 meters per second), at or near ambient temperature (68 °F, 20 °C), and at a concentration of approximately 263 parts per thousand. The area immediately adjacent to the brine port nozzles would have a modeled estimated salinity increase of 4.3 parts per thousand over the naturally occurring concentration (25 to 31 parts per thousand). (The brine discharge modeling reports that the value of the typical plume would be 4.3 parts per thousand, and the value for the maximum plume would be 4.7 parts per thousand).

Disruption to the species of fish, the EFH, and their prey would occur during the construction of the pipelines and brine diffusers and their operation.

Other common impacts would be caused indirectly to the EFHs or the species. A reduction in the prey for any of the managed species would have impacts to managed species populations. Prey reduction would result from the destruction of habitat, loss of food source, or incidental takings, which are impacts similar to those that affect the economically important species. In addition to mobile prey species, some sessile organisms would have an increased mortality from construction; however, the duration of the construction activities would be short and the affected areas would be relatively small.

During the construction phase of the proposed SPR project, the noise generated from the construction and support vessels may affect populations in the area. Depending on the species, the loudness (in decibels) and the frequency of the noise would create navigational disruption for some species of fishes. It is likely that noise and vibration from SPR project construction would cause species to leave the area. Once construction is complete, noise levels would return to normal and populations that vacated the area would return.

Table E.5.1-1 shows the estimated temporary impact to EFH from the construction footprint of the brine diffuser system.

Table E.5.1-1: Estimated Surface Area in Square Feet (Square Meters) of Estuarine and Marine Bottom Disturbed by Brine Pipeline Construction

	Big Hill square feet (square meters)	Stratton Ridge square feet (square meters)	Clovelly square feet (square meters)	Chacahoula square feet (square meters)	Richton square feet (square meters)
Temporary construction impact	N/A because new pipeline would not impact EFH	320,179 (30,550)	N/A because no new pipeline would be constructed	1,475,865 (140,600)	1,062,758 (101,250)

Note: The approximate area of disturbance was determined by calculating the length of the proposed offshore pipeline and the estimated width of the disturbance to sediments caused by the installation

E.5.2 Impacts to the Estuarine Component of the EFH

The estuarine environment throughout most of the proposed project areas already is disturbed. In some cases, the construction of the pipeline in estuarine areas would take place using directional drilling or would follow existing utility/pipeline corridors and canals. This would prevent adverse effects to the estuarine habitat.

The proposed construction of the brine pipeline would cause a temporary impact to this type of habitat, and many of its functions and value would be restored after construction is completed. Species that typically live within this habitat during one or all of their life phases would most likely leave the area during the construction phase of the proposed project. After the construction ceases, the fish populations would begin to return. There would be some local impacts where construction occurs, but the surrounding areas that remain undisturbed would allow the disturbed areas to quickly re-establish and function as habitat again.

The construction methods used for the pipeline installation would depend on several factors including cost, distance crossed, and habitat type. The clearing of the substrate to allow for burial of the pipeline would be the most intrusive part of the project, resulting in the greatest overall impact. Because of the construction, the concentration of suspended sediment would increase in the project area causing an increase in turbidity for a 1- to 2-day period immediately following construction (NEBC, 2003). Potential direct impacts to infaunal benthic communities resulting from the construction process include abrasion, clogging of filtration systems necessary for feeding and respiration, and burial and smothering. This impact also may be accompanied by harmful indirect effects such as changes in light attenuation leading to decreased feeding efficiency and changes in substrate composition (Berry, et al., 2003).

The survivorship of benthic invertebrates and other infauna in the project area is species- and location-specific. Many estuarine organisms have evolved mechanisms to survive changes in suspended and bedded sediment, and would not be affected by the project (Maurer, et al., 1986). Open water benthic organisms are less tolerant to sediment changes, and mortality rates would likely be higher offshore. Two vulnerable populations include mollusks, which would likely experience increased mortality and impaired growth rates in the project construction area, and demersal fish eggs that lie directly in the construction path (Berry, et al., 2003). Mature fish are fairly mobile, and likely they would leave the area during the construction process and return after completion.

The disturbance to suspended and bedded sediment may change the composition of the sediment, temporarily altering the distribution and relative frequencies of organisms in the infaunal community. Complete recovery of soft-bottomed benthic communities may take up to 2 years from the time of construction (NEBC, 2003). Even though the recovery period is long, the project area affected by construction is small relative to the amount of substrate habitat that exists.

The pipeline alignment and diffuser system for both Richton and Stratton Ridge would not be located in any known areas of seagrasses. The Richton pipeline would pass to the east of Gulf Islands National Shoreline, between a shipping lane and the barrier island. Given that the line is not passing over the barrier island or through known submerged aquatic vegetation, direct impacts from construction would not occur. Indirect impacts would depend upon the proximity to submerged aquatic vegetation.

If some submerged aquatic vegetation beds were to be affected by proposed pipeline ROWs, additional permits and approvals would be required and DOE would work with Gulf Islands National Seashore to restore those areas or rehabilitate other historical beds nearby.

E.5.3 Impacts to the Marine Component of the EFH

The impacts to the marine component of the EFH would be generated from the construction of the brine diffuser and the associated offshore pipeline. There would be two different methods of offshore trenching across the intertidal zone and barge construction with a jet-blasting sled.

The construction of the shore crossing at most locations would start from the shoreline, assemble the pipeline, and lay the pipeline in a trench that was already dug. The trenching method is a construction approach that permits low-cost construction and a shorter time frame. The construction impacts would be confined to the pipeline footprint and would be localized. The trenching method would disrupt habitat within the construction footprint only for a short time period during and immediately after construction (1-2 days). Each of the managed species would leave the area and return after completion.

Offshore construction would be conducted by barge and several support vessels. The pipeline would be first constructed on the barge and laid on the seafloor. After the pipeline was entirely assembled, a jet-blasting sled would then pass over the pipeline, burying the pipe below the sediment. The sled would straddle the pipeline and shoot high-pressure ambient water toward the sediment. After the sediment was removed from under the pipeline, the pipeline would fall into the trench created by the sled.

The main impact would come from the jet-blasting sled because it would increase the turbidity of the water column and cause mortality of sessile organisms unable to escape the immediate area. These sessile organisms would be a food resource for some of the commercially important species, and the reduction in the resource would affect some species populations; however, the construction footprint is relatively small and the duration of the construction is relatively short.

The operation of the brine diffuser system would cause some changes to the physiochemical makeup of the water column. For the Clovelly, Clovelly-Bruinsburg, and Big Hill sites the brine diffuser already exists and is already operating. Brine discharge would increase with the construction of new caverns for these sites. The brine water would leave the diffusers at a rate of 30 feet (9.14 meters) per second, at or near ambient temperature, and a concentration of about 263 parts per thousand. Consequently, the water immediately adjacent to the brine port nozzles would have a salinity of about 263 ppt. Moving away from the brine port nozzles, the salinity would decrease as the brine solution dilutes into the ambient environment and moves down current (see appendix C). The area of the mixing zone at a concentration of 4 ppt above ambient would vary by site and local conditions. At the Big Hill site, this plume would be as large as 4.3 square nautical miles (14.7 kilometers). Table E.5.3-1 highlights the ambient conditions at five of the sites. Table E.5.3-2 highlights the changes in the physiochemical characteristics that occur from the brine discharge.

Table E.5.3-1: Ambient Conditions at the Brine Diffuser Locations

Parameter	Texas		Louisiana		Mississippi
	Big Hill	Stratton Ridge	Clovelly*	Chacahoula	Richton
Ambient bottom salinity – average (ppt)	31	31	31	31	31
Ambient bottom salinity - worst case (ppt)	25	25	25	31	25
Ambient surface salinity - average (ppt)	31	31	31	25	31
Ambient surface salinity - worst case (ppt)	25	25	25	31	25
Ambient bottom temperature - average (F/C)	68/20	68/20	68/20	25	68/20
Ambient bottom temperature - worst case (F/C)	59/15	59/15	59/15	68/20	59/15
Ambient surface temperature - average (F/C)	68/20	68/20	68/20	59/15	68/20
Ambient surface temperature - worst case (F/C)	59/15	59/15	59/15	68/20	59/15
Water depth (feet/meters)	33/10.1	30/9.1	36/11	59/15	47/14.3
Ambient bottom current - average (meters per second; foot/sec)	0.30/0.09	0.30/0.09	0.30/0.09	30/9.1	0.30/0.09
Ambient bottom current - worst case (meters per second; foot/sec)	0.10/0.03	0.10/0.03	0.10/0.03	0.30/0.09	0.10/0.03

ppt = parts per thousand; F = Fahrenheit; C = Celsius
* Note: This would apply to the Clovelly-Bruinsburg alternative as well.

Table E.5.3-2: Changes to Ambient Conditions at the Brine Diffuser Locations

Parameter	Texas		Louisiana		Mississippi
	Big Hill	Stratton Ridge	Clovelly*	Chacahoula	Richton
Brine salinity (ppt)	263	263	263	263	263
Brine temperature (F/C)	68/20	68/20	68/20	68/20	68/20
Maximum number of ports	75	75	75	75	75
Number of open ports needed to reach maximum brine discharge rate	57	53	22	45	45
Port height above seafloor (feet/meters)	4/1.2	4/1.2	4/1.2	4/1.2	4/1.2
Port exit velocity (feet per second/meters per second)	30/9.1	30/9.1	30/9.1	30/9.1	30/9.1
Maximum brine discharge rate (MMBD)	1.3	1.2	0.5	1.0	1
Port diameter (inches/centimeters)	3/7.62	3/7.62	3/7.62	3/7.62	3/7.62
Port spacing (feet/meters)	60/18.3	60/18.3	60/18.3	60/18.3	60/18.3
Average area in plume for + 4 ppt salinity (nm^2)	1.2	1.1	0.4	see note A	0.9
Maximum area in plume for + 4 ppt salinity (nm^2)	4.3	4.0	1.7	see note A	3.4
Maximum vertical extent of brine jets – average (feet)	19	19	19	19	19
Maximum vertical extent of brine jets – worst case (feet)	18	18	18	18	18
Water depth (feet/meters)	33/10.1	30/9.1	36/11	30/9.1	47/14.3
Salinity increase downcurrent (ppt)					
1 nautical miles (average)	1.9	1.8	1.4	1.7	1.7
1 nautical miles (worst case)	3.4	3.3	2.3	3.1	3.1
2 nautical miles (average)	1.3	1.3	1.0	1.2	1.2
2 nautical miles (worst case)	2.5	2.4	1.8	2.2	2.2
3 nautical miles (average)	1.0	1.0	0.7	0.9	0.9
3 nautical miles (worst case)	1.9	1.8	1.2	1.7	1.7
4 nautical miles (average)	0.8	0.8	0.6	0.7	0.7
4 nautical miles (worst case)	1.5	1.5	1.0	1.4	1.4

ppt = parts per thousand

nm^2 = nautical miles squared

* Note: These results would apply to the Clovelly-Bruinsburg alternative as well.

A: Model predictions were calculated for Charcahoula, however not presented. This model was not designed to take into account the unique conditions of Ship Shoal.

The operation of the brine diffusers is one aspect of SPR operations that has the potential to adversely affect EFH. In addition to increasing the ambient salinity of the water near the diffusers, the brine can also introduce ions, metals, and other inorganics into the environment as contaminants. Based on studies of water characteristics and currently operational brine diffusers, projected brine plume modeling (see appendix C) showed that at all of the proposed sites – Big Hill, Stratton Ridge, Clovelly, Chacahoula, and Richton – salinity gradients would be generated if the proposed sites were developed. The modeling shows that there would be minor salinity peaks. Past analyses on brine contaminants showed that they can be present at slightly elevated levels around the diffusers, but that fish populations do not suffer adverse effects because the concentrations are low (Hann et. al, 1984).

The maximum amount of brine diffusion varies depending on the selected site. The Big Hill brine diffuser, which is located approximately 3.9 miles (6.3 kilometers) offshore, has the highest discharge potential at 1.3 MMBD. Stratton Ridge, which is about 3 miles (4.9 kilometers) offshore, is close behind at 1.2 MMBD. The maximum discharge from Richton and Chacahoula are lower, both at 1.2 and 0.7 MBD. The diffuser at those sites is located much farther offshore at approximately 14 and 17.5 miles (22 and 28 kilometers), respectively. The Clovelly and Clovelly-Bruinsburg alternative would utilize the existing brine diffuser of the LOOP facility to dispose of up to 0.5 MMBD of brine approximately 4 miles (6 kilometers) from shore. The Clovelly discharge is the lowest because much of the brine would be retained in the Clovelly brine pond system. For all brine plume models and impact assessments, the salinity of the brine was assumed to be 263 parts per thousand. This represents the saturation salinity for water at 68 °F (20 ^{o}C), which is slightly higher than the 250 parts per thousand levels previously observed at SPR diffusers in the past. The diffusers would sit 4 feet (1 meter) above the bottom and use a maximum of 75 potential diffusion ports spaced 60 feet (18 meters) apart, although no site would require 75 ports to operate at maximum capacity. The diffusers' depths and distances offshore vary by site, and the ambient salinity generally ranges from 25 to 31 parts per thousand at all sites, depending on the magnitude and direction of current flows.

Brine plume modeling was conducted for both an average-sized plume under typical conditions and the maximum plume under the most extreme environmental conditions. The brine dispersion modeling report indicates that "the maximum scenario is associated with an 18 centimeters per second current" and that the "large, typical and maximum scenarios [are] based upon the average percent occurrence of 0 to 3, 6 to 12, and 15 to 20 centimeters per second (see appendix C). The models provided +4 parts per thousand, +3 parts per thousand, +2 parts per thousand, and +1 parts per thousand contours for the typical and maximum plumes centered on the first brine diffuser port for each site. The brine plume contours were the largest at the Big Hill diffusion site because of its high brine discharge capacity of 1.3 MMBD. For Big Hill, the typical +4 parts per thousand contour is expected to cover an area of 1.2 square nautical miles (4.1 square kilometers), although that area would increase to 4.3 square nautical miles (14.7 square kilometers) under the maximum plume scenario. The total extent of the affected area for Big Hill, given by the area contained within the +1 part per thousand contour, was 7.2 square nautical miles (24.7 square kilometers) under typical conditions, but ranged as high as 24.4 square nautical miles (83.72 square kilometers) for the maximum condition and the +1 part per thousand contour. Brine contours were smaller at the other sites because of their lower diffusion capacities. Although the aerial extent of the brine plumes is large, the brine is heavier than seawater, and therefore, it spreads out along the seabed and does not reach the surface. Given the salinity and velocity of the brine exiting the diffusion ports, the maximum height for each plume is 18.5 feet (6 meters), which is well below the surface, even for the most shallow diffusion site, which is Stratton Ridge (30 feet, 9 meters).

The salinity increase from the brine diffusion is expected to have little or no direct impact on the fishery species in the Gulf of Mexico. The aerial extent of the brine plumes are relatively small compared to the total area occupied by the commercially important species. Furthermore, the fish and shellfish species managed in the proposed project area generally demonstrate high tolerances to changes in salinity beyond the potential +4 parts per thousand maximum salinity in the contour area. The shrimp fishery is the most profitable fishery in the Gulf of Mexico. Brown and white shrimp spend a large portion of their life cycle in estuarine environments, and they tolerate a wide range of salinity changes. Both species have been caught in salinity as high as 69 parts per thousand, which is almost double the highest projected value that can be attributed to the brine diffuser (Philips and James, 1988). Past studies indicate that a drastic increase in salinity may favor a switch in dominance from white shrimp to brown shrimp in the northern Gulf (Muncy, 1984). However, the overall impact on abundance of shrimp is expected to be negligible.

Other managed species, such as the finfish, also tolerate salinity ranges greater than what would be expected due to brine discharge. For example, Menhaden, for example, can survive in salinities up to

60 parts per thousand, and snappers and red drum are found in salinities between 45 and 50 parts per thousand (Lassuy, 1983; Reagan, 1984). Due to the freshwater influx from the Mississippi River, Gulf of Mexico species are generally euryhaline and able to tolerate salinity changes beyond what SPR operations would cause. Even in cases where species avoid the high salinities of the brine plume, the ambient salinity would return to normal levels quickly after the discharge ceases in about 4 to 5 years when the solution mining is complete. The species would repopulate the affected area fairly quickly after that period.

The species that would be most impacted from the brine discharge is the spiny lobster. Unlike the other managed species in the project area, adult and juvenile spiny lobsters are stenohaline and survive optimally in a narrow range of salinities from 32 to 36 parts per thousand. Furthermore, lobsters are confined to the benthic environments most affected by brine diffusion. Given the potential salinity changes associated with SPR operations, the proposed project would put the lobsters within the most concentrated salinity plumes at risk. Past studies indicate that lobsters exposed to high salinities relocate to areas of lower salinities (Butler, et al., 2002). This behavior continues until more favorable salinities are reached or metabolic demands associated with salinity stress lead to mortality. Given the relatively small area of the highest salinity contours (+4 and +3 parts per thousand), few lobsters would be affected and many would be able to move out of the high salinity range. Overall impacts to lobster populations are expected to be small and temporary.

Although the direct impacts to managed species are expected to be negligible, the impacts to benthic communities around the diffusion sites would temporarily impact the productivity of the environment. The heavy brine tends to sink to the bottom, and it would have a disproportionate impact on benthic species. Many of the commercially managed species in the Gulf of Mexico are demersal, and thus, they rely on the benthic organisms for a food supply. Depending on their salinity tolerance, sessile organisms (mollusks, worms) may be killed by the high salinity plume, and mobile organisms (fish, crustaceans) may be driven out of the mixing zone. Further, owing to currents, tides, storms, and other local events, neither the size nor the location of the high-salinity plume would be constant. Rather, it would move with changing conditions and affect an area of the water column and bottom that overall is larger than that estimated by the steady state models. Previous studies of the impact of brine diffusion on benthic biodiversity at the West Hackberry and Bryan Mound diffusion sites indicated a significant drop in benthic biomass within a range of 656 to 6,889 feet (200 to 2,100 meters) from the diffusers (Hann, et al., 1984). These findings are consistent with studies conducted at desalination plants that found drops in benthic macrofauna abundance around their brine diffusers (Argyrou, 2000). The change in benthic productivity would deter commercially managed species from inhabiting the project area. However, these effects would be negligible considering the relatively small area of decreased productivity compared to the surrounding unaffected area in the nearshore and offshore areas of the Gulf of Mexico.

In addition to raising ambient salinity levels, the introduced brine would cause a small increase in the concentration of metals and other inorganics in the project area. In previous studies of the West Hackberry and Bryan Mound sites, brine diffusion was accompanied by a slight increase in dissolved ion concentration compared to a control site, but all ranges were within the natural variability. The levels of nickel, copper, and lead did exceed Environmental Protection Agency (EPA) standards, but they were not significantly different from the levels observed at the control site. No evidence of any petroleum contamination was observed at either of the diffuser sites. Therefore, the operation of the brine diffusers is not expected to have a noticeable impact on water quality (Hann, et al., 1984).

A special case for the effect of brine diffusion on EFH would be posed by conditions at the Ship Shoal. Ship Shoal, located seaward of the Chacahoula site brine diffuser, is a depositional sand bar that rises from the seafloor of the 33 feet (10 meters) isobath to the 19 feet (6 meters) isobath. This sandy ecosystem is important for several fisheries, specifically white and brown shrimp and spotted sea trout.

The shrimp are important commercial fisheries, while the seatrout is an important recreational fishery. In addition, Atlantic croaker is a predatory species that is found on the shoal, but has limited commercial or recreational value. The area is being considered as a harvest site for sand used in beach replenishment, and the Mineral Management Service (MMS) is conducting an environmental assessment of the potential impacts of using Ship Shoal as a sand harvest site.

The construction of the brine disposal pipeline and the brine diffusers would not be close enough to Ship Shoal to have an adverse effect. The operation of the brine diffuser for the Chacahoula site would cause minor changes in salinity concentration near the brine diffuser, but the saturated brine would diffuse in the direction of ambient conditions in a short distance. The placement of the diffuser in the trough landward of the shoal would keep the highest salinity changes away from the shoal. DOE modified the orientation of the proposed brine diffusers at Chacahoula so they would be perpendicular to the brine pipeline and parallel to the primary current direction (see figure E.5-4). This modification would ensure more complete mixing and modify the shape of the brine plume so that it would not adversely impact Ship Shoal. The species found on Ship Shoal are euryhaline species, capable of tolerating a wide range of salinities. It is unlikely the brine would create a noticeable increase in salinity over present ambient conditions, but the species present would be able to tolerate the small and moderate salinity changes to the water.

E.5.4 Environmental Consequences of the Proposed Action

The environmental consequences of the Proposed Action, with respect to EFH, would be relatively small because the species of concern are found throughout the Gulf of Mexico region, and not limited to a specific area, and they are mobile enough to avoid areas of disturbance. The impacts caused by the construction activity would be localized to the immediate area of construction and would be temporary. The brine pipeline would be buried in the sediment and therefore would not permanently impact EFH or the water column. The only permanent footprint from the brine diffusers would be those from the diffuser ports, which are small (about 1 foot in diameter). Organisms that are intolerant of wide fluctuations in salinity would be killed by the high salinity plume or driven out of the mixing zone. The impacts to prey populations and managed species from the brine discharges have been shown by previous research to occur in a relatively small area. The discharges would comply with the National Pollutant Discharge Elimination System (NPDES) discharge limits that would be established by the resource agency with jurisdiction for the alternative selected. The permit would ensure that the water quality standards would not be violated by the discharge. Aquatic resources would not be adversely affected because the water quality standards are developed to protect aquatic resources as well as human health.

In addition, DOE would secure a Section 404 permit from the Army Corps of Engineers, a Section 401 Water Quality certification from the state, and a Section 10 Permit from the Coast Guard (if appropriate) for the proposed construction within jurisdictional waters including emergent wetlands. The permit would require avoidance and minimization of impacts to wetlands and waters (including EFH that qualifies as jurisdictional under Section 404) and compensation for unavoidable and permanent impacts. This compensation would require the preservation, restoration, or enhancement of other wetlands and waters or the purchase of credits from a wetland mitigation bank. This would ensure that there is no net loss of wetlands.

E.5.5 Proposed Mitigation Measures and Guidelines for EFH Protection

For trenching construction activities near or adjacent to EFH, the use of silt curtains would help reduce the amount of sediment that is suspended in the water body. While all increased sedimentation cannot be completely avoided, minimizing the sediment load would minimize the effects on fish and benthic organisms downcurrent.

Before construction begins, DOE and its contractor would examine the schedule and compare it to known spawning and migratory times of the year. This would be done to ensure construction would not interfere with routes used to reach spawning areas or impede migratory routes. This effort would minimize the disturbance to the EFH and to the species themselves during a more sensitive time of year.

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Appendix F
Evaluation of Federally Listed Species in Louisiana

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Appendix F
Evaluation of Federally Listed Species in Louisiana

F.1 INTRODUCTION

This evaluation of federally listed species was prepared in conjunction with the draft environmental impact statement (EIS) for expansion of the Strategic Petroleum Reserve (SPR). The draft EIS evaluates the expansion of the SPR by developing additional storage capacity at two or three existing sites (West Hackberry and Bayou Choctaw in Louisiana and Big Hill in Texas) or developing one of five new sites (Chacahoula and Clovelly in Louisiana; Richton and Bruinsburg in Mississippi; and Stratton Ridge in Texas), or a combination of the Clovelly and Bruinsburg sites.

This appendix analyzes potential effects on federally endangered and threatened species, and marine mammals protected under the Endangered Species Act (ESA) and Marine Mammal Protection Act (special status species), respectively, from the proposed development of sites in Louisiana. Potential effects on endangered and threatened species and marine mammals from development of sites in Mississippi and Texas are analyzed in appendices G and H, respectively.

The Department of Energy (DOE) prepared this evaluation of federally listed species to review and document its findings of "no effect" and "may affect" in accordance with the definitions found in the Final ESA Section 7 Consultation Handbook dated March 1998 (Consultation Handbook) (USFWS and NMFS 1998), a letter from U.S. Fish and Wildlife Service (USFWS) dated September 29, 2005 (Werner 2005), and consultations with the USFWS field offices. The evaluation was based on the following definitions of the effects to endangered or threatened species in the Handbook and letter:

- **No effect**. The proposed action would not affect federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area).
- **Is not likely to adversely affect**. The proposed project may affect listed species or critical habitat, or both; however, the effects would be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented to reach this level of effects.
- **Is likely to adversely affect**. Adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect would not be discountable, insignificant, or beneficial. If the overall effect of the proposed action would be beneficial to the listed species, but it also would be likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species.

DOE is evaluating the impacts associated with five proposed new sites and three proposed expansion sites, some of which would have more than 100 miles (160 kilometers) of new pipelines, new tank farms, and brine disposal systems (offshore diffuser or injection wells) associated with it. When DOE issues a record of decision, it will select either one new site (or a combination of the Bruinsburg and Clovelly sites) and two or three expansion sites for future development, or the no-action alternative. For these reasons, DOE has not conducted comprehensive field surveys and can only reach "no effect" or "may affect" conclusions for this evaluation of special status species instead of using all of the classifications described earlier. For the finding of "may affect," DOE has not completed onsite surveys to support a finding of "is not likely to adversely affect" or "is likely to adversely affect"; therefore, a finding of "no effect" or "may affect" is the conclusion that DOE can reach at this time.

After the record of decision is issued that specifies the new site or sites and the expansion sites that would be developed, DOE would perform site- and species-specific surveys for all the federally listed species that received a finding of “may affect.” DOE would perform the evaluation of the federally listed species in consultation with USFWS and in accordance with section 7 of the ESA and the Final ESA section 7 Consultation Handbook dated, March 1998.

F.1.1 Purpose

This evaluation analyzes the potential effects of construction, operation, and maintenance of additional SPR storage capacity on federally listed threatened and endangered species. In Louisiana, this additional capacity could be added by developing one of two new sites (Chacahoula or Clovelly) or expanding capacity at one or two existing sites (West Hackberry and Bayou Choctaw). Proposed activities vary by site (e.g., based on existing infrastructure) and may include: construction of underground storage caverns and surface facilities at the storage sites; construction of pipelines for crude oil distribution, raw water supply and brine disposal; surface or groundwater withdrawals to support solution mining of new caverns; discharge of brine in the Gulf of Mexico; and construction of miscellaneous facilities at oil distribution sites.

F.1.2 Threatened and Endangered Species Terminology

The USFWS lists a species on the Federal Endangered Species List as “threatened” when it is likely to become endangered throughout all or a significant portion of its range in the foreseeable future, and lists a species as “endangered” when it is in danger of extinction throughout all or a significant portion of its range. In addition, the USFWS maintains a list of what are called “candidate species” that are being considered for listing under the Endangered Species Act. A candidate species is a species that the USFWS has on file sufficient information to support a proposal to list as endangered or threatened, but for which preparation and publication of a proposal is precluded by higher-priority listing actions. Federal agencies are encouraged to consider these species in preparing environmental impact analysis done under NEPA in order to alleviate threats to them and thereby possibly eliminate the need to list the species as endangered or threatened.

To define all the species that are required to be addressed in the biological assessment, DOE contacted and obtained information from the USFWS and the Louisiana Department of Wildlife and Fisheries (LDWF). Appendix K, Consultants with Agencies, contains the consultation letters and lists the consultation meetings held.

F.1.3 Organization

This biological assessment includes the following information: a brief literature review for each of the species addressed (section F.2), observations made during site visits (section F.3), an assessment of the potential effects of the proposed action on the threatened and endangered species (section F.4), and recommendations for minimizing potential adverse effects on the subject species and other biological resources (section F.5). References cited in the biological assessment are identified in section F.6.

F.2 LITERATURE REVIEW

The literature review describes the natural histories of all species federally listed as threatened or endangered *and* identified as present or potentially present (e.g., based on historical records) in at least one parish where proposed new or expanded SPR facilities and associated infrastructure would be located. Although candidate species (i.e., those listed as candidates for Federal listing as threatened or endangered) are within the scope of this assessment, there were no candidate species identified in the literature review for the Louisiana parishes with proposed new and expanded SPR facilities. Table F.2-1 lists the species evaluated in this appendix.

Table F.2-1: Federally Listed Threatened or Endangered Species in Louisiana Parishes with Proposed SPR Sites

Common Name	Scientific Name	Federal Status	Louisiana Status	Parish Where Species May Exist[a]
Birds				
Bald Eagle	*Haliaeetus leucocephalus*	Threatened	Endangered	Calcasieu, Cameron, Iberville, Lafourche, St. James Terrebonne
Brown Pelican	*Pelecanus occidentalis*	Endangered	Endangered	Cameron, Lafourche, Terrebonne
Peregrine Falcon[b]	*Falco peregrinus*	Endangered	Threatened/ Endangered	Lafourche, Terrebonne
Piping Plover	*Charadrius melodus*	Threatened	Threatened/ Endangered	Cameron, Lafourche, Terrebonne
Red-Cockaded Woodpecker	*Picoides borealis*	Endangered	Endangered	Calcasieu
Fish				
Gulf Sturgeon	*Acipenser oxyrinchus desotoi*	Threatened	Threatened	Lafourche, Terrebonne, St. James, Cameron
Pallid Sturgeon	*Scaphirhynchus albus*	Endangered	Endangered	St. James, Iberville
Mammals				
Louisiana Black Bear	*Ursus americanus luteolus*	Threatened	Threatened	Iberville
Red Wolf	*Canis rufus*	Endangered	Not Listed	Calcasieu, Cameron, Terrebonne
Marine Mammals				
Gervais Beaked Whale	*Mesoplodon europaeus*	Protected	Threatened	All coastal Parishes
Goose-Beaked Whale	*Ziphius cavirostris*	Protected	Threatened	All coastal Parishes
Pygmy Sperm Whale	*Kogia breviceps*	Protected	Threatened	All coastal Parishes
Dwarf Sperm Whale	*Kogia simus*	Protected	Threatened	All coastal Parishes
Sperm Whale	*Physeter macrophalus*	Endangered	Endangered	All coastal Parishes
Atlantic Spotted Dolphin	*Stenella frontalis*	Protected	Threatened	All coastal Parishes
Rough-Toothed Dolphin	*Steno bredanensis*	Protected	Threatened	All coastal Parishes
Killer Whale	*Orcinus orca*	Protected	Threatened	All coastal Parishes
False Killer Whale	*Pseudorca crassidens*	Protected	Threatened	All coastal Parishes
Short-finned Pilot Whale	*Globicephala macrorhynchus*	Protected	Threatened	All coastal Parishes
Pygmy Killer Whale	*Feresa attenuata*	Protected	Threatened	All coastal Parishes
West Indian Manatee	*Trichechus manatus*	Endangered	Endangered	All coastal Parishes
Bottlenose Dolphin	(*Tursiops truncatus*)	Protected	Not Listed	All coastal Parishes
Reptiles				
Atlantic Hawksbill Sea Turtle	*Eretmochelys imbricata*	Endangered	Endangered	Cameron, Lafourche, Terrebonne
Green Sea Turtle	*Chelonia mydas*	Threatened	Threatened	Cameron, Lafourche, Terrebonne

Table F.2-1: Federally Listed Threatened or Endangered Species in Louisiana Parishes with Proposed SPR Sites

Common Name	Scientific Name	Federal Status	Louisiana Status	Parish Where Species May Exist[a]
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Endangered	Endangered	Cameron, Lafourche, Terrebonne
Leatherback Sea Turtle	*Dermochelys coriacea*	Endangered	Endangered	Cameron, Lafourche, Terrebonne
Loggerhead Sea Turtle	*Caretta caretta*	Threatened	Threatened	Cameron, Lafourche, Terrebonne

Not Listed: No state status; species is not classified as threatened or endangered by Louisiana.
[a] Includes only parishes in Louisiana where SPR facilities are proposed.
[b] Federal endangered status of the peregrine falcon varies by subspecies; one subspecies is endangered and the other two are recovered.

F.2.1 Birds

F.2.1.1 Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is a large bird of prey with an average wingspan of 7 feet (2 meters). Adult males and females are similar in appearance, with a dark brown body and wings and a distinctive white head and tail. This species is federally listed as threatened, although a proposal to de-list it has been made.

The bald eagle can be found throughout the continental United States and Alaska. It is most likely to be found in areas with large expanses of aquatic habitat with forested shorelines or cliffs where it selects supercanopy roost trees. The bald eagle is an opportunistic forager. Although it prefers fish, it will eat a great variety of mammals, amphibians, crustaceans, and birds, including many species of waterfowl (Buehler 2000).

The bald eagle nests almost exclusively at the edges of lakes, rivers, or seacoasts. It generally nests in tall trees or cliffs near the water's edge, although it occasionally nests on the ground. Nests are often reused in successive years. The breeding season generally begins in the spring (earlier in southern states), with the young fledging after about 6 months (USFWS 1983; USFWS 1995). According to comments submitted to DOE by the USFWS (James 2005), nesting activity occurs from September to January with young fledging usually by midsummer. The bald eagle is highly sensitive to human noise and interference (USFWS 1983; USFWS 1995). It is most sensitive during the first 12 weeks of the nesting cycle. Disturbance during nesting may lead to nest abandonment or reduced hatching and survival rates. Human activity near a nest late in the nesting cycle may also cause flightless birds to jump from the nest, lessening their likelihood of survival (Watson 2005).

F.2.1.2 Brown Pelican

The brown pelican (*Pelecanus occidentalis*) is a large water bird with a massive bill and throat pouch. Its wings and body are grayish-brown. Nonbreeding adults have a whitish head and neck, often with some yellow. The hindnecks of breeding adults are dark chestnut (NGS 1983; Palmer 1962). Larger individuals have a wing spread of more than 7 feet (2 meters) (USFWS 2005).

The brown pelican is a fish eater, and it is found almost exclusively in coastal areas along the southeast coast, the Gulf of Mexico, and throughout the west coast. It prefers to feed in shallow estuarine waters and use sand spits, offshore sand bars, and islets for nocturnal roosting. Dry roosting sites are essential to suitable habitat (NatureServe 2005). Nests usually are built on coastal islands, on the ground, or in small bushes and trees (Palmer 1962).

The brown pelican is a federally listed endangered species. Populations in California, Texas, and Louisiana were devastated by pesticide poisoning from dichlorodiphenyltrichloroethane (DDT), dichlorodiphenyldichloroethylene (DDE), and other compounds throughout the 1950s and 1960s. Eastern and Gulf Coast populations of the brown pelican appear to be stable and possibly increasing in recent years. Contaminant levels in both populations are below the threshold for reproductive failure, but the populations are still very vulnerable to pesticide pollution (Anderson and Hickey 1970). Other threats include the disturbance of nesting birds by humans, declining fish populations, increased water turbidity resulting from dredging, oil and chemical spills, entanglement in fishing gear, and extreme weather conditions. Recently, habitat degradation has affected both roosting and nesting. For example, nesting efforts have failed in the Gulf Coast because of erosion at the nesting sites (NatureServe 2005).

In Louisiana, the brown pelican is found in the Lower Calcasieu, Lower Mississippi-New Orleans, Eastern Louisiana Coastal, East Central Louisiana Coastal, and West Central Louisiana Coastal watersheds (NatureServe 2005).

F.2.1.3 Peregrine Falcon

The peregrine falcon (*Falco peregrinus*) is a medium-sized falcon with long, pointed wings and a dark crown and nape. Juveniles have pale foreheads and are mostly brown in color; adults are predominantly black or gray. Adults average 16.1 to 20.1 inches (41 to 51 centimeters) in length, with a 35.8- to 44.1-inches (91- to 112-centimeter) wingspan (NGS 1983).

There are three subspecies of peregrine falcons: the American peregrine falcon (*Falco peregrinus anatum*), the Arctic peregrine falcon (*Falco peregrinus tundrius*), and the Eurasian peregrine falcon (*Falco peregrinus peregrinus*). Of these three subspecies, only the Eurasian peregrine falcon, which is not found in the United States, is federally listed as an endangered species. Both the American and Arctic peregrine have been federally delisted (USFWS 2005).

These birds are carnivores and feed primarily on other birds, but they also feed on small mammals, lizards, fishes, and insects (particularly the young birds) (NatureServe 2005). Peregrine populations nesting in northern latitudes are highly migratory, while those nesting in northern maritime climates, at mid-latitudes, and in the southern hemisphere are much less migratory (Cade 1982).

The peregrine falcon typically nests on ledges of vertical rocky cliffs, usually with a sheltering overhang (Palmer 1988; Campbell et al. 1990). In the United States, parts of the Atlantic Coast and the barrier islands in the Gulf Coast are important feeding areas for long-distance migrants (NatureServe 2005). The average clutch size is four hatchlings, and incubation lasts between 32 and 35 days. The peregrine falcon usually mates for the first time at 2 or 3 years of age, and most often it mates for life (Palmer 1988).

F.2.1.4 Piping Plover

The piping plover (*Charadrius melodus*) is a small, sandy-colored shorebird similar in appearance to a sandpiper. Distinguishing field marks of this species include yellow-orange legs, a black band across the forehead from eye to eye, and a black ring around the base of its neck (USFWS undated). The piping plover is federally listed as threatened in Louisiana.

A migratory species, the piping plover overwinters on beaches, mudflats, and sandflats along the Atlantic Coast and the Gulf of Mexico, including barrier island beaches and spoil islands on the Gulf Intracoastal

Waterway (ICW) (USFWS 2005). In Louisiana, the piping plover has been observed in numerous locations along the Gulf Coast (NatureServe 2005). Critical habitat for wintering piping plovers has been established for several specific locations in Louisiana parishes where proposed SPR elements would be located (USFWS 2001a):

- **Unit LA–1:** Texas-Louisiana border to Cheniere au Tigre. 6,548 acres (2,650 hectares) in Cameron and Vermilion Parishes. This unit extends in three adjacent (but slightly separated) sections from the east side of Sabine Pass (Texas-Louisiana border) to 0.81 miles (1.3 kilometers) east of where the boundary of the Paul J. Rainey Wildlife Sanctuary (National Audubon Society) meets the shoreline. All three sections of this unit include the land from the seaward boundary of the mean lower low water level (MLLW), which is defined as the annual average of the lower low water height of each tidal day, to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur. The shoreline in this unit is owned both by the state and privately.

- **Unit LA–3:** Point Au Fer Island. 482 acres (195 hectares) in Terrebonne Parish. This unit includes the entire small island at the northwest tip of Point Au Fer Island to MLLW, then extends from the northwest tip of Point Au Fer Island following the shoreline southeast approximately 4.8 miles (7.7 kilometers) to the point where the unnamed oil and gas canal extending southeast from Locust Bayou meets the shoreline 0.5 miles (0.8 kilometers) southeast from Locust Bayou. This shoreline is bounded on the seaward side by MLLW and on the landward side to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur. This entire unit is privately owned.

- **Unit LA–4:** Isles Dernieres. 1,964 acres (795 hectares) in Terrebonne Parish. This unit includes the state-owned Isles Dernieres chain, including Raccoon, Whiskey, Trinity, and East Islands. This unit includes the entire islands where primary constituent elements occur to the MLLW.

- **Unit LA–5:** Timbalier Island to East Grand Terre Island. 5,735 acres (2,321 hectares) in Terrebonne, Lafourche, Jefferson, and Plaquemines Parishes. Most of the sections in this area are bounded on the seaward side by MLLW and on the landward side by densely vegetated habitat, not used by the piping plover, where the constituent elements no longer occur.

The piping plover begins to arrive at wintering habitats in July through September. Although a few plovers remain throughout the year, sightings are rare in late May, June, and early July (USFWS 2000).

F.2.1.5 Red-Cockaded Woodpecker

The red-cockaded woodpecker (*Picoides borealis*) is a federally listed endangered species. It is found in mature and old-growth pine forests in the southeastern United States. Red-cockaded woodpeckers are black and white with ladder backs and distinctive white cheek patches (USFWS 2003c). The species is named for barely visible red streaks called "cockades" on the heads of adult males (NatureServe 2005).

The red-cockaded woodpecker has specific habitat requirements that include open pine woodlands or savannahs with large, old pines. Large pines are required because cavity nests are built only in inactive pine heartwood. Nesting trees must be in open stands with little or no hardwood midstory and few or no overstory hardwoods (USFWS 2003c). Foraging occurs in older pine stands within 0.5 mile (0.8 kilometer) of a colony (Aycock 2005).

The red-cockaded woodpecker lives in family groups that usually include a breeding pair and nonbreeding helpers. Most helpers are male. Mating typically occurs between November and December and March to May, and egg laying usually occurs April to early May. Incubation lasts about 10 to 12 days (Hooper et al. 1980), and hatchlings remain in the nest for 26 to 29 days (NatureServe 2005).

According to the 1985 revision of the recovery plan for this species, there were approximately 14,068 red-cockaded woodpeckers living in 5,627 groups in 11 states (USFWS 2003c). One of the six largest remaining resident populations is located in or near the Kisatchie National Forest in Louisiana (James 1995). USFWS established criteria for delisting the species based on the status and size of primary and secondary core populations named in the recovery plan. Table F.2.1.5-1 shows the locations of core populations of the red-cockaded woodpecker in Louisiana.

Table F.2.1.5-1: Louisiana Locations of Designated Core Red-Cockaded Woodpecker Populations

Designated Core Population Type	Population Locations in Louisiana
Primary	Fort Polk (includes parts of Vernon Parish)
	Vernon Unit, Calcasieu Ranger District, Kisatchie National Forest (includes parts of Vernon Parish)
Secondary	Catahoula Ranger District, Kisatchie National Forest (includes parts of Grant and Rapides Parishes)
	Winn Ranger District (portion), Kisatchie National Forest (includes parts of Grant, Natchitoches, and Winn Parishes)

F.2.2 Fish

F.2.2.1 Gulf Sturgeon

The Gulf sturgeon (*Acipenser oxyrinchus desotoi*) is an anadromous fish species found in Gulf coastal waters from Louisiana to Florida. Primitive in appearance, the Gulf sturgeon has external bony plates, an extended snout, and four large barbels. Adults range from 4 to 8 feet (1.2 to 2.4 meters) in length, with adult females measuring larger than males (USFWS 2003a). This species is federally listed as threatened.

The Gulf sturgeon preys on benthic invertebrates and small fishes. Feeding is believed to occur only during the winter and spring in offshore or estuarine waters (Cross 1992).

USFWS has designated certain Gulf of Mexico tributaries as critical habitat for the Gulf sturgeon. In these locations, the Gulf sturgeon spends the first 2 years of its life and later returns to breed. Spawning habitats generally are fresh water (sometimes tidal) and usually are over a bottom of hard clay, rubble, gravel, or shell (USFWS 2003a). In Louisiana, the critical habitats include Lake Pontchartrain and the Pearl River system (USFWS 2003a).

F.2.2.2 Pallid Sturgeon

The pallid sturgeon (*Scaphirhynchus albus*) is a large fish measuring 73.2 inches (186 centimeters) with a flat, shovel-like snout that has four fringed barbells and 37 to 43 dorsal rays and 24 to 28 anal rays. The pallid sturgeon is similar to the shovelnose sturgeon, but there are several distinct differences such as the paucity of scale-like scutes on the belly, the larger head, the wider mouth, the smaller eye, and the paler gray-white color above and on sides (Page and Burr 1991). The pallid sturgeon is one of the largest fish species found in the Missouri and Mississippi River drainage (Gilbraith et al. 1988). Its diet consists of aquatic invertebrates (Carlson et al. 1985). This species is federally listed as endangered.

The pallid sturgeon's habitat consists of large, turbid free-flowing rivers or reservoirs. In rivers or reservoirs, the pallid sturgeon is most often found in strong currents over firm gravel or sandy substrate (USFWS 1989; Kallemeyn 1981). The pallid sturgeon's preferred temperature range is from 32 to 86 ˚Fahrenheit (0 to 30 ˚Celsius) (USFWS 1993).

The pallid sturgeon's range is quite large and includes approximately 3,515 miles (5,656 kilometers) of river encompassing 13 states including Louisiana and Mississippi (USFWS 1993). In Louisiana, the most frequent occurrence of the pallid sturgeon is in the Mississippi and Atchafalaya Rivers, where the Atchafalaya diverges from the Mississippi River (Dryer Undated).

The spawning season for the pallid sturgeon lasts from July to August. Males sexually mature at 3 to 4 years of age (Kallemeyn 1981), and females sexually mature at 7 years with several years for eggs to mature between spawnings (Conte et al. 1988). Little other information is available to describe the spawning requirements for the pallid sturgeon, so these requirements often are assumed to be similar to those of the shovelnose sturgeon. The shovelnose sturgeon spawns over rock, rubble, or gravel in the main channel of the Missouri and Mississippi Rivers and their major tributaries or in the wing dams in the main stem of larger rivers (Christiansen 1975; Elser et al. 1977; Moos 1978; Helms 1974). In addition, in June the shovelnose sturgeon responds to increased water flow from melting snow by migrating to spawn (Berg 1981).

F.2.3 Mammals

F.2.3.1 Louisiana Black Bear

The Louisiana black bear (*Ursus americanus luteolus*) is one of 16 recognized subspecies of the American black bear (Hall 1981). The Louisiana black bear is federally listed as threatened. Like other black bears, the Louisiana black bear has long black hair, and it can weigh more than 600 pounds (272 kilograms) (USFWS 1992). It is distinguished from other black bears by its longer, narrower, and flatter skull, and by its proportionately large molar teeth (Nowak 1986).

The Louisiana black bear prefers bottomland hardwood forests. It is found primarily in the Tensas and Atchafalaya River basins in Louisiana, areas that have been proposed as critical habitat. In fact, these areas of Louisiana are the locations of the only known breeding populations (Bowker and Jacobson 1995). Other areas with suspected occurrences of Louisiana black bears include the Loess Bluffs portion of the Mississippi River corridor in southwestern Mississippi and the adjacent Tunica Hills of Louisiana, as well as smaller areas in the lower East Pearl River and lower Pascagoula River basins of southern Mississippi (Wooding et al. 1993).

F.2.3.2 Red Wolf

The red wolf's (*Canis rufus*) range formerly included most of the southeastern states (NatureServe 2005), but now red wolf populations only occur in the wild in a few reintroduction sites. The red wolf is federally listed as endangered. Its diet is opportunistic and consists of a variety of invertebrates and vertebrates such as rabbits, rodents, deer, and birds, but it favors marsh rabbits, nutria, and carrion (Matthews and Moseley 1990).

The red wolf inhabits herbaceous and forested wetlands and riparian areas, coniferous, hardwood, and mixed forest, herbaceous grassland, and chaparral (NatureServe 2005). Home ranges vary depending on the environment, but typically they are approximately 16,000 to 32,000 acres (6,500 to 13,000 hectares) (Riley and McBride 1975), or approximately 29,000 acres (11,700 hectares) for males and approximately 19,000 acres (7,800 hectares) for females (Carley 1979). The red wolf mates once a year in a season from January to February. The average gestation is 60 to 63 days. Litters average six or seven pups that reach sexual maturity in 3 years (NatureServe 2005).

F.2.4 Marine Mammals

The onshore portion, including the directional drilling from onshore to open water in the Gulf of Mexico, associated with the proposed SPR Chacahoula site and Clovelly site would not affect the marine mammals. The construction and operation of the offshore brine disposal pipeline and operation of the brine diffusion system for the Chacahoula site and the Clovelly site may affect the marine mammal species. The dispersion of the brine discharge into the Gulf of Mexico would dissipate before reaching these depths as well.

F.2.4.1 Gervais Beaked Whale

The Gervais' beaked whale (*Ziphius cavirostris*) is a pelagic species that is associated with the continental shelf and deep oceanic waters, but it is also closely associated with the Gulf Stream waters. Little is known about this species, but it is believed that sexual maturity occurs when the whale reaches 15 feet (4.5 meters) in length. The life span is believed to be about 27 years. The diet consists mainly of squid and deepwater fishes (Wynne et al. 1999).

F.2.4.2 Goose-Beaked Whale

The goose-beaked whale (*Ziphius cavirostris*), also known as Cuvier's beaked whale, typically is found in waters that are greater than 3,280 feet (1,000 meters). The goose-beak is a pelagic species that is associated with the continental shelf and deep oceanic waters, but it is also closely associated with the Gulf Stream waters. Little is known about the goose-beaked whale, but it is believed to travel in pods of 2 to 25 animals, and it typically avoids vessels. Sexual maturity is believed to occur at about 7 to 11 years. Breeding occurs in the spring, with a calf born every 2 to 3 years after a 12-month gestation. The goose-beaked whale is believed to lactate for 12 months and live more than 35 years. Its diet consists mainly of deepwater fish and squid (Wynne et al. 1999).

F.2.4.3 Pygmy Sperm Whale

The pygmy sperm whale (*Kogia breviceps*) is a pelagic, deep-water species that inhabits the areas near the continental shelf edge, slope, and deep oceanic waters. It is found throughout the Gulf of Mexico in these waters. The pygmy sperm whale is not as social as other species, and it typically is found alone or in small groups. The male reaches sexual maturity at 8.9 to 9.8 feet (2.7 to 3.0 meters) in length, and the female reaches sexual maturity at a length of 8.5 to 9.1 feet (2.6 to 2.8 meters). A single calf is born after an 11-month gestation period, and lactation lasts about 12 months. The diet of the pygmy sperm whale consists mainly of squid, fish, and crustaceans (Wynne et al. 1999).

F.2.4.4 Dwarf Sperm Whale

The dwarf sperm whale (*Kogia simus*) is a pelagic, deep-water species that inhabits the areas near the continental shelf edge, slope, and deep oceanic waters. It is found throughout the Gulf of Mexico in these waters. The dwarf sperm whale is not as social as other species, and it typically is found alone or in small groups. Sexual maturity occurs at a length of about 6.9 to 7.2 feet (2.1 to 2.2 meters) in length. A single calf is born after a 9.5 month gestation period, and lactation lasts about 12 months. The diet of the dwarf sperm whale consists mainly of squid, fish, and crustaceans (Wynne et al. 1999).

F.2.4.5 Sperm Whale

The sperm whale (*Physeter macrophalus*) is a pelagic, deep-water species that inhabits areas near the continental slope. It is found throughout the Gulf of Mexico along the continental slope and along the Atlantic seaboard associated with Gulf Stream features. Female and young male sperm whales form breeding schools of 10 to 80 animals, while sexually inactive males form bachelor schools and older males are typically solitary. The female reaches sexual maturity at 7 to 11 years; the male reaches maturity at 19 years. A single calf is born every 3 to 6 years after a 14-month gestation period, and lactation lasts between 12 to 24 months. The diet of the sperm whale consists mainly of squid, but it can also include fish (Wynne et al. 1999).

F.2.4.6 Atlantic Spotted Dolphin

The Atlantic spotted dolphin (*Stenella frontalis*) is a tropical species that can be found in a variety of areas throughout the Gulf of Mexico ranging from coastal to pelagic environments, typically over the continental shelf and slope. It usually is associated with the Gulf Stream. The Atlantic spotted dolphin reaches sexual maturity at 8 to 15 years, and it breeds during the fall and spring. One calf is born every 1 to 2 years after a 12-month gestation period. Lactation typically lasts 3 to 5 years. The dolphin can live 25 to 30 years. The Atlantic spotted dolphin is a gregarious species, and it can be found in groups (less than 20) of other dolphins and small whales along the coast and in larger groups (less than 100) offshore. The diet of the Atlantic spotted dolphin consists of squid and a variety of fish (Wynne et al. 1999).

F.2.4.7 Rough-Toothed Dolphin

The rough-toothed dolphin (*Steno bredanensis*) is a tropical, pelagic species that is found seaward of the continental slope. Little is known about the rough-toothed dolphin, but it is thought to be sexually mature at about 10 to 14 years, and it may live as long as 32 years. The dolphin is believed to travel in pods of 10 to more than 100 and to associate with other species such as spinner dolphins, bottlenose dolphins, and pilot whales. Sometimes the rough-toothed dolphin can be found associated with large mats of Sargassum. The diet of the rough-toothed dolphin consists of deepwater octopus, squid, and fish (Wynne et al. 1999).

F.2.4.8 Killer Whale

The killer whale (*Orcinus orca*) can be found in both coastal and oceanic waters, ranging from tropical to polar waters. The killer whale is a highly social animal that travels in pods of between 3 to 55 animals, and it often cooperates in hunting and feeding efforts. The killer whale is sexually mature at 10 to 15 years and mates year round. A single calf is born every 3 to 8 years after a 17-month gestation period. Lactation lasts about 12 months. The killer whale can live more than 50 years. The diet of the killer whale is diverse and includes fish, birds, squid, turtle, and other marine mammals (Wynne et al. 1999).

F.2.4.9 False Killer Whale

The false killer whale (*Pseudorca crassidens*) is pelagic species found in the deeper waters of the Gulf of Mexico, seaward of the continental shelf. The false killer whale is a social species that can be found in groups from 10 to more than 100 with the same species or with other dolphin species. It is sexually mature at 8 to 14 years. A single calf is born every 3 to 4 years after a 16-month gestation period. This species has been known to be aggressive toward other smaller dolphins. The diet of the false killer whale consists mainly of squid and fish (Wynne et al. 1999).

F.2.4.10 Short-Finned Pilot Whale

The short-finned pilot whale (*Globicephala macrorhynchus*) can be found in a variety of water depths, and typically it is associated with squid, its main prey. It is a tropical species that is usually associated with the Gulf Stream, and it can be found in pelagic or coastal environments, possibly moving inshore during the summer months. The short-finned pilot whale is a social species that can be found in groups of 10 to more than 100, and often it is associated with bottlenose dolphins. The short-finned pilot whale is believed to be sexually mature at 6 to 12 years, and it breeds every 3 years, giving birth to a single calf after a 15- to 16-month gestation period. Lactation lasts about 20 months Individual whales can live between 50 to 70 years. Its diet consists primarily of squid, but it has been known to prey on fish (Wynne et al. 1999).

F.2.4.11 Pygmy Killer Whale

The pygmy killer whale (*Feresa attenuata*) is a pelagic species found in the deeper waters of the Gulf of Mexico, seaward of the continental shelf. Little is known about the pygmy killer whale, but its diet is believed to consist mostly of fish, and it has been observed preying on squid. The pygmy killer whale is a gregarious species that typically associates in groups of 10 to 50 individuals. The pygmy killer whale has shown aggressive tendencies, but typically it is wary of boats (Wynne et al. 1999).

F.2.4.12 West Indian Manatee

The West Indian manatee (*Trichechus manatus*) is a slow-moving aquatic mammal with gray to brown skin, a small head, flexible flippers, and a large tail. Its large rounded body weighs on average 441 to 1,102 pounds (200 to 500 kilograms) and it is approximately 9.8 to 13 feet (3 to 4 meters) in length (Nowak 1991). Its diet is primarily submergent, emergent, and floating vegetation, although it varies according to plant availability. West Indian manatees may live several decades (O'Shea and Ludlow 1992).

The West Indian manatee is present in the coastal areas from the southeastern United States to northeastern South America. In the southeastern United States, the manatee occurs primarily in Florida and southeastern Georgia; individuals may occur as far north as Rhode Island on the Atlantic Coast (Reid 1996) and as far west as Texas on the Gulf Coast, but these sightings are rare. The West Indian manatee is federally listed as endangered in its entire range (Florida, Georgia, Puerto Rico, and Texas).

Shallow coastal waters, estuaries, bays, rivers, and lakes comprise the West Indian manatee's habitat, although it seems to prefer rivers and estuaries to marine habitats (Lefebvre et al. 1989). In addition, the West Indian manatee sometimes travels through dredged canals or quiet marinas. In the north during October to April, the manatee congregates in warmer waters because it cannot tolerate prolonged exposure to water colder than 68 ˚Fahrenheit (20 ˚Celsius). The West Indian manatee prefers waters at least 3.3 to 6.6 feet (1 to 2 meters) in depth; however, along the coast, the manatee often can be found in water 9.8 to 16.4 feet (3 to 5 meters) deep. In addition, it prefers not to be in water with strong currents, and it is consistently associated with freshwater (Lefebvre et al. 1989). Because its young are born in the water, sheltered bays, coves, and canals are important for the West Indian manatee's reproductive success (O'Shea and Ludlow 1992).

While the female manatee is sexually mature at a minimum age of 4 to 5 years, most females do not breed successfully until the age of 7 to 9 years. The male manatee breeds at 9 to 10 years, although it may mature physically a few years earlier. Males and females mate promiscuously. Young are born after a gestational period of approximately 12 to 14 months, and typically an interval of 3 to 5 years passes before the individual female gives birth to another calf. Usually 2 years pass if a calf is lost early. Calves are born in spring or early summer, and normally a female gives birth to one calf. Young are weaned by the age of 1 to 2 years (O'Shea and Ludlow 1992).

F.2.4.13 Bottlenose Dolphin

The bottlenose dolphin (*Tursiops truncatus*) typically can be found in coastal or offshore waters. In the coastal environment, the bottlenose dolphin can be found in warm, sallow inshore waters of bays and rivers. When offshore, it is usually in deep waters over the continental shelf and slope. The female bottlenose dolphin reaches sexual maturity at 5 to 10 years of age, while the male reaches maturity at 8 to 12 years of age. The bottlenose dolphin breeds during the fall and spring, and produces one calf every 3 to 6 years after a 12-month gestation period. Lactation typically lasts 12 to 18 months. The dolphin may live more than 50 years. The bottlenose dolphin is a social species, and along the coast it can be found in small groups (less than 10) and in larger groups (10 to more than 100) offshore. This species usually can be found in mixed groups with pilot whales and right whales. The diet of the bottlenose dolphin consists of fish, invertebrates, and squid (Wynne et al. 1999).

F.2.5 Reptiles

F.2.5.1 Atlantic Hawksbill Sea Turtle

The Atlantic hawksbill sea turtle (*Eretmochelys imbricata*) has a large brown carapace with overlapping scutes and two claws on each flipper. Some individuals have a tortoiseshell pattern of radiating streaks. The young are all black or dark brown except for raised ridges, shell edges, and areas on the neck and flippers. Mature adults are usually 30 to 35 inches (76 to 89 centimeters) in length (Conant and Collins 1991). The Atlantic hawksbill sea turtle feeds on the ocean bottom and reef faces close to shore, eating a diet primarily consisting of crabs, sea urchins, shellfish, and jellyfish, but also including plant material and fish. This species is federally endangered.

The Atlantic hawksbill is a local and long distance migrant that prefers shallow coastal waters with rocky bottoms, coral reefs, mangrove-bordered bays, and estuaries (CSTC 1990), preferring to nest on undisturbed, deep-sand beaches on the Gulf Coast of Mexico, the West Indies, the Bahamas, and the Americas (Meylan 1992; Lund 1985). The adult female nests only once every 2 to 3 years from May to November and lays 4 to 6 clutches of 50 to more than 200 eggs at 14- to 18.5-day intervals (NatureServe 2005). Incubation lasts approximately 2 months; the age of sexual maturity is unknown (CSTC 1990).

F.2.5.2 Green Sea Turtle

The green sea turtle (*Chelonia mydas*) has a brown carapace covered in dark, wavy markings, radiating mottled markings, or large dark brown blotches; young are black or dark brown with white undersides. Mature adults are usually 35 to 48 inches (90 to 122 centimeters) up to more than 60 inches (153 centimeters) in length. The length of the hatchling carapace is usually between 1.6 and 2.4 inches (4 and 6 centimeters) (Conant and Collins 1991). This turtle most commonly feeds in shallow, low-energy waters containing abundant submerged vegetation. Adults are primarily herbivores, while juveniles are more invertivorous. The green sea turtle is federally threatened.

The green sea turtle is a long distance migrant preferring tidal flats, pelagic zones, and isolated sand dunes. It prefers to nest on high-energy beaches with deep sand (NatureServe 2005). Every 2 to 4 years, the female lays between 1 and 8 clutches, each averaging 90 to 140 eggs, at approximately 2-week intervals. Nesting occurs between March and October in the Caribbean-Gulf of Mexico region, with a peak in May and June (Ehrhart and Witherington 1992). There are no nesting records for green sea turtles in Louisiana, and sightings are fairly rare (LNHP 2004).

F.2.5.3 Kemp's Ridley Sea Turtle

The Kemp's Ridley sea turtle (*Lepidochelys kempii*) is a small sea turtle that is federally listed as endangered. The turtle is found in shallow coastal and estuarine waters, including those of the Gulf of Mexico. Adults are olive green above and yellow below, and young are gray above and yellow below. The shell of the Kemp's Ridley sea turtle is nearly round, and its limbs are flattened flippers. The shell length is usually between 23 and 28 inches (58 and 70 centimeters) for adults and 1.5 to 1.7 inches (3.8 to 4.4 centimeters) for hatchlings (Conant and Collins 1991).

In coastal waters, the Kemp's Ridley sea turtle is usually found over sand or mud bottoms where it feeds on crabs. Nests are built on elevated dunes, especially on beaches backed up by large swamps or bodies of open water with seasonal, narrow ocean connections (NatureServe 2005).

During the nesting season from April to July, the female lays 1 to 4 clutches of about 100 eggs at intervals of 10 to 28 days. Eggs hatch in an average of 50 to 55 days (CSTC 1990).

F.2.5.4 Leatherback Sea Turtle

The leatherback sea turtle (*Dermochelys coricea*) has a black or dark blue carapace, often with irregular white or pink blotches, and seven prominent longitudinal ridges. The adult is usually 53 to 70 inches (135 to 178 centimeters) in length, with some as long as 74 inches (189 centimeters). The leatherback hatchling is about 2.4 to 3 inches (6 to 7.5 centimeters) long, and it is black and white and covered with small beady scales that are later shed (Conant and Collins 1991). It feeds primarily on jellyfish. This species is federally listed as endangered.

Mainly pelagic, the leatherback tends to approach land exclusively for nesting (Eckert 1992). This turtle is a long-distance migrant that prefers the open ocean, particularly along the edge of continental shelves; but it is also found in seas, gulfs, bays, and estuaries. When nesting, the leatherback seeks moist sand on sloping sandy beaches backed by vegetation near deep water and rough seas (CSTC 1990). Every 2 to 3 years, the female leatherback lays up to 10 (possibly more) clutches of 50 to 170 eggs at intervals of about 1 to 2 weeks. Nesting occurs between March and August in the Western hemisphere; eggs hatch in 8 to 10 weeks (Eckert 1992). Due to its preference for open water, this sea turtle is one of the least recorded sea turtles in Louisiana; however, it may be found anywhere along the coast (LNHP 2004).

F.2.5.5 Loggerhead Sea Turtle

The loggerhead (*Caretta caretta*) is a reddish-brown sea turtle found in a variety of habitats, including open seas to more than 500 miles (805 kilometers) from shore, bays, estuaries, lagoons, creeks, and mouths of rivers, mainly in warm temperate and subtropical regions (NatureServe 2005). Adults have a carapace length typically between 28 to 49 inches (70 to 125 centimeters); hatchlings have a shell length of 1.6 to 2 inches (4 to 5 centimeters) (Dodd 1988 and 1992; Conant and Collins 1991). The loggerhead sea turtle is federally listed as threatened.

The female loggerhead sea turtle nests on open sandy beaches above the high-tide mark, seaward of well-developed dunes. This turtle favors high-energy and steeply sloped beaches with gradually sloped offshore approaches (CSTC 1990).

Between 50,000 to 70,000 clutches are deposited each year in southeastern states (Meylan et al. 1995). Despite some natural fluctuation in the size of the loggerhead population, numbers appear to be declining in some areas, largely because of habitat destruction and incidental take by shrimp trawlers. The nesting population in the southeastern United States is believed to be declining (CSTC 1990, Taylor 1992).

Every 2 to 3 years, a mature female lays between 1 and 9 clutches of around 120 eggs at intervals of 2 weeks. Nesting occurs mainly at night, often at high tide, from April to early September. The eggs hatch in 8 to 9 weeks in the southeastern states. The sex of the hatchlings is determined by incubation temperatures, with the ratio strongly biased toward females in Atlantic coastal waters. Hatchlings emerge from the nest a few days after hatching, typically during darkness (Wibbels et al. 1991; Mrosovsky and Provancha 1992).

F.3 FIELD OBSERVATIONS

This section presents observations made during field visits to the proposed Chacahoula and Clovelly storage sites.

F.3.1 Chacahoula, Louisiana

Biologists from ICF Consulting were unable to access land within the proposed Chacahoula site boundaries due to deep water and limited time. On October 21, 2005, observations were made from two points located south of the site boundary.

F.3.1.1 Proposed Chacahoula Storage Site

The proposed Chacahoula storage site area consists mainly of bottom hardwood swamp dominated by bald cypress. Other tree species observed were red maple, coastal plain willow, water tupelo, and Chinese tallow (an invasive species). The hardwood swamp is interspersed with open areas of deeper water covered in a vegetative mat. The National Wetlands Inventory describes the area as palustrine, semipermanently flooded, broadleaf deciduous or needleleaf deciduous wetland.

Table F.3.1.1-1: Plant Species Observed at the Chacahoula Candidate Site

Common name	Scientific Name	Vegetative Layer
Bald Cypress	*Taxodium distichum*	Canopy
Sweet Gum	*Liquidambar styraciflua*	Canopy
Eastern Cottonwood	*Populus deltoids*	Canopy
Oaks	*Quercus* spp.	Canopy
Black Willow	*Salix nigra*	Canopy
Ash	*Fraxinus* spp.	Canopy
Red Maple	*Acer rubrum*	Canopy
Box Elder	*Acer negundo*	Canopy
Hackberry	*Celtis occidentalis L.*	Canopy
Pecan	*Carya illinoensis*	Canopy
Tupelo	*Nyssa aquatica*	Canopy
Spanish Moss	*Tillandsia usneoides*	Epiphyte

F.3.1.2 Proposed Chacahoula Raw Water Intake Structure

The proposed location for the raw water intake (RWI) structure is on the ICW. The biologists were unable to visit this area during the visit due to limited access and time constraints.

F.3.2 Clovelly, Louisiana

Four biologists from ICF consulting visited the proposed Clovelly site on October 20, 2005.

F.3.2.1 Existing Clovelly Storage Site

The Louisiana Offshore Oil Port (LOOP) would operate the proposed Clovelly SPR site. LOOP has an existing storage facility at the Clovelly site consisting of eight crude oil caverns and a 25-million-barrel brine reservoir for brine used to displace oil from the caverns for distribution. The storage facility is located in a brackish, tidally influenced marsh. Areas that would be dredged for site expansion are spoil banks from LOOP construction. These areas support native marsh species and a significant amount of invasive species. LOOP monitors habitat changes in and around the facility and reported no inconsistencies with control areas in beach elevation, vegetation biomass, or vegetation land area in 2003.

Table F.3.2.1-1: Plant Species Typical of LOOP

Common name	Scientific Name	Vegetative Layer
Salt Meadow Cordgrass	*Spartina patens*	Emergent
Smooth Cordgrass	*Spartina alterniflora*	Emergent
Bitter Panicgrass	*Panicum amarum*	Emergent
Seaside Purslane	*Sesuvium portulacastrum*	Emergent
Salt Grass	*Distichlis spicata*	Emergent
Seaside Goldenrod	*Solidago sempervirens*	Emergent
Coast Drop Seed	*Sporobolus virginicus*	Emergent
Large Leaf Pennywort	*Centella javanica*	Emergent
Deer Pea Vetch	*Vicia ludoviclana*	Emergent
Common Reed	*Phragmites australis*	Emergent
Narrowleaf Baccharis	*Baccharis angustifolia*	Emergent
Catchfly Gentian	*Eustoma exaltatum*	Emergent
Torpedo Grass	*Panicum repens*	Emergent
Groundnut	*Apios Americana*	Emergent
Seashore Paspalum	*Paspalum vaginatum*	Emergent
Virginia Glasswort	*Salicornia virginica*	Emergent
Roseau Cane	*Phragmites communis*	Emergent
Sea Rocket	*Cakile edentula*	Emergent
Eastern Baccharis	*Baccharis halimifolia*	Emergent
Prostate Spurge	*Euphorbia supine*	Emergent
Seashore Elder	*Iva Imbricata*	Emergent
Beach Morning Glory	*Ipomoea imperati*	Emergent
Saltmarsh Morning Glory	*Ipomoea sagittata*	Emergent
Saltwort	*Batis maritima*	Emergent
Sea Oxeye	*Borrichia frutescens*	Emergent
Slender-Leafed Goldenrod	*Solidago tenuifolia*	Emergent

Table F.3.2.1-1: Plant Species Typical of LOOP

Common name	Scientific Name	Vegetative Layer
Yellow Nutgrass	*Cyperus esculentus*	Emergent
Bushy Beardgrass	*Andropogon glomeratus*	Emergent
Northern Fogfruit	*Phyla lanceolata*	Emergent
Saltmarsh Fimbry	*Fimbristylis castanea*	Emergent
Black Mangrove	*Avicennia germinans*	Emergent
Common Threesquare Bulrush	*Scirpus pungens*	Emergent
Shortleaf Flatsedge	*Cyperus brevifolius*	Emergent
Pointed Broom Sedge	*Carex scoparia*	Emergent
Coast Roast Gentian	*Sabatia calycina*	Emergent
Common Frogfruit	*Phyla nodiflora*	Emergent
Irisleaf Yellow Eye Grass	*Xyris laxifolia*	Emergent
Joint Grass	*Calamagrostis canadensis*	Emergent
Lamb’s Quarters	*Chenopodium album*	Emergent
Marsh Elder	*Iva frutescens*	Emergent
Marsh Swallow Wort	*Cynanchum angustifolium*	Emergent
Perennial Salt Marsh Aster	*Aster tenuifolius*	Emergent
Sea Lavender	*Limonium carolinianum*	Emergent
Sea Oats	*Uniola Paniculata*	Emergent
Seabeach Grass	*Panicum Amarulum*	Emergent
Silverhead	*Philoxerus vermicularis*	Emergent

F.3.2.2 Existing Clovelly RWI Structure

The RWI structure is located onsite at the LOOP facility; it is used as needed for cavern development.

F.4 HABITAT ASSESSMENT AND POTENTIAL IMPACTS

This section evaluates whether the proposed SPR development activities would take place in areas where threatened and endangered species are known to exist or where they may exist based on the natural history information presented in section F.2. For any component of the SPR proposal located in known or potential threatened, endangered, or candidate species habitat, the nature of potential impacts are described. The assessment considers potential mitigation measures that DOE would implement for selected development alternatives.

In the following sections, a separate assessment is provided for each of the proposed SPR candidate and expansion sites.

F.4.1 Chacahoula, Louisiana

The proposed Chacahoula site assessment evaluates the potential effects on threatened, endangered, and candidate species by each of the elements of the proposed action listed in table F.4.1-1.

Assessment findings for these components of the Chacahoula site proposal are presented for each of the following species.

Table F.4.1-1: Elements of the Proposed Action and Location on Chacahoula Candidate Site

Element of Proposed Action	Location by Parish or Offshore Area
Chacahoula candidate site	Lafourche
Power lines and associated rights-of-way (ROWs) to Chacahoula candidate site	Lafourche and Terrebonne
Pipeline ROWs from Chacahoula to St. James terminal	Lafourche and St. James
Pipeline ROWs from Chacahoula to LOOP storage facility at Clovelly	Lafourche
RWI in ICW and associated access road and pipeline and power line ROWs	Lafourche and Terrebonne
Brine disposal pipeline ROW to Gulf of Mexico	Lafourche, Terrebonne, Gulf of Mexico

F.4.1.1 Birds

F.4.1.1.1 Bald Eagle

The bald eagle has been recorded in all of the parishes containing elements of the proposed Chacahoula development (Lafourche, St. James, and Terrebonne). All of the proposed elements have the potential to affect bald eagles. Data provided by LDFW (Lester 2006) suggest there are 14 recorded nesting sites within 1 mile (2 kilometers) of the proposed Chacahoula site and facilities. Five of these nests are within 1,500 feet (460 meters) of a proposed element – one near the crude oil pipeline to Clovelly; two near the crude oil pipeline to St. James; and two near the RWI. Bald eagle nests in bald cypress trees near fresh to intermediate marshes or open water in the southeastern parishes (Carloss 2005); much of the habitat surrounding the site and associated infrastructure (i.e., cypress-tupelo swamp) is potential high quality habitat for this species.

Construction Impacts

All proposed ROWs have at least one documented nesting area within 1 mile (2 kilometers). The USFWS and LDWF recommend against construction activities that would occur during nesting periods in Louisiana (i.e., October to mid-May) within 1 mile (2 kilometers) of nest sites. They also recommend that large trees be saved for potential roost and perch trees (Carloss 2005). During preconstruction surveys, DOE would have a biologist identify and map all bald eagle nests within 1 mile (2 kilometers) of a proposed ROW. DOE would coordinate with the USFWS and LDWF to avoid adverse impacts. This coordination would include implementing a construction schedule and large tree preservation plan. Trees within the ROW construction easement would be cleared, but DOE would re-seed with native species within this area to re-establish native habitat.

Construction of the Chacahoula storage site would remove all trees in the 350 acre (140 hectare) site and security buffer. This would be a large area of potential nesting, roosting, and foraging habitat within 1 mile (2 kilometers) of a recorded nesting area. Because of the complexity of this site, DOE would not be able to avoid all construction activities during nesting periods. DOE would consult with USFWS and LDWF to avoid, minimize, or mitigate for affects to bald eagles.

Data provided by LDWF indicate that the proposed RWI, RWI pipeline, crude oil pipeline to Clovelly, and crude oil pipeline to St. James have recorded nesting areas within 1,500 feet (460 meters). USFWS and LDWF recommends against any activity taking place within this buffer area of an active nesting site (Carloss 2005; Watson 2005). DOE would have a biologist survey the area to identify the exact locations of nests near the proposed RWI and ROWs. Where feasible, DOE would adjust proposed locations to avoid crossing within 1,500 feet (460 meters) of a nest tree. If nests can not be avoided, DOE would complete a biological assessment and formal Section 7 consultations. DOE would follow all recommendations provided in the Biological Opinion from USFWS.

Operation and Maintenance Impacts

Operation and maintenance activities at the site may affect the bald eagle because noise, human activities, and lights near nesting and perching sites can disturb normal behavior or render sites unsuitable for continued use by this species. DOE would use lowmast lighting and downshield lights to minimize the impacts of photopollution. The presence of the power lines leading to the site may affect the bald eagle by obstructing its flight path.

Along the RWI and brine disposal pipeline ROWs, maintenance activity would be restricted during nesting season; therefore, operation and maintenance activities would have no effect on the bald eagle. Most of the pipelines would be built along existing ROWs, and operation and maintenance of the proposed expansion would be similar to existing conditions and should have negligible impact on the bald eagle. Near the RWI structure, DOE would enclose the raw water pump station to minimize noise impacts on wildlife, including the bald eagle. Normal operation and maintenance activities at the RWI would be restricted during nesting seasons. Operation activities associated with a drawdown of oil may happen at any time of the year, and may affect bald eagles near the RWI.

F.4.1.1.2 Brown Pelican

Of the locations listed in table F.4.1-1, Lafourche and Terrebonne Parishes have recorded brown pelicans. All elements of the development associated with the Chacahoula site would be located in these parishes, with the exception of portions of the crude oil pipeline to St. James Terminal and the offshore portion of the brine pipeline. Suitable habitat for the brown pelican is confined to the Gulf shore and associated barrier islands, sandbars, and wetlands. Consequently, the pipelines near the shore, which are the brine disposal pipeline ROW and the crude oil pipeline ROW to the storage facility at Clovelly, are the elements of the proposed development most likely to impact the brown pelican. According to USFWS, the brown pelican may roost in the vicinity of the Chacahoula ROWs close to the coast.

Construction Impacts

Nesting brown pelicans can be disturbed by human noise and activity nearby, especially if activity is closer than 330 to 1,970 feet (100 to 600 meters) to nests (NatureServe 2005). If the Chacahoula site is chosen for development, a biologist would identify brown pelican roosts along the proposed pipeline ROWs. If brown pelicans are identified in or near a pipeline ROW, construction would be scheduled to occur during periods when they are not present, if possible.

Operation and Maintenance Impacts

Operation and maintenance activities for these portions of the pipelines are expected to be infrequent and have no effect on the brown pelican. Operation and maintenance of the crude oil pipeline would be comparable to existing activities associated with the crude oil pipeline in the existing ROW. Along all pipelines, human activity would be minimal.

F.4.1.1.3 Peregrine Falcon

The peregrine falcon is a winter migratory visitor to Lafourche and Terrebonne Parishes. Barrier islands along the Gulf Coast are important feeding areas for this long-distance migrant. Based on this habitat, the only part of the development that potentially would affect the peregrine falcon is the brine disposal pipeline and ROW through Terrebonne Parish; however, because the construction of the pipeline and ROW would be fairly small in scope, and the species does not nest in Louisiana, it is expected that the construction, operation, and maintenance of the pipeline would have no effect on the peregrine falcon.

F.4.1.1.4 Piping Plover

Piping plovers have been identified in both Lafourche and Terrebonne Parishes. The piping plover overwinters on beaches, mudflats, and sandflats along the Gulf of Mexico, including barrier island beaches and spoil islands on the ICW. The piping plover uses these habitats for feeding, but not nesting. There is no beach habitat along the ROWs or at the Chacahoula site. The offshore portion of the brine disposal pipeline passes 7 miles (12 kilometers) to the west of designated critical habitat units (i.e., Unit LA–3, Point Au Fer Island, and Unit LA–4, Isles Dernieres). Construction, operation and maintenance of this ROW would not affect the piping plover since it would be located underwater and away from piping plover habitat.

F.4.1.2 Fish

F.4.1.2.1 Gulf Sturgeon

Historically, the gulf sturgeon has been found in coastal rivers in the northeastern Gulf of Mexico region. Although it is listed in all three parishes that would contain elements of the proposed Chacahoula development, none of the Federal critical habitats for gulf sturgeon in Louisiana are in these parishes (USFWS 2003a); therefore, it is expected that the Chacahoula development would have no effect on gulf sturgeon.

F.4.1.2.2 Pallid Sturgeon

Of the locations with proposed development for the Chacahoula site, only St. James Parish lists the pallid sturgeon species. The proposed element located in St. James Parish is the crude oil pipeline from the Chacahoula site to the existing St. James Terminal. The pallid sturgeon is reported to be present in the Mississippi River in St. James Parish, and it is found in other major free-flowing rivers within the Mississippi and Atchafalaya River systems in Louisiana. The proposed construction related to this element of the Chacahoula site would not cross the Mississippi River or any major tributaries, and there would be no effect on the pallid sturgeon.

F.4.1.3 Mammals

F.4.1.3.1 Red Wolf

Terrebonne Parish, which would contain portions of the proposed brine disposal pipeline, is within the historical range of the red wolf; however, the species currently exists only in a few reintroduction sites in North Carolina and Tennessee. Development of the Chacahoula site and associated infrastructure would have no effect on the red wolf species.

F.4.1.3.2 West Indian Manatee

The West Indian manatee has been reported in all three of the parishes that encompass the proposed Chacahoula site development. However, sightings of the West Indian manatee in Louisiana are rare. Consultations with USFWS and LDWF did not indicate any concerns that the proposed SPR facilities in would have any affect to the manatees (Carloss 2005; Watson 2005; Lester 2006).

F.4.1.4 Marine Mammals

The construction of the brine disposal pipeline and the operation of the brine disposal system would have no effect on the Gervais beaked whale, goose-beaked whale, pygmy sperm whale, dwarf sperm whale, sperm whale, rough-toothed dolphin, killer whale, false killer whale, short-finned pilot whale, pygmy killer whale, and the bottlenose dolphin. These species are found in deeper waters than the terminus of the offshore pipelines and the brine diffuser contours (see Appendix B, Brine Discharge Modeling).

A description of the potential impacts on the Atlantic spotted dolphin follow; impacts on the West Indian manatee were discussed earlier.

F.4.1.4.1 Atlantic Spotted Dolphin

The Atlantic spotted dolphin is a tropical species that can be found in a variety of areas through the Gulf of Mexico. It ranges from coastal to pelagic environments, typically over the continental shelf and slope. The Atlantic spotted dolphin is usually associated with the Gulf Stream.

Construction Impacts

The Atlantic spotted dolphin is usually found in deeper waters than the extent of the brine disposal system, but it is known to venture into shallower waters. The species likely would avoid or leave any construction area, and then return after construction was complete. Due to the limited construction time and the relatively small area of the Gulf of Mexico that would be impacted, no effect would result on the Atlantic spotted dolphin.

Operation and Maintenance Impacts

The Atlantic spotted dolphin may occur in the location of the brine diffusion; however, it is unlikely that the species would remain in the area for an extended period. Because the dissipation of the brine would occur in a relatively small area of the Gulf of Mexico and the species would not be restricted to such areas, there would be no effect on the Atlantic spotted dolphin.

F.4.1.5 Reptiles

F.4.1.5.1 Atlantic Hawksbill Sea Turtle

The Atlantic hawksbill sea turtle has been reported in Lafourche and Terrebonne Parishes, but the only component of the Chacahoula development with the potential to affect the Atlantic hawksbill sea turtle and its habitat is the brine disposal pipeline and ROW. The hawksbill turtle nests from May to November on sandy beaches, often in the proximity of coral reefs. The turtle is seen occasionally in Louisiana, but more commonly it is seen in more tropical waters.

Construction Impacts

Construction of the brine disposal pipeline onshore would have no effect on the Atlantic hawksbill sea turtle because the pipeline near the coast crosses through only wetland habitat, not beach. Offshore pipeline construction temporarily would disturb potential feeding habitat for Atlantic hawksbill sea turtle; however, the total area affected would be a small portion of the total available area of suitable habitat, and the species would suffer no effect.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would have no effect on the Atlantic hawksbill turtle because the pipeline does not cross beach habitat. Operation of the offshore component of the brine disposal system would have no effect on the feeding habits or habitat of the sea turtle because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat Assessment). Maintenance of the pipeline offshore would be infrequent, and it would not affect the Atlantic hawksbill sea turtle.

F.4.1.5.2 Green Sea Turtle

The green sea turtle has been reported in Lafourche and Terrebonne Parishes, but the only component of the Chacahoula development with the potential to affect the green sea turtle is the brine disposal pipeline and ROW. The green sea turtle nests from March to October, with a peak in May and June, on beaches with deep sand.

Construction Impacts

The Louisiana National Heritage Program (LNHP 2004) reports no nesting records of the green sea turtle in the state. Even if the green sea turtle is in the area, construction of the brine disposal pipeline onshore would have no effect on the species because, near the coast, the pipeline crosses only through wetland habitat, not beach. Offshore pipeline construction temporarily would disturb potential feeding habitat for the green sea turtle; however, the total area affected would be a small portion of the total available area of suitable habitat, and there would be no effect on the species.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would have no effect on the green sea turtle because the pipeline does not cross beach habitat. Operation of the offshore component of the brine disposal system would have no effect on the feeding and habitat of the green sea turtle because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat Assessment). Maintenance of the pipeline offshore would be infrequent, and it would not affect the green sea turtle.

F.4.1.5.3 Kemp’s Ridley Sea Turtle

Kemp’s Ridley sea turtle has been reported in Lafourche and Terrebonne Parishes, but the only component of the Chacahoula development with the potential to affect the Kemp’s Ridley sea turtle is the brine disposal pipeline and ROW. The Kemp’s Ridley sea turtle nests from April to July.

Construction Impacts

Construction of the brine disposal pipeline onshore would have no effect on the Kemp's Ridley sea turtle because, near the coast, the pipeline crosses only through wetland habitat, not beach. Offshore pipeline construction temporarily would disturb potential feeding habitat for the Kemp's Ridley sea turtle; however, the total area affected would be a small portion of the total available area of suitable habitat, and there would be no effect on the species.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would have no effect on the Kemp's Ridley sea turtle because the pipeline does not cross beach habitat. Operation of the offshore component of the brine disposal system would have no effect on the feeding and habitat of the species because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat Assessment). Maintenance of the pipeline offshore would be infrequent and would not affect the Kemp's Ridley sea turtle.

F.4.1.5.4 Leatherback Sea Turtle

The leatherback sea turtle has been reported in Lafourche and Terrebonne Parishes, but the only component of the Chacahoula development with the potential to affect the leatherback sea turtle is the brine disposal pipeline and ROW. The leatherback sea turtle nests from March and August, and it approaches land almost exclusively for nesting (Eckert 1992), which takes place on sloping sandy beaches backed by vegetation near deep water and rough seas (CSTC 1990).

Construction Impacts

Construction of the brine disposal pipeline onshore would have no effect on the leatherback sea turtle because, near the coast, the pipeline crosses only through wetland habitat, not beach. Offshore pipeline construction temporarily would disturb potential feeding habitat for the leatherback sea turtle; however, the total area affected would be a small portion of the total available area of suitable habitat, and there would be no effect on the species.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would have no effect on the leatherback sea turtle because the pipeline does not cross beach habitat. Operation of the offshore component of the brine disposal system would have no effect on the feeding and habitat of the species because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat Assessment). Maintenance of the pipeline offshore would be infrequent, and it would not affect the leatherback sea turtle.

F.4.1.5.5 Loggerhead Sea Turtle

The loggerhead sea turtle has been reported in Lafourche and Terrebonne Parishes, but the only component of the Chacahoula development with the potential to affect the loggerhead sea turtle is the brine disposal pipeline and ROW. The loggerhead sea turtle nests from April to early September.

Construction Impacts

Construction of the brine disposal pipeline onshore would have no effect on the loggerhead sea turtle because, near the coast, the pipeline crosses only through wetland habitat, not beach. Offshore pipeline construction temporarily would disturb potential feeding habitat for the loggerhead sea turtle; however, the total area affected would be a small portion of the total available area of suitable habitat, and there would be no effect on the species.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would have no effect on the loggerhead sea turtle because the pipeline does not cross beach habitat. Operation of the offshore component of the brine disposal system would have no effect on the feeding and habitat of the species because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat Assessment). Maintenance of the pipeline offshore would be infrequent, and it would not affect the loggerhead sea turtle.

F.4.2 Clovelly, Louisiana

The assessment for the proposed Clovelly site evaluates the potential effects on threatened, endangered, and candidate species by each of the elements of the proposal listed in table F.4.2-1:

Table F.4.2-1: Elements of the Proposed Action and Location on the Clovelly Candidate Site

Element of Proposed Action	Location by Parish or Offshore Area
Clovelly candidate site	Lafourche
Connection to existing crude oil distribution system	Lafourche
RWI system upgrade	Lafourche
Brine disposal system upgrade	Lafourche

Development of the Clovelly candidate site would use existing infrastructure of the adjacent LOOP storage facility at Clovelly. No new construction would be required for the raw water, brine disposal, and crude oil distribution systems. Only minor upgrades and connections to these systems would be necessary; therefore, effects on threatened, endangered, and candidate species from normal operations and maintenance activities of these elements would be insignificant. This DOE evaluation of potential effects associated with the Clovelly site addresses only the potential construction, operation, and maintenance impacts.

The following paragraphs describe evaluation findings for each potentially affected species. Note that all proposed actions associated with the Clovelly site would be located in Lafourche Parish (except operation and maintenance of the offshore brine pipeline and diffuser, which would be located in the Gulf of Mexico).

F.4.2.1 Birds

F.4.2.1.1 Bald Eagle

The Clovelly site is located amidst mixed coastal wetlands and open water habitat suitable for the bald eagle, and the Louisiana Natural Heritage Program reports that the bald eagle is present in Lafourche Parish. Data from LDWF reports no bald eagle nests within 1 mile (2 kilometers) of the proposed storage site. Further, the Clovelly site is an existing oil storage facility with frequent human activity. Bald eagles that would be near the area would be tolerant to human activity. The proposed Clovelly storage site would not affect bald eagles.

F.4.2.1.2 Brown Pelican

According to the LDWF (Carloss 2005), colonial nesting birds, including the brown pelican, are known to exist in the vicinity of the Clovelly site.

Construction Impacts

Suitable habitat for the brown pelican in Lafourche Parish would be confined to the Gulf shore and associated barrier islands, sandbars, and wetlands, and nearby shallow estuarine waters, sand spits, offshore sand bars, and islets (for nocturnal roosting). Data from LDWF did not report any rookeries within 1 mile (2 kilometers) of the site, but LDWF points out that the locations of rookeries may change from year to year (Lester 2006). Habitat at the site is considered poor quality due to previous disturbance and the existing human activity associated with the LOOP storage facility at Clovelly. Because the site is disturbed with daily human activities, any pelicans that moved into the area would be considered tolerant of human activity. The proposed Clovelly storage site would have no affect on the brown pelican.

F.4.2.1.3 Peregrine Falcon

The peregrine falcon, which is listed by the State of Louisiana as threatened/endangered, is a migratory visitor to Louisiana in the winter. Barrier islands along the Gulf Coast are important feeding areas for long-distance migrants. Nesting does not occur along the Gulf Coast. Any peregrine falcon feeding in the vicinity of proposed development would be expected to move to adjacent undisturbed areas, which are plentiful, and thus, construction at the site and associated infrastructure upgrades would have no effect on this species. Likewise, operation and maintenance activities would be comparable to those associated with the adjacent LOOP existing storage facility at Clovelly and would have no effect on the species.

F.4.2.1.4 Piping Plover

The piping plover is a migratory species that overwinters on beaches, mudflats, and sandflats along Gulf of Mexico, including barrier island beaches and spoil islands (USFWS 2005). Suitable habitat for the piping plover exists in Lafourche Parish, but has not been identified at the Clovelly storage site. The Clovelly storage site is an existing facility with daily human activity. The site is located 25 miles (40 kilometers) from the nearest designated critical habitat area. Thus, the proposed site would not affect the piping plover.

F.4.2.2 Fish

The only endangered, threatened, or candidate species of fish in Lafourche Parish is the gulf sturgeon. The USFWS has designated as critical habitat certain Gulf Coast rivers where the gulf sturgeon spawns. The Clovelly candidate site is not in critical habitat and the existing site conditions are not suitable for spawning by this species. Gulf sturgeon, particularly adults, may feed in the area of proposed development. Construction of storage caverns, surface facilities, and infrastructure would cause temporary disturbance and long-term loss of potential feeding habitat; however, any gulf sturgeon present at the site would be expected to move to adjacent undisturbed areas during construction. The loss of suitable feeding area would have no effect on the gulf sturgeon because the area disturbed would be an insignificant portion of the suitable habitat in the region. Operation and maintenance activities would be comparable to existing activities of the LOOP existing storage facility at Clovelly, and therefore, would have no additional effect on the species.

F.4.2.3 Mammals

The only endangered, threatened, or candidate mammal species in Lafourche Parish is the West Indian manatee. Although the manatee occurs primarily along the Gulf of Mexico coast in Florida, individuals range as far west as Texas. The West Indian manatee has been reported as possibly present in Lafourche Parish. The Clovelly site includes shallow coastal waters, such as canals, that are suitable habitat for this species. If the manatee is present at the site, construction of storage caverns, surface facilities, and infrastructure potentially would cause a temporary disturbance and some minor long-term loss of suitable habitat. Any manatee present at the site would be expected to move to adjacent undisturbed areas during construction. Because suitable habitat is abundant in the vicinity of the candidate site and any manatee present in the area likely would be occasional visitors rather than long-term residents, there would be no long-term effect on the species. Operation and maintenance impacts would be comparable to those of the existing LOOP existing storage facility at Clovelly and would have no additional effect on the manatee.

F.4.2.4 Marine Mammals

The operation of the brine disposal system would have no effect on the Gervais beaked whale, goose-beaked whale, pygmy sperm whale, dwarf sperm whale, sperm whale, rough-toothed dolphin, killer whale, false killer whale, short-finned pilot whale, pygmy killer whale, and the bottlenose dolphin. These species are found in deeper waters than the brine diffuser contours (see Appendix B, Brine Discharge Modeling).

Descriptions of potential impacts on the Atlantic spotted dolphin follow; descriptions of impacts on the West Indian manatee were described in the preceding section.

F.4.2.4.1 Atlantic Spotted Dolphin

The Atlantic spotted dolphin is a tropical species that can be found in a variety of areas through the Gulf of Mexico. It ranges from coastal to pelagic environments, typically over the continental shelf and slope. The Atlantic spotted dolphin is usually associated with the Gulf Stream.

Operation Impacts

The Atlantic spotted dolphin may occur in the location of the brine diffuser; however, it is unlikely that the species would remain in the area for an extended period. Because the dissipation of the brine would occur in a relatively small area of the Gulf of Mexico and the species would not be restricted to such areas, there would be no effect on the Atlantic spotted dolphin.

F.4.2.5 Reptiles

F.4.2.5.1 Atlantic Hawksbill Sea Turtle

The Atlantic hawksbill sea turtle is a migratory species that prefers shallow coastal waters with rocky bottoms, coral reefs, mangrove-bordered bays, and estuaries (CSTC 1990). The Atlantic hawksbill sea turtle prefers to nest from May to November on undisturbed, deep-sand beaches (Meylan 1992; Lund 1985), often in the proximity of coral reefs.

Construction Impacts

Other than modifications and upgrades to the pipeline, RWI, and brine disposal systems, construction would be limited primarily to the site. The only upland habitat available for nesting at the Clovelly site is revegetated dredge spoil, which is not considered suitable for this species. Although the species is seen occasionally in Louisiana, and it has been reported in Lafourche Parish, it is more commonly found in more tropical waters. The hawksbill sea turtle is not expected to be found at the Clovelly site, and it would not be affected by construction. Because the existing LOOP brine disposal pipeline would be used, no construction would take place on the beach where the species might nest.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would have no effect on the Atlantic hawksbill turtle because the pipeline would be buried. Operation of the offshore component of the brine disposal system would have no effect on the feeding and habitat of the species because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E Essential Fish Habitat Assessment). Maintenance of the pipeline offshore should be infrequent and not affect the Atlantic hawksbill turtle.

F.4.2.5.2 Green Sea Turtle

The green sea turtle most commonly feeds in shallow, low-energy waters containing abundant submerged vegetation. Its preferred habitat includes tidal flats, pelagic zones, and isolated sand dunes. Nesting typically occurs from March to October on high-energy beaches with deep sand (NatureServe 2005). With these habitat preferences, this migratory species might occasionally occur at or near the Clovelly candidate site, but it is unlikely to nest there.

Construction Impacts

Other than modifications and upgrades to the pipeline, RWI, and brine disposal systems, construction would be limited primarily to the candidate site. The only upland habitat available for nesting at the Clovelly site is revegetated dredge spoil, which is not considered suitable for this species. If any green sea turtle is present at the Clovelly site, it would be expected to avoid any temporary disturbance associated with construction activities, and it would not be affected by construction. Because the existing LOOP brine disposal pipeline would be used, no construction would take place on the beach where the turtle might nest.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would have no effect on the green sea turtle because the pipeline would be buried. Operation of the offshore component of the brine disposal system would have no effect on the feeding and habitat of the species because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat Assessment). Maintenance of the pipeline offshore should be infrequent and not affect the green sea turtle.

F.4.2.5.3 Kemp's Ridley Sea Turtle

In coastal waters, the Kemp's Ridley sea turtle usually feeds over sand or mud bottoms in shallow coastal and estuarine waters. It nests on elevated dunes, especially on beaches backed up by large swamps or bodies of open water having seasonal, narrow ocean connections (NatureServe 2005). Although canals and open water areas on and near the Clovelly site are suitable for feeding the Kemp's Ridley sea turtle, the available habitat is not suitable for nesting.

Construction Impacts

Other than modifications and upgrades to the pipeline, RWI, and brine disposal systems, construction would be limited primarily to the candidate site. If the Kemp's Ridley sea turtle is present at the Clovelly site, it would be expected to avoid the temporary disturbance associated with construction activities, and it would not be affected by construction. Temporary construction impacts and the long-term loss of marginal quality habitat would have no effect on this species, if it is present.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would have no effect on the Kemp's Ridley sea turtle because the pipeline would be buried. Operation of the offshore component of the brine disposal system would have no effect on the feeding and habitat of the species because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat Assessment). Maintenance of the pipeline offshore should be infrequent and not affect the Kemp's Ridley sea turtle.

F.4.2.5.4 Leatherback Sea Turtle

The leatherback sea turtle has been recorded in Lafourche Parish, but it is unlikely to be found at the Clovelly site. This species spends most of its life in open ocean waters, where it feeds primarily on jellyfish. It approaches land almost exclusively for nesting (Eckert 1992), which takes place on sloping sandy beaches backed by vegetation near deep water and rough seas (CSTC 1990).

Construction Impacts

Other than modifications and upgrades to the pipeline, RWI, and brine disposal systems, construction would be limited primarily to the Clovelly site. Because there are no suitable nesting areas in the vicinity of the Clovelly site, no effects on this species are anticipated from construction.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would have no effect on the leatherback sea turtle because the pipeline would be buried. Operation of the offshore component of the brine disposal system would not affect the feeding and habitat of the species because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat Assessment). Maintenance of the pipeline offshore should be infrequent, and it would not affect the leatherback sea turtle.

F.4.2.5.5 Loggerhead Sea Turtle

The loggerhead sea turtle is found in a variety of habitats, including open seas, bays, estuaries, lagoons, creeks, and mouths of rivers (NatureServe 2005). It tends to nest on open and sandy, high-energy beaches with well-developed dunes (CSTC 1990). Based on these habitat preferences, portions of the Clovelly site may be suitable habitat for the loggerhead sea turtle, but not for nesting. The loggerhead has been reported in Lafourche Parish but not specifically at the Clovelly site.

Construction Impacts

Other than modifications and upgrades to the pipeline, RWI, and brine disposal systems, construction would be limited primarily to the Clovelly site. If any loggerhead sea turtle is present at the Clovelly site, it would be expected to avoid any temporary disturbance associated with construction activities, and it would not be affected by construction. Temporary construction impacts and the long-term loss of marginal quality habitat would have no effect on this species, if it is present.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would have no effect on the loggerhead sea turtle because the pipeline would be buried. Operation of the offshore component of the brine disposal system would not affect the feeding and habitat of the species because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat Assessment). Maintenance of the pipeline offshore should be infrequent, and it would not affect the loggerhead sea turtle.

F.4.3 Bayou Choctaw, Louisiana

This assessment for the proposed Bayou Choctaw expansion site evaluates the potential effects on threatened, endangered, and candidate species by each of the elements of the proposed action listed in table F.4.3-1.

Table F.4.3-1: Elements of the Proposed Action and Location on Bayou Choctaw Site

Element of Proposed Action	Location by Parish or Offshore Area
Bayou Choctaw site	Iberville
Brine Injection Well Area	Iberville

The proposed action would involve developing two additional caverns on the existing DOE site, acquiring one existing cavern co-located on the same salt dome, and developing six new offsite brine injection wells south of the storage facility. Approximately 3,000 feet (900 meters) of new pipeline would be required to connect the existing brine injection wells to the new injection wells. No offsite construction would be required for the existing RWI and crude oil distribution pipelines; therefore the Bayou Choctaw site and the new brine injections wells are the only elements assessed for the effects of construction on threatened, endangered, and candidate species.

If DOE proceeds with expansion at the Bayou Choctaw site, regular operation and maintenance activities associated with the site would be similar to current activities associated with storage caverns currently located there, and additional effects would be negligible or none.

Descriptions of evaluation findings for this element of the Bayou Choctaw site for each species follow. Note that all proposed elements associated with the Bayou Choctaw site are located in Iberville Parish.

F.4.3.1 Birds

The bald eagle is the only threatened, endangered, or candidate bird species reported in Iberville Parish. The Bayou Choctaw site is located near areas with potentially suitable habitat for the bald eagle, including open waters or wetlands adjacent to forest lands; however, no nests have been identified near the site. The Bayou Choctaw site is an existing petroleum storage site, and proposed construction activities would be limited to the current site location. Because there are no known bald eagle nests in the area and the site is already developed, construction, operation, and maintenance activities for the proposed action would have no effect on the bald eagle.

F.4.3.2 Fish

F.4.3.2.1 Gulf Sturgeon

The gulf sturgeon can be found in some rivers, streams, and estuarine and coastal waters in Louisiana, especially in the eastern part of the state (USFWS 2003a). The gulf sturgeon reportedly occurs in Iberville Parish (USFWS 2003b); however, available information sources do not identify specific gulf sturgeon habitat areas in this parish. Critical habitat for the gulf sturgeon has been designated in riverine and estuarine areas of Louisiana (USFWS 2003a), but the areas in or near Iberville Parish are not included in the critical habitat units for the gulf sturgeon listed by USFWS. The proposed Bayou Choctaw expansion site is located on Cavern Lake, which is connected to the ICW by a canal, and potentially it would serve as habitat for the gulf sturgeon. Considering the site's location relative to the coast and the minimal effects that expansion of this site would have on aquatic habitat in Cavern Lake, the proposed action would have no effect on the gulf sturgeon.

F.4.3.2.2 Pallid Sturgeon

The pallid sturgeon inhabits larger channels of the Mississippi and Atchafalaya River systems in Louisiana. Iberville Parish, where the proposed action would be located, borders the Mississippi river, and it is reported to be within the known range of the pallid sturgeon; however, the proposed site is not located on the Mississippi River, its tributaries, or any large, free-flowing river (listed as the desired habitat of the pallid sturgeon). The proposed action would have no effect on the pallid sturgeon.

F.4.3.3 Mammals

The range of the Louisiana black bear once included all of Louisiana, including the location of the proposed Bayou Choctaw expansion site. Today, the only known breeding populations are in Louisiana in the Tensas and Atchafalaya river basins (Bowker and Jacobson 1995), areas that have been designated as critical habitat. The Bayou Choctaw site is not located in the designated critical habitat of the Louisiana black bear. All construction, operation and maintenance activities would occur within the current boundary of the Bayou Choctaw storage site. The Louisiana black bear has never been sighted at the existing facility. Thus, the expansion at the Bayou Choctaw site would have no effect on the Louisiana black bear.

F.4.3.4 Marine Mammals

No offshore elements are associated with Bayou Choctaw; no marine mammals would be affected.

F.4.4 West Hackberry, Louisiana

The assessment for the proposed West Hackberry site evaluates the potential effects on threatened, endangered, and candidate species by each of the elements of the proposed action listed in table F.4.4-1.

The proposed action would involve acquiring three existing caverns adjacent to the existing DOE site and construction at the site to connect the caverns to the existing RWI, brine disposal, and oil distribution systems. The construction associated with making the connections would be relatively minor and limited to onsite work; therefore, the West Hackberry site is the only element assessed for effects to threatened, endangered, and candidate species.

Table F.4.4-1: Elements of the Proposed Action and Location on West Hackberry Site

Element of Proposed Action	Location by Parish or Offshore Area
West Hackberry site	Cameron and Calcasieu

If DOE proceeded with expansion at the West Hackberry site, regular operation and maintenance activities associated with the site would be comparable to current activities associated with storage caverns currently located there, and additional incremental effects would be negligible or none.

Following are descriptions of the evaluation findings for this element of the West Hackberry site for each species.

F.4.4.1 Birds

F.4.4.1.1 Bald Eagle

The bald eagle has been reported in Cameron and Calcasieu Parishes in Louisiana. The West Hackberry candidate site is located near areas with potentially suitable habitat for the bald eagle, including open waters or wetlands adjacent to forest lands. DOE has reported occurrence of the bald eagle at the West Hackberry site or on lands through which the SPR pipelines pass (DOE 2002); however there are currently no known bald eagle nests near the site. The West Hackberry site is an existing petroleum storage site. Proposed construction activities would be limited to the current site location, and operation and maintenance would be similar to current activities; therefore, construction, operation, and maintenance activities for the proposed action would have no effect on the bald eagle.

F.4.4.1.2 Brown Pelican

The brown pelican has been reported in parishes along the Gulf Coast of Louisiana including Cameron Parish where the West Hackberry site is located. The brown pelican typically is found in coastal areas, including barrier islands, sandbars, and wetlands, and nearby shallow estuarine waters, sand spits, offshore sand bars, and islets (for nocturnal roosting). Although the West Hackberry expansion site does not have ideal habitat for the brown pelican, this species has been reported by DOE in locations near or on the site (DOE 2002). Because the area is not prime habitat for the brown pelican and construction would be restricted to onsite areas, construction activities are expected to have no effect on the species. Impacts from operation and maintenance activities would be comparable to those resulting from ongoing activities, and they would also have no effect on the brown pelican.

F.4.4.1.3 Piping Plover

The piping plover is found along the Gulf Coast of Louisiana, including Cameron Parish where the West Hackberry site is located. The habitat of the piping plover consists of areas directly adjacent to the coast (e.g., beaches, mudflats, sandflats, and dune systems). Due to the inland location of the West Hackberry site, construction, operation, and maintenance of the proposed action would have no effect on the piping plover.

Unit LA-1 in Cameron Parish is on the Federal list of designated critical habitat for the piping plover; however, all piping plover critical habitat areas in Louisiana, including Unit LA-1, are restricted to areas in the immediate vicinity of the shoreline, and they do not extend inland beyond where densely vegetated habitat is located. Construction, operation, and maintenance activities associated with the West Hackberry site (all located inland) would have no effect on any areas of critical habitat.

F.4.4.1.4 Red-Cockaded Woodpecker

The red-cockaded woodpecker is reported to be present in Calcasieu Parish where the proposed West Hackberry expansion site is located. The landscape of the storage site and area surrounding the site has emergent wetlands and open water areas, with abundant lakes, bayous, and canals. The red-cockaded woodpecker's usual habitat includes open pine woodlands or savannahs with large, old pines, and it is unlikely that the habitat in the vicinity of the West Hackberry site would be preferable to this species. There are designated primary and secondary core populations of the red-cockaded woodpecker in Louisiana, as described in section F.2.1.5; however, these populations are located in the central part of the state, more than 50 miles (80 kilometers) from the West Hackberry site.

Considering the site characteristics and the distance from known core populations of red-cockaded woodpecker, there would be no effect from construction and operation and maintenance activities on this species at the West Hackberry site.

F.4.4.2 Fish

The gulf sturgeon is potentially found in rivers, streams, estuarine, and coastal waters in Louisiana, especially in the eastern part of the state (USFWS 2003a). The gulf sturgeon reportedly occurs in Cameron Parish (USFWS 2003b). Critical habitat for the gulf sturgeon has been designated in riverine and estuarine areas of Louisiana (USFWS 2003a); however, the Federal list of designated critical habitat for the gulf sturgeon in Louisiana includes areas only in the eastern part of the state, and areas in or near Iberville Parish are not included. Available information sources do not identify specific gulf sturgeon habitat areas in this parish. The proposed West Hackberry expansion site is located near water bodies that potentially would serve as habitat for the gulf sturgeon; however, considering the site's location relative to the coast and the minimal impacts expansion of this site would have on aquatic habitat near the site, the proposed action would have no effect on the gulf sturgeon.

F.4.4.3 Mammals

F.4.4.3.1 Red Wolf

The historical range of the red wolf included coastal areas of Louisiana, including Cameron and Calcasieu Parishes; however, the red wolf is now considered to be extinct from Louisiana (Davis and Schmidly 1997). The red wolf population along the Texas and Louisiana coast was rendered functionally extinct due to hybridization with the coyote (NatureServe 2005). Based on this current range information, construction, operation, and maintenance activities at the proposed West Hackberry site and associated infrastructure would have no effect on the red wolf.

F.4.4.3.2 West Indian Manatee

The West Indian manatee has been reported to occasionally inhabit the coastal waters off of Louisiana, including coastal areas of Cameron Parish. Construction activities associated with expansion at the West Hackberry site would occur only on land, and it would not affect the aquatic habitat of the manatee. Operation and maintenance activities also would have no effect on the manatee.

F.4.4.4 Marine Mammals

No offshore elements are associated with West Hackberry; no marine mammals would be affected.

F.4.4.5 Reptiles

There are five species of endangered or threatened sea turtles that have been reported to inhabit coastal parishes in Louisiana, including Cameron Parish:

- Atlantic hawksbill sea turtle,
- Green sea turtle,
- Kemp's Ridley sea turtle,
- Leatherback sea turtle, and
- Loggerhead sea turtle.

These turtles all inhabit open ocean waters and nest on beaches or similar regions (e.g., tidal flats, pelagic zones, and isolated sand dunes). Loggerhead and Kemp's Ridley sea turtles also are occasionally found in near-shore or estuarine waters.

Because the West Hackberry site is located on the north side of Cameron Parish away from the coast, construction activities at the site would not affect areas inhabited by these species of sea turtles. Regular operation and maintenance activities at the site and the associated existing oil pipelines and RWI would also have no effect on these species.

F.4.5 Assessment Summary

Tables F.4.5-1 though F.4.5-8 identify the threatened, endangered, and candidate species that may be affected by each element of the four proposed new and expansion Louisiana sites. The potential for effects for each element was estimated based on information about the presence or absence of the species or suitable habitat in areas that would be affected. The evaluation also considered the potential mitigation factors. Tables F.4.5-1, F.4.5-3, F.4.5-5, and F.4.5-7 identify whether construction activities for each site may affect species. Tables F.4.5-2, F.4.5-4, F.4.5-6, and F.4.5-8 summarize whether operation and maintenance activities for each site may affect species.

Tables F.4.5-9 and F.4.5-10 summarize the number of species that may be affected by construction and operation and maintenance for the four sites. This summary is presented in table F.4.5-9 for the Chacahoula and Clovelly sites and in table F.4.5-10 for the Bayou Choctaw and West Hackberry expansion sites. Based on current information, only two species (bald eagle and brown pelican) may be affected by the Chacahoula site proposal and no species are expected to be affected at the other two sites.

F.5 RECOMMENDATIONS

The evaluation summarized in section F.4 considered how some potential effects would be minimized, avoided, or more accurately forecasted by the use of preconstruction field investigations, mitigation measures, and other precautionary measures. The recommendations below summarize the types of measures identified in section F.4 that would lessen the potential for effects resulting from the development of the SPR candidate sites in Louisiana. Additional measures may be identified during detailed planning if either the Chacahoula or Clovelly site is selected for development.

Table F.4.5-1: Summary of Potential Construction-Related Impacts to Threatened, Endangered, and Candidate Species from Development of the Chacahoula Site

Species	Site	Power lines to Site	Chacahoula to St. James ROW	Chacahoula to Clovelly ROW	RWI and ROW to ICW	ROW to Gulf of Mexico	Offshore Brine Diffuser
Birds							
Bald Eagle	May affect	May affect	May affect	May affect	May affect	No effect	No effect
Brown Pelican	No effect	No effect	No effect	May affect	No effect	May affect	No effect
Peregrine Falcon	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Piping Plover	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Fish							
Gulf Sturgeon	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Pallid Sturgeon	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Mammals							
Red Wolf	No effect	No effect	No effect	No effect	No effect	No effect	No effect
West Indian Manatee	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Marine Mammals							
Atlantic Spotted Dolphin	No effect	No effect	No effect	No effect	No effect	No effect	No effect
West Indian Manatee	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Reptiles							
Atlantic Hawksbill Sea Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Green Sea Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Kemps Ridley Sea Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Leatherback Sea Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Loggerhead Sea Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect

Table F.4.5-2: Summary of Potential Operation and Maintenance Impacts on Threatened, Endangered, and Candidate Species from Development of Chacahoula Site

Species	Site	Power lines to Site	Chacahoula to St. James ROW	Chacahoula to Clovelly ROW	RWI and ROW to ICW	ROW to Gulf of Mexico	Offshore Brine Diffuser
Birds							
Bald Eagle	May affect	May affect	May affect	May affect	May affect	No effect	No effect
Brown Pelican	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Peregrine Falcon	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Piping Plover	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Fish							
Gulf Sturgeon	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Pallid Sturgeon	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Mammals							
Red Wolf	No effect	No effect	No effect	No effect	No effect	No effect	No effect
West Indian Manatee	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Marine Mammals							
Atlantic Spotted Dolphin	No effect	No effect	No effect	No effect	No effect	No effect	No effect
West Indian Manatee	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Reptiles							
Atlantic Hawksbill Sea Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Green Sea Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Kemps Ridley Sea Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Leatherback Sea Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Loggerhead Sea Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect

Table F.4.5-3: Summary of Potential Construction-Related Impacts to Threatened, Endangered, and Candidate Species from Clovelly Site Development

Species	Site (including connections to existing oil pipelines)
Birds	
Bald Eagle	No effect
Brown Pelican	No effect
Peregrine Falcon	No effect
Piping Plover	No effect
Fish	
Gulf Sturgeon	No effect
Marine Mammals	
Atlantic Spotted Dolphin	No effect
West Indian Manatee	No effect
Reptiles	
Atlantic Hawksbill Sea Turtle	No effect
Green Sea Turtle	No effect
Kemp’s Ridley Sea Turtle	No effect
Leatherback Sea Turtle	No effect
Loggerhead Sea Turtle	No effect

Table F.4.5-4: Summary of Potential Operation and Maintenance Impacts to Threatened, Endangered, and Candidate Species from Clovelly Site Development

Species	Site (including connections to existing oil pipelines)
Birds	
Bald Eagle	No effect
Brown Pelican	No effect
Peregrine Falcon	No effect
Piping Plover	No effect
Fish	
Gulf Sturgeon	No effect
Marine Mammals	
Atlantic Spotted Dolphin	No effect
West Indian Manatee	No effect
Reptiles	
Atlantic Hawksbill Sea Turtle	No effect
Green Sea Turtle	No effect
Kemp’s Ridley Sea Turtle	No effect
Leatherback Sea Turtle	No effect
Loggerhead Sea Turtle	No effect

Table F.4.5-5: Summary of Potential Construction-Related Impacts to Threatened, Endangered, and Candidate Species by Development of Bayou Choctaw Site

Species	Site	Brine Injection Wells
Birds		
Bald Eagle	No effect	No effect
Fish		
Gulf Sturgeon	No effect	No effect
Pallid Sturgeon	No effect	No effect
Mammals		
Louisiana Black Bear	No effect	No effect

Table F.4.5-6: Summary of Potential Operation and Maintenance Impacts to Threatened, Endangered, and Candidate Species by Development of the Bayou Choctaw Site

Species	Site	Brine Injection Wells
Birds		
Bald Eagle	No effect	No effect
Fish		
Gulf Sturgeon	No effect	No effect
Pallid Sturgeon	No effect	No effect
Mammals		
Louisiana Black Bear	No effect	No effect

Table F.4.5-7: Summary of Potential Construction-Related Impacts to Threatened, Endangered, and Candidate Species by Development of the West Hackberry Site

Species	Site
Birds	
Bald Eagle	No effect
Brown Pelican	No effect
Piping Plover	No effect
Red-Cockaded Woodpecker	No effect
Fish	
Gulf Sturgeon	No effect
Mammals	
Red Wolf	No effect
West Indian Manatee	No effect
Reptiles	
Atlantic Hawksbill Sea Turtle	No effect
Green Sea Turtle	No effect
Kemp’s Ridley Sea Turtle	No effect
Leatherback Sea Turtle	No effect
Loggerhead Sea Turtle	No effect

Table F.4.5-8: Summary of Potential Operation and Maintenance Impacts to Threatened, Endangered, and Candidate Species Affected by Development of the West Hackberry Site

Species	Site
Birds	
Bald Eagle	No effect
Brown Pelican	No effect
Piping Plover	No effect
Red-Cockaded Woodpecker	No effect
Fish	
Gulf Sturgeon	No effect
Mammals	
Red Wolf	No effect
West Indian Manatee	No effect
Reptiles	
Atlantic Hawksbill Sea Turtle	No effect
Green Sea Turtle	No effect
Kemp's Ridley Sea Turtle	No effect
Leatherback Sea Turtle	No effect
Loggerhead Sea Turtle	No effect

Table F.4.5-9: Summary of the Number of Species Potentially Affected at the Chacahoula and Clovelly Sites

Potential for Effect	Number of Species			
	Chacahoula, Louisiana		Clovelly, Louisiana	
	Construction	Operation and Maintenance	Construction	Operation and Maintenance
No effect	12	13	12	12
May affect	2	1	0	0

Table F.4.5-10: Summary of the Number of Species Potentially Affected at the Bayou Choctaw and West Hackberry Sites

Potential for Effect	Number of Species			
	Bayou Choctaw, Louisiana		West Hackberry, Louisiana	
	Construction	Operation and Maintenance	Construction	Operation and Maintenance
No effect	4	4	12	12
May affect	0	0	0	0

F.5.1 Chacahoula, Louisiana

Following are the recommendations of the types of measures that could lessen the potential effects from developing the Chacahoula site:

- Conduct a preconstruction survey to identify bald eagle nests near the proposed site and on all pipeline ROWs. If any nests are found, DOE would coordinate with the USFWS and LDWF to avoid adverse impacts. Construction activities along ROWs would be scheduled to avoid nesting periods and pipeline ROWs routed around nesting trees, if possible. If ROWs cannot be rerouted, nesting trees and other large trees nearby would be left undisturbed if possible. Construction activities should be timed to avoid the nesting season and all activity should be restricted within 1,500 feet (450 meters) of active nests.

- Conduct a preconstruction survey to identify brown pelican roosts on or near the proposed brine disposal ROW in Terrebonne Parish or the crude oil pipeline ROW to Clovelly. If evidence of this species is found in or near a pipeline ROW, construction would be scheduled to occur during periods when the potentially affected species are not present, if possible. In all cases, bird nests and roosts should be left undisturbed, and all activity should be restricted within 1,320 feet (402 meters) of any sensitive species.

- Notify USFWS and the appropriate state wildlife officials if any protected species are observed either during preconstruction field surveys or during construction.

- Use directional drilling to construct the pipeline crossing, if feasible, at a proposed pipeline ROW that intersects a surface water body where there is confirmation of one or more endangered, threatened, or candidate species.

- Install and maintain sediment basins, silt fences, and hay bale barriers before or concurrent with soil disturbing activities when directional drilling is not used to construct a pipeline crossing a surface water body where an endangered, threatened, or candidate species may be present; silt curtains or other instream sediment barriers should be used to mitigate water quality impacts and downstream siltation.

- Schedule activities, to the extent practicable, to avoid sensitive life-cycle stages (e.g., spawning, nesting) identified in section F.2 when construction, operation, or maintenance activities would occur in areas identified as habitat for a threatened, endangered, or candidate species.

F.5.2 Clovelly, Louisiana

Following are the recommendations of the types of measures that could lessen the potential effects from developing the Clovelly site:

- Conduct a preconstruction survey to identify brown pelican roosts or rookeries within 2,300 feet (700 meters) of proposed development. If evidence of these species is found nearby, construction activities should be scheduled to avoid nesting season (spring and summer).

- Notify USFWS and the appropriate state wildlife officials if any protected species are observed either during preconstruction field surveys or construction.

- Schedule activities, to the extent practicable, to avoid sensitive life-cycle stages (e.g., spawning, nesting) identified in section F.2 when construction, operation, or maintenance activities would occur in areas identified as habitat for a threatened or endangered species.

F.5.3 Bayou Choctaw, Louisiana

Following is the recommendation of a measure that could lessen the potential effects from developing the Bayou Choctaw site and brine injection wells:

- Notify USFWS and the appropriate state wildlife officials if any protected species are observed either during preconstruction field surveys or construction.

F.5.4 West Hackberry, Louisiana

Following is the recommendation of a measure that could lessen the potential effects from developing the West Hackberry site:

- Notify USFWS and the appropriate state wildlife officials if any protected species are observed either during preconstruction field surveys or construction.

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Appendix G
Evaluation of Federally Listed Species in Mississippi

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Appendix G
Evaluation of Federally Listed Species in Mississippi

G.1 INTRODUCTION

This evaluation of federally listed species was prepared in conjunction with the draft environmental impact statement (EIS) for expansion of the Strategic Petroleum Reserve (SPR). The draft EIS evaluates the expansion of the SPR by developing additional storage capacity at two or three existing sites (West Hackberry and Bayou Choctaw in Louisiana and Big Hill in Texas) or developing one of five new sites (Chacahoula and Clovelly in Louisiana; Richton and Bruinsburg in Mississippi; and Stratton Ridge in Texas), or a combination of the Clovelly and Bruinsburg sites.

This appendix analyzes potential effects on federally endangered, threatened and candidate species, and marine mammals protected under the Endangered Species Act (ESA) and Marine Mammal Protection Act (special status species), respectively, from the proposed development of sites in Mississippi. Potential effects on endangered, threatened and candidate species and marine mammals from development of sites in Louisiana and Texas are analyzed in appendices F and H, respectively.

The Department of Energy (DOE) prepared this evaluation of federally listed species to review and document its findings of no effect and may affect in accordance with the definitions found in the Final ESA Section 7 Consultation Handbook dated March 1998 (Consultation Handbook) (USFWS and NMFS 1998), a letter from U.S. Fish and Wildlife Service (USFWS) dated September 29, 2005 (Werner 2005), and consultations with the USFWS field offices. The evaluation was based on the definitions of the effects to endangered or threatened species in the Handbook and letter, as provided below.

- **No effect**. The proposed action would not affect federally listed species or habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area).

- **Is not likely to adversely affect**. The project may affect listed species and/or critical habitat; however, the effects would be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effects.

- **Is likely to adversely affect**. Adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect would not be discountable, insignificant, or beneficial. If the overall effect of the proposed action would be beneficial to the listed species but also would be likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species.

DOE is evaluating the impacts associated with five proposed new sites and three proposed expansion sites, some of which may have more than 100 miles (161 kilometers) of new pipelines, new tank farms, and brine disposal systems (offshore diffuser or injection wells) associated with it. When DOE issues a record of decision, it will select either one new site (or a combination of the Bruinsburg and Clovelly sites) and two or three expansion sites for future development, or the no-action alternative. For these reasons, DOE has not conducted comprehensive field surveys and can reach only “no effect” or “may affect” conclusions for this evaluation of special status species instead of using all of the classifications described earlier. For the finding of “may affect,” DOE has not completed onsite surveys to support a finding of “is not likely to adversely affect” or “is likely to adversely affect;” therefore, a finding of “no effect” or “may affect” is the conclusion that DOE can reach at this time.

After issuing the record of decision that specifies the new site or sites and the expansion sites that would be developed, DOE would perform site- and species-specific surveys for all the federally listed species that received a finding of "may affect." DOE would perform the evaluation of the federally listed species in consultation with USFWS and in accordance with section 7 of the ESA and the Final ESA section 7 Consultation Handbook dated March 1998.

G.1.1 Purpose

This evaluation analyzes the potential effects on federally listed threatened and endangered species of construction, operation, and maintenance of additional SPR storage capacity. Proposed activities vary by site (e.g., based on existing infrastructure) and may include construction of underground storage caverns and surface facilities at the storage sites; construction of pipelines for crude oil distribution, raw water supply, and brine disposal; surface or groundwater withdrawals to support solution mining of new caverns; discharge of brine in the Gulf of Mexico; and construction of miscellaneous facilities at oil distribution sites.

G.1.2 Threatened and Endangered Species Terminology

USFWS lists a species on the Federal Endangered Species List as "threatened" when it is likely to become endangered throughout all or a significant portion of its range in the foreseeable future, and lists a species as "endangered" when it is in danger of extinction throughout all or a significant portion of its range. In addition, the USFWS maintains a list of what are called "candidate species" that are being considered for listing under the Endangered Species Act. A candidate species is a species that the USFWS has on file sufficient information to support a proposal to list as endangered or threatened, but for which preparation and publication of a proposal is precluded by higher-priority listing actions. Federal agencies are encouraged to consider these species in preparing environmental impact analysis done under NEPA in order to alleviate threats to them and thereby possibly eliminate the need to list the species as endangered or threatened.

To define all the species that are required to be addressed in the biological assessment, DOE contacted and obtained information from the USFWS, National Oceanic and Atmospheric Administration (NOAA) Fisheries, and the Mississippi Department of Wildlife, Fisheries, and Parks. Appendix K contains lists of the consultation meetings held.

G.1.3 Organization

This appendix includes the following: a brief literature review for each of the species addressed (section G.2); observations made during site visits (section G.3); an assessment of the potential effects of the proposed action on the threatened, endangered, and candidate species (section G.4); and recommendations for minimizing potential adverse effects on the subject species and on other biological resources (section G.5). References cited in this appendix are identified in section G.6.

G.2 LITERATURE REVIEW

The literature review describes the natural histories of all species federally listed as threatened, endangered, or candidate *and* identified as present or potentially present (e.g., based on historical records) in at least one county or parish where proposed new and expanded SPR facilities and associated infrastructure would be located. Table G.2-1 lists the species evaluated in this appendix. Although table

G.2-1 pertains only to the Bruinsburg and Richton candidate sites in Mississippi, it includes species present in Louisiana parishes because the Bruinsburg oil distribution pipeline would cross into Louisiana from Mississippi.

Table G.2-1: Federally Listed Threatened or Endangered Species in Louisiana Parishes and Mississippi Counties Associated with Proposed SPR Sites in Mississippi

Common Name	Scientific Name	Federal Status	Mississippi and Louisiana Status[a]	Counties/Parishes Where Species May Exist[b]
Birds				
Bald Eagle	*Haliaeetus leucocephalus*	Threatened	*Mississippi*: Critically imperiled (breeding); imperiled (nonbreeding) *Louisiana*: Endangered	*Mississippi*: Adams, Jackson, Warren, Wilkinson *Louisiana*: East Baton Rouge, West Feliciana
Brown Pelican	*Pelecanus occidentalis*	Endangered	*Mississippi*: Critically imperiled (nonbreeding)	*Mississippi*: Jackson
Interior Least Tern	*Sterna antillarum ath alassos*	Endangered	*Mississippi*: Rare or uncommon	*Mississippi:* Claiborne, Warren
Mississippi Sandhill Crane	*Grus canadensis pulla*	Endangered	*Mississippi*: Critically imperiled	*Mississippi*: Jackson
Piping Plover	*Charadrius melodus*	Threatened	*Mississippi*: Not Listed	*Mississippi*: Jackson
Red-Cockaded Woodpecker	*Picoides borealis*	Endangered	*Mississippi*: Critically imperiled	*Mississippi*: Amite, Forrest, George, Greene, Jackson, Perry, Wilkinson
Fish				
Bayou Darter	*Etheostoma rubrum*	Threatened	*Mississippi*: Critically imperiled	*Mississippi*: Claiborne, Copiah, Hinds
Gulf Sturgeon	*Acipenser oxyrhynchus desotoi*	Threatened	*Mississippi*: Critically imperiled *Louisiana*: Threatened	*Mississippi*: Forrest, Copiah, George, Greene, Jackson, Hinds, Marion, Pike, Perry, Walthall *Louisiana*: East Baton Rouge, East Feliciana
Pallid Sturgeon	*Scaphirhynchus albus*	Endangered	*Mississippi*: Critically imperiled *Louisiana*: Endangered	*Mississippi*: Adams (P), Claiborne (P), Jefferson (P), Warren (P), Wilkinson (P) *Louisiana*: East Baton Rouge, East Feliciana, West Baton Rouge, West Feliciana
Pearl Darter	*Percina aurora*	Candidate	*Mississippi*: Not listed	*Mississippi*: Forrest, George, Jackson, Perry
Invertebrates				
Alabama Heelsplitter Mussel	*Potamilus inflatus*	Threatened	*Louisiana*: Threatened	*Louisiana*: East Baton Rouge

Table G.2-1: Federally Listed Threatened or Endangered Species in Louisiana Parishes and Mississippi Counties Associated with Proposed SPR Sites in Mississippi

Common Name	Scientific Name	Federal Status	Mississippi and Louisiana Status[a]	Counties/Parishes Where Species May Exist[b]
Camp Shelby Burrowing Crayfish	*Fallicambarus gordoni*	Candidate	*Mississippi*: Critically imperiled	*Mississippi*: Perry
Fat Pocketbook Mussel	*Potamilus capax*	Endangered	*Mississippi*: Critically imperiled	*Mississippi*: Jefferson
Mammals				
Gray Myotis (Gray Bat)	*Myotis grisescens*	Endangered	*Mississippi*: Not listed	*Mississippi*: Perry (P)
Louisiana Black Bear	*Ursus americanus luteolus*	Threatened	*Mississippi*: Critically imperiled *Louisiana*: Threatened	Mississippi: Adams, Amite, Claiborne, Copiah, Forrest, George, Greene, Hinds, Jackson, Jefferson, Lamar (P), Marion, Perry, Pike (P), Walthall (P), Warren, Wilkinson *Louisiana*: West Feliciana
Marine Mammals				
Gervais Beaked Whale	*Mesoplodon europaeus*	Protected	Threatened	*Mississippi*: Jackson
Goose-Beaked Whale	*Ziphius cavirostris*	Protected	Threatened	*Mississippi*: Jackson
Pygmy Sperm Whale	*Kogia breviceps*	Protected	Threatened	*Mississippi*: Jackson
Dwarf Sperm Whale	*Kogia simus*	Protected	Threatened	*Mississippi*: Jackson
Sperm Whale	*Physeter macrophalus*	Endangered	Endangered	*Mississippi*: Jackson
Atlantic Spotted Dolphin	*Stenella frontalis*	Protected	Threatened	*Mississippi*: Jackson
Rough-Toothed Dolphin	*Steno bredanesis*	Protected	Threatened	*Mississippi*: Jackson
Killer Whale	*Orcinus orca*	Protected	Threatened	*Mississippi*: Jackson
False Killer Whale	*Pseudorca crassidens*	Protected	Threatened	*Mississippi*: Jackson
Short-Finned Pilot Whale	*Globicephala macrorhynchus*	Protected	Threatened	*Mississippi*: Jackson
Pygmy Killer Whale	*Feresa attenuate*	Protected	Threatened	*Mississippi*: Jackson
West Indian Manatee	*Trichechus manatus*	Endangered	Endangered	*Mississippi*: Jackson *Louisiana: East Baton Rouge*
Bottlenose Dolphin	(*Tursiops truncatus*)	Protected	Not listed	*Mississippi*: Jackson
Plants				
Louisiana Quillwort	*Isoetes louisianensis*	Endangered	*Mississippi*: Imperiled	*Mississippi*: Forrest, George, Greene, Jackson, Perry
Reptiles				
Alabama Red-Belly Turtle	*Pseudemys alabamensis*	Endangered	*Mississippi:* Endangered	*Mississippi:* Jackson

Table G.2-1: Federally Listed Threatened or Endangered Species in Louisiana Parishes and Mississippi Counties Associated with Proposed SPR Sites in Mississippi

Common Name	Scientific Name	Federal Status	Mississippi and Louisiana Status[a]	Counties/Parishes Where Species May Exist[b]
Black Pine Snake	*Pituophis melanoleucuc spp. Lodingi*	Candidate	*Mississippi:* Imperiled	*Mississippi*: Forrest, George, Marion, Perry
Eastern Indigo Snake	*Drymarchon corais couperi*	Threatened	*Mississippi:* Critically imperiled	*Mississippi*: Forrest (P), George (P), Greene (P), Jackson (P), Marion, Perry (P)
Gopher Tortoise	*Gopherus polyphemus*	Threatened	*Mississippi:* Imperiled	*Mississippi*: Forrest, George, Greene, Jackson, Lamar, Marion, Perry, Walthall
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Endangered	*Mississippi:* Critically imperiled (nonbreeding)	*Mississippi*: Jackson
Loggerhead Sea Turtle	*Caretta caretta*	Threatened	*Mississippi:* Critically imperiled (breeding); imperiled (nonbreeding)	*Mississippi*: Jackson
Ringed Map Turtle	*Graptemys oculifera*	Threatened	*Mississippi:* Imperiled	Mississippi: Copiah, Hinds, Marion
Yellow-Blotched Map Turtle	*Graptemys flavimaculata*	Threatened	*Mississippi:* Imperiled	*Mississippi*: Forrest, George, Greene, Jackson, Perry

Not listed: No state status; species is not classified as threatened or endangered by Louisiana.
[a] State status for Mississippi is provided for every species; state status for Louisiana is provided for only those species also present or potentially present in at least one Louisiana parish where SPR facilities are proposed.
[b] Includes only counties in Mississippi where SPR facilities are proposed.
(P) Potentially or historically present in the county.

G.2.1 Birds

G.2.1.1 Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is a large bird of prey with an average wingspan of about 7 feet (2 meters). The adult male and female are similar in appearance, with a dark brown body and wings, and a distinctive white head and tail. This species is federally listed as threatened, although delisting has been proposed.

The bald eagle may be found throughout the continental United States and Alaska. It is most likely to be found in areas with large expanses of aquatic habitat with forested shorelines or cliffs where it selects supercanopy roost trees. The bald eagle is an opportunistic forager. Although it prefers fish, it will eat a great variety of mammals, amphibians, crustaceans, and birds, including many species of waterfowl (Buehler 2000).

The bald eagle nests almost exclusively at the edges of lakes, rivers, or seacoasts. It generally nests in tall trees or cliffs near the water's edge, although it occasionally nests on the ground. Nests are often reused in successive years. The breeding season generally begins in the spring (earlier in southern states), with the young fledging after about 6 months (USFWS 1983; USFWS 1995). According to comments submitted to DOE by the USFWS (James 2005), nesting activity occurs from September to January with young fledged usually by midsummer. Although resident breeding populations occur along the eastern Gulf Coast, the bald eagle in Mississippi is likely to be a nonbreeding migrant (NatureServe 2005).

The bald eagle is highly sensitive to human noise and interference (USFWS 1983; USFWS 1995). It is most sensitive during the first 12 weeks of the nesting cycle. Disturbance during nesting may lead to nest abandonment or reduced hatching and survival rates. Human activity near a nest late in the nesting cycle may also cause flightless birds to jump from the nest, lessening their likelihood of survival (Watson 2005).

G.2.1.2 Brown Pelican

The brown pelican (*Pelecanus occidentalis*) is a large water bird with a massive bill and throat pouch. Its wings and body are grayish-brown. The nonbreeding adult has a whitish head and neck, often with some yellow. The hindneck of a breeding adult is dark chestnut (NGS 1983, Palmer 1962). A larger individual has a wingspread of more than 7 feet (2 meters) (USFWS 2005).

The brown pelican is a fish eater, and it is found almost exclusively in coastal areas along the southern east coast, the Gulf of Mexico, and throughout the west coast. It prefers to feed in shallow estuarine waters and use sand spits, offshore sand bars, and islets for nocturnal roosting. Dry roosting sites are essential to suitable habitat (NatureServe 2005). Nests usually are built on coastal islands, on the ground or in small bushes and trees (Palmer 1962).

The brown pelican is a federally listed endangered species. Populations in California, Texas, and Louisiana were devastated by pesticide poisoning from dichlorodiphenyltrichloroethane (DDT), dichlorodiphenyldichloroethylene (DDE), and other compounds throughout the 1950s and 1960s; nevertheless, eastern and Gulf Coast populations of the brown pelican appear to be stable and possibly have been increasing in recent years. Contaminant levels in both populations are below the threshold for reproductive failure, but the populations are still very vulnerable to pesticide pollution (Anderson and Hickey 1970). Other threats include the disturbance of nesting birds by humans, a decline in fish populations, increased water turbidity resulting from dredging, oil and chemicals spills, entanglement in fishing gear, and extreme weather conditions. Recently, habitat degradation has affected both roosting and nesting. For example, nesting efforts have failed in the Gulf Coast because of erosion at the nesting sites (NatureServe 2005).

The brown pelican is classified as vulnerable in Texas and imperiled in Louisiana. The State of Mississippi has no listed conservation status for the species, although the species is found in Jackson and Harrison Counties.

G.2.1.3 Interior Least Tern

The least tern (*Sterna antillarum*) is the smallest North American tern, with an average body length of about 9 inches (23 centimeters). The breeding adult is mainly gray, topped by a black cap and nape and a white forehead. The least tern is classified by the USFWS as endangered in Louisiana in areas along the Mississippi River and its tributaries, Mississippi along the Mississippi River, and all of Texas except in areas within 50 miles (80.5 kilometers) of the coast (USFWS 2005).

There are two recognized subspecies of the least tern, one of which—the interior least tern (*Sterna antillarum athalassos*)—is found in Texas, Louisiana, and Mississippi. This subspecies includes interior populations of the bird (not a taxonomic variation), which tend to be more critically endangered because of habitat loss caused by large-scale water management projects that destroy breeding grounds (NatureServe 2005).

Breeding grounds for the least tern are found locally throughout the Mississippi River system. Nesting occurs on and near the river with eggs often resting directly on sandbars (Aycock 2005). Good nesting areas are above the high-tide mark, have shells or stones for egg camouflage, and are near a plentiful source of small fish (Burger and Gochfeld 1990). Hatching success is easily disrupted by poor weather, tides, predation, and human disturbance.

The breeding season of the least tern is from May through August, although adult birds may roost near the nesting sites for up to a month before laying occurs (usually in May or June). The least tern that breeds in the southern Atlantic states migrates to wintering grounds in the Caribbean between August and September (NatureServe 2005).

The primary prey of the least tern is small fish from shallow rivers, streams, and lakes. When available, crustaceans, insects, mollusks, and annelids may also form part of the diet (Whitman 1988).

G.2.1.4 Mississippi Sandhill Crane

The Mississippi sandhill crane (*Grus canadensis pulla*) is an endangered subspecies. Like other sandhill cranes, the Mississippi subspecies is a tall, about 4 feet (1 meter), long-necked crane that is uniformly gray-brown except for a red crown. The Mississippi subspecies is darker than other sandhill cranes (Valentine and Lohoefener 1991). The entire wild population of this subspecies, which consists of slightly more than 100 birds, is found on and near the Mississippi Sandhill Crane National Wildlife Refuge in Jackson County, MS.

The habitats preferred by Mississippi sandhill crane include open savannas, swamp edges, young pine plantations, and wetlands along edges of pine forests (NatureServe 2005). The diet of this species consists primarily of aquatic invertebrates, reptiles, amphibians, insects, and aquatic plants (Ehrlich et al. 1992).

G.2.1.5 Piping Plover

The piping plover (*Charadrius melodus*) is a small, sandy-colored shorebird similar in appearance to a sandpiper. Distinguishing field marks of this species include yellow-orange legs, a black band across the forehead from eye to eye, and a black ring around the base of its neck (USFWS 2005). The piping plover is federally listed as threatened in Mississippi.

A migratory species, the piping plover overwinters on beaches, mudflats, and sandflats along the Atlantic coast and the Gulf of Mexico including barrier island beaches and spoil islands on the Gulf Intracoastal Waterway (USFWS 2005). Critical habitat for the wintering piping plover has been proposed for the following several specific locations in Jackson County, MS (USFWS 2001c):

- **Unit MS–10:** Ocean Springs West. 1.2 miles (1.9 kilometers) of shoreline in Jackson County. This unit extends from U.S. 90 and includes the shore of Biloxi Bay following the shoreline southeast to the Ocean Springs Harbor inlet. The shoreline of this unit is privately owned.

- **Unit MS–11:** Ocean Springs East. 1.6 miles (2.6 kilometers) of shoreline in Jackson County. This unit extends from Weeks Bayou and includes the shore of Biloxi Bay following the shoreline southeast to Halstead Bayou. The shoreline of this unit is privately owned.

- **Unit MS–12:** Deer Island. 9.1 miles (14.6 kilometers) of shoreline in Harrison County. The entire unit is on Deer Island. This unit includes privately owned Mississippi Sound shoreline.

- **Unit MS–13:** Round Island. 1.6 miles (2.6 kilometers) of shoreline in Jackson County. This unit includes privately owned Mississippi Sound shoreline.

- **Unit MS–14:** Mississippi Barrier Islands. 81.1 miles (130.5 kilometers) of shoreline in Harrison and Jackson Counties. This unit includes shoreline of the Mississippi Sound and Gulf of Mexico on Cat, East and West Ship, Horn, Spoil, and Petit Bois Islands. Approximately 24.8 miles (39.9 kilometers) are privately owned, and 59.4 miles (95.6 kilometers) are part of Gulf Islands National Seashore.

- **Unit MS–15:** North and South Rigolets. 3.7 miles (5.9 kilometers) of shoreline in Jackson County, MS, and Mobile County, AL. This unit extends from the southwestern tip of South Rigolets Island and includes the shore of Point Aux Chenes Bay, the Mississippi Sound, and Grand Bay following the shoreline east around the western tip, then north to the South Rigolets Bayou; then from the southeastern corner of North Rigolets Island north to the northeastern most point of the island. Approximately 2.7 miles (4.3 kilometers) are in Mississippi and 1.0 mile (1.6 kilometers) is in Alabama. Almost half the Mississippi shoreline length is in the Grand Bay National Wildlife Refuge.

The piping plover begins to arrive at wintering habitats in July and remains through September. Although a few plovers remain throughout the year, sightings are rare in late May, June, and early July (USFWS 2001c).

G.2.1.6 Red-Cockaded Woodpecker

The red-cockaded woodpecker (*Picoides borealis*) is a federally listed endangered species found in mature and old-growth pine forests in the southeastern United States. The red-cockaded woodpecker is black and white with a ladder back and distinctive white cheek patches (USFWS 2003b). The species is named for barely visible red streaks called “cockades” on the head of the adult male (NatureServe 2005).

The red-cockaded woodpecker has specific habitat requirements that include open pine woodlands or savannahs with large, old pines. Large pines are required because cavity nests are built only in inactive pine heartwood. Nesting trees must be in open stands with little or no hardwood midstory and few or no overstory hardwoods (USFWS 2003b). Foraging occurs in older pine stands within 0.5 mile (0.8 kilometer) of a colony (Aycock 2005).

The red-cockaded woodpecker lives in family groups that usually include a breeding pair and nonbreeding helpers. Most helpers are male. Mating typically occurs in November and December and March through May, and egg laying usually occurs in April and early May. Incubation lasts about 10 to12 days (Hooper et al. 1980) and hatchlings remain in the nest for 26 to 29 days (NatureServe 2005).

According to the 1985 revision of the recovery plan for this species, there were approximately 14,068 red-cockaded woodpeckers living in 5,627 groups in 11 states (USFWS 2003b). USFWS established criteria for delisting the species based on the status and size of primary and secondary core populations named in the recovery plan. Table G.2.1.6-1 shows the locations of core populations of red-cockaded woodpeckers in Mississippi.

Table G.2.1.6-1: Locations of Designated Core Red-Cockaded Woodpecker Populations in Mississippi

Designated Core Population Type	Population Locations in Mississippi
Primary	Chickasawhay Ranger District, De Soto National Forest (includes parts of Jones, Wayne, and Green Counties)
	Bienville National Forest (includes parts of Jasper, Newton, Scott, and Smith Counties)
Secondary	De Soto Ranger District, De Soto National Forest (includes parts of Pearl River, Forrest, Perry, Greene, George, Stone, Harrison, and Jackson Counties)
	Homochitto National Forest (includes parts of Amite, Adams, Copiah, Franklin, Jefferson, Lincoln, and Wilkinson Counties)

G.2.2 Fish

G.2.2.1 Bayou Darter

The bayou darter (*Etheostoma rubrum*) is a threatened fish species found in western Mississippi in the Bayou Pierre and the lower reaches of its tributaries: White Oak Creek, Foster Creek, and Turkey Creek (USFWS 2005). The largest concentrations of the 2-inch (5.1-centimeter) fish are found in the sections of Bayou Pierre and Foster Creek in Copiah County, north of state highway 548 (Page and Burr 1991). Although the population density was stable in the 1980s and 1990s, continuing geomorphic changes have shifted the distribution upstream (Ross et al. 2001).

The typical habitat of the bayou darter includes creeks and small to medium rivers. The adult bayou darter is commonly collected near heads of gravel riffles in water less than 6 to 12 inches (15 to 30 centimeters) deep, which reflects the bayou darter's preference for stable, moderately swift riffles of large gravel and rock (USFWS 1990b). In the winter, the bayou darter is often found near logs, cobble, and boulders, which may provide refuge during periods of high stream flow (Ross et al. 1990, 1992).

The female usually starts spawning after its first year, and it spawns at least twice per reproductive season, and lives 3 years (Burris and Bagley 1983; USFWS 1990b; Knight and Ross 1992). Clutch size ranges from 20 to 75 ova depending on the size of the female (USFWS 2005). Reproduction occurs mid-April or early May to mid-August at a water temperature of 68 to 86 degrees Fahrenheit (20 to 30 degrees Celsius). The juvenile has been collected from late July to late August, but it also has been reported as early as June. The peak-spawning season is April to late May, or early June during rising water temperatures 72 to 84 degrees Fahrenheit (22 to 29 degrees Celsius) (Burris and Bagley 1983; USFWS 1990b; Knight and Ross 1992). After spawning, the bayou darter buries its eggs for protection (Ross and Wilkins 1993).

G.2.2.2 Gulf Sturgeon

The Gulf sturgeon (*Acipenser oxyrinchus desotoi*) is a threatened anadromous fish species found in Gulf coastal waters from Louisiana to Florida. Primitive in appearance, the Gulf sturgeon has external bony plates, an extended snout, and four large barbels. Adults range from 4 to 8 feet (1.2 to 2.4 meters) in length, with the adult female measuring larger than the male (USFWS 2003a).

The Gulf sturgeon preys on benthic invertebrates and small fishes. Feeding is believed to occur only during the winter and spring in offshore or estuarine waters (Cross 1992).

USFWS has designated certain Gulf of Mexico rivers and tributaries as critical habitat for the Gulf sturgeon; it spends the first 2 years of its life in these habitats, and later it returns to breed. Spawning habitats are generally fresh water (sometimes tidal) and usually over a bottom of hard clay, rubble, gravel, or shell. Eggs of the Gulf sturgeon are demersal (heavy, sinking to the bottom) and adhesive (USFWS 2003a). In Mississippi, the designated critical habitats include major portions of the Pascagoula, Leaf, Chickasawhay, Pearl, and Bogue Chitto Rivers (USFWS 2003a).

G.2.2.3 Pallid Sturgeon

The endangered pallid sturgeon (*Scaphirhynchus albus*) is a large fish, up 73 inches (186 centimeters), with a flat, shovel-like snout that has four fringed barbells. The pallid sturgeon has 37 to 43 dorsal rays and 24 to 28 anal rays. It is similar to the shovelnose sturgeon, but it has several distinct differences such as the paucity of scale-like scutes on the belly, a larger head, a wider mouth, smaller eyes, and a paler gray-white color above and on the sides (Page and Burr 1991). The pallid sturgeon is one of the largest fish species found in the Missouri/Mississippi River drainage (Gilbraith et al. 1988). Its diet consists of aquatic invertebrates (Carlson et al. 1985).

The pallid sturgeon's habitat consists of large, turbid free-flowing rivers or reservoirs. In a river or reservoir, the pallid sturgeon is most often found in strong current over firm gravel or sandy substrate (USFWS 1989a; Kallemeyn 1981). The pallid sturgeon's preferred temperature range is from 32 to 86 degrees Fahrenheit (0 to 30 degrees Celsius) (Dryer and Sandoval 1993).

The pallid sturgeon's range is quite large, covering about 3,515 miles (5,656 kilometers) of river through 13 states including Louisiana and Mississippi (Dryer and Sandoval 1993). In Louisiana, the most frequent occurrence of the pallid sturgeon is in the Mississippi and Atchafalaya Rivers, where the Atchafalaya diverges from the Mississippi River (Dryer and Sandoval 1993).

The spawning season for the pallid sturgeon lasts from July to August. The male becomes sexually mature at 3 to 4 years of age (Kallemeyn 1981), and the female becomes sexually mature at 7 years. It takes several years for eggs to mature between spawnings (Conte et al 1988). Little other information is available to describe the spawning requirements for the pallid sturgeon, so these requirements are often assumed to be similar to those of the shovelnose sturgeon. The shovelnose sturgeon spawns over rock, rubble, or gravel in the main channel of the Missouri and Mississippi Rivers and their major tributaries, or in the wing dams in the main stem of larger rivers (Christiansen 1975; Elser et al. 1977; Moos 1978; Helms 1974). In addition, in June the shovelnose sturgeon responds to increased waterflow from melting snow by migrating to spawn (Berg 1981).

G.2.2.4 Pearl Darter

The pearl darter (*Percina aurora*) is a candidate endangered fish. It has a blunt snout, horizontal mouth, and large eyes set high on its head. Both sexes have a black spot at the base of the caudal fin, and the breeding male has dark bands on and at the base of the dorsal fin (Ross, in press). The female pearl darter reaches a maximum of 2.3 inches (57 millimeters) in length, and the male reaches a maximum length of 2.6 inches (6.6 centimeters) (Suttkus et al. 1994).

Historically, the pearl darter inhabited the Pearl and Pascagoula drainage systems in Mississippi and Louisiana. No pearl darters have been collected from the Pearl River drainage system since 1973, and it is now believed to exist only in the Pascagoula River drainage system, where specimens are rarely found

(NatureServe 2005). In surveys since 1983, pearl darters have been found only in the Pascagoula, Chickasawhay, Chunky, Leaf, and Bouie Rivers and Okatoma and Black Creeks in Mississippi (USFWS 2001a). The only documented location where spawning is known to occur is in the Leaf River in the vicinity of Eastabutchie and the confluence of the Bouie and Leaf Rivers near Hattiesburg (USFWS 2001a).

Although the habitat requirements of the pearl darter are not well known, the choice may be similar to those of the channel darter. The channel darter generally inhabits rivers and large creeks in areas of moderate current, usually over sand and gravel substrates. These habitat conditions are typical of the lower ends of riffles or the edges of deep channels (NatureServe 2005). The pearl darter is deemed to be threatened by changes in the flow regime of its host rivers, by pollutant loadings from streambank erosion and nonpoint source runoff, and the potential for catastrophic losses resulting from oil toxicity or chemical spills (USFWS 2001a).

G.2.3 Invertebrates

G.2.3.1 Alabama Heelsplitter Mussel

The Alabama heelsplitter (*Potamilus inflatus*), also known as the inflated heelsplitter, is a bivalve mollusk with an adult shell size of approximately 5.5 inches (14 centimeters) in length. Shells are typically brown or black, and they may be streaked with green rays in juveniles (NatureServe 2005). The specific feeding habits of the heelsplitter are unknown, but its prey likely includes detritus, diatoms, phytoplankton, and zooplankton. As with other freshwater mussels, the heelsplitter feeds by filtering food particles from the water column (Churchill and Lewis 1924).

The Alabama heelsplitter prefers stable and soft substrata including sand, sandy-gravel, mud, and silt (Stern 1976; Hartfield 1988). It tends to collect on the protected side of bars, and it is found in water up to 20 feet (6 meters) deep (Hartfield 1988). Historically, the Alabama heelsplitter was found in the Pearl River of Mississippi, as well as some rivers in Alabama and Louisiana (Hurd 1974; Stern 1976; Hartfield 1988). Currently, this species is not abundant in any of its historical range.

Little is known about the life history of this species. The reproductive cycle is similar to that of other freshwater mussels; the male releases sperm into the water column, which are in turn taken in by the female's siphons during feeding and respiration. The female keeps the fertilized eggs until the larvae (glochidia) develop. After the larvae are fully developed, the mussel glochidia are released into the water, where they must attach to an appropriate type of fish while they further develop into juvenile mussels (Hartfield 1988). Studies have indicated that the freshwater drum (*Aplodinotus grunniens*) is a suitable host for heelsplitter glochidia (Roe et al. 1997).

G.2.3.2 Camp Shelby Burrowing Crayfish

The Camp Shelby burrowing crayfish (*Fallicambarus gordoni*) is a nonpetitioned candidate species. All known occurrences of this species are in flat, woodland pitcher plant wetlands, locally referred to as pitcher plant bogs, in central Perry County, MS (Fitzpatrick 1987, 1991). In particular, all known habitat for the species occur on U.S. Forest Service lands leased by U.S. Army National Guard. No SPR development is proposed in this area of Perry County.

G.2.3.3 Fat Pocketbook Mussel

The fat pocketbook mussel (*Potamilus capax*) is endangered through its range in the United States (USFWS 2005). A freshwater mussel, the fat pocketbook prefers a mixture of sand, silt, and clay beds in flowing water 2 inches to 8 feet deep (5 centimeters to 2.4 meters) (Parmalee 1967; Jenkinson and Ahlstedt 1988). Its lifecycle is unknown, but its reproductive anatomy is believed to be similar to the others in the *Lamsilinae* subfamily (Ortman 1912). It is a long-term breeder and is fertile during the late summer from July through October. (Ortman 1914) Nearly all mussels require a host, usually a fish, during the parasitic larval portion of the lifecycle. A host for this species has not been conclusively identified (USFWS 1989b, NatureServe 2005), but the red drum (*Sciaenops ocellatus*) is a suspected host (Aycock 2005).

The fat pocketbook was once common from Louisiana and Mississippi in the south to Minnesota, Wisconsin, and New York in the north. It is now presumed extinct in Minnesota and Wisconsin, and there is a high likelihood that it is also extinct in New York (NatureServe 2005). Before 1970, the fat pocketbook was most commonly found in the Mississippi River above St. Louis, MO, the Wabash River in Indiana, and the St. Francis River in Arkansas (Dennis 1985). Since 1970, the range has decreased and the mussel seems to be primarily restricted to the St. Francis River, with very scattered populations in the Wabash and Ohio Rivers and southeastern Missouri (NatureServe 2005). The Mississippi River is the one exception because, although the population has decreased significantly, a new population was recently discovered in Jefferson County (Jones et al. 2005).

The depletion of fat pocketbook mussel populations in many of the rivers once inhabited results largely from navigation and flood management activities. It is especially vulnerable to perturbations from channel maintenance because it is a fairly large mussel species and requires flowing water for survival. Its absence in the upper Mississippi River suggests that it may be particularly sensitive to dredging activities. Siltation and pollution are two other factors that probably have had an effect, although less than dredging, on the declining populations (USFWS 1989b).

G.2.4 Mammals

G.2.4.1 Gray Myotis (Gray Bat)

Literature gathered for this biological assessment indicates that the gray bat is unlikely to be present in Mississippi. For example, the range of the gray bat as characterized by USFWS (2005) and NatureServe (2005) either does not include Mississippi or includes only the northeast corner of the state. One source (USFWS 2000) indicated that, based on historical records, the gray bat potentially is present in Perry County where the proposed Richton site would be located.

Roost sites of this species are nearly exclusively restricted to caves year round (Barbour and Davis 1969). No caves within the known range of this species have been identified in areas where SPR activities are proposed.

G.2.4.2 Louisiana Black Bear

The endangered Louisiana black bear (*Ursus americanus luteolus*) is one of 16 recognized subspecies of the American black bear (Hall 1981). Like other black bears, the Louisiana black bear has long black hair, and it may weigh more than 600 pounds (272 kilograms) (USFWS 1992). It is distinguished from other black bears by its longer, narrower, and flatter skull, and by its proportionately large molar teeth (Nowak 1986).

The Louisiana black bear prefers bottomland hardwood forests. It is found primarily in the Tensas and Atchafalaya River basins in Louisiana, areas that have been proposed as designated critical habitat. In fact, these areas of Louisiana are the locations of the only known breeding populations of the Louisiana black bear (Bowker and Jacobson 1995). Other areas with suspected occurrences of Louisiana black bears include the Loess Bluffs portion of the Mississippi River corridor in southwestern Mississippi and the adjacent Tunica Hills of Louisiana, as well as smaller areas in the lower East Pearl River and lower Pascagoula River basins of southern Mississippi (Wooding et al. 1993). According to the Sierra Club (Gillette 2005), the Louisiana black bear has been sighted several times recently in Vancleave, Jackson County, MS.

G.2.5 Marine Mammals

The onshore portion, including the directional drilling from onshore to open water in the Gulf of Mexico associated with the proposed SPR Richton site would not affect marine mammals. The construction and operation of the offshore brine disposal pipeline and operation of the brine diffusion system may affect marine mammal species. The location of the offshore pipeline and the diffuser system would not reach the depths of Gulf of Mexico where the majority of these species can be found because the diffuser systems are at an approximately 30-foot (9-meter) depth. Also, the dispersion of the brine discharge into the Gulf of Mexico would dissipate before reaching these depths.

G.2.5.1 Gervais Beaked Whale

The Gervais beaked whale (*Ziphius cavirostris*) is a pelagic species associated with the continental shelf and deep oceanic waters, but it is also closely associated with the Gulf Stream waters. Little is known about this species, but sexual maturity is believed to occur when the whale reaches 15 feet (4.5 meters) in length. The whale is believed to live about 27 years. Its diet consists mainly of squid and deepwater fishes (Wynne et al., 1999).

G.2.5.2 Goose-Beaked Whale

The goose-beaked whale (*Ziphius cavirostris*), also known as Cuvier's beaked whale, is typically found in waters that are greater than 1,000 meters (3,280 feet) in depth. The goose-beaked whale is a pelagic species that is associated with the continental shelf and deep oceanic waters, but it is also closely associated with the Gulf Stream waters. Little is known about the species, but it is believed to travel in pods of 2 to 25 animals, typically avoiding vessels. Sexual maturity is believed to occur at 7 to 11 years, with breeding in the spring and birth of a single calf occurring every 2 to 3 years after a 12-month gestation. The goose-beaked whale is believed to lactate for 12 months and live more than 35 years. Its diet consists mainly of deepwater fish and squid (Wynne et al., 1999).

G.2.5.3 Pygmy Sperm Whale

The pygmy sperm whale (*Kogia breviceps*) is a pelagic, deep-water species that inhabits the areas near the continental shelf edge, slope, and deep oceanic waters. It is found throughout the Gulf of Mexico in these waters. The pygmy sperm whale is not as social as other species, and it is typically found alone or in small groups. The male reaches sexual maturity at 2.7 to 3.0 meters (8.9 to 9.8 feet) in length; the female reaches sexual maturity at 2.6 to 2.8 meters (8.5 to 9.1 feet) in length. A single calf is born after an 11-month gestation period, and lactation lasts about 12 months. The pygmy sperm whale has a diet of mainly squid, fish, and crustaceans (Wynne et al., 1999).

G.2.5.4 Dwarf Sperm Whale

The dwarf sperm whale (*Kogia simus*) is a pelagic, deep-water species that inhabits areas near the continental shelf edge, slope, and deep oceanic waters. It is found throughout the Gulf of Mexico in these waters. The dwarf sperm whale is not as social as other species, and it is typically found alone or in small groups. It reaches sexual maturity at 2.1 to 2.2 meters (6.9 to 7.2 feet) in length. A single calf is born after a 9.5 month gestation period, and lactation lasts about 12 months. The diet of the dwarf sperm whale consists mainly of squid, fish, and crustaceans (Wynne et al., 1999).

G.2.5.5 Sperm Whale

The sperm whale (*Physeter macrophalus*) is pelagic, deep-water species that inhabits the areas near the continental slope. It is found throughout the Gulf of Mexico along the continental slope, and along the Atlantic seaboard associated with Gulf Stream features. Female and young sperm whales form breeding schools of 10 to 80 animals, while sexually inactive males form bachelor schools; older males are typically solitary. The female reaches sexual maturity at 7 to 11 years; the male reaches maturity at 19 years. A single calf is born every 3 to 6 years after a 14-month gestation period, and lactation lasts between 12 to 24 months. The diet of the sperm whale consists mainly of squid, but it also eats fish (Wynne et al, 1999).

G.2.5.6 Atlantic Spotted Dolphin

The Atlantic spotted dolphin (*Stenella frontalis*) is a tropical species found in a variety of areas throughout the Gulf of Mexico. It ranges from coastal to pelagic environments, typically over the continental shelf and slope, and it is usually associated with the Gulf Stream. The Atlantic spotted dolphin reaches sexual maturity at 8 to 15 years, breeding in fall and spring. One calf is born to a female every 1 to 2 years after a 12-month gestation period; lactation typically lasts 3 to 5 years. The dolphin may live 25 to 30 years. The Atlantic spotted dolphin is a gregarious species, and it can be found in groups (fewer than 20) of other dolphins and small whales along the coast and in larger groups (fewer than 100) offshore. The diet of the Atlantic spotted dolphin consists of squid and a variety of fish (Wynne et al., 1999).

G.2.5.7 Rough-Toothed Dolphin

The rough-toothed dolphin (*Steno bredanensis*) is a tropical, pelagic species found seaward of the continental slope. Little is known about the species, but it is thought to be sexually mature at 10 to 14 years, and it may live as long as 32 years. The rough-toothed dolphin is believed to travel in pods of 10 to more than 100, and it associates with other species such as the spinner dolphin, bottlenose dolphin, and pilot whale. Sometimes the rough-toothed dolphin is associated with large mats of Sargassum. The diet of the rough-toothed dolphin diet consists of deepwater octopus, squid, and fish (Wynne et al., 1999).

G.2.5.8 Killer Whale

The killer whale (*Orcinus orca*) can be found in both coastal and ocean waters ranging from tropical to polar. The killer whale is a highly social animal that travels in pods of 3 to 55 animals, and it often cooperates in hunting and feeding efforts. The species is sexually mature at 10 to 15 years, mating year round. The female gives birth to a single calf every 3 to 8 years after a 17-month gestation period; lactation typically lasts about 12 months. Individuals may live more than 50 years. The killer whale has a diverse diet that includes fish, birds, squid, turtle, and other marine mammals (Wynne et al., 1999).

G.2.5.9 False Killer Whale

The false killer whale (*Pseudorca crassidens*) is pelagic species found in the deeper waters of the Gulf of Mexico, seaward of the continental shelf. The false killer whale is a social species that can be found in groups from 10 to more than 100 with the same species or with other dolphin species. It is sexually mature at 8 to 14 years, and the female has a single calf every 3 to 4 years after a 16-month gestation period. This species has been known to be aggressive toward other smaller dolphins. The diet of the false killer whale consists mainly of squid and fish (Wynne et al., 1999).

G.2.5.10 Short-Finned Pilot Whale

The short-finned pilot whale (*Globicephala macrorhynchus*) can be found in a variety of water depths, and it is typically associated with squid, its main prey. The short-fin is a tropical species that is usually associated with the Gulf Stream, and it can be found in pelagic or coastal environments, possibly moving inshore during the summer months. The short-finned pilot whale is a social species that can be found in groups of 10 to more than 100, and it is often associated with the bottlenose dolphin. The species is believed to be sexually mature at 6 to 12 years, breeding every 3 years. The female gives birth to a single calf after a 15- to 16-month gestation period. Lactation lasts about 20 months, and an individual whale may live between 50 to 70 years. The diet of the short-finned pilot whale consists primarily of squid, but it also has been known to prey on fish (Wynne et al., 999).

G.2.5.11 Pygmy Killer Whale

The pygmy killer whale (*Feresa attenuata*) is a pelagic species found in the deeper waters of the Gulf of Mexico seaward of the continental shelf. Little is known about the life of this whale, but its diet is believed to consist mostly of fish, and it has been observed preying on squid. The pygmy killer whale is a gregarious species that typically associates in groups of 10 to 50 individuals. The pygmy killer whale has shown aggressive tendencies, but typically it is wary of boats (Wynne et al., 1999).

G.2.5.12 West Indian Manatee

The West Indian manatee (*Trichechus manatus)* is a slow-moving aquatic mammal with gray to brown skin, a small head, flexible flippers, and a large tail. Its large rounded body weighs on average 441 to 1,102 pounds (200 to 500 kilograms), and it is approximately 9.8 to 13.1 feet (3 to 4 meters) long (Nowak 1991). Its diet is primarily submergent, emergent, and floating vegetation, although it varies according to plant availability. The West Indian manatee may live several decades (O'Shea and Ludlow 1992).

The West Indian Manatee is present in the coastal areas from the southeastern United States to northeastern South America. In the southeastern United States, the manatee occurs primarily in Florida and southeastern Georgia; however, individual manatees may also range as far north as Rhode Island on the Atlantic coast (Reid 1996) and as far west as Texas on the Gulf Coast. Some believe the manatee in Texas may be a wanderer from the Mexican population. An individual manatee captured in Texas was linked to the Florida population through deoxyribonucleic acid (DNA) testing (Ettel undated). The West Indian manatee is federally listed as endangered in Florida, Georgia, Puerto Rico, and Texas.

The West Indian manatee's habitat comprises shallow coastal waters, estuaries, bays, rivers, and lakes, although it seems to prefer rivers and estuaries to marine habitats (Lefebvre et al. 1989). In addition, the West Indian manatee sometimes travels through dredged canals or quiet marinas. In the north during October to April, the manatee congregates in warmer waters because it cannot tolerate prolonged exposure to water colder than 68 degrees Fahrenheit (20 degrees Celsius). The West Indian manatee prefers water depths of at least 3.3 to 6.6 feet (1 to 2 meters); however, along the coast the manatee is often in water 9.8 to 16.4 feet (3 to 5 meters) deep. It also prefers not to be in water with strong currents, and it is consistently associated with freshwater (Lefebvre et al. 1989). Because the young are born in the water, sheltered bays, coves, and canals are important for the West Indian manatee's reproductive success (O'Shea and Ludlow 1992).

While the female manatee is sexually mature at a minimum age of 4 to 5 years, it does not breed successfully until the age of 7 to 9 years. The male manatee breeds at 9 to 10 years, although it may mature physically a few years earlier. The species mates promiscuously. A single calf is born in spring or early summer after a gestational period of approximately 12 to 14 months, and typically an interval of 3 to 5 years passes before a female gives birth to another calf (possibly 2 years if a calf is lost early). The calf is weaned by the age of 1 to 2 years (O'Shea and Ludlow 1992).

G.2.5.13 Bottlenose Dolphin

The bottlenose dolphin (*Tursiops truncatus*) typically is found in coastal or offshore waters. In the coastal environment, the bottlenose dolphin can be found in warm, sallow inshore waters of bays and rivers. When offshore, it usually is in deep waters over the continental shelf and slope. The female bottlenose dolphin reaches sexual maturity at 5 to 10 years; the male reaches maturity at 8 to 12years. The species breeds during fall and spring, and produces one calf every 3 to 6 years after a 12-month gestation period. Lactation typically lasts 12 to 18 months, and the dolphin may live more than 50 years. The bottlenose dolphin is a social species, and along the coast it can be found in small groups (less than 10) and larger groups offshore (10 to more than 100). This species can usually be found in mixed groups with pilot whales and right whales. The bottlenose dolphin's diet consists of fish, invertebrates, and squid (Wynne et al., 1999).

G.2.6 Plants

Louisiana quillwort is an endangered, semi-aquatic, seedless plant related to ferns. It has a shallowly rooted, two-lobed stem and numerous grassy leaves of approximately 0.6 to 1.6 inches (1.5 to 4 centimeters) long. It produces reproductive spores in the spring and fall (NatureServe 2005).

This species is found in shallow blackwater streams in riparian woodland and headwater pine forest. The plants are found on stable sand and gravel bars, moist overflow channels with silty sand substrates, and low, sloping banks near and below water level (NatureServe 2005).

According to the USFWS recovery plan prepared in 1996, reproducing populations of Louisiana quillwort are known to exist only in Washington and St. Tammany Parishes in southeastern Louisiana and Perry and Jackson Counties in Mississippi (Larke 1996). The Mississippi population is found in the following locations:

- **Jackson County**—De Soto National Forest, Red Creek Wildlife Management Area; approximately 50 plants in overflow channels near the head of a branch of Bayou Billie.

- **Perry County—**De Soto National Forest, Camp Shelby National Guard Training Site, Pascagoula River watershed; approximately 2,500 plants in five colonies near the headwaters of Pearces Creek; 1,500 plants along a small tributary to Joes Creek; and 20 plants near an intermittent stream draining into Whiskey Creek (Larke 1996).

A more recent information source (NatureServe 2005) describes distribution of this species as consisting of 9 localized populations in St. Tammany and Washington Parishes in Louisiana and more than 50 populations in 10 counties in Mississippi. According to comments submitted by the USFWS (James 2005), this species is present in Forrest, George, and Greene Counties in Mississippi. Specific locations were not identified.

G.2.7 Reptiles

G.2.7.1 Alabama Red-Belly Turtle

The Alabama red-belly turtle (*Pseudemys alabamensis*) has an orange or reddish plastron and a brown to olive carapace with yellow, orange, or reddish streaks and mottling. The skin is olive to black with yellow or light orange stripes, and the adult is usually 8 to 12 inches (20 to 30.5 centimeters) long (NatureServe 2005; Dobie 1985). Aquatic plants are the primary food source of red-belly turtle (Mount 1975).

Although this species is primarily (though not historically) restricted to the northern Mobile Bay and associated tributary streams in Alabama, it was recently recorded in Mississippi as well (NatureServe 2005). James (2005) identified locations in Jackson County, MS, as the lower Pascagoula River and its tributaries, Bluff Creek, and the Escatawpa River. Currently, the red-belly turtle is most abundant in river channels and the quiet backwaters of the upper Mobile Bay, particularly in areas with dense submerged vegetation and water no more than 6.6 feet (2 meters) deep (McCoy and Vogt 1985). The female red-belly lays clutches of between three and nine eggs each from May to July (Behler and King 1979; Dobie and Bagley 1988). Preferred nesting sites include sand banks, natural levees, and along rivers (Dobie and Bagley 1988; Nelson 2003).

G.2.7.2 Black Pine Snake

The black pine snake (*Pituophis melanoleucus lodingi*) inhabits upland longleaf pine forests that once covered the southeastern United States. It prefers areas with sandy, well-drained soils with an overstory of longleaf pine, a fire-suppressed midstory, and a dense herbaceous ground cover (Duran 1998b). The snake is rarely found in riparian areas, hardwood forests, or closed canopy conditions (Duran 1998a). A petition to list the black pine snake was published on May 11, 2004.

The current population of the black pine snake occurs in fragmented areas in Mississippi and Alabama. The species is probably extinct in Louisiana (NatureServe 2005). The reason for its decline is the deforestation of many of the pine forests throughout the southeastern United States—the forests now cover only 5 percent of their original land area (Frost 1993), and they have been converted into urban developments, agriculture, and pine plantations. The largest populations of the black pine snake are now found on private land and in the De Soto National Forest in Mississippi (NatureServe 2005).

G.2.7.3 Eastern Indigo Snake

The eastern indigo snake is a threatened species currently known to occur throughout Florida and the coastal plain of Georgia (USFWS 1991). Although the USFWS Threatened and Endangered Species System (TESS) does not include Mississippi in this species' current range (USFWS 2005), other sources suggest that it may occur in six Mississippi counties where SPR activities are proposed. A list prepared by the U.S. Fish and Wildlife Service (2000) identifies the eastern indigo as present in Marion County and potentially present or historically recorded in Forrest, Greene, George, Jackson, and Perry Counties.

The eastern indigo snake is a large, shiny bluish-black snake with some red or cream coloring on the chin and sides of the head (USFWS 1991). With a maximum length of about 8 feet (2.4 meters), it is the longest North American snake (NatureServe 2005).

The principal habitat of the eastern indigo snake includes high, dry, well-drained sandy soils, closely paralleling the sandhill habitat preferred by the gopher tortoise. The eastern indigo snake uses gopher tortoise burrows and other subterranean cavities as dens and for egg laying. In warmer months, these snakes may be found near streams and swamps (USFWS 1991).

G.2.7.4 Gopher Tortoise

The gopher tortoise (*Gopherus polyphemus*) is the only tortoise indigenous to the southeastern United States. It is relatively large. The carapace length is often 5.9 to 11 inches (15 to 28 centimeters), but it can measure up to 15 inches (38 centimeters). It has a smooth, dark-brown to grayish-black shell. The gopher tortoise is primarily an herbivore, but it sometimes eats insects, carrion, and fruit (NatureServe 2005).

The preferred habitat of the gopher tortoise is characterized by well-drained, sandy soils suitable for burrowing; abundant herbaceous ground cover; and generally open canopy and sparse shrub cover that allow sunlight to reach the forest floor (Landers 1980). The gopher tortoise digs burrows that average approximately 14.8 feet (4.5 meters) long and about 6.6 feet (2 meters) deep (Diemer 1989). Burrows, which are used for shelter and nesting, generally can be identified by a mound of excavated subsoil at the mouth of the burrow. Nesting occurs from late April to mid-July (mainly mid-May to mid-June) (Iverson 1980). The adult female lays only one clutch per year, but she does not necessarily nest every year. Hatching occurs in August and September, and the offspring demonstrate temperature-dependent sex determination (Burke et al. 1996).

The gopher tortoise is found only in the southeastern United States, and its population has declined rapidly over the past century. It is estimated that the population is now only 80 percent of what it was 100 years ago, and the species is listed as threatened west of the Mobile and Tombigbee Rivers in Alabama, Mississippi, and Louisiana (Auffenberg and Franz 1982; NatureServe 2005). The most important cause of the decline is habitat loss and degradation caused by urban development and agricultural conversion, although mining has also affected the gopher tortoise population in some areas (NatureServe 2005). Road kill, a byproduct of urban development, is also a minor problem.

G.2.7.5 Kemp’s Ridley Sea Turtle

The Kemp’s Ridley sea turtle (*Lepidochelys kempii*) is a small endangered sea turtle found in shallow coastal and estuarine waters, including those of the Gulf of Mexico. The adult is olive green above and yellow below, and the young are gray above and yellow below. The shell is nearly round and the limbs are flattened flippers. The shell length is usually between 22.8 and 27.6 inches (58 and 70 centimeters) for adults and 1.5 and 1.7 inches (3.8 to 4.4 centimeters) for hatchlings (Conant and Collins 1991).

In coastal waters, the Kemp’s Ridley sea turtle is usually found over sand or mud bottoms where it feeds on crabs. Nests are built on elevated dunes, especially on beaches backed up by large swamps or bodies of open water having seasonal, narrow ocean connections (NatureServe 2005).

During the nesting season from April to July, the female lays one to four clutches of about 100 eggs at intervals of 10 to 28 days. Eggs hatch in an average of 50 to 55 days (CSTC 1990).

G.2.7.6 Loggerhead Sea Turtle

The loggerhead sea turtle (*Caretta caretta*) is a reddish-brown sea turtle found in a variety of habitats including open seas to more than 500 miles (805 kilometers) from shore, bays, estuaries, lagoons, creeks, and mouths of rivers, mainly in warm temperate and subtropical regions (NatureServe 2005). The adult has a carapace length typically between 27.6 and 49.2 inches (70 and 125 centimeters), and hatchlings have a shell length of 1.6 to 2 inches (4 to 5 centimeters) (Dodd 1988, 1992; Conant and Collins 1991).

The female loggerhead sea turtle nests on open sandy beaches above the high-tide mark, seaward of well-developed dunes. High-energy and steeply sloped beaches with gradually sloped offshore approaches are favored (CSTC 1990). Between 50,000 to 70,000 clutches are deposited each year in southeastern states (Meylan et al. 1995). Despite some natural fluctuation in the size of the loggerhead population, numbers appear to be declining in some areas largely because of habitat destruction and incidental take by shrimp trawlers. The nesting population in the southeastern United States is believed to be declining (CSTC 1990, Taylor 1992).

Every 2 to 3 years, a mature female lays between 1 and 9 clutches of around 120 eggs at intervals of 2 weeks. Nesting occurs mainly at night, often at high tide, from April to early September. The eggs hatch in 8 to 9 weeks in the southeastern states, with the sex of the hatchlings is determined by incubation temperatures, with the ratio strongly biased toward females in Atlantic coastal waters. Hatchlings emerge from the nest a few days after hatching, typically during darkness (Wibbels et al. 1991, Mrosovsky and Provancha 1992).

G.2.7.7 Ringed Map Turtle

The ringed map turtle or ringed sawback turtle (*Graptemys oculifera*) is small. Typically, the male is 4 inches (10 centimeters) and the female is 7.1 inches (18 centimeters) in plastron length. It has a yellow ring bordered with dark olive-brown on its upper shell. Its undershell is yellow, and it has a yellow dot behind its eye, yellow stripes from its orbit backwards, and another yellow strip on its lower jaw (Cagle 1953). In 1986, this turtle was federally listed as threatened (USFWS 1992).

The preferred riverine habitat of the ringed map turtle includes many logs, a moderate current, and large, high riparian sand and gravel bars for laying eggs in nests (USFWS 1992). Because the ringed map turtle spends most of its day basking in the sun, it requires a channel wide enough for the sun to reach the logs from during the day (McCoy and Vogt 1980, Dickerson and Reine 1996). In addition, the ringed map turtle must have high water quality to support its main food sources, which include insects, mollusks, and crustaceans (NatureServe 2005). This species is not found in tributaries or tidal areas.

The ringed map turtle is present in the Pearl River system in Mississippi, specifically in the main streams of the Pearl River and the Bogue Chitto River. The turtle’s range is from near the upstream mouth of the Pearl River to Neshoba County, MS, and from the upstream confluence of the Bogue Chitto River and the Pearl River to near Franklinton, LA (Jones 1991).

In total, the population size of the ringed map turtle is likely greater than 10,000 (Dickerson and Reine 1996). In the Pearl River, a mark-and-recapture study estimated the population at 137 to 549 turtles per mile (85 to 341 per kilometer) (Jones and Hartfield 1995). Another study estimated (40 turtles per mile (25 turtles per kilometer) in the Pearl River (Lindeman 1999). Dickerson and Reine (1996) estimated the population in two upper Pearl River sections at greater than 119 basking turtles per mile (74 basking turtles per kilometer). In 1999, the population of ringed map turtles in the Bogue Chitto River was estimated at between 5,411 and 16,348 (NatureServe 2005). The population per distance in the Pearl River is highest above Ross Barnett Reservoir and below the confluence with the Strong River in Simpson County (Matthews and Moseley 1990). The highest population is in the Bogue Chitto River, downstream from Franklinton (NatureServe 2005).

The ringed map turtle lays a clutch in June and then most likely another clutch later. The clutch averages about 3 to 4 eggs (Kofron 1991) (4 to 8 eggs according to Matthews and Moseley (1990)). The male is typically mature at 3.5 years, while the female is mature at 10 to 16 years (Jones and Hartfield 1995).

G.2.7.8 Yellow-Blotched Map Turtle

The yellow-blotched map turtle (*Graptemys flavimaculata*) is named for yellow or orange blotches in the center of each olive to light greenish-brown shell plate. Some individuals have yellow bars, circles, or semicircles in place of blotches. Plates along the edge of the shell have orange bars or semicircles. The juvenile and adult male have prominent spine-like projections flanked by irregular orange blotches on the first four central shell plates. These spines are much smaller on the female. The sexes also differ significantly in size, with shells ranging from about 3.5 to 4.7 inches (9 to 12 centimeters) in the male and from about inches 3.9 to 8.3 inches (10 to 21 centimeters) for the female (Jones 1993).

The yellow-blotched map turtle inhabits rivers and large creeks with moderate currents, abundant basking sites, and sandbars. This species prefers habitats with sand, clay, or rocky bottoms with limestone ledges along banks (McCoy and Vogt 1987). It also uses oxbow lakes, semipermanent ponds, or temporary flood pools (Jones 1996). It is not usually found in smaller streams shaded by bank vegetation for much of the day. Nesting occurs on sandbars or in small clearings along the bank of a river such as on a clay bank with a steep slope (Horne et al. 2003). The nesting season is from mid to late May through early to mid August (NatureServe 2005).

The yellow-blotched map turtle is found only in rivers of southeastern Mississippi, including the following sites:

- Leaf River from the U.S. Highway 84 bridge in Covington County (Cliburn 1971) downstream to the confluence of the Leaf and the Chickasawhay Rivers;
- Chickasawhay River upstream to Enterprise in Clarke County (McCoy and Vogt 1987);
- Pascagoula River from its point of origin in George County, south to where the river forks into the East and West Pascagoula channels near Vancleave, Jackson County;
- West Pascagoula River to just south of the I-10 bridge (Dobie 1991); and
- East Pascagoula River from the downstream to approximately 1 mile (1.6 kilometers) north of the I-10 Bridge (Jones 1993).

Small populations also have been reported in the lower Escatawpa River in Jackson County (Jones 1993); Tallahala Creek in Perry County; and Red Creek in Jackson County (Cliburn 1971).

Habitat alteration resulting from channel modification and water quality degradation from siltation and pollution are the primary causes for the decline of this species. Channel modification removes materials used for basking and water quality degradation impairs feeding resources. This species is also threatened by commercial collection for retail sale (USFWS 1992).

G.3 FIELD OBSERVATIONS

This section presents observations made by ICF Consulting staff during field visits to the Bruinsburg and Richton sites.

G.3.1 Bruinsburg, MS

Four biologists from ICF Consulting conducted a pedestrian survey of the Bruinsburg candidate site on November 21, 2005. Proposed pipeline ROW surveys were continued on November 22, 2005. Surveys of the proposed ROWs were conducted by following the routes by car and making vegetative and land use observations along the route at predetermined way points.

G.3.1.1 Bruinsburg Candidate Site

The Bruinsburg site is 10 miles west of Port Gibson, MS, off of Rodney Road. The site is situated within the Northern Holocene Meander Belt and the Bluff Hills Ecoregions of Mississippi (Chapman et al. 2004). Approximately two-thirds of the proposed Bruinsburg site is located in a relatively flat landscape, which is currently occupied by cultivated cotton fields, cypress swamp, and deciduous forest. Two intermittent streams converge to form Mammy Judy Bayou, which is the only permanent stream within the proposed boundaries. Areas adjacent to the Bayou are permanently flooded, while the remaining areas show signs of intermittent or semipermanent flooding. The remaining third of the proposed site, where the administrative buildings, pumps, and brine pond would be located, is an upland forested area outside of the floodplain of the Mississippi River.

The study area has the following principal habitat types:

- Cypress swamp;
- Cultivated row-crop (cotton fields);
- Palustrine forested wetlands; and
- Mixed hardwood forest.

Each of the principal habitat types in the study area are described below, and table G.3.1.1-1 lists plant species observed on site.

Cypress Swamp: Inundated portions of the site are characterized by a cypress swamp ecosystem with duckweed floating in the 3 to 4 feet (0.9 and 1.2 meters) of standing water. Spanish moss was prevalent on the branches of the bald cypress trees. Dryer areas surrounding the cypress swamps contained freshwater emergent wetland vegetation dominated by sedges and grasses. The natural hydrology of the site has been altered by a levee extending across the center of the site separating Mammy Judy Bayou from the cotton fields to the north. Beaver dams have further altered the hydrography by creating temporary ponds along the intermittent streams crossing the center portion of the site.

Cultivated Row-Crop: Large portions of the site were actively maintained as cultivated cotton fields. The center of the fields held a large shed surrounded by farm equipment. At the time of the site visit, cotton had already been harvested. Remnants of the harvested crop remained on the field to retain soil during the winter months.

Palustrine Forested Wetlands: Portions of the forest that were not inundated during the site visit displayed signs of periodic inundation through vegetative composition, water marks on trees, and tree buttressing. These forested wetland areas were characterized by white oak, box elder, and tupelo trees. The intermittent or semipermanent forested wetland areas on the site were dominated by a white oak and hickory canopy. Other trees common throughout the forest included sweet gum, basswood, water oak, tupelo, and box elder. The understory included holly, bamboo, and arrowood, while groundcover consisted of various grasses and sedges, horsetail, clearweed, and smartweed.

Table G.3.1.1-1: Plant Species Observed at the Bruinsburg Candidate Site

Common Name	Scientific Name	Vegetative Layer
Cypress Swamp		
Bald Cypress	*Taxodium distichum*	Canopy
Spanish Moss	*Tillandsia usneoides*	Epiphyte
Duckweed	*Lemna minor*	Floating aquatic plant
Palustrine Forested Wetland		
White Oak	*Quercus alba L.*	Canopy
Hickory	*Carya spp.*	Canopy
Post Oak	*Quercus stellata*	Canopy
Cherry	*Prunus sp.*	Canopy
Tupelo	*Nyssa aquatica*	Canopy
Honey Locust	*Gleditsia triacanthos*	Canopy
Sycamore	*Platanus occidentalis*	Canopy
Box Elder	*Acer negundo*	Canopy
Sweetgum	*Liquidambar styraciflua*	Canopy
Southern Arrowood	*Viburnum dentatum*	Understory
Holly	*Ilex spp.*	Understory
Horsetail	*Equisetum arvense L.*	Groundcover
Smartweed	*Polygonum coccineum*	Groundcover
Clearweed	*Pilea pumila*	Groundcover
Lizard Tail	*Saururus cernuus*	Groundcover
Water Locust	*Gleditsia aquatica*	Canopy
Eastern Cottonwood	*Populus deltoides*	Canopy
Pecan	*Carya illinoinensis*	Canopy
Black Willow	*Salix nigra*	Canopy

Mixed Hardwood Forest: The proposed administrative buildings would be located on the west side of the site. This area is characterized by steep rolling hills and ravines covered with mixed hardwood/pine forests. The area appeared previously disturbed due to the presence of bamboo mixed in the interior of the upland forest. The forest is dominated by oaks and hickories intermingled with pine. The understory is composed of herbaceous cover, shrubs, and seedlings.

G.3.1.2 Bruinsburg Raw Water Intake Structure

The area along the proposed raw water pipeline ROW was similar to that of the area surrounding the proposed site. The RWI structure would be located on the Mississippi River to the south west of the candidate site. The RWI would be located on or adjacent to the protective levee system that runs along the Mississippi River. The area is mostly forested along the levee, with similar species composition to that of the storage facility. Nearby some forested areas have been cleared and planted with corn or soybean to attract deer during hunting season. The beachfront along the east side of the Mississippi River is approximately 20 feet (6.1 meters) below the top of the levee system. The beachfront is a narrow strip of sand extending approximately 20 feet (6.1 meters) from the bottom of the levee to the river.

G.3.2 Richton, MS

Four biologists from ICF Consulting conducted a pedestrian survey of the project area on October 17 and 18, 2005. The biologists walked over the proposed site and RWI structure. The proposed pipeline ROWs were observed at road intersections at a distance from vehicles. Except for the proposed ROW to Pascagoula terminal, which would follow an existing pipeline ROW, the proposed routes of the ROWs had not been defined precisely.

None of the species addressed by the biological assessment (see section G.2) were observed directly during the mid-October site inspection.

G.3.2.1 Richton Candidate Site

The proposed Richton storage site would be about 350 acres (140 hectares), which includes a 300-foot (91-meter) buffer cleared for security purposes and an access road. The site is an actively managed pine plantation. The slash pine plantation, which is estimated to be between 10 to 20 years old, covers approximately 312.4 acres (133.2 hectares), or 88 percent, of the site. The overgrown fields, which include portions of former timber stands and cropland, occupy 22.6 acres (9.15 hectares), or 7 percent. Forested, open-water, and emergent wetlands flank a manmade pond located on the western site boundary. These wetlands are limited to the perimeter of the pond. Another forested and emergent wetland area is associated with a small depression and Pine Branch, which is an intermittent creek that originates in the center of the site and flows south to cross beneath Highway 42. The stream channel and the depression in the southwestern portion of the site are palustrine forested wetland areas, while the pond contains submergent and emergent wetlands, with a small area of forested wetlands.

The study area includes the following principal habitat types:

- Ponds (open water);
- Evergreen forest (slash-pine plantation);
- Palustrine emergent and forested wetlands; and
- Old fields (former pine plantation and row crops).

Each of the principal habitat types in the study area are described below, and table G.3.2.1-1 lists plant species observed on site.

Table G.3.2.1-1: Plant Species Observed at the Richton Candidate Site

Common name	Scientific Name	Vegetative Layer
Evergreen Forest - 176.5 acres (71.4 hectares) (72 percent of the site)		
Slash Pine	*Pinus elliottii*	Canopy
Blackberry	*Rubus argutus*	Understory/Ground cover
Poison Ivy	*Toxicodendron radicans*	Understory/Ground cover
Trumpet Creeper	*Campsis radicans*	Understory/Ground cover
Old Field - 47.5 acres (19.2 hectares) (19 percent of the site)		
Chinese Tallow Tree	*Triadica sebifera*	Understory/Ground cover
Horseweed	*Conyza canadensis*	Understory/Ground cover
Thistle	*Carduus*	Understory/Ground cover
Goldenrod	*Solidago spp.*	Understory/Ground cover

Table G.3.2.1-1: Plant Species Observed at the Richton Candidate Site

Common name	Scientific Name	Vegetative Layer
Deciduous Forest and Palustrine Wetlands - 21.8 acres (8.8 hectares) (9 percent of the site)		
Red Maple	*Acer rubrum*	Canopy
Chinese Tallow Tree	*Sapium sebiferum*	Understory/Ground cover
Sweet Gum	*Liquidambar styraciflua*	Canopy
Tupelo	*Nyssa aquatica*	Canopy
Smartweed	*Polygonum roccineum*	Understory/Ground cover
Greenbriar	*Smilax spp.*	Understory/Ground cover
Palustrine Wetlands		
Sedge	*Carex spp.*	Ground cover
Pitcher Plant	*Sarracenia spp.*	Ground cover
Soft Rush	*Juncus effuses*	Ground cover
Smartweed	*Polygonum coccineum*	Ground cover
Bulrush	*Scirpus spp.*	Ground cover
Spike Rush	*Eleocharis quadrangulata*	Ground cover

Ponds: The manmade pond, located on the western portion of the site, is fed by a stream that originates offsite. The pond appears to be large enough to support common aquatic species.

Evergreen Forest: The evergreen forest is an even-aged, managed timber stand canopy dominated almost entirely of slash pine. Limited understory is present in the slash pine plantation because of the dense mat of pine needles and timbering activities. At locations where the mobile timber-harvesting base was sent up, the debris (branches and wood chips) may cover up to an acre along the roadside within the slash pine plantation. Numerous timber access roads crisscross the site, and they are littered with branches, bark, and wood chips from the timber-harvesting activities.

Palustrine Emergent and Forested Wetlands: The wetlands on the site are associated with a manmade pond, an intermittent stream channel, and a topographical depression. The forested wetland community associated with Pine Branch is primarily made up with red maple in the canopy and a variety of sedge, rush, bulrush, and pitcher plants within and adjacent to the stream channel. At the time of the survey, the stream channel did not contain any standing water; however, standing water was present in Pine Branch on the south side of Highway 42.

Old Field: The old fields occupied the southeast portion of the site, and they included old timber stands and fallow fields. The old fields adjacent to the chicken farm appeared to be old croplands because no evidence of former timber stands was observed and historical information indicates that the area was formerly cropland (DOE 1992). The old fields north of the chicken farm were old slash pine timber stands, deduced because of the evenly spaced stumps located throughout the area.

G.3.2.2 Raw Water Intake Structure

The Richton RWI structure is proposed on the Leaf River. The opposing bank had a large beach area void of vegetation, suggesting seasonal changes in depth and width. The bank of the proposed raw water intake structure had a vertical drop of approximately 30 feet (9.1 meters) to the water surface. The site was a mature deciduous mixed hardwood and pine forest typical of the area. Effects of Hurricane Katrina were dramatic—the mature forest had only 20 percent of its canopy remaining intact. Many of the trees still standing are likely to die within a year or so because of canopy damage.

G.4 HABITAT ASSESSMENT AND POTENTIAL EFFECTS

This section evaluates whether the proposed SPR development activities would take place in areas where threatened, endangered, and candidate species are known to exist or where they may exist based on the natural history information presented in section G.2. For any element of the SPR proposal located in known or potential threatened, endangered, or candidate species habitat, the nature and potential for effects on the species are described. The assessment considers potential mitigation measures that DOE would implement for each element of the proposed action.

In sections G.4.1 and G.4.2, separate assessments are provided for the Bruinsburg and Richton sites, respectively. Section G.4.3 provides an overall summary of impacts for both sites.

G.4.1 Bruinsburg, MS

The assessment for the Bruinsburg site evaluates the potential effects on threatened, endangered, and candidate species by each element of the proposed action listed in table G.4.1-1.

Table G.4.1-1: Elements of the Proposed Action and Location on Bruinsburg Candidate Site

Element of Proposed Action	Location by County or Parish
Bruinsburg site	*Mississippi*: Claiborne
Pipeline and power line ROW from Bruinsburg to Peetsville	*Mississippi*: Claiborne, Copiah, Lincoln
Pipeline ROW from Bruinsburg to Anchorage	*Mississippi*: Adams, Claiborne, Jefferson, Wilkinson *Louisiana*: East Baton Rouge, East Feliciana, West Baton Rouge, West Feliciana
Pipeline ROW from Bruinsburg to Jackson terminal	*Mississippi:* Copiah, Warren, Hinds
Pipeline and power line ROW from Bruinsburg to Entergy power plant	*Mississippi:* Warren, Hinds
Raw water intake and associated pipeline and power line ROWs	*Mississippi*: Claiborne
Brine disposal pipeline ROW	*Mississippi*: Claiborne
Marine terminal in Anchorage	*Louisiana*: West Feliciana

Evaluation findings for these components of the Bruinsburg site are presented for each species below.

G.4.1.1 Birds

G.4.1.1.1 Bald Eagle

Of the locations listed in table G.4.1-1 USFWS (2000), and the Mississippi and Louisiana Natural Heritage programs report the bald eagle only in Jackson, Warren, and Wilkinson County in Mississippi (MMNS 2002) and East Baton Rouge and West Feliciana Parishes in Louisiana (LNHP 2004). This includes the proposed crude oil pipeline to Anchorage. Data provided by MNHP identify the closest recorded occurrence of the bald eagle to be 9 miles (14 kilometers) from the proposed crude oil pipeline to Anchorage. Information submitted by USFWS (James 2005) identifies the bald eagle as potentially present Statewide in Mississippi, and this species is conservatively assumed to be potentially present throughout Louisiana as well. Natural history data indicate that any bald eagle in the region likely is a nonbreeding seasonal migrant (NatureServe 2005). A non-nesting transitory bald eagle would be expected to avoid human activity and move to undisturbed areas. DOE would consult with USFWS and state wildlife agencies if bald eagle nests were identified during preconstruction surveys.

G.4.1.1.2 Interior Least Tern

Interior least terns breed locally throughout the Mississippi River system. Nesting occurs on and near the river with eggs often resting directly on sandbars (Aycock 2005). Of the elements of the proposed action listed in table G.4.1-1, only the RWI structure with connecting RWI pipeline and power line, and the crude oil pipeline tie-in to the Entergy facility in Vicksburg would be built near the Mississippi River.

Data provided by MNHP (2006) show no known nesting areas within 2 miles (3 kilometers) of the raw water intake structure. Because this area is potential suitable habitat, DOE would complete a preconstruction survey to verify there are no signs of active nesting. If nesting activity is verified, construction of the RWI structure would be timed to avoid the period when the terns would be nesting. Operation and maintenance of the raw water intake involve little human activity and would not affect interior least terns in the area.

MNHP identified one nesting area approximately 3 miles (5 kilometers) downstream from the Entergy facility at Vicksburg. The area immediately surrounding the Entergy facility is not suitable habitat for the interior least tern because it is an urbanized area with frequent human disturbance. The construction, operation, and maintenance of the proposed tie-in to the Entergy facility would not affect the least interior tern.

G.4.1.1.3 Red-Cockaded Woodpecker

According to the recovery plan for the red-cockaded woodpecker (USFWS 2003b), the Homochitto National Forest in southwestern Mississippi contains a secondary core population of this species. Two elements of the proposed activity would pass thorough or near the Homochitto National Forest. The pipeline ROW from Bruinsburg to the Peetsville station would pass through the National Forest in Copiah and Lincoln Counties parallel to existing ROWs, and the pipeline ROW from Bruinsburg to Anchorage would pass near the National Forest in Adams and Wilkinson Counties parallel to an existing ROW. In these four counties, the red-cockaded woodpecker has been reported only in Lincoln and Wilkinson (MMNS 2002). MNHP (2006) confirms two occurrences of the red-cockaded woodpecker within 2 miles (3 kilometers) of the crude oil pipeline to Peetsville, and one within 2 miles (3 kilometers) of the crude oil pipeline to Anchorage. All of these populations are located in Homochitto National Forest.

In consultations with USFWS, MNHP, and U.S. Forest Service (USFS), DOE reviewed proposed pipeline alignments to discuss potential impacts to the red-cockaded woodpecker population. These consultations did not reveal specific concerns of impacts to known red-cockaded woodpecker population. The proposed pipelines follow existing ROWs, and they would affect disturbed habitat. The USFS (Howell 2006) confirmed that the proposed pipeline to Peetsville would not cross potential red-cockaded woodpecker habitat. The Red-cockaded woodpecker has specific habitat requirements of pine stands over 60 years of age for nesting and 30 years of age for foraging. If mature pine stands of 30 years or more are identified in preconstruction ROW alignment surveys, DOE would have a biologist survey the area for red-cockaded woodpecker nesting cavities and foraging activity. Nesting cavity trees would be marked and, if feasible, the ROW alignment adjusted to avoid impacts to stands more than 30 years old within 0.5 miles (0.8 kilometers) of the nesting cavity (Aycock 2005). DOE would engage in further consultation with USFWS and MNHP to avoid impacts to the red-cockaded woodpecker along the proposed ROW.

G.4.1.2 Fish

G.4.1.2.1 Bayou Darter

Of the counties listed in table G.4.1-1 where elements of the Bruinsburg site and its associated infrastructure would be located, the bayou darter is present only in Claiborne, Copiah, and Hinds Counties in Mississippi. Elements of the proposed action in these counties are the Bruinsburg site, the pipeline ROW from Bruinsburg to the Jackson terminal, the pipeline ROW from Bruinsburg to Peetsville, the pipeline ROW from Bruinsburg to Anchorage, the brine disposal system, and the raw water intake system.

The range of the bayou darter is limited to Bayou Pierre and three of its tributaries including White Oak Creek, Turkey Creek, and Foster Creek. The pipelines to the Jackson terminal and the Entergy docks would be directionally drilled under Bayou Pierre. None of these water bodies would be crossed through open water construction or otherwise affected by any element of the proposed action; therefore, the proposed action would not affect this species.

G.4.1.2.2 Gulf Sturgeon

Critical habitat for the Gulf sturgeon has been designated in two counties where infrastructure associated with the proposed Bruinsburg site would be located: Copiah and Hinds Counties. The pipeline ROW from Bruinsburg to Peetsville would pass through the southwest corner of Copiah County. Designated critical habitat for the Gulf sturgeon in Copiah County is located in the Pearl River, which forms the eastern boundary of Copiah County. Because the ROW from Bruinsburg to Peetsville would not cross the Pearl River, it would not affect the Gulf sturgeon or its designated critical habitat.

The endpoint of the pipeline ROW from Bruinsburg to the Jackson terminal would be a connection to the Capline pipeline in Hinds County. Hinds County, like Copiah County discussed above, is bordered to the east by the Pearl River. Because the ROW from Bruinsburg to the Jackson terminal would end in Hinds County and would not cross the Pearl River, this element of the proposed action would not affect the Gulf sturgeon or its designated critical habitat.

The Gulf sturgeon is found in coastal waters from Florida to Louisiana (USFWS 2003a), potentially including waters that have not been designated as critical habitat. Among all counties and parishes where infrastructure associated with the Bruinsburg site would be located (see table G.4.1-1), the Gulf sturgeon reportedly occurs in two Louisiana parishes, East Feliciana and East Baton Rouge, where no designated critical habitat exists (LNHP 2004). Available information sources do not identify specific Gulf sturgeon habitat areas in these parishes.

The pipeline ROW from Bruinsburg to Anchorage would cross two surface water bodies in Louisiana: Thompson Creek, which forms the border of East and West Feliciana Parishes; and the Mississippi River, which lies on the border of East and West Baton Rouge Parishes. Both of the surface water bodies are assumed to provide suitable habitat for the Gulf sturgeon. Impacts to the sturgeon and its habitat would be avoided by the use of directionally drilling.

G.4.1.2.3 Pallid Sturgeon

The pallid sturgeon inhabits larger channels of the Mississippi-Missouri River system. Five counties in Mississippi (Claiborne, Jefferson, Adams, Warren, and Wilkinson) and four parishes in Louisiana (East Baton Rouge, East Feliciana, West Baton Rouge, and West Feliciana) border the Mississippi River within the known range of the pallid sturgeon. Elements of the proposed action located on or adjacent to the

Mississippi River in these counties and parishes include the Bruinsburg RWI, the pipeline ROW from Bruinsburg to the Entergy power plant, the pipeline ROW from Bruinsburg to Anchorage, and the Anchorage marine terminal.

Construction Impacts

Construction of the RWI on the Mississippi would have no effect on the pallid sturgeon. Construction activities would temporarily disturb a small area of the Mississippi River bottom and resuspend sediments; however, impacts on water quality would be negligible because of the large size and flow rate of the Mississippi in this area. Impacts on habitat characteristics would be inconsequential because of the small size of the area affected. Any potential construction impacts would be minimized with the use of onshore erosion barriers, instream silt curtains, postconstruction restoration, and other measures.

Portions of the pipeline and power line ROWs from Bruinsburg to Anchorage and to the Entergy power plant would pass near the Mississippi River. Construction of these two ROWs would not affect the pallid sturgeon. Construction-related soil runoff would not affect the Mississippi River habitat of the Gulf sturgeon because the pipeline ROWs would not pass sufficiently close to the river for construction activities to have an effect.

The pipeline crossing of the Mississippi River would be constructed using directional drilling. With this method, the pipeline would be placed beneath the river without excavation or any other instream activity; therefore, construction of the pipeline would not affect the pallid sturgeon.

Construction of the Anchorage terminal would have no effect on pallid sturgeon. Construction would be located more than 300 feet (100 meters) from the river and standard erosion and runoff control best management practices would be used during construction to mitigate these impacts. In addition, the Mississippi River at Baton Rouge is highly turbid and any increase in turbidity resulting from construction activities would not significantly affect water quality or the quality of the pallid sturgeon’s habitat in the river.

Operation and Maintenance Impacts

Operation of the RWI would have the potential to entrain and impinge young sturgeon and their prey. If this alternative were selected, DOE would work with USFWS to design the raw water intake with appropriate mesh size, intake velocity, and other technologies to minimize or avoid adverse impacts. Because the planned 1.2 million barrels per day (MMBD) raw water withdrawal would be a small fraction of the total flow, there would be no significant changes in the sturgeon habitat due to operation of the RWI.

Operation and maintenance of the portion of the crude oil pipeline ROW beneath the Mississippi River would have no impact. Because directional drilling would be used to construct the pipeline below the riverbed, no instream maintenance activities would be required.

Operation and maintenance of the Anchorage terminal would cause potential instream noise and disturbance impacts (e.g., related to tanker loading and navigation) and present a risk of oil spills. The increase in tanker navigation to the existing docks at Anchorage resulting from SPR operations would be very small and infrequent; therefore, the operation and maintenance of the marine terminal would have no effect on the pallid sturgeon.

G.4.1.3 Invertebrates

G.4.1.3.1 Alabama Heelsplitter Mussel

The Alabama heelsplitter is found in the Amite River in Louisiana, including a portion of the river in East Baton Rouge Parish. Although the pipeline ROW from Bruinsburg to Anchorage would pass through East Baton Rouge Parish, it would not cross or pass near the Amite River; therefore, none of the proposed actions would affect the Alabama heelsplitter.

G.4.1.3.2 Fat Pocketbook Mussel

A population of the fat pocketbook mussel was recently discovered in the Mississippi River and associated tributaries in Jefferson County, MS (Aycock 2005; NatureServe 2005). As shown in table G.4.1-1, the proposed activity in Jefferson County associated with development of the Bruinsburg site is construction of the pipeline ROW from Bruinsburg to Anchorage. The pipeline ROW would not intersect the Mississippi River in Jefferson County, but it would cross two small tributaries, Coles Creek and Fairchilds Creek. Based on the information provided by MNHP (2006), this species is not present in the Mississippi River at the RWI location in Copiah County, which is roughly 15 miles (24.1 kilometers) upstream from the mouth of Coles Creek.

Construction Impacts

Fat pocketbooks in the Mississippi River adjacent to Jefferson County would not be affected by construction of the pipeline ROW from Bruinsburg to Anchorage because the pipeline would not cross the river in this area. The species might be affected in Coles Creek or Fairchilds Creek at the pipeline crossings; MNHP (2006) identified these water bodies as an area of concern. Because these tributaries are small, conventional construction methods (e.g., open-ditch excavation) would be used to bury the pipeline below the streambeds. During construction of the stream crossings at Coles and Fairchilds Creeks, excavation might directly affect fat pocketbooks, if present. In addition, construction would temporarily disrupt sand, silt, or clay streambed habitat favored by the species. If construction were to occur during the reproductive stage (July to October) of the species, construction might drive away red drum or other fish hosts of its larval stage.

A small bridge would be built for the brine access road to Coles Creek. Construction of the bridge may have a temporary affect on the mussels because some instream disturbance would occur even with the best management practices to control siltation. The streambed would be restored after construction, and the bridge would be constructed of grates to allow sunlight to reach the stream surface. Operation and maintenance of the road would occur infrequently and would not affect the mussels.

DOE would have a qualified biologist survey the area of the two proposed crossings. If the mussels are identified in the area of the crossings, they would be relocated to suitable habitat upstream of the crossing or construction would be avoided during the reproductive season, or both. Relocation of freshwater mussels has been documented as a successful strategy to avoid impacts during instream construction disturbances (Reutter et al. 2001). Erosion barriers, silt curtains, and other best management practices would be used to limit downstream siltation. After construction, the streambeds would be restored to their original condition.

Operation and Maintenance Impacts

Operation and maintenance of the pipeline ROW from Bruinsburg to Anchorage would have no effect on the fat pocketbook. These activities would include periodic inspection and debris removal. These activities would be infrequent and cause minimal disturbance to the mussel and its habitat.

G.4.1.4 Mammals

G.4.1.4.1 Louisiana Black Bear

The range of the Louisiana black bear once included all of Louisiana and lower Mississippi where the Bruinsburg site and its associated infrastructure would be located. Today, the only known breeding populations are in Louisiana in the Tensas and Atchafalaya River basins (Bowker and Jacobson 1995). These areas have been designated as critical habitat. Other areas with suspected occurrences of Louisiana black bears include the Loess Bluffs portion of the Mississippi River corridor in southwestern Mississippi and the adjacent Tunica Hills of Louisiana, as well as smaller areas in the lower East Pearl River and lower Pascagoula River basins of southern Mississippi (Wooding et al. 1993).

The Bruinsburg site and its associated infrastructure are not located in the designated critical habitat of the Louisiana black bear; however, the pipeline ROW from Bruinsburg to Anchorage passes through southwest Mississippi and adjacent areas of Louisiana where a population of the bears is suspected. In addition, suitable habitat for the Louisiana black bear is present in every county in Mississippi, as well as East and West Feliciana Parishes in Louisiana, where infrastructure for the proposed Bruinsburg site would be located. The Louisiana black bear is not likely to occur in the populated areas of East and West Baton Rouge Parishes in Louisiana.

Construction Impacts

Development, operation, and maintenance of the Bruinsburg site and its associated infrastructure would have no effect on the Louisiana black bear. If any Louisiana black bears are present in areas of suitable habitat in the planned pipeline ROWs (e.g., in southwest Mississippi and adjacent areas of Louisiana), they could be expected to avoid construction and other temporary human activities.

Construction of the pipeline ROWs would contribute to habitat fragmentation, which has been cited as a concern for this species (James 2005). Pipelines would be buried and the ROW would not impose a barrier to the movement of this species, so it is expected there would be no effect on the species.

Operation and Maintenance Impacts

Operation and maintenance of the ROWs would include periodic inspection and clearing of excessive vegetation. These activities would be minimal and would not affect the Louisiana black bear, if present. The Louisiana black bear would be expected to avoid the Bruinsburg site and RWI; thus, operation and maintenance activities at these locations would not affect this species.

G.4.1.4.2 West Indian Manatee

Although the West Indian manatee along the Gulf of Mexico coast in the United States occurs primarily in Florida, individuals range as far west as Texas. Of the locations listed in table G.4.1-1, the West Indian manatee has been reported only in East Baton Rouge Parish in Louisiana. The pipeline ROW from Bruinsburg to Anchorage is the only element of the proposed action in table G.4.1-1 that would be located in East Baton Rouge Parish. The Anchorage terminal would be located in West Baton Rouge Parish directly across the Mississippi River from East Baton Rouge Parish.

The pipeline ROW crossing of the Mississippi River from East Baton Rouge Parish to the Anchorage terminal is in a segment of the Mississippi River with significant navigational traffic and industrial activity. This segment of the river does not possess characteristics of the manatee's preferred habitat, which consists of shallow sheltered bays and coves without strong currents and with abundant aquatic vegetation. Further, the proposed crude oil pipeline would be directionally drilled under the river and would have no affect on the species.

Construction, operation, and maintenance activities associated with the Anchorage terminal would take place more than 300 feet (100 meters) from the river, and standard erosion and runoff control best management practices would be used during construction to mitigate these impacts. In addition, the Mississippi River at Baton Rouge is highly turbid and any increase in turbidity resulting from construction activities would not significantly affect water quality. Operation and maintenance of the marine terminal would cause potential instream noise and disturbance impacts (e.g., related to tanker loading and navigation) and would present a risk of oil spills. The increase in tanker navigation to the existing docks at Anchorage resulting from SPR operations would be very small; therefore, the routine operation and maintenance at the docks would have no effect on the manatee.

G.4.1.5 Marine Mammals

No offshore elements are associated with the proposed Bruisburg site; no marine mammals would be affected other than the West Indian manatee discussed above.

G.4.1.6 Reptiles

The ringed map turtle is present in the Pearl River in Mississippi, including the portion of the Pearl River that forms the eastern boundary of Copiah and Hinds Counties (Jones 1991). Two elements of the proposed action listed in table G.4.1-1 would be located in Copiah and Hinds Counties. The pipeline ROW from Bruinsburg to Peetsville would pass through the southwest corner of Copiah County, and the pipeline ROW from Bruinsburg to the Jackson terminal would end in central Hinds County. Neither of these elements of the proposed action would cross the Pearl River; therefore, the proposed action would not affect the ringed map turtle or its habitat in the Pearl River.

G.4.2 Richton, MS

The assessment for the proposed Richton candidate site evaluates the potential effects on threatened, endangered, and candidate species by each element of the proposed action listed in table G.4.2-1.

Table G.4.2-1: Elements of the Proposed Action and Location on the Richton Candidate Site

Element of Proposed Action	Location by County or Offshore Area
Richton site and associated access road	Perry
Pipeline ROW from Richton to Pascagoula	Perry, Greene, George, Jackson
Pipeline ROW from Richton to Liberty Station	Perry, Forrest, Lamar, Marion, Walthall, Pike, Amite
Raw water intake and associated access road, pipeline, and power lines	Perry
Power lines and associated ROW from utility lines south of Leaf River to RWI	Perry

Table G.4.2-1: Elements of the Proposed Action and Location on the Richton Candidate Site

Element of Proposed Action	Location by County or Offshore Area
Marine terminal in Pascagoula (docks and storage tanks)	Jackson
Storage tanks at Liberty Station	Amite
Offshore brine pipeline and diffuser	Gulf of Mexico

Assessment findings for these components of the proposed Richton site are presented for each species below.

G.4.2.1 Birds

G.4.2.1.1 Bald Eagle

Information submitted by USFWS (James 2005) identifies the bald eagle as potentially present statewide in Mississippi. Based on the online database provided by Mississippi Natural Heritage Program (MNHP) (MMNS 2002), the bald eagle has been confirmed in two counties, George and Jackson, where development of the pipeline ROW from Richton to Pascacoula and the Pascagoula terminal is proposed. Further analysis conducted by MNHP reports no known bald eagles within 2 miles (3 kilometers) of the proposed pipeline or terminal (MNHP 2006). The closest documented bald eagle nests are 5 to 6 miles (8 to 10 kilometers) away. Approximately 20 percent of the proposed pipeline ROW is composed of palustrine forested wetlands which are suitable habitat for nesting and foraging bald eagles. The proposed Pascagoula terminal would be built on emergent wetlands, which are rarely used by the bald eagle for nesting. Because the bald eagle may be present Statewide, potential impacts on this species have been evaluated for all elements of the proposed action in table G.4.2-1. Natural history data indicate that bald eagles occurring in Mississippi are likely to be nonbreeding seasonal migrants (NatureServe 2005).

Construction Impacts

Construction activities would not affect bald eagles because none are known to nest within 2 miles (3 kilometers) of the site or any of proposed ROWs or other infrastructure, and range data indicate that most bald eagles in Mississippi are likely nonbreeding. Because no nesting activity is anticipated, it is assumed that the construction activities would have no effect on the species.

Operation and Maintenance Impacts

Operation and maintenance activities would have no effect on the species. The proposed elements located near documented bald eagles are the proposed pipeline to Pascagoula and the Pascagoula terminal. The proposed pipeline to Pascagoula would be collocated along an existing ROW. Operation and maintenance activities would be the same as current activities along this ROW. The Pascaoula terminal would be located on disturbed land adjacent to a naval station. Operation and maintenance activities would be less than current human activity levels at the naval station. Bald eagles that would move to areas near these proposed elements would be tolerant of human activity and noise.

G.4.2.1.2 Brown Pelican

Of the locations listed in table G.4.2-1, the brown pelican has been recorded only in Jackson County, MS. (MMNS 2002). The proposed pipeline ROW from Richton to Pascagoula, the Pascagoula terminal, and the offshore brine pipeline in and adjacent to Jackson County includes habitat types potentially suitable for the brown pelican. Records indicate one known occurrence of the brown pelican approximately 1,700 feet (500 meters) from the proposed pipeline to Pascagoula. The area of that section of the pipeline is in open water.

Construction Impacts

In Jackson County, MS, suitable habitat for brown pelicans is confined to the Gulf shore and associated barrier islands, sandbars, and wetlands. The terminus of the crude oil pipeline, along with the existing Plantation Pipeline, at Pascagoula, MS, is located in an industrially developed area of the Gulf Coast. Pipeline construction activities in this area would not affect undisturbed habitat and would have no effect on the brown pelican.

The offshore segments of the crude oil pipeline to Pascagoula and the brine disposal pipeline pass within 1,700 feet (500 meters) of one known brown pelican area and may pass through other areas inhabited by the brown pelican. No activity is permitted within 2,300 feet (700 meters) of nesting brown pelicans (USFWS 2005). If the Richton site is chosen for development, a biologist would accompany the alignment survey crew to identify brown pelican roosts along the proposed brine disposal pipeline ROW. If any brown pelican roosting sites are identified during the alignment survey, the construction would be scheduled to avoid roosting times (March through July). Assuming that construction activities can be avoided in or near rookeries, there would be no effect on brown pelicans.

Operation and Maintenance Impacts

Operation and maintenance of the crude oil distribution pipeline would be comparable to existing activities associated with the Plantation pipeline. The pipeline would be buried and human activity would be minimal; therefore, there would be no effect on the brown pelican.

The offshore segments of the crude oil pipeline to Pascagoula and the brine disposal pipeline would be buried, and minimal maintenance activity would be necessary; therefore, operation and maintenance of the pipeline would have no effect on the brown pelican.

G.4.2.1.3 Mississippi Sandhill Crane

The only wild population of the Mississippi sandhill crane is located at the Mississippi sandhill crane National Wildlife Refuge in western Jackson County, MS. The only elements of the proposed action in Jackson County are the pipeline ROW from the Richton to Pascagoula, the brine pipeline ROW to the Gulf of Mexico, and the Marine Terminal at Pascagoula. All of these elements would be located more than 5 miles to the east of the refuge. At this distance, no effect on the Mississippi sandhill crane or its habitat are expected to result from construction, operation, or maintenance of the crude oil distribution pipeline, brine disposal pipeline, or marine terminal.

G.4.2.1.4 Piping Plover

As shown in table G.4.2-1, the marine terminal at Pascagoula and the oil distribution and brine disposal pipeline ROWs would be the only elements of the proposed action in Jackson County, MS, where the piping plover is known to occur. Designated critical habitat is located on barrier islands and shores around the Gulf of Mexico. None of the proposed elements cross designated critical habitat of the piping plover. The brine disposal pipeline passes near designated critical habitat on Horn Island National Wildlife Reserve. The proposed alignment would be located 1,600 feet (480 meters) from the island. The proposed pipelines in Jackson County, MS, cross beaches, mudflats, or sandflats that may also be potential feeding habitat for the piping plover.

Construction Impacts

Construction of the proposed brine disposal pipeline would be away from designated critical habitat on Horn Island National Wildlife Refuge. The construction of this section of the pipeline would not impact the designated critical habitat or the piping plover because it is located in open water 1,600 feet (480 meters) away from the designation boundary. In other potential piping plover habitat areas, construction impacts would be avoided by use of directional drilling under beaches, mudflats, or sandflats. Using this construction method, construction would not affect the piping plover and its habitat. Because the pipeline would be buried, there would be no long-term construction effects.

Operation and Maintenance Impacts

Operation of the pipeline would not affect the species, its behavior, or the quality of its habitat. The pipeline would be a static structure buried under ground, and it would not produce noise or other effects that would disturb the plover. Maintenance activities would be minor, and they would not affect this species.

G.4.2.1.5 Red-Cockaded Woodpecker

National Forest lands in Mississippi are home to four primary and secondary core populations of the red-cockaded woodpecker. These and other core populations throughout the southeastern United States are monitored to assess recovery of the species. None of the core populations in Mississippi is located in areas that would be affected by development of the Richton site and associated infrastructure. Table G.4.2.1.5-1 shows that in all counties where elements of the proposed action for the Richton site would be located, all activities would occur outside of designated core population areas.

Elements of the proposed action, including the pipeline ROWs from Richton to Pascagoula and Richton to Liberty Station, would pass through areas with potential suitable habitat of low- to medium-density pine forests. Analysis provided by MNHP found no occurrences of the red-cockaded woodpecker within 2 miles (3 kilometers) of any proposed element (MNHP 2006). The proposed ROW to Pascagoula follows an existing pipeline ROW where mature stands suitable for the red-cockaded woodpecker are not likely to be found. The crude oil pipeline to Liberty largely does not follow an existing ROW. If mature pine stands of 60 years or more are identified in preconstruction ROW alignment surveys, DOE would use a biologist to survey the area for red-cockaded woodpecker nesting cavities and foraging activity. Nesting cavity trees would be marked and the ROW alignment would be adjusted to avoid impacts to stands more than 30 years old within 0.5 miles (0.8 kilometers) of the nesting cavity (Aycock 2005).

Table G.4.2.1.5-1: Proximity of Red-Cockaded Woodpecker Designated Core Populations to Elements of Proposed Action for the Richton Site

County	Elements of the Proposed Action for the Richton Site	Location of Designated Core Population	SPR Elements Located in Designated Core Population Areas
Amite	• Pipeline ROW from Richton to Liberty Station • Storage tanks at Liberty Station	Homochitto National Forest	None
Forrest	• Pipeline ROW from Richton to Liberty Station	De Soto National Forest	None
George	• Pipeline ROW from Richton to Pascagoula	De Soto National Forest	None

Table G.4.2.1.5-1: Proximity of Red-Cockaded Woodpecker Designated Core Populations to Elements of Proposed Action for the Richton Site

County	Elements of the Proposed Action for the Richton Site	Location of Designated Core Population	SPR Elements Located in Designated Core Population Areas
Greene	• Pipeline ROW from Richton to Pascagoula	De Soto National Forest	None
Jackson	• Pipeline ROW from Richton to Pascagoula • Marine terminal in Pascagoula • Brine disposal pipeline ROW to Gulf of Mexico	De Soto National Forest	None
Perry	• Richton candidate site • Pipeline and power line ROWs and raw water intake • Pipeline ROW from Richton to Pascagoula • Pipeline ROW from Richton to Liberty Station	De Soto National Forest	None

G.4.2.2 Fish

G.4.2.2.1 Gulf Sturgeon

Three proposed elements of the Richton site and its associated infrastructure may directly affect federally designated critical habitat of the Gulf sturgeon: (1) the raw water intake on the Leaf River in Perry County, (2) the pipeline ROW from Richton to Pascagoula in Greene County, and (3) the pipeline ROW from Richton to Liberty Station in Forrest and Marion Counties. The potentially impacted designated critical habitat areas are located in the Leaf, Chickasawhay, Pearl, Pascagoula, and Bogue Chitto Rivers. Spawning generally occurs in these water bodies where the streambed is hard clay, rubble, gravel, or shell (USFWS 2003a). After spawning, the adult Gulf sturgeon migrates downstream to specific areas in the lower Pascagoula River system and remains until November (Heise et al 2004). This anadromous species may be found in the designated critical habitat year-round because the young spend their first 2 years in the river where they were spawned (USFWS 2003a).

Construction Impacts

The raw water intake structure would be located on the Leaf River in Perry County and the power lines for the RWI structure and site would cross the Leaf River. Construction of the RWI would affect the designated critical habitat at this location and the area immediately downstream. For example, excavation would disturb the Leaf River streambed, remove vegetation, and temporarily raise turbidity and reduce dissolved oxygen levels. These potential effects would be mitigated with the use of onshore erosion barriers, instream silt curtains, postconstruction restoration, and other measures. Construction would be scheduled to avoid spawning periods (mid February to April) and limited to high water periods. Construction of the power lines across the Leaf River is not expected to have any additional effect on the sturgeon.

Construction activities in the pipeline ROW from Richton to Pascagoula would have no effect on designated critical habitat of the Gulf sturgeon. The ROW would cross designated critical habitat in one location, the Chickasawhay River in Greene County. This crossing would be constructed using directional drilling to avoid disturbing sensitive habitat. Because no direct impact on the river would take place, construction of the pipeline ROW from Richton to Pascagoula would have no effect on the Gulf sturgeon.

The pipeline ROW from Richton to Liberty Station would intersect designated critical habitat for the Gulf sturgeon in the Leaf River in Forrest County, the Pearl River in Marion County, and the Bogue Chitto River in Pike County. All of these crossings would be constructed with directional drilling, which would prevent any effect on designated critical habitat at these locations. Smaller upriver tributaries, such as Tallahala Creek, would be crossed using conventional methods. Sedimentation and turbidity would be minimized through best management practices, and they would be a temporary disturbance. DOE would avoid instream construction methods of pipeline ROWs near Gulf sturgeon designated critical habitat during spawning.

Operation and Maintenance Impacts

Operation and maintenance of the RWI may have a serious adverse affect on the Gulf sturgeon, especially during low flow periods. During periods of low flow, the RWI may divert up to 11 percent of the total flow of the Leaf River. DOE has conducted informal consultation with the USFWS and Mississippi Natural Heritage Program on the proposed withdrawal. Both agencies expressed serious concerns about water flow and the Gulf sturgeon. The Mississippi Natural Heritage Program stated that “because of the importance of the Leaf River near Hattiesburg to spawning and juvenile sturgeon, it is recommended that water withdrawals be discontinued if discharge from the Leaf River reaches 30 percent of the mean daily discharge.” DOE reviewed the daily average streamflow data for the Leaf River for a 21-year period from 1983 through 2004 and determined that the mean daily discharge was 3,770 cubic feet per second and that 30 percent of that flow was 1,131 cubic feet per second. During the same 21-year period, the daily discharge was less than the 30 percent minimum instream flow recommended by the Mississippi Natural Heritage about 27 percent of the time.

Decreased flow would alter the designated critical habitat by reducing water depth and width, increasing pollutant concentrations, and altering water temperatures. These changes may expose breeding areas, limit adult migration movements, or increase mortality of larval and juvenile sturgeon, or all of these. Intake of water during low flow periods would affect water volumes downstream and lower water depth in pools at the confluence of the Leaf and Chickasawhay Rivers where adult sturgeon rest with nonspawning individuals until fall when they return to salt water (Heise et al 2004).

The raw water withdrawal may cause impingement of young Gulf sturgeon. The intake of the RWI would be designed for a maximum intake velocity of 0.5 feet (0.15 meters) per second. Moving vertical screens deposit impinged fish or materials into a chute that releases them downstream of the intake. Impingement of young Gulf sturgeon would cause bodily harm that may result in mortality.

Maintenance of the pipeline ROWs constructed with directional drilling would not affect the Gulf sturgeon or its designated critical habitat because no instream activities would take place. Maintenance of ROWs constructed in upstream tributaries by conventional methods also would not affect the Gulf sturgeon or its designated critical habitat because instream activities are minor and infrequent.

G.4.2.2.2 Pearl Darter

The pearl darter is believed to exist only in the Pascagoula River drainage system, which includes the Leaf River, Black Creek, and the Pascagoula River (NatureServe 2005). A 2005 study on the distribution of the pearl darter confirmed its presence throughout the Leaf River (Slack et al 2005). Elements of the proposed action in this drainage system include the raw water system, the pipeline ROW from Richton to Pascagoula, and the pipeline ROW from Richton to Liberty Station.

Construction Impacts

The pearl darter has been documented throughout the Leaf River to the lower Pascagoula drainage, but little is known about its specific habitat requirements or spawning behavior (Slack et al. 2005). Construction of the RWI may temporarily increase water turbidity and temperature downstream. Increased turbidity has the potential to adversely affect pearl darters and other fish species downstream by making the habitat less suitable for feeding and reproduction (USFWS 2001a). These temporary impacts would be mitigated with erosion and sedimentation best management practices, as well as habitat restoration, but the construction of the RWI may affect the pearl darter.

The pipeline ROW from Richton to Liberty Station would cross the Leaf River in Forrest County in the general area where pearl darters are known to spawn. No construction effects would occur at this location because directional drilling would be used to place the pipeline beneath the riverbed without instream activity. The pipeline ROW from Richton to Liberty station would also cross Black Creek in Lamar County and Tallahala Creek in Perry County. These crossings would be constructed with either directional drilling or the conventional open-ditch excavation method. If directional drilling is used, the pipeline ROW would not affect pearl darters, because no activity would be required in the creek. Conventional construction methods might affect the pearl darter in the short-term. Excavation would temporarily remove vegetation and other beneficial characteristics of the streambed and streambanks. Water quality also might be impacted locally during construction. These impacts would be mitigated with erosion barriers and silt curtains that reduce downstream sediment transport. The affected streambed and streambanks would be restored to the extent practicable following construction; therefore, in the long term, the construction would have no effect on pearl darter habitat in Black Creek or Tallahala.

Where the pipeline ROW from Richton to Pascagoula would cross surface waters of the Pascagoula River drainage system (i.e., at the Chickasawhay River), directional drilling would be used to avoid impacts in the river. Because no excavation would take place in the river, no effects are expected.

Operation and Maintenance Impacts

Operation of the RWI may affect the pearl darter. The water withdrawal would be expected to have negligible impacts on the river while it is flowing near or above its overall average flow rate of 4,100 cubic feet per second (116 cubic meters per second). During periods of low flow, however, the withdrawal may constitute up to 11 percent of the river's flow. Changes in flow would alter water depth, channel width, water temperatures, and pollutant concentrations downstream. These types of alterations are identified as a major threat to pearl darter population (USFWS 2001a).

The water intake would also cause entrainment and impingement of pearl darters as well as their feeding resources. The RWI would have a maximum intake velocity 0.5 feet (0.15 meters) per second with traveling 0.5 inch (40mm) mesh screen. Standard length of the adult pearl darter ranged from 1 inch (30 mm) to 2 inches (50 mm) in sampling of the Leaf River in 2004 (Slack et al. 2005). An adult darter would be able to swim through the mesh screens. Due to its small size, the pearl darter might suffer impingement on the screens, which would cause bodily harm likely to lead to death.

Maintenance of the pipeline crossings constructed with directional drilling would not involve instream activities and no effects would be expected. Where the crossings are constructed using conventional methods, the crossings would be periodically inspected and maintained. For example, it may be necessary to remove debris from the river channel in the ROW. These maintenance activities would be minimal and infrequent, and they would have no effect on the pearl darter.

G.4.2.3 Invertebrates

The only endangered, threatened, or candidate invertebrate species in counties where the proposed Richton site and its associated infrastructure would be located is the Camp Shelby burrowing crayfish. The only known population of this species is in Perry County, MS. As discussed in section G.2.3.2, no SPR development is proposed in this area of Perry County. The proposed action would not affect this species.

G.4.2.4 Mammals

G.4.2.4.1 Gray Myotis (Gray Bat)

The literature review identified some evidence that the gray bat may occur in Perry County, MS. Elements of the Richton alternative in Perry County include the proposed Richton site, the raw water intake and pipeline, power lines and associated ROWs, and the pipeline ROWs from Richton to Pascagoula and Liberty Station. Most information sources indicate that all proposed SPR construction and operation would occur well outside the species' current range. In addition, the proposed development locations do not include caves, which are the year-round roosting sites for this species. Therefore, construction, operation, and maintenance of the Richton site and associated pipelines and other structures would have no effect on the gray bat.

G.4.2.4.2 Louisiana Black Bear

All elements of the proposed action listed in table G.4.2-1 are located within the historical range of the Louisiana black bear. The literature review identified one source (Wooding et al. 1993) that named the lower East Pearl River and lower Pascagoula River basins of southern Mississippi as possible current range for the Louisiana black bear. An additional source (Gillette 2005) referred to recent sightings in Jackson County, MS, within the lower Pascagoula River basin. The crude oil pipeline to Pascagoula is the only proposed action in the lower Pascagoula River basin. Analysis provided by the Mississippi Natural Heritage Program did not identify any known occurrences of Louisiana black bear within 2 miles (3 kilometers) of any proposed element associated with the Richton site. This species is a highly mobile, habitat generalist that avoids humans, and the proposed crude oil pipeline to Pascagoula is co-located on an existing pipeline ROW. Therefore, any Louisiana black bears remaining in southeast Mississippi near the proposed action would be expected to avoid the temporary activities of constructing and maintaining the pipeline ROW, and there would be no effect on this species.

G.4.2.5 Marine Mammals

The operation of the brine disposal system would have no effect on the Gervais beaked whale, goose-beak whale, pygmy sperm whale, dwarf sperm whale, sperm whale, rough-toothed dolphin, killer whale, false killer whale, short-finned pilot whale, pygmy killer whale, West Indian manatee, and the bottlenose dolphin. These species are found in deeper waters than the brine diffuser contours (see Appendix B, Brine Discharge Modeling).

Potential impacts on the Atlantic spotted dolphin are presented below. The Atlantic spotted dolphin is a tropical species that can be found in a variety of areas through the Gulf of Mexico. The species ranges from coastal to pelagic environments, typically over the continental shelf and slope. The Atlantic spotted dolphin is usually associated with the Gulf Stream.

Construction Impacts

The Atlantic spotted dolphin species is usually found in deeper waters than the extent of the brine disposal system, but it is known to venture into shallower waters. The species would likely avoid or leave any areas of construction, and would return after construction had been completed. Due to the limited construction time and the relatively small area of the Gulf of Mexico that would be impacted, there would be no effect on the Atlantic spotted dolphin.

Operation Impacts

The Atlantic spotted dolphin may occur in the location of the brine diffuser; however, it is unlikely that the species would remain in the area for an extended period. Because the dissipation of the brine would occur in a relatively small area of the Gulf of Mexico and the species would not be restricted to such areas, there would be no effect on the Atlantic spotted dolphin.

G.4.2.6 Plants

As discussed in section G.2.6.1, the Louisiana quillwort recovery plan report stated that the only known reproducing populations of Louisiana quillwort in Mississippi are in the De Soto National Forest in Jackson and Perry Counties (Larke 1996). No elements of the proposed action are located in the specific areas of Jackson and Perry Counties identified in the recovery plan; therefore, construction, operation, and maintenance of the Richton site and associated infrastructure would not affect this species. However, results of an uncited species distribution summary presented by NatureServe (2005) indicated that Louisiana quillwort may be more widely distributed in Mississippi than reported by the recovery plan. If populations of Louisiana quillwort are identified (e.g., from interagency consultations or public participation) and verified in the areas affected by proposed activities, appropriate mitigation measures would be identified and implemented to ensure that there are no effects.

G.4.2.7 Reptiles

G.4.2.7.1 Alabama Red-Belly Turtle

Although the Alabama red-belly turtle is found primarily in Alabama, in 2005 it was identified in the lower Pascagoula River and two of its tributaries in Mississippi (James 2005). One of these tributaries, the Escatawpa River, would be crossed by the pipeline ROW from Richton to Pascagoula if the Richton candidate site is chosen for development. MNHP identified two known occurrences of Alabama red-belly turtle populations located within 1 mile (2 kilometers) from the proposed crude oil pipeline to Pascagoula crossing of the Escatawpa River.

Construction Impacts

Directional drilling would be used to construct the crossing of the Escatawpa River. Directional drilling would be set up away from the river and habitat of the Alabama red-belly turtle and, therefore, nearby populations of the Alabama red-belly turtle would not be affected.

Operation and Maintenance Impacts

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Because the Escatawpa River crossing would be constructed with directional drilling, maintenance would not involve instream activities, and no effects on the turtles would be expected.

G.4.2.7.2 Black Pine Snake

Of the counties listed in table G.4.2-1, the black pine snake reportedly occurs in Forrest, George, Marion, and Perry Counties in Mississippi. If the Richton candidate site is chosen for development, elements of the proposed action in these counties include the Richton candidate site, the RWI intake and pipeline ROW, power line ROWs, a portion of the pipeline ROW from Richton to Liberty Station, and a portion of the pipeline ROW from Richton to Pascagoula. The black pine snake has been documented within 2 miles (3 kilometers) of the proposed Richton site in Perry County (Clark 2005; MNHP 2006).

Construction Impacts

Each of these elements of the proposed action identified above would affect forest lands that would be suitable for the species. If the black pine snake is present in these locations, it generally would be expected to avoid human activity during construction; however, disturbance and direct mortality are possible consequences of excavation, earth moving, and other construction activities. Because this species has been confirmed within 2 miles (3 kilometers) of the site, DOE would survey the site for evidence of black pine snakes. Individuals would be relocated to nearby suitable habitat areas under supervision of USFWS. DOE would conduct habitat assessments of the proposed RWI and ROWs to determine if surveys for black pine snakes are necessary. Individuals would be relocated under supervision of USFWS.

Operation and Maintenance Impacts

Following construction, the black pine snake would be expected to favor adjacent habitat areas unaffected by SPR infrastructure and operations. The Richton site and ROWs would not be a barrier to the black pines snake or its prey; the snake could still use these areas for hunting, and it might continue to inhabit pipeline ROWs. Therefore, operation and maintenance of the Richton site and associated infrastructure would have no effect on the species.

G.4.2.7.3 Eastern Indigo Snake

As discussed in G.2.7.3, the eastern indigo snake is unlikely to be found in the proposed project area because records indicate the range in Mississippi is historical. Comments received from USFWS (2005) and MNHP (2006) do not mention the species as being potentially impacted by the proposed Richton project. Further analysis conducted by MNHP (2006) did not find any populations within 2 miles (3 kilometers) of the proposed project elements. It is unlikely that the eastern indigo snake would be found in the areas affected by the proposed Richton site, and so there would be no effect on this species.

G.4.2.7.4 Gopher Tortoise

Of the locations listed in table G.4.2-1, the gopher tortoise has been recorded in eight counties: Forrest, George, Greene, Jackson, Lamar, Marion, Perry, and Walthall. Elements of the proposed action in these counties include the proposed Richton site, the raw water intake and pipeline, power line ROWs, all of the pipeline ROW from Richton to Pascagoula, and a portion of the pipeline ROW from Richton to Liberty Station. Analysis provided by Mississippi Natural Heritage Program confirms 26 recorded occurrences of gopher tortoises within or with ranges intersecting a 2 mile (3 kilometer) buffer of the proposed elements in gopher tortoise range. Half of these records are associated with the ROW to Pascagoula. Habitat suitable for the gopher tortoise may be found at all elements within gopher tortoise range. As discussed in section G. 2.7.4, the gopher tortoise prefers locations with dry sandy soils, abundant ground cover, and a sparse canopy. Although seldom seen above ground, the presence of gopher tortoises is indicated by large conspicuous burrows.

Construction Impacts

Construction activities such as excavation and the operation of large earthmoving equipment have the potential to unearth, smother, or compact gopher tortoise burrows, and therefore, construction would affect this species.

All proposed elements within gopher tortoise range and on moderately well-drained to excessively well-drained sandy soils would be surveyed by a biologist for tortoise burrows. If the tortoise or its burrows are found, DOE would contact the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) and the USFWS to avoid harm to this federally threatened species. All burrows identified during preconstruction field assessments would be marked and cogon grass, an invasive species that destroys tortoise habitat (Van Loan et al. 2002), would be mapped and treated with chemicals approved for use around tortoises. Where possible, clearing and construction activities would be precluded within a 25-foot (8-meter) radius around each burrow. The crude oil pipeline to Liberty, RWI pipeline and power lines largely do not follow an existing ROW. Alignments may be adjusted to avoid relatively large clusters of burrows. When burrows cannot be avoided, tortoises would be relocated only with concurrence of the USFWS and MDWFP, and according to strict protocols and within seasonal windows specified by these agencies. During construction, special care should be taken to avoid cogon promulgation (MNHP 2006).

Operation and Maintenance Impacts

After development, the Richton site would be poor habitat for the gopher tortoise, and this species generally would not be expected onsite. The moderately to excessively well-drained sandy soils of the maintained pipeline and power line ROWs and cleared security area around the Richton site would provide preferred habitat for the gopher tortoise. These areas may attract more tortoise than its preconstruction condition. DOE would monitor these areas for the presence of gopher tortoise mounds and control the invasion and spread of cogon grass. Only herbicides approved for use around tortoises would be used in gopher tortoise habitat areas to avoid poisoning food resources (MNHP 2006). With proper monitoring and procedures, operation and maintenance activities may improve habitat quality for gopher tortoises.

G.4.2.7.5 Kemp's Ridley Sea Turtle

The Kemp's Ridley sea turtle inhabits estuarine waters of the Gulf coast, potentially including areas of Jackson County, MS. Nesting occurs on coastal beaches and dunes. The only component of the proposed Richton site development with a potential to affect these habitats is the brine disposal pipeline. Based on data provided by MNHP, the closest recorded nesting area is 7 miles (11 kilometers) from the Pascagoula terminal and brine disposal pipeline in the Grand Bay National Estuarine Research Reserve. Construction and operation of the brine disposal pipeline would not affect undocumented nesting areas because the pipeline would be directionally drilled from an inland area to open water to avoid excavations along the shoreline.

Offshore pipeline construction would temporarily disturb potential feeding habitat for the Kemp's Ridley sea turtle; however, the turtle could feed at the nearby Grand Bay National Estuarine Research Reserve during the temporarily disturbance.

G.4.2.7.6 Loggerhead Sea Turtle

The loggerhead sea turtle nests on Gulf Coast beaches, including those of Jackson County, MS, where the proposed Richton brine disposal pipeline would pass. Construction and operation of the brine disposal pipeline would not affect nesting because the pipeline would be directionally drilled from an inland area to open water to avoid excavations along the shoreline.

Construction of the offshore segment of the brine disposal pipeline would not directly affect the loggerhead sea turtle. Construction would potentially impact the loggerhead feeding habitat in near shore areas; however, the disturbance would be short term, and plentiful feeding habitat may be found at the nearby Grand Bay National Estuarine Research Reserve.

G.4.2.7.7 Ringed Map Turtle

The ringed map turtle is found in the Pearl River system of Mississippi and Louisiana. Of the elements of the proposed action listed in table G.4.2-1, only the pipeline ROW from Richton to Liberty station crosses the Pearl River system. Analysis by MNHP did not find any records of the turtle within 2 miles (3 kilometers) of the proposed crossing. Because directional drilling would be used to construct the Pearl River crossings, construction, operation, and maintenance of the pipeline ROW from Richton to Liberty Station would not affect the ringed map turtle.

G.4.2.7.8 Yellow-blotched Map Turtle

The range of the yellow-blotched map turtle includes river segments in five counties listed in table G.4.2-1: Forrest, George, Greene, Jackson, and, Perry Counties. Water bodies potentially affected by SPR activities within these counties include the Leaf, Chickasawhay, and Escatawpa Rivers and Tallahala Creek (see section G.2.7.8). Data provided by MNHP confirmed recent records of populations at all of these water bodies. Elements of the Richton site development in this species' range include the Richton site, the raw water intake and pipeline, power line ROW, all of the pipeline ROW from Richton to Pascagoula, and a portion of the pipeline ROW from Richton to Liberty Station. No yellow-blotched map turtle habitat occurs at the Richton site or in the raw water pipeline ROW.

Construction Impacts

Potential construction impacts on the yellow-blotched map turtle may occur during construction of pipeline crossings across rivers in the species' range and during construction of the raw water intake on the Leaf River. The pipeline ROW from Richton to Pascagoula would cross the Chickasawhay and Lower Escatawpa Rivers in areas known to be inhabited by the yellow-blotched map turtle. In addition, the pipeline ROW from Richton to Liberty Station would cross yellow-blotched map turtle habitat in Tallahala Creek in Perry County and in the Leaf River in Forrest County.

The Richton to Pascagoula pipeline crossings at the Chickasawhay River and the Escatawpa River would be constructed using directional drilling. This method would prevent construction from affecting the yellow-blotched map turtle in these locations because no activity would occur within the rivers.

Where the pipeline ROW from Richton to Liberty Station would cross Tallahala Creek in Perry County, conventional construction methods would be used, which may affect the turtle. Temporary habitat disturbance in the immediate work zone would be unavoidable. Instream excavation would resuspend sediment and temporarily degrade water quality and increase downstream sedimentation. These moderate short-term impacts would be minimized by the use of best management practices. For example, silt curtains would be placed immediately downstream from the construction site. After construction, instream habitat would be restored, and there would be no long-term effect on the turtle.

Directional drilling would be used where the pipeline ROW from Richton to Liberty Station would cross the Leaf River in Forrest County. Because this construction method does not involve instream activity, no effect on the yellow-blotched map turtle would occur in this location.

Construction of the RWI on the Leaf River may affect the yellow-blotched map turtle. Any turtles in the work zone would be moved to an adjacent undisturbed area upstream each day prior to the start of work. Best management practices, such as the use of a cofferdam, would be used instream and stream side to minimize water quality and sedimentation impacts. After completion of the raw water intake structure, the streambed would be restored to the extent possible to minimize long-term impacts of construction. Although there may be short-term effects, in the long-term construction would not affect the turtle.

Operation and Maintenance Impacts

Where pipelines are constructed using conventional methods, maintenance activities would include periodic inspection and potential clearing of obstacles. These infrequent and minor activities would have no effect on the yellow-blotched map turtle.

Operation of the raw water intake during cavern development would withdraw about 1.2 MMBD (50.4 million gallons per day) for the 4-year period of solution mining. This would alter flow, especially during low flow periods in the late summer and early fall. Reduced flow would degrade water quality by reducing the capacity of the river to assimilate wastes from nonpoint pollution sources and permitted discharges. Impaired water quality is attributed to the decline of the yellow-blotched map turtle through adverse effects to its food resources. In addition, withdrawal of water may affect the species by entraining or impinging small turtles or their invertebrate prey. Impinged turtles would be returned to the water downstream of the intake by traveling screens, which would not harm the turtles. During normal to above average flows, the entrainment or impingement of yellow-blotched map turtle prey food resources would be a small portion of the available resources. During extreme low flow periods, entrainment or impingement of prey may stress the species, but such periods are expected to be temporary.

G.4.3 Assessment Summary

Tables G.4.3-1 and G.4.3-2 identify the threatened, endangered, and candidate species that may be affected by each element of the proposal to develop the Bruinsburg site. The potential for effects for each element was estimated based on information about the presence or absence of the species or suitable habitat in areas that would be affected. The evaluation also considered the potential mitigation factors. Table G.4.3-1 identifies whether construction activities may affect species. Table G.4.3-2 summarizes whether operation and maintenance activities may affect species. Similar potential effect summaries for the Richton site are presented in tables G.4.3-3 and G.4.3-4.

Table G.4.3-5 summarizes the number of species that may be affected by construction and operations and maintenance for both of the proposed sites in Mississippi. This summary shows that the fat pocketbook mussel may be affected by construction activities for the Bruinsburg site and associated infrastructure. This assessment is uncertain because the presence of the fat pocketbook at the potentially affected location has not been confirmed, and it is uncertain whether directional drilling would be used to completely avoid the potential impacts. The summary shows no effects are expected to the least interior tern and red-cockaded woodpecker based on current available data on population locations. DOE would survey for these species if potential habitat areas are identified during preconstruction alignment surveys.

Table G.4.3-1: Summary of Potential Construction-Related Impacts to Threatened, Endangered, and Candidate Species from Development of the Bruinsburg Candidate Site

Species	Site	Bruinsburg to Peetsville ROW	Bruinsburg to Anchorage ROW	Bruinsburg to Jackson Terminal ROW	Bruinsburg to Entergy Power Plant ROW	RWI and ROW	Brine Disposal ROW	Anchorage Marine Terminal
Birds								
Bald Eagle	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Interior Least Tern	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Red-Cockaded Woodpecker	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Fish								
Bayou Darter	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Gulf Sturgeon	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Pallid Sturgeon	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Invertebrates								
Alabama Heelsplitter	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Fat Pocketbook	No effect	No effect	May affect	No effect	No effect	No effect	No effect	No effect
Mammals								
Louisiana Black Bear	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
West Indian Manatee	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Reptiles								
Ringed Map Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect

Table G.4.3-2: Summary of Potential Operation and Maintenance Impacts to Threatened, Endangered, and Candidate Species from Development of the Bruinsburg Candidate Site

Species	Site	Bruinsburg to Peetsville ROW	Bruinsburg to Anchorage ROW	Bruinsburg to Jackson Terminal ROW	Bruinsburg to Entergy Power Plant ROW	RWI and ROW	Brine Disposal ROW	Anchorage Terminal
Birds								
Bald Eagle	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Interior Least Tern	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Red-Cockaded Woodpecker	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Fish								
Bayou Darter	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Gulf Sturgeon	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Pallid Sturgeon	No effect	No effect	No effect	No effect	No effect	May affect	No effect	No effect
Invertebrates								
Alabama Heelsplitter	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Fat Pocketbook	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Mammals								
Louisiana Black Bear	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
West Indian Manatee	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Reptiles								
Ringed Map Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect

Table G.4.3-3: Summary of Potential Construction-Related Impacts to Threatened, Endangered, and Candidate Species from Development of the Richton Candidate Site

Species	Site	Richton to Pascagoula ROW	Richton to Liberty Terminal ROW	RWI and ROW	Power lines ROW	Liberty Terminal	Pascagoula Terminal	Brine Diffuser and ROW[a]
Birds								
Bald Eagle	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Brown Pelican	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Mississippi Sandhill Crane	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Piping Plover	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Red-Cockaded Woodpecker	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Fish								
Gulf Sturgeon	No effect	No effect	No effect	May affect	No effect	No effect	No effect	No effect
Pearl Darter	No effect	No effect	May affect	May affect	No effect	No effect	No effect	No effect
Invertebrates								
Camp Shelby Burrowing Crayfish	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Mammals								
Gray Myotis (Gray Bat)	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Louisiana Black Bear	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Marine Mammals								
Atlantic Spotted Dolphin	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Plants								
Louisiana Quillwort	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Reptiles								
Alabama Red-Belly Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Black Pine Snake	May affect	May affect	May affect	May affect	May affect	No effect	No effect	No effect
Eastern Indigo Snake	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Gopher Tortoise	May affect	May affect	May affect	May affect	May affect	No effect	No effect	No effect

Table G.4.3-3: Summary of Potential Construction-Related Impacts to Threatened, Endangered, and Candidate Species from Development of the Richton Candidate Site

Species	Site	Richton to Pascagoula ROW	Richton to Liberty Terminal ROW	RWI and ROW	Power lines ROW	Liberty Terminal	Pascagoula Terminal	Brine Diffuser and ROW[a]
Kemp's Ridley Sea Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Loggerhead Sea Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Ringed Map Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Yellow-Blotched Map Turtle	No effect	No effect	May affect	May affect	No effect	No effect	No effect	No effect

Table G.4.3-4: Summary of Potential Operation and Maintenance Impacts to Threatened, Endangered, and Candidate Species from Development of the Richton Candidate Site

Species	Site	Richton to Pascagoula ROW	Richton to Liberty Terminal ROW	RWI and ROW	Power Lines ROW	Liberty Terminal	Pascagoula Terminal	Brine Diffuser and ROW
Birds								
Bald Eagle	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Brown Pelican	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Mississippi Sandhill Crane	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Piping Plover	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Red-Cockaded Woodpecker	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Fish								
Gulf Sturgeon	No effect	No effect	No effect	May affect	No effect	No effect	No effect	No effect
Pearl Darter	No effect	No effect	No effect	May affect	No effect	No effect	No effect	No effect
Invertebrates								
Camp Shelby Burrowing Crayfish	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Mammals								
Gray Myotis (Gray Bat)	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Louisiana Black Bear	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect

Table G.4.3-4: Summary of Potential Operation and Maintenance Impacts to Threatened, Endangered, and Candidate Species from Development of the Richton Candidate Site

Species	Site	Richton to Pascagoula ROW	Richton to Liberty Terminal ROW	RWI and ROW	Power Lines ROW	Liberty Terminal	Pascagoula Terminal	Brine Diffuser and ROW
Marine Mammals								
Atlantic Spotted Dolphin	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Plants								
Louisiana Quillwort	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Reptiles								
Alabama Red-Belly Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Black Pine Snake	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Eastern Indigo Snake	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Gopher Tortoise	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Kemp's Ridley Sea Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Loggerhead Sea Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Ringed Map Turtle	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect

Table G.4.3-4: Summary of Potential Operation and Maintenance Impacts to Threatened, Endangered, and Candidate Species from Development of the Richton Candidate Site

Species	Site	Richton to Pascagoula ROW	Richton to Liberty Terminal ROW	RWI and ROW	Power Lines ROW	Liberty Terminal	Pascagoula Terminal	Brine Diffuser and ROW
Yellow-Blotched Map Turtle	No effect	No effect	No effect	May affect	No effect	No effect	No effect	No effect

Table G.4.3-5: Summary of the Number of Species Potentially Affected

Potential for Effect	Number of Species			
	Bruinsburg, MS		Richton, MS	
	Construction	Operation and Maintenance	Construction	Operation and Maintenance
No effect	10	10	15	17
May affect	1	1	5	3

Operation and maintenance of the Bruinsburg site may affect the pallid sturgeon during raw water withdrawals, which could entrain or impinge larval or juvenile sturgeon.

The development of the Richton site may affect five species during construction and three species during operation and maintenance. The gopher tortoise and black pine snake may be affected during construction of the site and certain pipeline ROWs. These impacts would be short term and operation and maintenance of the site or ROWs are not expected to affect these species. Maintained pipeline ROWs may improve and expand preferred habitat for the gopher tortoise. The Gulf sturgeon, pearl darter, and yellow-blotched map turtle may be affected by the construction of the RWI structure and certain pipeline water body crossings. The operation of the RWI structure would cause alterations to the Leaf River flow, which may seriously affect these species dependent on the Leaf River.

Overall, selection of the Richton site may affect a greater number of federally listed threatened, endangered, and candidate species than selection of the Bruinsburg site. Consideration of potential threatened and endangered species effects during selection of SPR development alternatives would not be based only on the number of species affected. Additional factors considered would include the likelihood of affecting the species, the availability and feasibility of mitigation measures, the duration of effects, the likelihood of recovery, and other considerations.

G.5 RECOMMENDATIONS

The evaluation summarized in section G.4 considered how some potential effects would be minimized, avoided, or, more accurately, forecasted by the use of preconstruction field investigations, mitigation measures, and other precautionary measures. The recommendations below summarize the types of measures identified in section G.4 that would lessen the potential for effects due to the development of the SPR candidate sites in Mississippi. Additional measures may be identified during detailed planning if either of the candidate sites is selected for development.

G.5.1 Bruinsburg, MS

- Conduct preconstruction habitat assessments of proposed elements to determine if surveys are needed for the bald eagle, interior least tern, and red-cockaded woodpecker.

- Conduct field survey to determine whether the fat pocketbook mussel is present in Coles Creek or Fairchilds Creek at the locations of proposed crossings of the pipeline ROW from Bruinsburg to Anchorage. If present, identify suitable habitat upstream where the mussel could be relocated if directional drilling is not a feasible construction method.

- Notify the USFWS and the appropriate state wildlife officials if any protected species are observed either during preconstruction field surveys or during construction.

- Where a proposed pipeline ROW would intersect a surface water body where one or more endangered, threatened, or candidate species has been confirmed, use directional drilling to construct the pipeline crossing, if possible. The feasibility of directional drilling should be evaluated for the following crossings:

  - The crossings of Coles Creek and Fairchilds Creek by the pipeline ROW from Bruinsburg to Anchorage if the fat pocketbook mussel is found to be present in these creeks.

  - The crossing of Thompson Creek by the pipeline ROW from Bruinsburg to Anchorage if the Gulf sturgeon is confirmed to be present.

- When directional drilling is not used to construct a pipeline crossing of a surface water where an endangered, threatened, or candidate species may be present, use best available methods to minimize water quality impacts and downstream siltation.

- When construction, operation, or maintenance activities would occur in areas identified as habitat for a threatened, endangered, or candidate species, schedule activities, to the extent practicable, to avoid sensitive life-cycle stages (e.g., spawning, nesting) identified in section G.2.

G.5.2 Richton, MS

- Complete formal consultation with the USFWS or NOAA Fisheries, or both, as mandated under Section 7 of the Endangered Species Act for any potential adverse effects to the Gulf sturgeon, pearl darter, and yellow-blotched map turtle from water withdrawal on the Leaf River. DOE would prepare a biological assessment and implement any requirements prepared during formal consultation by the USFWS or NOAA Fisheries, or both. DOE would coordinate these specific mitigation measures during the application process for a Surface Water Diversion Permit Application to the MDEQ, a Section 404 permit from the USACE, and a formal Section 7 Consultation with the USFWS and NMFS. Mitigation measures might include water conservation, water re-use, and use of a supplemental water source during low flow periods.

- Conduct a preconstruction habitat assessment on proposed elements and survey on moderately well-drained to excessively well-drained sandy soils for the gopher tortoise burrows. Relocate wildlife within the burrows before construction under supervision of USFWS. Where possible, adjust pipeline ROW alignments to avoid large clusters of burrows. Control invasion and spread of cogon grass. Use only herbicides safe for use around tortoises in preferred habitat areas.

- Conduct preconstruction habitat assessment and survey for the black pine snake at the proposed Richton storage site. If found, relocate individuals to nearby suitable habitat areas during construction, as recommended by USFWS.

- Conduct habitat assessments along proposed pipeline ROWs to determine if surveys are needed for the black pine snake, red-cockaded woodpecker, piping plover, brown pelican, or Louisiana quillwort.

- Notify USFWS and the appropriate State wildlife officials if any protected species are observed either during preconstruction field surveys or during construction.

- Where a proposed pipeline ROW would intersect a surface water body where one or more endangered, threatened, or candidate species has been confirmed, use directional drilling to construct the pipeline crossing, if possible. The feasibility of directional drilling should be evaluated for the following crossings:

- Black Creek in Lamar County by the pipeline ROW from Richton to Liberty Station; and
- Tallahala Creek in Perry County by the pipeline from Richton to Liberty Station.

- When directional drilling is not used to construct a pipeline crossing of a surface water where an endangered, threatened, or candidate species may be present, use best available methods to minimize water quality impacts and downstream siltation.

- When construction, operation, or maintenance activities would occur in areas identified as habitat for a threatened, endangered, or candidate species, schedule activities, to the extent practicable, to avoid sensitive life-cycle stages (e.g., spawning, nesting) identified in section G.2.

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Appendix H
Evaluation of Federally Listed Species in Texas

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H.1 INTRODUCTION

This evaluation of federally listed species was prepared in conjunction with the draft environmental impact statement (EIS) for expansion of the Strategic Petroleum Reserve (SPR). The draft EIS evaluates the expansion of the SPR by developing additional storage capacity at up to three existing sites (West Hackberry and Bayou Choctaw in Louisiana and Big Hill in Texas) or developing one of five new sites (Chacahoula and Clovelly in Louisiana; Richton and Bruinsburg in Mississippi; and Stratton Ridge in Texas), or a combination of the Clovelly and Bruinsburg sites.

This appendix analyzes potential effects on federally listed endangered and threatened species, and marine mammals protected under the Endangered Species Act (ESA) and Marine Mammal Protection Act (special status species), respectively, from the development of the proposed new and expansion sites in Texas. Potential effects on endangered and threatened species and marine mammals from development of the proposed new and expansion sites in Louisiana and Mississippi are analyzed in appendices F and G, respectively.

The Department of Energy (DOE) prepared this evaluation of federally listed species to review and document its findings of "no effect" and "may affect" in accordance with the definitions found in the Final ESA Section 7 Consultation Handbook dated March 1998 (Consultation Handbook), a letter from U.S. Fish and Wildlife Service (USFWS) dated September 29, 2005, and consultations with the USFWS field offices. The evaluation was based on the definitions of the effects to endangered or threatened species in the Handbook and letter, as provided in the following list:

- **No effect.** The proposed action would not affect federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area).

- **Is not likely to adversely affect.** The project may affect listed species or critical habitat, or both; however, the effects would be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented to reach this level of effects.

- **Is likely to adversely affect.** Adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect would not be discountable, insignificant, or beneficial. If the overall effect of the proposed action would be beneficial to the listed species, but it also would be likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species.

DOE is evaluating the impacts associated with five proposed new sites and three proposed expansion sites, some of which would have more than 100 miles (160 kilometers) of new pipelines, new tank farms, and brine disposal systems (offshore diffuser or injection wells) associated with them. When DOE issues a record of decision, it will select either one new site (or a combination of the Clovelly and Bruinsburg sites) and either two or three expansion sites for future development, or the no-action alternative. For these reasons, DOE has not conducted comprehensive field surveys and can reach only "no effect" or "may affect" conclusions for this evaluation of special status species instead of using all of the classifications described earlier. For the finding of "may affect," DOE has not completed onsite surveys to support a finding of "is not likely to adversely affect" or "is likely to adversely affect"; therefore, a finding of "no effect" or "may affect" is the conclusion that DOE can reach at this time.

After the record of decision is issued that specifies the new site or sites and the expansion sites that would be developed, DOE would perform site- and species-specific surveys for all the federally listed species that received a finding of "may affect." DOE would perform the evaluation of the federally listed species in consultation with USFWS and section 7 of the ESA and the Final ESA section 7 Consultation Handbook dated March 1998.

H.1.1 Purpose

This evaluation analyzes the potential effects on federally listed threatened and endangered species of construction, operation, and maintenance of additional SPR storage capacity. In Texas, this additional capacity could be added by developing one new site (Stratton Ridge) and expanding capacity at one existing site (Big Hill). For the proposed new Stratton Ridge site, the proposed activities would include: construction of underground storage caverns and surface facilities at the storage site; construction of pipelines for crude oil distribution, raw water supply, and brine disposal; surface water withdrawal to support solution mining of new caverns; discharge of brine in the Gulf of Mexico; and construction of the Texas City terminal. The proposed Big Hill expansion would use the existing raw water intake (RWI) system, brine disposal pipeline and Gulf of Mexico brine discharge, and existing crude oil distribution system; in addition to cavern construction, a new 21-mile (34-kilometer) crude oil pipeline to the Sun Terminal in Nederland would be constructed.

H.1.2 Threatened and Endangered Species Terminology

The USFWS lists a species on the Federal Endangered Species List as "threatened" when it is likely to become endangered throughout all or a significant portion of its range in the foreseeable future, and lists a species as "endangered" when it is in danger of extinction throughout all or a significant portion of its range. In addition, the USFWS maintains a list of what are called "candidate species" that are being considered for listing under the Endangered Species Act. A candidate species is a species that the USFWS has on file sufficient information to support a proposal to list as endangered or threatened, but for which preparation and publication of a proposal is precluded by higher-priority listing actions. Federal agencies are encouraged to consider these species in preparing environmental impact analysis done under NEPA in order to alleviate threats to them and thereby possibly eliminate the need to list the species as endangered or threatened.

To define all the species that are required to be addressed in the biological assessment, DOE contacted and obtained information from the USFWS and the Texas Parks and Wildlife Department (TPWD). Appendix K contains the consultation letters and lists the consultation meetings held.

H.1.3 Organization

This appendix includes the following information: a brief literature review for each of the species addressed (section H.2); observations made during site visits (section H.3); an assessment of the potential effects of the proposed action on the threatened, endangered, and candidate species (section H.4); and recommendations for minimizing potential adverse effects on the subject species and on other biological resources (section H.5). References cited in this appendix are identified in section H.6.

H.2 LITERATURE REVIEW

The literature review describes the natural histories of all species federally listed as threatened or endangered *and* identified as present or potentially present (e.g., based on historical records) by the USFWS (2006) in at least one county where proposed new and expanded SPR facilities and associated infrastructure would be located. Although candidate species (i.e., those listed as candidates for Federal listing as threatened or endangered) are within the scope of this assessment, there were no candidate species identified in the literature review for the Texas counties with proposed SPR facilities. Table H.2-1 lists the species evaluated in this appendix.

Table H.2-1: Federally Listed Threatened or Endangered Species in Texas Counties Where SPR Development is Proposed

Common Name	Scientific Name	Federal Status	Texas Status	County Where Species May Exist[a]
Birds				
Attwater's Greater Prairie Chicken	*Tympanuchus cupido attwateri*	Endangered	Endangered	Galveston
Bald Eagle	*Haliaeetus leucocephalus*	Threatened	Threatened	Brazoria
Brown Pelican	*Pelecanus occidentalis*	Endangered	Endangered	Brazoria, Galveston
Eskimo Curlew	*Numenius borealis*	Endangered	Endangered	Galveston (P)[b]
Piping Plover	*Charadrius melodus*	Threatened	Threatened	Brazoria, Galveston, Jefferson
Whooping Crane	*Grus americana*	Endangered	Endangered	Brazoria (P)
Marine Mammals				
Gervais Beaked Whale	*Mesoplodon europaeus*	Protected	Threatened	Brazoria, Galveston, Jefferson
Goose-Beaked Whale	*Ziphius cavirostris*	Protected	Threatened	Brazoria, Galveston, Jefferson
Pygmy Sperm Whale	*Kogia breviceps*	Protected	Threatened	Brazoria, Galveston, Jefferson
Dwarf Sperm Whale	*Kogia simus*	Protected	Threatened	Brazoria, Galveston, Jefferson
Sperm Whale	*Physeter macrophalus*	Endangered	Endangered	Brazoria, Galveston, Jefferson
Atlantic Spotted Dolphin	*Stenella frontalis*	Protected	Threatened	Brazoria, Galveston, Jefferson
Rough-Toothed Dolphin	*Steno bredanensis*	Protected	Threatened	Brazoria, Galveston, Jefferson
Killer Whale	*Orcinus orca*	Protected	Threatened	Brazoria, Galveston, Jefferson
False Killer Whale	*Pseudorca crassidens*	Protected	Threatened	Brazoria, Galveston, Jefferson
Short-Finned Pilot Whale	*Globicephala macrorhynchus*	Protected	Threatened	Brazoria, Galveston, Jefferson
Pygmy Killer Whale	*Feresa attenuata*	Protected	Threatened	Brazoria, Galveston, Jefferson
West Indian Manatee	*Trichechus manatus*	Endangered	Endangered	Brazoria, Galveston, Jefferson

Table H.2-1: Federally Listed Threatened or Endangered Species in Texas Counties Where SPR Development is Proposed

Common Name	Scientific Name	Federal Status	Texas Status	County Where Species May Exist[a]
Bottlenose Dolphin	(*Tursiops truncatus*)	Protected	Not Listed	All Coastal Counties
Reptiles				
Atlantic Hawksbill Sea Turtle	*Eretmochelys imbricate*	Endangered	Endangered	Brazoria, Galveston, Jefferson
Green Sea Turtle	*Chelonia mydas*	Threatened	Threatened	Brazoria, Galveston, Jefferson
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Endangered	Endangered	Brazoria, Galveston, Jefferson
Leatherback Sea Turtle	*Dermochelys coriacea*	Endangered	Endangered	Brazoria, Galveston, Jefferson
Loggerhead Sea Turtle	*Caretta caretta*	Threatened	Threatened	Brazoria, Galveston, Jefferson

[a] Includes only counties in Texas where SPR facilities are proposed for development or expansion.
[b] Potentially or historically present in the county.

H.2.1 Birds

H.2.1.1 Attwater's Greater Prairie Chicken

Attwater's greater prairie chicken (*Tympanuchus cupido attwateri*) is a heavily barred, chunky, chicken-sized bird with dark brown, cinnamon, and pale buff feathers (NGS 1983). The average weight for males and females is 35.8 and 25.6 ounces (1,014 grams and 730 grams), respectively (Dunning 1993). Their diet consists primarily of insects, particularly grasshoppers, during the summer and fruit, leaves, flowers, shoots, seeds, and grain during other times of the year (NatureServe 2005).

The historical range of these birds was in the Gulf Coast prairies of southwestern Texas and Louisiana, south of the Rio Grande (NatureServe 2005). Currently, Attwater's greater prairie chicken is found only in a narrow band of coastal prairie along the Texas coast, including some offshore islands, and as of 1991, several remnant inland populations existed in Goliad, Refugio, Austin, Colorado, Fort Bend, and Victoria Counties (Matthews and Moseley 1990). Beginning in early April, males gather for communal courtship (10 to 30 birds). Incubation lasts 23 or 24 days, after which the hatchlings leave the nest within a few hours of hatching (NatureServe 2005). Home ranges can vary widely, but they are smallest in summer and largest in winter (Horkel 1979).

H.2.1.2 Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is a large bird of prey with an average wingspan of 7 feet (2 meters). Adult males and females are similar in appearance, with a dark brown body and wings, and a distinctive white head and tail. This species is listed as a federally threatened species, although delisting has been proposed.

Bald eagles may be found throughout the continental United States and Alaska. They are most likely found in areas with large expanses of aquatic habitat with forested shorelines or cliffs where they select supercanopy roost trees. Bald eagles are opportunistic foragers. Although they prefer fish, they eat a great variety of mammals, amphibians, crustaceans, and birds, including many species of waterfowl (Buehler 2000).

Bald eagles nest almost exclusively at the edges of lakes, rivers, or seacoasts. They generally nest in tall trees or cliffs near the water's edge, although they occasionally nest on the ground. Nests are often reused in successive years. The breeding season begins in the spring (earlier in southern states), with the young fledging after about 6 months (USFWS 1983; USFWS 1995). According to comments submitted to DOE by the USFWS (James 2005), nesting activity occurs from September to January with young fledged usually by midsummer. Nonbreeding populations occur throughout Texas; breeding populations are found primarily in eastern Texas along the Gulf Coast (NatureServe 2005; TPWD 2005).

Bald eagles are highly sensitive to human noise and interference (USFWS 1983; USFWS 1995). They are most sensitive during the first 12 weeks of the nesting cycle. Disturbance during nesting may lead to nest abandonment or reduced hatching and survival rates. Human activity near a nest late in the nesting cycle may also cause flightless birds to jump from the nest, lessening their likelihood of survival (Watson 2005).

H.2.1.3 Brown Pelican

The brown pelican (*Pelecanus occidentalis*) is a large water bird with a massive bill and throat pouch. Its wings and body are grayish-brown. Nonbreeding adults have a whitish head and neck often with some yellow. The hindnecks of breeding adults are dark chestnut (NGS 1983; Palmer 1962). Larger individuals have a wingspread of more than 7 feet (2 meters) (USFWS 2005).

The brown pelican is a fish eater. It is found almost exclusively in coastal areas along the southern east coast, the Gulf of Mexico, and throughout the west coast. It prefers to feed in shallow estuarine waters and use sand spits, offshore sand bars, and islets for nocturnal roosting. Dry roosting sites are essential to suitable habitat (NatureServe 2005). Nests usually are built on coastal islands, on the ground, or in small bushes and trees (Palmer 1962).

The brown pelican is federally listed as endangered. Populations in California, Texas, and Louisiana were devastated by pesticide poisoning from dichlorodiphenyltrichloroethane (DDT), dichlorodiphenyldichloroethylene (DDE), and other compounds throughout the 1950s and 1960s. Now eastern and Gulf Coast populations of the brown pelican appear to be stable and possibly increasing in recent years. Contaminant levels in both populations are below the threshold for reproductive failure, but the populations are still very vulnerable to pesticide pollution (Anderson and Hickey 1970). Other threats include the disturbance of nesting birds by humans, declining fish populations, increased water turbidity caused by dredging, oil and chemicals spills, entanglement in fishing gear, and extreme weather conditions. Recently, habitat degradation has affected both roosting and nesting. For example, nesting efforts have failed in the Gulf Coast because of erosion at the nesting sites (NatureServe 2005).

The brown pelican is classified as vulnerable in Texas and imperiled in Louisiana. In Texas, brown pelicans can be found along the entire coast; most of the breeding brown pelicans in Texas nest in counties near Corpus Christi (TPWD 2005).

H.2.1.4 Eskimo Curlew

The Eskimo curlew (*Numenius borealis*) is a very rare, 12- to 14-inch (30- to 36-centimeter), long-legged shorebird with a gray-brown upper body with dark eyelines, a slightly downward-curved bill, cinnamon wing linings, and white streaks on the lower body. Female Eskimo curlews are generally larger than males (NYDEC 2003). Their diet consists of grasshoppers and grasshopper eggs, crickets, grubs, ants, moths, spiders, snails, earthworms, freshwater insects, seeds, and berries (Gollop et al. 1986).

A possible sighting of four Eskimo curlews was reported in Texas in 1987 (Gollop 1988), but no recent reliable sightings have been reported for Texas, and the global population is believed to be less than 50 and possibly extinct (NatureServe 2005). Historically, Eskimo curlews arrived in Texas in early March and migrated through the Great Plains from late March to mid-May (Gollop et al. 1986; Johnson and Herter 1989) to their breeding areas further north (e.g., Alaska). Their nonbreeding habitat consists of tidal flats, herbaceous grasslands, pastures, and plowed fields within a few miles (kilometers) of the sea (AOU 1983). Preferred nesting habitat includes open artic tundra, uplands grassy tundra, and tundra and tidal marshes near the Arctic Ocean (Harrison 1978; Johnson and Herter 1989; Matthews and Moseley 1990). Female Eskimo curlews lay a clutch of four eggs between late May and early July (NatureServe 2005).

H.2.1.5 Piping Plover

The piping plover (*Charadrius melodus*) is a small, sandy-colored shorebird similar in appearance to a sandpiper. Distinguishing field marks of this species include yellow-orange legs, a black band across the forehead from eye to eye, and a black ring around the base of its neck (USFWS 2005). The piping plover is federally listed as threatened in Texas.

A migratory species, the piping plover overwinters on beaches, mudflats, and sandflats along the Atlantic Coast and the Gulf of Mexico including barrier island beaches and spoil islands on the Gulf Intracoastal Waterway (ICW) (USFWS 2005). In Texas, piping plovers have been observed in most of the counties bordering the Gulf of Mexico (NatureServe 2005). Critical habitat for wintering piping plovers has been established for several specific locations in Brazoria and Galveston Counties in Texas (USFWS 2001):

- **Unit TX–31:** San Bernard National Wildlife Refuge Beach, 410 acres (166 hectares) in Matagorda and Brazoria Counties. This is a unit composed of Gulf beach, 5 miles (8 kilometers), and extends from the mouth of the San Bernard River to a point along the beach 8.7 miles (14 kilometers) to the southwest.

- **Unit TX–32:** Gulf Beach, 269 acres (109 hectares) of shoreline in Brazoria County. This unit is a segment of Gulf beach between the Brazos River and the San Bernard River and borders an area known as Wolf Island.

- **Unit TX–33:** Bryan Beach and adjacent beach, 388 acres (157 hectares) in Brazoria County. The boundaries enclose a length of Gulf beach between the mouth of the Brazos River and the Farm-to-Market 1495 road. A portion of this area is owned and managed by the TPWD.

- **Unit TX–34:** San Luis Pass, 272 acres (110 hectares) near the Brazoria-Galveston county line. This unit extends along the Gulf side of Galveston Island from San Luis Pass to the site of the former town of Red Fish Cove. Approximately 57 percent of the unit includes flats in the floodtide delta that are state-owned and managed by the Texas General Lands Office (TGLO).

- **Unit TX–35:** Big Reef, 117 acres (47 hectares) in Galveston County. This unit consists of beach and sandflats on the north, west, and east shore of Big Reef, down to mean lower low water (MLLW) level. South Jetty is not included. The area is managed by the City of Galveston.

- **Unit TX–36:** Bolivar Flats, 395 acres (160 hectares) in Galveston County. This unit extends from the jetties on the southwest end of the Bolivar Peninsula to a point on the Gulf beach 0.6 miles (1 kilometer) north of Beacon Bayou. It includes 3 miles (4.8 kilometers) of Gulf shoreline. The area is leased from the TGLO by Houston Audubon Society, and it is managed for its important avian resources. The uplands areas are used for roosting by the piping plover.

- **Unit TX–37:** Rollover Pass, 16 acres (6.5 hectares) in Galveston County. This unit consists of Rollover Bay on the bayside of Bolivar Peninsula. It includes tidal flats on state-owned land managed by the TGLO. This unit captures the intertidal complex of the bay, and it is bounded by the towns of Gilchrist to the east and the Gulf beach of the Bolivar Peninsula to the south.

For all of these units, the landward boundary of the critical habitat is defined as the line indicating the beginning of dense vegetation (which is not used by piping plovers as habitat) and the gulfside (or bayside) boundary is the MLLW, defined as the annual average of the lower low-water height of each tidal day. All of the units listed here include lands known as wind tidal flats that are infrequently inundated by seasonal winds.

Piping plovers begin their fall migration to wintering habitats along the Gulf Coast and elsewhere in mid to late summer, where they remain until around March when they migrate northward to breeding grounds (NatureServe 2005). Although a few plovers remain throughout the year, sightings in winter habitats are rare in late May, June, and early July (USFWS 2001).

H.2.1.6 Whooping Crane

The whooping crane (*Grus americana*) is a very tall, mostly white bird with long legs and neck, red facial skin, and a straight bill. It averages 52 inches (132 centimeters) in length (NatureServe 2005). Its summer diet consists of insects, crustaceans, and berries; its winter diet is supplemented with grains, acorns, wolfberry fruit, insects, crustaceans, mollusks, fishes, reptiles, amphibians, and marine worms (USFWS 1980; Hunt and Slack 1989).

The whooping crane's preferred habitat is typically herbaceous wetlands, lagoons, and tidal flats. It typically nests in dense emergent vegetation found in shallow ponds, fresh-water marshes, wet prairies, and lake margins in large tracts of undisturbed wilderness (NatureServe 2005). Breeding begins in early May, and pairs of whooping cranes mate for life. The crane also establishes and defends winter territories on coastal marshes in parts of Texas. Breeding territories are large, averaging 1,900 acres (769 hectares) (Johnsgard 1991). Nestlings fledge after mid-August, and they mature sexually at 4 to 6 years (NatureServe 2005).

H.2.2 Marine Mammals

At the proposed Stratton Ridge site, the onshore portion of the brine disposal pipeline construction would not affect marine mammals. That construction would include directional drilling from onshore to open water in the Gulf of Mexico. The construction and operation of the offshore brine disposal pipeline and brine diffusion system for the Stratton Ridge site may affect the marine mammal species; likewise, operation of the brine diffusion systems for both the Big Hill and Stratton Ridge sites may affect the marine mammal species. The locations of the offshore pipelines and the diffuser system would not reach the depths of the Gulf of Mexico where the majority of these species are found because the locations of the diffuser systems are at a depth of approximately 30 feet (9 meters). In addition, the dispersion of the brine discharge into the Gulf of Mexico would dissipate before reaching these depths.

H.2.2.1 Gervais Beaked Whale

The Gervais beaked whale (*Ziphius cavirostris*) is a pelagic species associated with the continental shelf and deep oceanic waters, and, in addition, it is closely associated with the Gulf Stream waters. Its diet consists mainly of squid and deepwater fishes. Little is known about this species, but it is believed sexual maturity occurs when it measures 15 feet (4.5 meters). The Gervais beaked whale lives about 27 years (Wynne et al. 1999).

H.2.2.2 Goose-Beaked Whale

The goose-beaked whale (*Ziphius cavirostris*), also known as Cuvier's beaked whale, typically is found in waters that are greater than 3,280 feet (1,000 meters). The goose-beaked is a pelagic species associated with the continental shelf and deep oceanic waters, but it is also closely associated with the Gulf Stream waters. Little is known about the goose-beaked whale. It is believed to travel in pods of 2 to 25 animals, and it typically avoids vessels. Sexual maturity is believed to occur at 7 to 11 years, with breeding occurring in the spring. Females give birth to a calf every 2 to 3 years after a 12-month gestation. The goose-beaked whale is believed to lactate for 12 months and live more than 35 years. Its diet consists mainly of deepwater fish and squid (Wynne et al. 1999).

H.2.2.3 Pygmy Sperm Whale

The pygmy sperm whale (*Kogia breviceps*) is a pelagic, deep-water species that inhabits the areas near the continental shelf edge, slope, and deep oceanic waters. It is found throughout the Gulf of Mexico in these waters. The pygmy sperm whale is not as social as other species, and it is typically found alone or in small groups. The male reaches sexual maturity when it measures 8.9 to 9.8 feet (2.7 to 3.0 meters). The female reaches sexual maturity when it measures 8.5 to 9.1 feet (2.6 to 2.8 meters) in length. A single calf is born after an 11-month gestation period, and lactation lasts about 12 months. The pygmy sperm whale's diet consists mainly of squid, fish, and crustaceans (Wynne et al. 1999).

H.2.2.4 Dwarf Sperm Whale

The dwarf sperm whale (*Kogia simus*) is a pelagic, deep-water species that inhabits the areas near the continental shelf edge, slope, and deep oceanic waters. It is found throughout the Gulf of Mexico in these waters. The dwarf sperm whale is not as social as other species, and it typically is found alone or in small groups. It reaches sexual maturity when it measures between 6.9 and 7.2 feet (2.1 and 2.2 meters) in length. A single calf is born after a 9.5-month gestation period, and lactation lasts about 12 months. The dwarf sperm whale's diet consists mainly of squid, fish, and crustaceans (Wynne et al. 1999).

H.2.2.5 Sperm Whale

The sperm whale (*Physeter macrophalus*) is a pelagic, deep-water species that inhabits areas near the continental slope. It is found throughout the Gulf of Mexico along the continental slope and along the Atlantic seaboard associated with Gulf Stream features. Female and young sperm whales form breeding schools of 10 to 80 animals. Sexually inactive males form bachelor schools, and older males are typically solitary. Females reach sexual maturity between 7 to 11 years; males reach sexual maturity at 19 years. A single calf is born every 3 to 6 years after a 14-month gestation period, and lactation lasts 12 to 24 months. The sperm whale's diet consists mainly of squid, but the species also will eat fish (Wynne et al. 1999).

H.2.2.6 Atlantic Spotted Dolphin

The Atlantic spotted dolphin (*Stenella frontalis*) is a tropical species that can be found in a variety of areas throughout the Gulf of Mexico. It ranges from coastal to pelagic environments, typically near the continental shelf and slope, and it usually is associated with the Gulf Stream. The Atlantic spotted dolphin reaches sexual maturity at 8 to 15 years. It breeds during the fall and spring and produces one calf every 1 to 2 years after a 12-month gestation period. Lactation typically lasts 3 to 5 years. The

Atlantic spotted dolphin can live 25 to 30 years. It is a gregarious species found in groups of less than 20 other dolphins and small whales along the coast and in larger groups of less than 100 individuals offshore. The Atlantic spotted dolphin's diet consists of squid and a variety of fish (Wynne et al. 1999).

H.2.2.7 Rough-Toothed Dolphin

The rough-toothed dolphin (*Steno bredanensis*) is a tropical, pelagic species found seaward of the continental slope. Little is known about the rough-toothed dolphin, but it is thought to be sexually mature at 10 to 14 years and to live as long as 32 years. It is believed to travel in pods of 10 to more than 100 individuals and associated other species such as spinner dolphins, bottlenose dolphins, and pilot whales. Sometimes the rough-toothed dolphin can be found associated with large mats of Sargassum. The rough-toothed dolphin's diet consists of deepwater octopus, squid, and fish (Wynne et al. 1999).

H.2.2.8 Killer Whale

The killer whale (*Orcinus orca*) can be found in both coastal and oceanic waters ranging from tropical to polar. The killer whale is a highly social species that travels in a pod of 3 to 55 animals, and the pod often cooperates in hunting and feeding efforts. The whale is sexually mature at 10 to 15 years and mates year round. A single calf is born every 3 to 8 years after a 17-month gestation period. Lactation typically lasts about 12 months. The killer whale may live more than 50 years. It has a diverse diet that includes fish, birds, squid, turtle, and other marine mammals (Wynne et al. 1999).

H.2.2.9 False Killer Whale

The false killer whale (*Pseudorca crassidens*) is a pelagic species found in the deeper waters of the Gulf of Mexico, seaward of the continental shelf. The false killer whale is a social species that can be found in groups of 10 to more than 100 individuals with the same species or with other dolphin species. It is sexually mature at 8 to 14 years, and it has a single calf every 3 to 4 years after a 16-month gestation period. This species has been known to be aggressive toward smaller dolphins. The false killer whale's diet consists mainly of squid and fish (Wynne et al. 1999).

H.2.2.10 Short-Finned Pilot Whale

The short-finned pilot whale (*Globicephala macrorhynchus*) can be found in a variety of water depths. Typically it is associated with squid, its main prey. The short-finned pilot whale is a tropical species usually associated with the Gulf Stream, and it can be found in pelagic or coastal environments. It may move inshore during the summer months. The short-finned pilot whale is a social species that can be found in groups of 10 to more than 100 individuals, and it is often associated with bottlenose dolphins. It is believed to be sexually mature at 6 to 12 years and thought to breed every 3 years. A single calf is born after a 15- or 16-month gestation period. Lactation for calves lasts about 20 months. An individual short-finned pilot whale can live between 50 and 70 years. Its diet consists primarily of squid, but it also has been known to prey on fish (Wynne et al. 1999).

H.2.2.11 Pygmy Killer Whale

The pygmy killer whale (*Feresa attenuata*) is a pelagic species found in the deeper waters of the Gulf of Mexico, seaward of the continental shelf. Little is known about the life history of this whale. Its diet is believed to consist mostly of fish, but it has been observed preying on squid. The pygmy killer whale is a gregarious species that typically associates in groups of 10 to 50 individuals. The pygmy killer whale has shown aggressive tendencies, but typically it is wary of boats (Wynne et al. 1999).

H.2.2.12 West Indian Manatee

The West Indian manatee (*Trichechus manatua*), also known as the Florida manatee, is an herbivore found in the warm coastal and inland waters. This manatee has a low tolerance for cold waters below 68 ºFahrenheit (20 ºCelsius), and it is typically found in warm springs and rivers. The manatee does not typically extend beyond the Florida–Alabama border, but sometimes it is found along the entire Gulf Coast. This slow swimming mammal spends its days feeding on submerged aquatic vegetation, floating vegetation, and emergent vegetation. The manatee is sexually mature at 3 to 5 years and produces a single calf every 2 to 5 years after a 12-month gestation period (Wynne et al. 1999).

H.2.2.13 Bottlenose Dolphin

The bottlenose dolphin (*Tursiops truncatus*) typically is found in coastal or offshore waters. In a coastal environment, the bottlenose dolphin can be found in warm, sallow inshore waters of bays and rivers. When offshore, it usually is in deep waters over the continental shelf and slope. The female bottlenose dolphin reaches sexual maturity at 5 to 10 years, while the male reaches maturity at 8 to 12 years. It breeds during fall and spring, and it produces one calf every 3 to 6 years after a 12-month gestation period. Lactation typically lasts 12 to 18 months. The bottlenose dolphin may live more than 50 years. It is a social species; it can be found along the coast in small groups of less than 10 individuals and offshore in larger groups of 10 to more than 100 individuals. This species usually can be found in mixed groups with pilot whales and right whales. The bottlenose dolphin's diet consists of fish, invertebrates, and squid (Wynne et al. 1999).

H.2.3 Reptiles

H.2.3.1 Atlantic Hawksbill Sea Turtle

The Atlantic hawksbill sea turtle (*Eretmochelys imbricata*) has a large brown carapace with overlapping scutes and two claws on each flipper. Some individuals have a tortoiseshell pattern of radiating streaks. The young are all black or dark brown except for raised ridges, shell edges, and areas on the neck and flippers. Mature adults usually measure 30 to 35 inches (76 to 89 centimeters) in length (Conant and Collins 1991). It feeds on the ocean bottom and reef faces close to shore on a diet consisting primarily of crab, sea urchin, shellfish, and jellyfish, and also some plant material and fish.

The Atlantic hawksbill is a local- and long-distance migrant that prefers shallow coastal waters with rocky bottoms, coral reefs, mangrove-bordered bays, and estuaries (CSTC 1990). This turtle prefers to nest on undisturbed, deep-sand beaches on the Gulf Coast of Mexico, the West Indies, the Bahamas, and the Americas (Meylan 1992; Lund 1985). The age of sexual maturity is unknown. Adult females nest only once every 2 to 3 years between May and November, laying 4 to 6 clutches of 50 to more than 200 eggs at 14- to 18.5-day intervals (NatureServe 2005). Incubation lasts approximately 2 months (CSTC 1990).

H.2.3.2 Green Sea Turtle

The green sea turtle (*Chelonia mydas*) turtle has a brown carapace covered in dark, wavy markings, radiating mottled markings, or large dark brown blotches; young are black or dark brown with white undersides. Mature adults are usually 35 to 48 inches (90 to 122 centimeters), but they can reach more than 60 inches (153 centimeters) in length. The length of a hatchling carapace is usually between 1.6 and 2.4 inches (4.1 and 6.1 centimeters) (Conant and Collins 1991). This turtle most commonly feeds in shallow, low-energy waters containing abundant submerged vegetation. Adults are primarily herbivores, while juveniles are more invertivorous.

The green sea turtle is a long-distance migrant preferring tidal flats, pelagic zones, and isolated sand dunes. It prefers to nest on high-energy beaches with deep sand (NatureServe 2005). Every 2 to 4 years, the female lays between 1 and 8 clutches, each averaging 90 to 140 eggs, at approximately 2-week intervals. Nesting occurs between March and October in the Caribbean–Gulf of Mexico region, with a peak nesting rate during May and June (Ehrhart and Witherington 1992).

H.2.3.3 Kemp's Ridley Sea Turtle

Kemp's Ridley sea turtle (*Lepidochelys kempii*) is a small endangered sea turtle found in shallow coastal and estuarine waters including those of the Gulf of Mexico. The adult is olive green above and yellow below, and young are gray above and yellow below. The shell is nearly round, and its limbs are flattened flippers. The shell length is usually between 23 and 28 inches (58 and 70 centimeters) for adults and 1.5 to 1.7 inches (3.8 to 4.4 centimeters) for hatchlings (Conant and Collins 1991).

In coastal waters, the Kemp's Ridley sea turtle is usually found over sand or mud bottoms where it feeds on crabs. Nests are built on elevated dunes, especially on beaches backed up by large swamps or bodies of open water having seasonal, narrow ocean connections (NatureServe 2005).

During the nesting season from April to July, the female lays 1 to 4 clutches of about 100 eggs at intervals of 10 to 28 days. Eggs hatch after an average of 50 to 55 days (CSTC 1990).

H.2.3.4 Leatherback Sea Turtle

The leatherback sea turtle (*Dermochelys coricea*) has a black or dark blue carapace, often with irregular white or pink blotches, and seven prominent longitudinal ridges. The adult is usually 53 to 70 inches (135 to 178 centimeters) in length. Leatherback hatchlings are about 2.4 to 3 inches (6 to 7.5 centimeters) long, and they are black and white and covered with small beady scales that are later shed (Conant and Collins 1991). The leatherback sea turtle feeds primarily on jellyfish.

Mainly pelagic, the leatherback tends to approach land exclusively for nesting (Eckert 1992). This long-distance migrant prefers the open ocean, particularly along the edge of continental shelves, but it is also found in seas, gulfs, bays, and estuaries. When nesting, the leatherback seeks moist sand on sloping sandy beaches backed by vegetation near deep water and rough seas (CSTC 1990). Every 2 to 3 years, the female leatherback lays 10 or possibly more clutches of 50 to 170 eggs at intervals of about 1 to 2 weeks. Nesting occurs between March and August in the Western hemisphere. Eggs hatch in 8 to 10 weeks (Eckert 1992).

H.2.3.5 Loggerhead Sea Turtle

The loggerhead (*Caretta caretta*) is a reddish-brown sea turtle found in a variety of habitats including open seas more than 500 miles (805 kilometers) from shores, bays, estuaries, lagoons, creeks, and mouths of rivers in warm, temperate, and subtropical regions (NatureServe 2005). Adults have a carapace length typically between 28 and 49 inches (70 and 125 centimeters). Hatchlings have a shell length of 1.5 to 2 inches (4 to 5 centimeters) (Dodd 1988, 1992; Conant and Collins 1991).

The female loggerhead sea turtle nests on open sandy beaches above the high-tide mark, seaward of well-developed dunes. High-energy and steeply sloped beaches with gradually sloped offshore approaches are favored (CSTC 1990). In southeastern states, females deposit between 50,000 to 70,000 clutches each year (Meylan et al. 1995). Despite some natural fluctuation in the size of the loggerhead population, numbers appear to be declining in some areas largely due to habitat destruction and incidental take by shrimp trawlers. The nesting population in the southeastern United States is believed to be declining (CSTC 1990; Taylor 1992).

Every 2 to 3 years, a mature female lays between 1 and 9 clutches of around 120 eggs at intervals of 2 weeks. Nesting occurs mainly at night, often at high tide, from April to early September. In the southeastern states, eggs hatch in 8 to 9 weeks. The sex of the hatchlings is determined by incubation temperatures, with the ratio strongly biased toward females in Atlantic coastal waters. Hatchlings emerge from the nest a few days after hatching, typically during darkness (Wibbels et al. 1991; Mrosovsky and Provancha 1992).

H.3 FIELD OBSERVATIONS

This section reports the observations made during field visits to the proposed Stratton Ridge SPR site.

On October 6 and 7, 2005, four biologists from ICF Consulting conducted pedestrian surveys of the proposed Stratton Ridge SPR site. The inspectors walked over the proposed site and RWI structure. The survey included limited portions of the proposed pipeline right-of-way (ROW).

H.3.1 Stratton Ridge Storage Site

The proposed Stratton Ridge storage site encompasses 273 acres (102 hectares) west of Highway 523. Cattle and feral pigs roam and graze throughout the site, influencing the vegetative communities. The biologists observed perennial streambeds in the northeastern portion of the site and culverts along the pipeline that bisects the site from east to west. They observed no permanent streams in the site, but they did see three areas of standing water and emergent and potentially submergent vegetation.

The study area includes the following principal habitat types:

- Evergreen forest (primarily forested wetlands),
- Deciduous forest,
- Emergent wetlands, and
- Open and old fields.

A description of each principal habitat type in the study area follows. Plant species observed on the site are identified in table H.3.1-1.

Table H.3.1-1: Plant Species Observed at the Stratton Ridge Site

Common name	Scientific Name	Vegetative Layer
Evergreen Forest		
Live Oak	*Quercus virginiana*	Canopy
Water Oak	*Q. phellos*	Canopy
Holly	*Ilex* spp.	Understory
Yaupon	*Ilex vomitoria*	Understory
Dahoon	*Ilex cornuta*	Understory
Devil's Walking Stick	Aralia spinosa	Understory
Chinese Tallow Tree	*Sapium sebiferum*	Canopy/Understory (invasive)
Vibernum	*Viburnum* spp.	Understory/Ground cover
Rattlebush	*Symplocos tinctoria*	Understory/Ground cover
Saw Palmetto	*Serenoa repens*	Understory/Ground cover
Greenbriar	*Smilax* spp.	Understory/Ground cover

Table H.3.1-1: Plant Species Observed at the Stratton Ridge Site

Common name	Scientific Name	Vegetative Layer
Blackberry	*Rubus argutus*	Understory/Ground cover
Butterweed	*Packera glabella*	Understory/Ground cover
Pigweed	*Amaranthus* spp.	Understory/Ground cover
Trumpet Creeper	*Campsis radicans*	Understory/Ground cover
Deciduous Forest		
Winged Elm	*Ulmus alata*	Canopy
Chinese Tallow Tree	*Sapium sebiferum*	Canopy
Pigweed	*Amaranthus* spp.	Understory/Ground cover
Rattlebush	*Symplocos tinctoria*	Understory/Ground cover
Saw Palmetto	*Serenoa repens*	Understory/Ground cover
Viburnum	*Viburnum* spp.	Understory/Ground cover
Emergent Wetlands		
Sedge	*Carex* spp.	Ground cover
Soft Rush	*Juncus marginatus*	Ground cover
Legume	*Fabaceae*	Ground cover
Bulrush	*Scirpus* spp.	Ground cover
Spike Rush	*Eleocharis quadrangulata*	Ground cover

Evergreen Forest: Approximately 85 percent of the evergreen forest is forested wetlands with upland portions consisting of scattered isolated islands and berms. The evergreen forest is dominated by live oak and an understory that includes holly, yaupon holly, devil's walking stick, and vibernum. The ground cover varies based on the amount of sunlight reaching the forest floor and the level of grazing.

Deciduous Forest: Deciduous hardwood forests are present in higher elevation areas at the southern portion of the site. The dominant species are winged elm and Chinese tallow tree.

Emergent Wetlands: The largest emergent wetland area is in the central-eastern area of the site. Standing water was present at all of the emergent wetlands observed during the site visit. The biologists observed a variety of sedge, rush, and bulrush, along with legumes, rattlebush, and Chinese tallow tree along the edges of the wetlands.

Open and Old Fields: The observed open fields are associated with power line and pipeline ROWs. The old fields adjacent to the proposed site were for cattle grazing. The entire site is now grazed by cattle.

H.3.2 Stratton Ridge RWI Structure

The proposed RWI structure for the Stratton Ridge site is on the ICW. The surrounding area is flat brackish to saltwater marshland with some tidal influence.

H.4 HABITAT ASSESSMENT AND POTENTIAL IMPACTS

This section evaluates whether the proposed SPR development activities would take place in areas where threatened, endangered, and candidate species are known to exist or where they may exist based on the natural history information reported in chapter 2 of the draft EIS. For any element of the proposed new Stratton Ridge site or proposed Big Hill expansion site located in known or potential threatened, endangered, or candidate species habitat, the nature and potential for effects on that species are described. The assessment considers potential avoidance and minimization measures that DOE would implement for each element of the proposed action.

In the following sections, a separate assessment is provided for the proposed new Stratton Ridge site and the Big Hill proposed expansion site.

H.4.1 Stratton Ridge

This assessment for the proposed Stratton Ridge site evaluates the potential effects on threatened, endangered, and candidate species by each of the elements of the proposed new site listed in Table H.4.1-1.

Table H.4.1-1: Elements of the Proposed Action and Location on Stratton Ridge Candidate Site

Element of Proposed Action	Location by County or Offshore Area
Stratton Ridge site	Brazoria
Oil distribution pipeline ROW from Stratton Ridge to the Texas City terminal	Brazoria and Galveston
RWI structure, RWI pipeline ROW, brine disposal pipeline ROW, and RWI power line ROW to the ICW	Brazoria
Brine disposal ROW from ICW to Gulf of Mexico	Brazoria
Offshore brine pipeline and diffuser	Gulf of Mexico

The following paragraphs describe the evaluation findings for each species that could result from the elements of the proposed action at the Stratton Ridge candidate site.

H.4.1.1 Birds

H.4.1.1.1 Attwater's Greater Prairie Chicken

Attwater's greater prairie chickens are recorded in Galveston County, where part of the crude oil distribution pipeline for the Stratton Ridge site would be located. Woodrow (2005) listed the species as a species of concern for the proposed new Stratton Ridge site. As of 2003, two fragments of habitat were recorded for Attwater's greater prairie chicken in Texas, including one in Galveston County at the Texas City Prairie Preserve and the other in Colorado County (TPWD 2005; Nature Conservancy 2005). The element of the proposed action in Galveston County associated with the proposed new Stratton Ridge site is construction of the crude oil distribution pipeline along the existing ROW to the Texas City terminal. The existing ROW where the new pipeline would be built passes through the southern part of Texas City; the Prairie Reserve is to the north of Texas City, at least 4 miles (6.4 kilometers) away. Because this is an existing ROW that does not pass through the Prairie Reserve, the construction of the pipeline and the subsequent operation and maintenance activities would have no effect on the existing population of Attwater's greater prairie chickens.

H.4.1.1.2 Bald Eagle

Eastern Texas including Brazoria County has breeding and wintering-over populations of bald eagles (TWPD 2005). Construction on the proposed Stratton Ridge site; the ROW for the RWI pipeline, brine disposal pipeline, and power lines to the RWI structure; and the crude oil distribution pipeline ROW would occur in or near areas with potentially suitable habitat for the bald eagle. These suitable habitats include open water or wetlands adjacent to forested area.

Construction Impacts

A pair of bald eagles is known to nest northwest of the proposed Stratton Ridge site near Ash Lake, approximately 2 miles (3.2 kilometers) from the Stratton Ridge site. Research has shown that most nests are not disturbed by development activities that are farther than 0.25 miles (0.4 kilometers) away. Although this nest location is further than 0.25 miles (0.4 kilometers) from the proposed site, these bald eagles may be affected by the Stratton Ridge site development because the habitat at the site may provide suitable foraging area. Tree removal onsite and in the 300-foot (91-meter) security area around the site, construction noise, and human activity may affect bald eagles foraging in the area, although the construction would be a temporary impact. There are no known bald eagle nests at the proposed Stratton Ridge site, but the bottomland hardwood forest (palustrine forested wetlands) and emergent wetlands habitat at the site may be suitable for nesting and foraging or roosting habitat. If the proposed Stratton Ridge site is selected for development, a biologist would survey the site for bald eagle nests. If a nest is identified, DOE would consult with USFWS and TPWD. DOE would implement appropriate mitigation strategies. For example, construction of the pipeline would be completed to avoid the time when nesting bald eagles are particularly sensitive to human activity. Bald eagles are particularly sensitive to human activity during the period when they nest in Texas from October to July, with peak egg-laying in December and hatching in January (Watson 2005).

The construction of the proposed RWI and brine disposal pipelines and power lines leading to the RWI structure may affect habitat that is potentially suitable for foraging and nesting bald eagles; however, no known nests have been identified along these ROWs. If the Stratton Ridge site is selected for development, a biologist would survey the area for nests and suitable habitat along the ROWs and RWI construction site. If a nest is identified, DOE would consult with USFWS and TPWD, as described earlier. If no nests are identified, construction still may have an effect on bald eagles because the suitable foraging area would be disrupted. It is also possible that habitats may exist for bald eagle nesting and foraging along the existing pipeline ROW to the Texas City terminal. The new construction would have no effect on bald eagles because the area currently is disturbed by the existing ROW from ongoing maintenance activities (mowing and tree trimming). As a result, eagles that would frequent the area would be tolerant of human disturbances.

Operation and Maintenance Impacts

Operation and maintenance activities at the site and at the RWI may affect foraging bald eagles because they are sensitive to human noise and interference (USFWS 1983; USFWS 1995). At the RWI, DOE would downshield lights to minimize the impacts of artificial lighting and use noise attenuation barriers to minimize the impact to wildlife, including bald eagles. But for the pipeline ROW, the pipelines would be a static structure and would not produce noise that would disturb the eagles. Maintenance activities along the ROW and at the RWI structure would be infrequent and minor. In addition, the crude oil pipeline would be constructed in an existing pipeline ROW; therefore, operation and maintenance activities for this element of the proposed action would closely resemble existing conditions, and would have no effect on foraging or nesting bald eagles.

H.4.1.1.3 Brown Pelican

The brown pelican has been recorded in both Brazoria and Galveston Counties in Texas (TPWD 2005). Brown pelicans are found almost exclusively in coastal areas where they feed in shallow estuarine waters; thus, the elements most likely to affect brown pelicans are the RWI structure, the brine disposal pipeline

ROW to the Gulf of Mexico, and brine discharge. Most of the known breeding nests for brown pelicans in Texas are south of Brazoria County in Corpus Christi Bay, Sundown Island, Matagorda Bay, and Aransas Bay (TPWD 2005). There are no known nesting sites for brown pelicans in the proposed Stratton Ridge site development areas; however, the habitat near the RWI structure and along the proposed brine pipeline ROW is suitable, particularly because the ROW crosses the Brazoria National Wildlife Refuge that provides isolated coastal wetlands habitat for many birds. Part of the brown pelican population spends the nonbreeding and breeding seasons along the Texas coast.

Construction Impacts

No known brown pelican nests are located near the proposed location for the RWI structure or the brine disposal pipeline ROW. In addition, the brine disposal pipeline would be directionally drilled under the beach into the Gulf of Mexico, and total area of construction would be relatively small compared to the entire area available for feeding brown pelicans. Therefore, it is expected that the proposed Stratton Ridge site development would have no effect on the brown pelican species.

Operation and Maintenance Impacts

Operation and maintenance of the proposed Stratton Ridge site would have no effect on brown pelicans because there are no known nests nearby. For the pipeline ROW, the pipeline would be a static structure and would not produce noise that would disturb the pelicans. Maintenance activities along the ROW and at the RWI structure would be infrequent and minor.

H.4.1.1.4 Eskimo Curlew

In the past, the Eskimo curlew has been recorded in Galveston County where the crude oil distribution pipeline would be built along an existing ROW to the Texas City terminal. Historically, the Eskimo curlew migrated through Texas in early March, but it did not breed there. The species is thought to be extinct, and the last sightings in Texas occurred in 1987 (Gollop 1988). Because this species is not known to currently inhabit the area, construction, operation, and maintenance of the crude oil distribution pipeline for the Stratton Ridge development would have no effect on Eskimo curlew.

H.4.1.1.5 Piping Plover

The piping plover has been recorded in both Brazoria and Galveston Counties. All of the proposed development for the Stratton Ridge site would take place within these counties; however, only the brine disposal pipeline ROW and the RWI structure potentially would affect habitat suitable for the piping plover. The ROW for the brine and RWI pipelines would be directionally drilled under the ICW and the brine pipeline would be directionally drilled under the beach into the Gulf of Mexico.

Construction Impacts

More than 35 percent of the known piping plover population winters along the Texas coast from mid-July until early May, and some birds can be found in Texas year round (TPWD 2005). Several areas along the coast in Brazoria and Galveston Counties have been designated as critical habitat (see section H.2.1.5); however, the proposed route of the brine pipeline ROW does not intersect with any of these areas. The brine pipeline ROW would be located more than 6 miles (10 kilometers) northeast of critical habitat Unit TX–33 and more than 11 miles (18 kilometers) southwest of critical habitat Unit TX–34. Because the ROW falls between these two habitats and the brine pipeline would be directionally drilled under the beach to the Gulf of Mexico, there would be no effect on the piping plover from construction of the brine disposal pipeline and RWI structure. The RWI structure would be located adjacent to the ICW, which is not considered suitable habitat for the piping plover.

Operation and Maintenance Impacts

If any piping plovers feed in the area, the pipeline operation would have no affect on the birds, their behavior, or the quality of their habitat. The pipeline would be a static structure, and it would not produce noise that would disturb the plovers. Maintenance activities along the ROW and at the RWI structure would be infrequent and minor. Overall, operations and maintenance would have no effect on piping plovers.

H.4.1.1.6 Whooping Crane

The whooping crane migratory population winters on the Gulf Coast of Texas, but it does not breed there. Suitable habitats for nonbreeding whooping cranes include herbaceous wetlands, lagoons, and tidal flats. The only wild self-sustaining population of the whooping crane in Texas is known to winter in and around the Aransas National Wildlife Refuge, which is in Aransas County more than 100 miles (160 kilometers) southwest of the proposed Stratton Ridge site (TPWD 2005). However, it is possible that some whooping cranes could potentially winter in Brazoria County and other counties nearby. Woodrow (2005) of TPWD noted that there are occurrences of whooping cranes within 1.5 miles (2.4 kilometers) of the proposed Stratton Ridge pipeline ROWs.

Construction Impacts

The RWI structure, the RWI and brine disposal pipelines ROW, the power line ROW to the RWI structure, and the crude oil distribution pipeline ROW all would be located within Brazoria County and could be sited in areas amenable to whooping crane habitat. Whooping cranes often occupy and defend discrete territories, so it would be possible to identify whether whooping crane winter habitats are near construction sites for the proposed Stratton Ridge project. Because the cranes do not nest in Texas, construction would disrupt only a small portion of feeding area at a time. Because power lines would be buried through the Brazoria National Wildlife Refuge, construction would have no effect on the species.

Operation and Maintenance Impacts

Because whooping cranes do not nest in Texas and may only infrequently use the surrounding habitat, the operation and maintenance of the site, RWI structure, and pipeline ROWs would have no effect on the birds, their behavior, or the quality of their habitat. The pipelines would be static structures and would not produce noise that would disturb the cranes. Maintenance activities would be infrequent and minor.

H.4.1.2 Marine Mammals

The construction of the brine disposal pipeline and the operation of the brine disposal system would have no effect on the Gervais beaked whale, goose-beaked whale, pygmy sperm whale, dwarf sperm whale, sperm whale, rough-toothed dolphin, killer whale, false killer whale, short-finned pilot whale, and the pygmy killer whale. These species are found in deeper waters than the terminus of the offshore pipelines and brine diffuser contours (see Appendix C, Brine Plume Modeling). The brine diffuser for the Stratton Ridge site would be located at a depth of 30 feet (9 meters).

Discussion follows on potential impacts on the Atlantic spotted dolphin, the West Indian manatee, and the bottlenose dolphin.

H.4.1.2.1 Atlantic Spotted Dolphin

The Atlantic spotted dolphin is a tropical species that can be found in a variety of areas through the Gulf of Mexico. It ranges from coastal to pelagic environments, typically over the continental shelf and slope. The Atlantic spotted dolphin is usually associated with the Gulf Stream.

Construction Impacts

The Atlantic spotted dolphin species is usually found in deeper waters than the extent of the brine disposal system and brine diffuser, but it is known to venture into shallower waters. The species would likely avoid or leave any areas of construction, and return after construction was complete. There would be no effect on the Atlantic spotted dolphin because of the limited construction time and the relatively small area of the Gulf of Mexico that would be impacted.

Operation Impacts

The Atlantic spotted dolphin may occur in the location of the brine diffuser; however, it is unlikely that the species would remain in the area for an extended period. Because the dissipation of the brine would occur in a relatively small area of the Gulf of Mexico (see Appendix C, Brine Plume Modeling) and the species would not be restricted to such areas, there would be no effect on the Atlantic spotted dolphin.

H.4.1.2.2 West Indian Manatee

The West Indian manatee, also known as the Florida manatee, is found in the warm, coastal and inland waters where it feeds. The manatee typically does not extend beyond the borders of Florida and Alabama, but sometimes it can be found along the entire Gulf of Mexico coastline.

Construction Impacts

The West Indian manatee rarely is found off the coast of Texas or in coastal inland water including the ICW. The species likely would avoid or leave any areas of construction, and return after construction was complete. There would be no effect on the West Indian manatee because it is rarely off the coast of Texas, the limited construction time, and the relatively small area of the Gulf of Mexico that would be impacted.

Operation Impacts

The West Indian manatee is rarely found off the coast of Texas or in coastal inland water including the ICW. The operation of the RWI would not affect the West Indian manatee. There would be no effect on the West Indian manatee because it is rarely off the coast of Texas, the dissipation of the brine would occur in a relatively small area of the Gulf of Mexico, and the species would not be restricted to such areas.

H.4.1.2.3 Bottlenose Dolphin

The bottlenose dolphin (*Tursiops truncatus*) typically can be found in coastal or offshore waters. In the coastal environment, the bottlenose dolphin can be found in warm, sallow inshore waters of bays and rivers. When offshore, it is usually in deep waters over the continental shelf and slope.

Construction Impacts

The bottlenose dolphin may be affected by the construction of the RWI and the brine disposal pipelines for the proposed Stratton Ridge site because it can be found in both onshore and offshore environments. The disturbance created by the construction of the RWI likely would keep the bottlenose dolphin from the immediate area, but it could return after construction was complete. The construction of the brine disposal pipeline and diffuser would create a disturbance that would keep the dolphin from the immediate area, but it would not harm the dolphin.

Operation Impacts

The bottlenose dolphin would not be adversely affected by the operation of the RWI or the brine disposal system. The intake for the raw water would create a slight current (less than 0.5 feet [0.15 meters] per second) that the dolphin could easily avoid. The operation of the brine diffusers offshore for the Stratton Ridge site would not affect the bottlenose dolphin. The dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance. The bottlenose dolphin most likely would avoid the area directly adjacent to the diffuser ports, but this area would be limited in size compared to the area of the Gulf where they would feed.

H.4.1.3 Reptiles

H.4.1.3.1 Atlantic Hawksbill Sea Turtle

The Atlantic hawksbill sea turtle nests from May to November on sandy beaches, often in the proximity of coral reefs. The turtle is seen occasionally in Texas, including coastal areas of Brazoria and Galveston Counties, but more commonly in more tropical waters. The brine disposal pipeline would be the only element of the proposed Stratton Ridge site development with a potential to affect this species.

Construction Impacts

Construction of the brine disposal pipeline onshore would have no effect on this species because directional drilling would be used for the pipeline in the area where it would pass under the beach to the Gulf of Mexico. Offshore pipeline construction temporarily would disturb potential feeding habitat for the Atlantic hawksbill sea turtle; however, the total area affected would be a small portion of the total available area of suitable habitat, and there would be no effect.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would not affect the Atlantic hawksbill sea turtle because the pipeline would be buried. Operation of the offshore component of the brine disposal system would have no effect on the sea turtle’s feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat). Maintenance of the pipeline offshore would be infrequent, and it would not affect the Atlantic hawksbill sea turtle.

H.4.1.3.2 Green Sea Turtle

The green sea turtle nest from March to October in tidal flats, pelagic zones, and isolated sand dunes. The turtle is seen occasionally in Texas, including coastal areas of Brazoria and Galveston Counties, but more commonly in more tropical waters. The brine disposal pipeline would be the only element of the proposed Stratton Ridge development with a potential to affect this species.

Construction Impacts

Construction of the brine disposal pipeline onshore would have no effect on this species because directional drilling would be used for the pipeline in the area where it would pass under the beach to the Gulf of Mexico. Offshore pipeline construction temporarily would disturb potential feeding habitat for the green sea turtle; however, the total area affected would be a small portion of the total available area of suitable habitat, and there would be no effect on the species.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would not affect the green sea turtle because the pipeline would be buried. Operation of the offshore component of the brine disposal system would have no effect on the sea turtle's feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat). Maintenance of the pipeline offshore would be infrequent, and it would not affect the green sea turtle.

H.4.1.3.3 Kemp's Ridley Sea Turtle

The Kemp's Ridley sea turtle inhabits estuarine waters of the Gulf, including coastal areas of Brazoria and Galveston Counties, with nesting occurring on coastal beaches and dunes. Woodrow (2005) of TPWD noted that the Kemp's Ridley sea turtle potentially could inhabit areas near portions of the Stratton Ridge development. The brine disposal pipeline would be the only element of the proposed Stratton Ridge site development with a potential to affect this species.

Construction Impacts

Construction of the brine disposal pipeline onshore would not affect this species because directional drilling would be used for the pipeline, and it would pass under the beach to the Gulf of Mexico. Offshore pipeline construction temporarily would disturb potential feeding habitat for the Kemp's Ridley sea turtle; however, the total area affected would be a small portion of the total available area of suitable habitat, and there would be no effect.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would not affect the Kemp's Ridley sea turtle because the pipeline would be buried. Operation of the offshore component of the brine disposal system would have no effect on the sea turtle's feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat). Maintenance of the pipeline offshore would be infrequent, and it would not affect the Kemp's Ridley sea turtle.

H.4.1.3.4 Leatherback Sea Turtle

The leatherback sea turtle inhabits open ocean waters and seeks moist sand on sloping sandy beaches backed by vegetation for nesting between March and August, and it has been recorded in Brazoria and Galveston Counties. The brine disposal pipeline would be the only element of the proposed Stratton Ridge development with a potential to affect this species.

Construction Impacts

Construction of the brine disposal pipeline onshore would not affect the leatherback sea turtle because directional drilling would be used for the pipeline, and it would pass under the beach to the Gulf of Mexico. Offshore pipeline construction temporarily would disturb potential feeding habitat for the leatherback sea turtle; however, the total area affected would be a small portion of the total available area of suitable habitat, and there would be no effect.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would not affect the leatherback sea turtle because the pipeline would be buried. Operation of the offshore component of the brine disposal system would have no effect on the sea turtle's feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat). Maintenance of the pipeline offshore would be infrequent, and it would not affect the leatherback sea turtle.

H.4.1.3.5 Loggerhead Sea Turtle

The loggerhead sea turtle can be found in both open ocean waters and along the coast and in near-shore waters (such as river mouths), and it nests on Gulf Coast beaches, including those of Brazoria and Galveston Counties. The brine disposal pipeline would be the only element of the proposed Stratton Ridge site development with a potential to affect this species.

Construction Impacts

Construction of the brine disposal pipeline onshore would not affect the loggerhead sea turtle because directional drilling would be used for the pipeline and it would pass under the beach to the Gulf of Mexico. Offshore pipeline construction would temporarily disturb potential feeding habitat for the loggerhead sea turtle. However, the total area affected would be a small portion of the total available area of suitable habitat, and there would be no effect.

Operation and Maintenance Impacts

Operation and maintenance of the onshore portion of the brine disposal pipeline would not affect the loggerhead sea turtle because the pipeline would be buried. Operation of the offshore component of the brine disposal system would have negligible impact on the sea turtle's feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat). Maintenance of the pipeline offshore would be infrequent and would not affect the loggerhead sea turtle.

H.4.2 Big Hill, Texas

This assessment for the proposed Big Hill expansion site evaluates the potential effects on threatened, endangered, and candidate species by each of the elements of the proposed site expansion listed in table H.4.2-1.

The following paragraphs describe the evaluation findings for each species that could result from the elements of the proposed action at the Big Hill site expansion.

Table H.4.2-1: Elements of the Proposed Action and Location at the Proposed Big Hill Expansion Site

Element of Proposed Action	Location by County or Offshore Area
Big Hill candidate site	Jefferson
Oil distribution pipeline ROW from Big Hill to the Sun Terminal in Nederland	Jefferson
Brine disposal pipeline[a] ROW	Jefferson
Offshore brine pipeline and diffuser	Gulf of Mexico

[a] Only 7,000 feet (2,130 meters) of the brine disposal pipeline, starting from where it leaves the site, would be replaced.

H.4.2.1 Bird

The piping plover is known to inhabit Jefferson County, and the species uses beaches, mudflats, and sandflats on the Gulf of Mexico and the ICW for feeding but not nesting. The proposed expansion development would not be located in this type of habitat; therefore, construction, operation, and maintenance activities associated with the Big Hill expansion would have no effect on the piping plover.

H.4.2.2 Marine Mammals

The operation of the brine disposal system would have no effect on the Gervais beaked whale, goose-beaked whale, pygmy sperm whale, dwarf sperm whale, sperm whale, rough-toothed dolphin, killer whale, false killer whale, short-finned pilot whale, or the pygmy killer whale. These species are found in deeper waters than the brine diffuser contours (see Appendix C, Brine Plume Modeling).

The next paragraphs describe potential impacts on the Atlantic spotted dolphin and the West Indian manatee.

H.4.2.2.1 Atlantic Spotted Dolphin

The Atlantic spotted dolphin is a tropical species that can be found in a variety of areas through the Gulf of Mexico. This dolphin ranges from coastal to pelagic environments, typically over the continental shelf and slope. The Atlantic spotted dolphin is usually associated with the Gulf Stream.

Construction Impacts

No offshore construction is associated with the proposed Big Hill expansion; therefore, there would be no effect to the Atlantic spotted dolphin.

Operation Impacts

The Atlantic spotted dolphin may occur in the location of the brine diffusion; however, it is unlikely that the species would remain in the area for an extended period. Because the dissipation of the brine would occur in a relatively small area of the Gulf of Mexico and the species would not be restricted to such areas, there would be no effect on the Atlantic spotted dolphin.

H.4.2.2.2 West Indian Manatee

The West Indian manatee, also known as the Florida manatee, is found in the warm, coastal and inland waters where it feeds. The manatee typically does not extend beyond the borders of Florida and Alabama, but sometimes it is found along the entire coast of the Gulf of Mexico.

Construction Impacts

No offshore construction is associated with the proposed Big Hill expansion; therefore, there would be no effect to the West Indian manatee.

Operation Impacts

The West Indian manatee is rarely found off the coast of Texas or in coastal inland water including the ICW. The operation of the RWI would not affect the West Indian manatee. There would be no effect on the West Indian manatee because it rarely occurs off the coast of Texas, the dissipation of the brine would occur in a relatively small area of the Gulf of Mexico, and the species would not be restricted to such areas.

H.4.2.2.3 Bottlenose Dolphin

The bottlenose dolphin (*Tursiops truncatus*) typically can be found in coastal or offshore waters. In the coastal environment, the bottlenose dolphin can be found in warm, sallow inshore waters of bays and rivers. When offshore, it is usually in deep waters over the continental shelf and slope.

Construction Impacts

No offshore construction is associated with the proposed Big Hill expansion; therefore, there would be no effect to the bottlenose dolphin.

Operation Impacts

The operation of the brine diffusers offshore for the Big Hill site would not impact the bottlenose dolphin. The dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance. The bottlenose dolphin most likely would avoid the area directly adjacent to the diffuser ports, but this area would be limited in size compared to the area of the Gulf where the species would feed.

H.4.2.3 Reptiles

H.4.2.3.1 Atlantic Hawksbill Sea Turtle

The Atlantic hawksbill turtle nests from May to November on sandy beaches, often in the proximity of coral reefs. The turtle is occasionally seen in Texas, including Jefferson County, but more commonly it is found in more tropical waters. None of the new development for the expansion of the Big Hill site would be located in this type of habitat; therefore, construction of the Big Hill expansion would have no effect on the Atlantic hawksbill sea turtle. Operation of the offshore component of the brine disposal system would result in a brine plume; however, the plume would have no effect on the sea turtle’s feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat).

H.4.2.3.2 Green Sea Turtle

The green sea turtle nests from March to October in tidal flats, pelagic zones, and isolated sand dunes. The turtle is occasionally seen in Texas, including Jefferson County, but more commonly it is found in more tropical waters. No new development would be required for the expansion of the Big Hill site in this type of habitat; therefore, construction of the Big Hill expansion would have no effect on the green sea turtle. Operation of the offshore component of the brine disposal system would result in a brine plume; however, the plume would have no effect on the sea turtle's feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat).

H.4.2.3.3 Kemp's Ridley Sea Turtle

The Kemp's Ridley sea turtle inhabits estuarine waters of the Gulf Coast, including coastal areas of Jefferson County, with nesting occurring on coastal beaches and dunes. No new development for the expansion of the Big Hill site would be located in this type of habitat; therefore, construction of the Big Hill expansion would have no effect on the Kemp's Ridley sea turtle. Operation of the offshore component of the brine disposal system would result in a brine plume; however, the plume would have no effect on the sea turtle's feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat).

H.4.2.3.4 Leatherback Sea Turtle

The leatherback sea turtle inhabits open ocean waters and seeks moist sand on sloping sandy beaches backed by vegetation for nesting between March and August. The turtle is found along the Gulf, including coastal areas of Jefferson County. No new development for the expansion of the Big Hill site would be located in this type of habitat; therefore, construction of the Big Hill expansion would have no effect on the leatherback sea turtle. Operation of the offshore component of the brine disposal system would result in a brine plume; however, the plume would have no effect on the sea turtle's feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat).

H.4.2.3.5 Loggerhead Sea Turtle

The loggerhead sea turtle may nest Gulf Coast beaches, including those of Jefferson County. No new development for the expansion of the Big Hill site would be located in this type of habitat; therefore, construction of the Big Hill expansion would have no effect on the loggerhead sea turtle. Operation of the offshore component of the brine disposal system would result in a brine plume; however, the plume would have no effect on the sea turtle's feeding and habitat because the dissipation of the concentrated brine would allow for ambient or near-ambient conditions to exist in a short distance (see Appendix E, Essential Fish Habitat).

H.4.3 Assessment Summary for the Stratton Ridge and Big Hill Sites

Tables H.4.3-1 through H.4.3-4 identify the threatened, endangered, and candidate species that may be affected by each element the proposed new Stratton Ridge site and proposed expansion of the Big Hill site. DOE estimated the potential for effects based on information about the presence or absence of the species and suitable habitat in areas that would be affected by development. The evaluation also considered the potential mitigation factors. Tables H.4.3-1 and H.4.3-3 identify whether construction

Table H.4.3-1: Summary of Potential Construction-Related Impacts on Threatened and Endangered Species at the Proposed Stratton Ridge Site

Species	SPR Storage Site	Stratton Ridge to Texas City ROW	RWI and ROW to ICW	Brine Disposal Pipeline ROW to Gulf of Mexico	Offshore Brine Diffuser Discharge
Birds					
Attwater's Greater Prairie Chicken	No effect	No effect	No effect	No effect	No effect
Bald Eagle	May affect	No effect	May affect	No effect	No effect
Brown Pelican	No effect	No effect	No effect	No effect	No effect
Eskimo Curlew	No effect	No effect	No effect	No effect	No effect
Piping Plover	No effect	No effect	No effect	No effect	No effect
Whooping Crane	No effect	No effect	No effect	No effect	No effect
Marine Mammals					
Gervais Beaked Whale	No effect	No effect	No effect	No effect	No effect
Goose-Beaked Whale	No effect	No effect	No effect	No effect	No effect
Pygmy Sperm Whale	No effect	No effect	No effect	No effect	No effect
Dwarf Sperm Whale	No effect	No effect	No effect	No effect	No effect
Sperm Whale	No effect	No effect	No effect	No effect	No effect
Atlantic Spotted Dolphin	No effect	No effect	No effect	No effect	No effect
Rough-Toothed Dolphin	No effect	No effect	No effect	No effect	No effect
Killer Whale	No effect	No effect	No effect	No effect	No effect
False Killer Whale	No effect	No effect	No effect	No effect	No effect
Short-Finned Pilot Whale	No effect	No effect	No effect	No effect	No effect
Pygmy Killer Whale	No effect	No effect	No effect	No effect	No effect
West Indian Manatee	No effect	No effect	No effect	No effect	No effect
Bottlenose Dolphin	No effect	No effect	No effect	No effect	No effect
Reptiles					
Atlantic Hawksbill Sea Turtle	No effect	No effect	No effect	No effect	No effect
Green Sea Turtle	No effect	No effect	No effect	No effect	No effect
Kemps Ridley Sea Turtle	No effect	No effect	No effect	No effect	No effect
Leatherback Sea Turtle	No effect	No effect	No effect	No effect	No effect
Loggerhead Sea Turtle	No effect	No effect	No effect	No effect	No effect

Table H.4.3-2: Summary of Potential Operation and Maintenance Impacts to Affect Threatened and Endangered Species at the Proposed Stratton Ridge Site

Species	SPR Storage Site	Stratton Ridge to Texas City ROW	RWI and ROW to ICW	Brine Disposal Pipeline ROW to Gulf of Mexico	Offshore Brine Diffuser Discharge
Birds					
Attwater's Greater Prairie Chicken	No effect	No effect	No effect	No effect	No effect
Bald Eagle	May affect	No effect	May affect	No effect	No effect
Brown Pelican	No effect	No effect	No effect	No effect	No effect
Eskimo Curlew	No effect	No effect	No effect	No effect	No effect
Piping Plover	No effect	No effect	No effect	No effect	No effect
Whooping Crane	No effect	No effect	No effect	No effect	No effect
Marine Mammals					
Gervais Beaked Whale	No effect	No effect	No effect	No effect	No effect
Goose-Beaked Whale	No effect	No effect	No effect	No effect	No effect
Pygmy Sperm Whale	No effect	No effect	No effect	No effect	No effect
Dwarf Sperm Whale	No effect	No effect	No effect	No effect	No effect
Sperm Whale	No effect	No effect	No effect	No effect	No effect
Atlantic Spotted Dolphin	No effect	No effect	No effect	No effect	No effect
Rough-Toothed Dolphin	No effect	No effect	No effect	No effect	No effect
Killer Whale	No effect	No effect	No effect	No effect	No effect
False Killer Whale	No effect	No effect	No effect	No effect	No effect
Short-Finned Pilot Whale	No effect	No effect	No effect	No effect	No effect
Pygmy Killer Whale	No effect	No effect	No effect	No effect	No effect
West Indian Manatee	No effect	No effect	No effect	No effect	No effect
Bottlenose Dolphin	No effect	No effect	No effect	No effect	No effect
Reptiles					
Atlantic Hawksbill Sea Turtle	No effect	No effect	No effect	No effect	No effect
Green Sea Turtle	No effect	No effect	No effect	No effect	No effect
Kemps Ridley Sea Turtle	No effect	No effect	No effect	No effect	No effect
Leatherback Sea Turtle	No effect	No effect	No effect	No effect	No effect
Loggerhead Sea Turtle	No effect	No effect	No effect	No effect	No effect

Table H.4.3-3: Summary of Potential of Construction-Related Impacts on Threatened and Endangered Species at Proposed Big Hill Expansion Site

Species	SPR Storage Site	Big Hill Site to Shell Crude Oil Pipeline ROW	Brine Disposal Pipeline ROW	Brine Diffuser Discharge
Bird				
Piping Plover	No effect	No effect	No effect	No effect
Marine Mammals				
Gervais Beaked Whale	No effect	No effect	No effect	No effect
Goose-Beaked Whale	No effect	No effect	No effect	No effect
Pygmy Sperm Whale	No effect	No effect	No effect	No effect
Dwarf Sperm Whale	No effect	No effect	No effect	No effect
Sperm Whale	No effect	No effect	No effect	No effect
Atlantic Spotted Dolphin	No effect	No effect	No effect	No effect
Rough-Toothed Dolphin	No effect	No effect	No effect	No effect
Killer Whale	No effect	No effect	No effect	No effect
False Killer Whale	No effect	No effect	No effect	No effect
Short-Finned Pilot Whale	No effect	No effect	No effect	No effect
Pygmy Killer Whale	No effect	No effect	No effect	No effect
West Indian Manatee	No effect	No effect	No effect	No effect
Bottlenose Dolphin	No effect	No effect	No effect	No effect
Reptiles				
Atlantic Hawksbill Sea Turtle	No effect	No effect	No effect	No effect
Green Sea Turtle	No effect	No effect	No effect	No effect
Kemps Ridley Sea Turtle	No effect	No effect	No effect	No effect
Leatherback Sea Turtle	No effect	No effect	No effect	No effect
Loggerhead Sea Turtle	No effect	No effect	No effect	No effect

Table H.4.3-4: Summary of Potential Operation and Maintenance Impacts to Threatened and Endangered Species from Proposed Big Hill Site Expansion

Species	SPR Storage Site	Big Hill Site to Shell Crude Oil Pipeline ROW	Brine Disposal Pipeline ROW	Brine Diffuser Discharge
Bird				
Piping Plover	No effect	No effect	No effect	No effect
Marine Mammals				
Gervais Beaked Whale	No effect	No effect	No effect	No effect
Goose-Beaked Whale	No effect	No effect	No effect	No effect
Pygmy Sperm Whale	No effect	No effect	No effect	No effect
Dwarf Sperm Whale	No effect	No effect	No effect	No effect
Sperm Whale	No effect	No effect	No effect	No effect
Atlantic Spotted Dolphin	No effect	No effect	No effect	No effect
Rough-Toothed Dolphin	No effect	No effect	No effect	No effect
Killer Whale	No effect	No effect	No effect	No effect
False Killer Whale	No effect	No effect	No effect	No effect
Short-Finned Pilot Whale	No effect	No effect	No effect	No effect
Pygmy Killer Whale	No effect	No effect	No effect	No effect
West Indian Manatee	No effect	No effect	No effect	No effect
Bottlenose Dolphin	No effect	No effect	No effect	No effect
Reptiles				
Atlantic Hawksbill Sea Turtle	No effect	No effect	No effect	No effect
Green Sea Turtle	No effect	No effect	No effect	No effect
Kemps Ridley Sea Turtle	No effect	No effect	No effect	No effect
Leatherback Sea Turtle	No effect	No effect	No effect	No effect
Loggerhead Sea Turtle	No effect	No effect	No effect	No effect

activities for each site may affect species. Tables H.4.3-2 and H.4.3-4 summarize whether operation and maintenance activities for each site may affect species.

Table H.4.3-5 summarizes the number of species that would be affected by construction or operations and maintenance for both of the sites in Texas. This summary shows that with the current information, only one species (the bald eagle) may be affected by the construction and operation of the proposed new Stratton Ridge site, and no species would be affected by the proposed expansion of the Big Hill site.

Table H.4.3-5: Summary of the Number of Species Potentially Affected

Potential for Effect	Number of Species			
	Stratton Ridge, Texas		Big Hill, Texas	
	Construction	Operation and Maintenance	Construction	Operation and Maintenance
No effect	23	23	19	19
May affect	1	1	0	0

H.5 RECOMMENDATIONS

The evaluation of potential impacts described in section H.4 considered how some potential impacts could be minimized, avoided, or more accurately forecasted by the use of preconstruction field investigations, mitigation measures, and other precautionary measures. The following recommendations summarize the types of measures identified in section H.4 that would lessen the potential for effects caused by the development of the proposed new and expansion SPR sites in Texas. Additional measures may be identified during detailed planning if DOE were to select both the Stratton Ridge site and the Big Hill site for development or only the expansion of the Big Hill site.

H.5.1 Recommendations for Stratton Ridge, Texas

- Conduct a preconstruction survey to identify bald eagle nests within 0.25 miles (0.4 kilometers) of the proposed Stratton Ridge site and the proposed ROW from the site to the Gulf of Mexico for the RWI and brine disposal pipelines and power lines in Brazoria County, Texas. If any nests are found, consult with the USFWS and TPWD and implement appropriate mitigation strategies. For example, construction of the pipeline could be completed to avoid the time when nesting bald eagles are particularly sensitive to human activity. If nests or active foraging are identified near the proposed RWI structure, DOE would use noise attenuation measures such as concrete enclosures for the pumps and installation of quieter pump equipment.

- Coordinate with USFWS and TPWD if any protected species are observed or suitable habitat is determined to be present onsite.

- Use directional drilling in all beach crossings to avoid affecting sea turtles and sea birds that use the beaches.

H.5.2 Recommendations for Big Hill, Texas

Coordinate with USFWS and TPWD if any protected species are observed or suitable habitat is determined to be present onsite.

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Appendix I
State Listed Species Screening Evaluation

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Appendix I
State Listed Species Screening Evaluation

I.1 INTRODUCTION

This appendix to the draft environmental impact statement (DEIS) analyzes potential effects of the expansion of the Strategic Petroleum Reserve (SPR) on endangered and threatened species protected under State laws in Louisiana, Mississippi, and Texas. The potential impacts to species that are afforded protection under both Federal and state laws are described in appendices F, G, and H respectively. The potential expansion would involve developing additional storage capacity at up to three existing sites (West Hackberry and Bayou Choctaw in Louisiana and Big Hill in Texas) or developing one of five new sites (Chacahoula and Clovelly in Louisiana, Richton and Bruinsburg in Mississippi, and Stratton Ridge in Texas), or a combination of the sites at Clovelly and Bruinsburg. In addition, this appendix includes an analysis of species listed as regional forest service sensitive species in the Homochitto National Forest (USDA 2000). Part of the proposed pipelines associated with the Bruinsburg site would include land in the National forest. No screening table was prepared for Louisiana because species on the State list could be affected by proposed action concerning threatened and endangered species on the Federal list. Appendix F contains an evaluation of those species.

I.2 SCREENING EVALUATION TABLES

The following screening evaluation tables indicate threatened or endangered species on the State list and forest service sensitive species that may have a habitat in a proposed new or expansion SPR site or its associated infrastructure (e.g. terminals, pipeline and power line rights-of-way). To collect information for this screening evaluation, the Department of Energy (DOE) consulted state-based land cover data, U.S. Fish and Wildlife Wetland inventory data, state data from fish and wildlife agencies and natural heritage programs (LNHP 2004; MMNS 2002; TPWD 2005), and literature reviews covering threatened and endangered species in each state to define preferred habitats and life cycles. Results of this screening evaluation of all the state-listed species that may be affected by construction and operation of any of the proposed new or expansion sites and its associated elements appears in corresponding chapter sections of the DEIS.

Following is a list of screening evaluation tables that appear in this appendix:

Table I.2-1: State Threatened or Endangered Species and Forest Service Sensitive Species in Area of Proposed Bruinsburg, MS, Site[a]

Species Information					Potential Presence of Species Based on Preferred Habitat of the Species and the Existing Habitat							
Common Name	**Latin Name**	**County or Parish**	**State Status[b]**	**Habitat Description**	**Candidate Site**	**Bruinsburg to Peetsville ROW and Terminal**	**Bruinsburg to Anchorage ROW and Terminal**	**Bruinsburg to Vicksburg ROW**	**Bruinsburg to Jackson ROW and Terminal**	**RWI and ROW**	**Brine Disposal ROW**	**References**
Birds												
Arctic Peregrine Falcon[c]	*Falco peregrinus tundrius*	*Louisiana:* East and West Feliciana, East and West Baton Rouge	T/E	Occurs in the barrier islands along the Gulf Coast, which are important feeding areas for long-distance migrants.								24
Bewick's Wren	*Thryomanes bewickii*	*Mississippi:* Warren	E	Occurs in old fields, chaparral, coniferous and hardwood forests, and suburban areas and orchards.				X	X			24
Fish												
Crystal Darter[d]	*Crystallaria asprella*	*Mississippi:* Copiah, Claiborne	E	Occurs in small- to medium-sized freshwater rivers, and prefers water more than 2-feet (60-centimeters) deep with a strong current and a clean sand and/or gravel bottom.		X		X	X	X		24
Frecklebelly Madtom[e]	*Noturus munitus*	*Mississippi:* Copiah	E	Thrives in large- to medium-sized rivers with a high to moderate gradient.		X		X	X	X		24
Southern Redbelly Dace[f]	*Phoxinus erythrogaster*	*Mississippi:* Wilkinson, Warren	E	Occurs in small creeks and prefers headwaters and upland creeks with clear water. Spawning takes place from April to June in the south, most often in shallow water near riffles among gravel, and occasionally in nests of other species.			X	X	X			24

Table I.2-1: State Threatened or Endangered Species and Forest Service Sensitive Species in Area of Proposed Bruinsburg, MS, Site[a]

Species Information					Potential Presence of Species Based on Preferred Habitat of the Species and the Existing Habitat							
Common Name	**Latin Name**	**County or Parish**	**State Status[b]**	**Habitat Description**	**Candidate Site**	**Bruinsburg to Peetsville ROW and Terminal**	**Bruinsburg to Anchorage ROW and Terminal**	**Bruinsburg to Vicksburg ROW**	**Bruinsburg to Jackson ROW and Terminal**	**RWI and ROW**	**Brine Disposal ROW**	**References**
Invertebrates												
Pearl Blackwater Crayfish	*Procambarus penni*	*Mississippi:* Copiah	NA[g]	Burrows in streambeds, banks, and dry water bodies, including areas in Homochitto National Forest.		X						16. 33
Sheepnose	*Plethobasus Cyphyus*	*Mississippi:* Hinds and Warren	E	Occurs mainly in large rivers (but also medium-sized rivers) where it is usually found in water more than 6.6 feet (2 meters) deep with a slight to swift current and a mud, sand, or gravel bottom.				X	X			12, 27
Rabbitsfoot	*Quadrula cylindrica cylindrical*	*Mississippi:* Hinds	E	Occurs in small- and medium-sized rivers with moderate to swift currents, in sand and gravel in medium- to large-sized rivers, and in bars or gravel close to a fast current in smaller streams. Generally inhabits water up to 9.8 feet (3 meters) deep.				X	X			8, 12, 26
Mammals												
Southeastern Shrew	*Sorex longirostris*	*Mississippi*[h]	NA[g]	Occurs in various habitats ranging from bogs to damp woods to uplands shrub and scrub or wooded areas; however, prefers moist to wet areas, often associated with heavy ground cover, including areas in Homochitto National Forest.		X						24, 33

Table I.2-1: State Threatened or Endangered Species and Forest Service Sensitive Species in Area of Proposed Bruinsburg, MS, Site[a]

Species Information					Potential Presence of Species Based on Preferred Habitat of the Species and the Existing Habitat							References
Common Name	Latin Name	County or Parish	State Status[b]	Habitat Description	Candidate Site	Bruinsburg to Peetsville ROW and Terminal	Bruinsburg to Anchorage ROW and Terminal	Bruinsburg to Vicksburg ROW	Bruinsburg to Jackson ROW and Terminal	RWI and ROW	Brine Disposal ROW	
Plants												
Trillium	*Trillium foetidissimum*	*Mississippi:* Adams, Claiborne, Copiah, Jefferson, Lincoln, Wilkinson	NA[g]	Occurs in moderately moist deciduous woodlands with rich soil usually including loess (an unstratified loamy deposit chiefly deposited by the wind), on moderate to steep slopes, sides of ravines, and knolls within floodplain forests, including areas in Homochitto National Forest.		X						24, 33
Reptiles												
Rainbow Snake	*Farancia erytrogramma*	*Mississippi:* Copiah	E	Usually found in or near streams, marshes, springs, and sandy fields.	X	X	X	X	X	X	X	11

RWI = raw water intake; ROW = right-of-way

Notes:

[a] Species on State lists that are also on Federal lists as endangered, threatened, or candidate species are not included in this table because they are evaluated in detail in Appendix G Evaluations of Special Status Species in Mississippi. Excluded species are:

> **Birds:** Bald eagle, interior least tern, red-cockaded woodpecker;
> **Fish:** Bayou darter, Gulf sturgeon, pallid sturgeon;
> **Invertebrates:** Alabama heelsplitter mussel, fat pocketbook mussel;
> **Mammals:** Louisiana black bear, West Indian manatee; and
> **Reptiles:** Ringed map turtle.

[b] **State Status:** T=threatened; E=endangered.

[c] **Arctic peregrine falcon:** Preferred habitat is not present at the proposed Bruinsburg site.

[d] **Crystal darter:** DOE is consulting with the U.S. Fish and Wildlife Service, the Mississippi Department of Wildlife, Fisheries, and Parks, and the Mississippi Museum of Natural Science about specific water bodies in Copiah and Claiborne Counties where this species is found. Impacts associated with the Peetsville ROW would be possible if the species is found in Clarks Creek (a tributary to Bayou Pierre) or the Homochitto River. Impacts associated with the raw water intake could occur if the species is in the Mississippi River. No impacts would occur if the species is found in Bayou Pierre.

[e] **Frecklebelly madtom**: DOE is consulting with the U.S. Fish and Wildlife Service, the Mississippi Department of Wildlife, Fisheries, and Parks, and the Mississippi Museum of Natural Science about specific water bodies in Copiah County where this species is found. Impacts associated with the Peetsville ROW would be possible if the species is found in Clarks Creek (a tributary to Bayou Pierre). Impacts associated with the raw water intake could occur if the species is found in the Mississippi River. No impacts would occur if the species is found in Bayou Pierre.

[f] **Southern redbelly dace**: DOE is consulting with the U.S. Fish and Wildlife Service, the Mississippi Department of Wildlife, Fisheries, and Parks, and the Mississippi Museum of Natural Science about specific water bodies in Wilkinson County. The only pipeline proposed to cross this county is at the Buffalo River. Potential impacts would not be expected if the species is not in the Buffalo River. If it is found in the river, directional drilling may be a construction consideration.

[g] Pearl blackwater crayfish, southeastern shrew, and trillium do not have a State status of threatened or endangered in Mississippi; however, these species are listed as regional forest service sensitive species in the Homochitto National Forest according to the National Forests in Mississippi Forest Plan (USDA 2000).

[h] The southeastern shrew is found throughout Mississippi, but it is not specifically listed in any of the counties associated with the proposed Bruinsburg candidate site. The U.S. Forest Service lists the southeastern shrew as a regional forest service sensitive species in the Homochitto National Forest (USDA 2000); therefore, it is included in this list.

Table I.2-2: State Threatened or Endangered Species in Area of Proposed Richton, MS, Site[a]

Species Information					Potential Presence of Species Based on Preferred Habitat of the Species and the Existing Habitat					
Common Name	Latin Name	County	State Status[b]	Habitat Description	Candidate Site	Richton to Pascagoula ROW and Terminal	Richton to Liberty Station ROW and Terminal	RWI and ROW	Brine Diffuser and ROW	References
Amphibians										
Dark Gopher Frog	*Rana sevosa*	*Mississippi:* Forrest, Jackson	E	Occurs in upland evergreen forested areas and prefers upland sandy areas historically forested with longleaf pine with isolated temporary wetland breeding sites nearby.		X	X			1
One-Toed Amphiuma	*Amphiuma pholeter*	*Mississippi:* Jackson	E	Occurs in swamps and slow-moving streams and prefers deep, organic, liquid muck in swamps, spring runs, and occasionally floodplain swampy streams.		X			X	24
Birds										
Bewick's Wren	*Thryomanes bewickii*	*Mississippi:* Jackson	E	Occurs in old fields, chaparral, coniferous and hardwood forests, and suburban areas and orchards.		X				24
Fish										
Crystal Darter[c]	*Crystallaria asparella*	*Mississippi:* Marion	E	Occurs in small- to medium-sized freshwater rivers, and prefers water more than 2-feet (60-centimeters) deep with a strong current on a clean sand and/or gravel bottom.			X			24
Frecklebelly Madtom[d]	*Noturus munitus*	*Mississippi:* Marion, Pike, Walthall	E	Thrives in large- to medium-sized rivers with a high to moderate gradient.			X			24
Ironcolor Shiner[e]	*Notropis chalybaeus*	*Mississippi:* Marion	E	Occurs in pools and slow runs of streams with a low gradient, small acidic creeks, and rivers with a sandy substrate and clear, well-vegetated water.			X			24
Invertebrates										
Delicate Spike[f]	*Elliptio arctata*	*Mississippi:* George	E	Found in rivers along the shoreline and among rocks, sand, and gravel.						5, 17

Table I.2-2: State Threatened or Endangered Species in Area of Proposed Richton, MS, Site[a]

Species Information					Potential Presence of Species Based on Preferred Habitat of the Species and the Existing Habitat					
Common Name	**Latin Name**	**County**	**State Status[b]**	**Habitat Description**	**Candidate Site**	**Richton to Pascagoula ROW and Terminal**	**Richton to Liberty Station ROW and Terminal**	**RWI and ROW**	**Brine Diffuser and ROW**	**References**
Reptiles										
Rainbow Snake	*Farancia erytrogramma*	*Mississippi:* Forrest, Jackson, Lamar	E	Usually found in or near streams, marshes, springs, and sandy fields.		X	X			11
Southern Hognose Snake	*Heterodon simus*	*Mississippi:* Forrest	E	Thrives in open, well-drained, sandy soil habitats in the southeastern United States.			X			7

RWI = raw water intake; ROW = right-of-way.

Notes:

[a] Species on State lists that are also on Federal lists as endangered, threatened, or candidate species are not included in this table because they are evaluated in detail in Appendix G Evaluations of Special Status Species in Mississippi. Excluded species are:

> **Birds:** Bald eagle, brown pelican, Mississippi sandhill crane, piping plover, red-cockaded woodpecker;
> **Fish:** Gulf sturgeon, pearl darter;
> **Invertebrates:** Camp Shelby burrowing crayfish;
> **Mammals:** Gray myotis, Louisiana black bear;
> **Plants:** Louisiana quillwort; and
> **Reptiles:** Alabama red-belly turtle, black pine snake, eastern indigo snake, gopher tortoise, Kemps Ridley sea turtle, loggerhead sea turtle, ringed map turtle, yellow-blotched map turtle.

[b] State Status T=threatened; E=endangered.

[c] Crystal darter: Species is in the Pearl River. No impact is expected because directional drilling would be used for the crossing.

[d] Frecklebelly madtom: Species is in the Pearl River and the Bogue Chitto River. No impact is expected at the Pearl River and Bogue Chitto River, because directional drilling would be used for the crossing.

[e] Ironcolor shiner: Species is in the Pearl River. No impact is expected because directional drilling would be used for the crossing.

[f] Delicate spike: Pascagoula ROW does not cross Pascagoula River where this species is found in George County.

Table I.2-3: State Threatened or Endangered Species in Area of Proposed Stratton Ridge, TX, Site[a]

Species Information					Potential Presence of Species Based on Preferred Habitat of the Species and the Existing Habitat					
Common Name	Latin Name	County	State Status[b]	Habitat Description	Candidate Site	Stratton Ridge to Texas City ROW and Terminal	RWI and ROW to Intracoastal Waterway	ROW to Gulf of Mexico	Offshore Brine Diffuser	References
Birds										
Arctic Peregrine Falcon	*Falco peregrinus tundrus*	Brazoria, Galveston	T	Occurs in the barrier islands along the Gulf coast, which are important feeding areas for long-distance migrants.				X		24
Eastern Brown Pelican	*Pelecanus occidentalis*	Brazoria, Galveston	E	Nests on small, isolated coastal islands where it is safe from predators.			X	X		32
Reddish Egret	*Egretta rufescens*	Brazoria, Galveston	T	Found in estuarine habitats where it forages in shallow water. Nests typically are located on natural or manmade dredge spoil islands, or occasionally on the mainland in mangrove swamps and terrestrial vegetation.			X	X		24, 28
Sooty Tern	*Sterna fuscata*	Brazoria, Galveston	T	Typically nests on remote outlying islets and rocks, sandy beaches, bare ground, or coral, most often with scattered grasses present or among bushes, occasionally on rocky ledges. Nonbreeding habitat is primarily pelagic.			X	X		24
Swallow-Tailed Kite	*Elanoides forficatus*	Brazoria, Galveston	T	Found in diverse vegetation types, including pine forests, savannas, cypress and cypress-hardwood swamps, mangrove swamps, hardwood hammocks, riparian forests, prairies, and freshwater and brackish marshes.	X	X	X			21. 31
White-Faced Ibis	*Plegadis chihi*	Brazoria, Galveston	T	Occurs in freshwater habitats, including marshes, swamps, ponds, and rivers in tropical to temperate zones.	X	X	X			2
White-Tailed Hawk	*Buteo albicaudatus*	Brazoria, Galveston	T	Thrives in prairies near the coastline, cordgrass flats, scrub-live oak, mesquite and oak savannas, and mixed savanna-chaparral.			X	X		18
Wood Stork	*Mycteria Americana*	Brazoria, Galveston	T	Found in freshwater marshes, swamps, lagoons, and ponds; forages in shallow freshwater wetlands, and has also been reported in brackish wetlands.	X	X	X	X		25

Table I.2-3: State Threatened or Endangered Species in Area of Proposed Stratton Ridge, TX, Site[a]

Species Information					Potential Presence of Species Based on Preferred Habitat of the Species and the Existing Habitat					
Common Name	Latin Name	County	State Status[b]	Habitat Description	Candidate Site	Stratton Ridge to Texas City ROW and Terminal	RWI and ROW to Intracoastal Waterway	ROW to Gulf of Mexico	Offshore Brine Diffuser	References
Fish										
Paddlefish[c]	*Polyodon spathula*	Brazoria, Galveston	T	Occurs in medium- and large-sized rivers and seeks slow-flowing segments with depths greater than 5 feet (1.5 meters). During winter, moves to deeper water, and in the summer is often found in areas downstream from submerged sandbars.						6, 29
Mammals										
Black Bear	*Ursus americanus*	Brazoria, Galveston	T	Occurs in mixed deciduous-coniferous forests and prefers areas with a thick understory.	X					15
Reptiles										
Alligator Snapping Turtle	*Macrochelys temminckii*	Galveston	T	Occurs in deep rivers, canals, and lakes associated with rivers, swamps, bayous, ponds near rivers, shallow tributaries to rivers, and sometimes the brackish waters near river mouths. Seeks segments with slow-moving currents.			X			24
Smooth Green Snake	*Liochlorphis vernalis*	Brazoria, Galveston	T	Occurs in grassland and forest and often can be found in burrows, fallen logs, and debris.	X	X	X			24
Texas Horned Lizard[c]	*Phrynosoma cornutum*	Brazoria, Galveston	T	Thrives in arid and semi-arid regions of sparse vegetation, including deserts, prairies, bajadas, dunes, and foothills.						4, 9, 13, 30
Timber Rattlesnake[c]	*Crotalus horridus*	Brazoria, Galveston	T	Seeks high, dry ridges with oak-hickory forest interspersed with open areas and deciduous forests with rock outcrops.						10, 22

RWI = raw water intake; ROW = right-of-way

NOTES:

[a] Species on State lists that are also on Federal lists as endangered, threatened, or candidate species are not included in this table because they are evaluated in detail in Appendix H Evaluations of Special Status Species in Texas. Excluded species are:

Birds: Attwater's greater prairie chicken, bald eagle, brown pelican, Eskimo curlew, least tern, piping plover, whooping crane;
Mammals: Jaguarundi, red wolf, West Indian manatee; and
Reptiles: Atlantic hawksbill sea turtle, green sea turtle, Kemp's Ridley sea turtle, leatherback sea turtle, loggerhead sea turtle.

[b] **State Status** T=threatened; E=endangered.

[c] **Paddlefish, Texas horned lizard, and timber rattlesnake:** Habitats for these species are not found on the proposed Stratton Ridge site.

Table I.2-4: State Threatened or Endangered Species in Area of Proposed Big Hill, TX, Expansion Site[a]

Species Information					Potential Presence of Species Based on Preferred Habitat of the Species and the Existing Habitat				
Common Name	**Latin Name**	**County**	**State Status[b]**	**Preferred Habitat Description**	**Expansion Site**	**Big Hill to Shell ROW**	**Brine Disposal ROW Upgrade Near Site**	**Brine Diffuser**	**References**
Birds									
Arctic peregrine Falcon	*Falco peregrinus tundrus*	Jefferson	T	Occurs in the barrier islands along the Gulf Coast, which are important feeding areas for long-distance migrants.					24
Bachman's Sparrow	*Aimophila aestivalis*	Jefferson	T	Occurs in mature or old-growth southern pine woodlands subject to growing-season fires; breeds wherever fires have created ideal conditions, including dry, open pine in southern states and oak woods with an undercover of grasses and shrubs.	X	X			24
Eastern Brown Pelican	*Pelecanus occidentalis*	Jefferson	E	Nests on small, isolated coastal islands where it is safe from predators.					32
Reddish Egret	*Egretta rufescens*	Jefferson	T	Found in estuarine habitats, where it forages in shallow water. Nests typically are located on natural or manmade dredge spoil islands, or occasionally on the mainland in mangrove swamps and terrestrial vegetation.		X	X		24, 28
Sooty Tern	*Sterna fuscata*	Jefferson	T	Typically nests on remote outlying islets and rocks, sandy beaches, bare ground, or coral, most often with scattered grasses present or among bushes, occasionally on rocky ledges. Nonbreeding habitat is primarily pelagic.					24
Swallow-Tailed Kite	*Elanoides forficatus*	Jefferson	T	Found in diverse vegetation types, including pine forests, savannas, cypress and cypress-hardwood swamps, mangrove swamps, hardwood hammocks, riparian forests, prairies, and freshwater and brackish marshes.	X	X	X		21. 31
White-Faced Ibis	*Plegadis chihi*	Jefferson	T	Occurs in freshwater habitats, including marshes, swamps, ponds, and rivers in tropical to temperate zones.	X	X	X		2
Wood Stork	*Mycteria Americana*	Jefferson	T	Found in freshwater marshes, swamps, lagoons, and ponds; forages in shallow freshwater wetlands, and has also been reported in brackish wetlands.	X	X	X		25
Fish									
Paddlefish	*Polyodon spathula*	Jefferson	T	Occurs in medium- and large-sized rivers and seeks slow-flowing segments with depths greater than 5 feet (1.5 meters). During winter, moves to deeper water, and in the summer is often found in areas downstream from submerged sandbars.					6, 29
Mammals									
Black Bear	*Ursus americanus*	Jefferson	T	Occurs in mixed deciduous-coniferous forests and prefers areas with a thick understory.	X				15

Table I.2-4: State Threatened or Endangered Species in Area of Proposed Big Hill, TX, Expansion Site[a]

Species Information					Potential Presence of Species Based on Preferred Habitat of the Species and the Existing Habitat				
Common Name	**Latin Name**	**County**	**State Status[b]**	**Preferred Habitat Description**	**Expansion Site**	**Big Hill to Shell ROW**	**Brine Disposal ROW Upgrade Near Site**	**Brine Diffuser**	**References**
Rafinesque's Big-Eared Bat	*Corynorhinus rafinesquii*	Jefferson	T	Inhabits forested regions; summer roosts often are in hollow trees, occasionally under loose bark, or in abandoned buildings in or near wooded areas. Bridges, especially girder bridges, are important day-roost sites. Hibernates in caves in northern and mountainous regions.	X	X			3, 14, 19, 24
Reptiles									
Alligator Snapping Turtle	*Macrochelys temminckii*	Jefferson	T	Occurs in deep rivers, canals, and lakes associated with rivers, swamps, bayous, ponds near rivers, shallow tributaries to rivers and sometimes the brackish waters near river mouths. Seeks segments with slow-moving currents.					24
Scarlet Snake	*Cemophora coccinea copei*	Jefferson	T	Occurs in hardwood, pine, or mixed forest and woodland habitats and burrows, fallen logs, and debris.	X	X			24
Texas Horned Lizard	*Phrynosoma cornutum*	Jefferson	T	Thrives in arid and semi-arid regions of sparse vegetation, including deserts, prairies, bajadas, dunes, and foothills.					4, 9, 13, 30
Timber rattlesnake	*Crotalus horridus*	Jefferson	T	Seeks high, dry ridges with oak-hickory forest interspersed with open areas and deciduous forests with rock outcrops.					10. 22

ROW = right-of-way

NOTES:

[a] Species on State lists that are also on Federal lists as endangered, threatened, or candidate species are not included in this table because they are evaluated in detail in Appendix H Evaluations of Special Status Species in Texas. Excluded species are:

> **Birds:** Attwater's greater prairie chicken, brown pelican, least tern, piping plover;
> **Mammals:** Red wolf, West Indian manatee; and
> **Reptiles:** Atlantic hawksbill sea turtle, green sea turtle, Kemp's Ridley sea turtle, leatherback sea turtle, loggerhead sea turtle.

[b] **State Status** T=threatened; E=endangered.

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Appendix J
Environmental Justice Populations

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LIST OF TABLES

Appendix J
Environmental Justice Populations

This appendix identifies minority and low-income populations that are located in the potential project areas for the Strategic Petroleum Reserve (SPR) expansion. To identify these populations, DOE followed Council on Environmental Quality (CEQ) guidance (CEQ 1997). CEQ defines the following groups as minorities:

- Black/African American,
- Asian,
- Native Hawaiian or Other Pacific Islander,
- American Indian or Alaska Native, and
- Hispanic populations (regardless of race).

According to CEQ, a minority population exists where either:

- The minority population of the affected area exceeds 50 percent; or
- The minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

CEQ defines low-income by using the annual statistical poverty thresholds from the U.S. Census Bureau. A low-income population exists when the low-income population percentage in the area of interest is "meaningfully greater" than the low-income population in the general population. For purposes of the analysis of low-income and minority populations, DOE used both the United States and the state in which a city, town, or county/parish is located as the "general population." In other words, a population is low-income if its percentage of low-income residents is greater than the percentage in either the United States, its state, or both. In addition, DOE used the population below the poverty level to define low-income population.

DOE's methodology to identify the potential environmental justice populations consisted of the following three steps, which adhere to CEQ guidance:

- DOE first identified the potential project areas. DOE identified the potentially affected areas for each proposed new and expansion site by mapping the location of the proposed storage site, support facilities, raw water intake, pipelines, and oil distribution facilities and identifying their corresponding counties or parishes. Cities and towns within 5 miles (8 kilometers) of the proposed storage sites and within 2 miles (3.2 kilometers) associated infrastructure were also included. DOE used this assumption because potential significant adverse environmental and human health impacts generally would be limited to this area. If DOE had found any potential high and adverse impacts, DOE would have considered examining broader population areas. For this analysis, DOE did not include towns with a population of fewer than 1,000 people. DOE supplemented this information with Census block information in a few instances where there were no towns of greater than 1,000 people near a proposed facility.
- DOE gathered 2000 Census data for each of the Census tracts and jurisdictions in the potential project areas and for the States of Louisiana, Mississippi, and Texas. These data predate Hurricanes Katrina and Rita, which may have had systematic demographic effects on many of the potentially affected areas. DOE could not avoid this limitation because detailed post-hurricane data are not yet available.

- Using the Census data, DOE compared the minority and low-income populations in each potentially affected jurisdiction to the same data for the United States and the relevant state. To be conservative, this analysis identifies any percentages that were greater than that of the United States or the state as potential environmental justice populations, no matter how small the difference. DOE calculated the total minority group percentage of the population by subtracting the Census-reported percentage of the white, non-Hispanic population from 100 percent.

The following tables J-1 through J-9 present the results for each proposed new and expansion site and its associated infrastructure. Data for the new sites are presented in alphabetical order, followed by the expansion sites in alphabetical order. The data for states and the United States are italicized for comparison. The minority and low-income populations, according to CEQ definitions, are identified in bold font, that is, where the percentages are greater than the relevant state or the nation.

Table J-10 summarizes the results. It shows that each proposed site has at least two types of environmental justice populations. For example low-income populations and Black or African American populations, as defined by CEQ, are located in the potentially affected areas for each site and its associated infrastructure.

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Table J-1: Demographic Overview of Bruinsburg Site Project Area

Location	Total Population	Percent Minority (%)	White (%)	Black or African American (%)	American Indian or Alaska Native (%)	Asian (%)	Native Hawaiian or Other Pacific Islander (%)	Persons Reporting Some Other Race (%)	Persons Reporting Two or More Races (%)	Percentage of Individuals of Hispanic or Latino Origin (any race) (%)	Percent Below Poverty Level[a] (%)
Brookhaven city	9,861	**52.9**	47.6	**50.9**	0.1	0.6	0	0.2	0.7	0.8	**26.9**
Census Tract 9503[b]	6,335	**90.3**	9.8	**89.5**	0.1	0.1	0	0.1	0.4	0.9	**34.7**
Port Gibson city	1,840	**80.6**	19.4	**80.0**	0.1	0.2	0	0.1	0.3	0.7	**31.3**
Adams County	34,340	**54.3**	46.0	**52.8**	0.1	0.2	0	0.2	0.6	0.8	**25.9**
Claiborne County	11,831	**84.9**	15.2	**84.1**	0.1	0.1	0	0.1	0.4	0.8	**32.4**
Jefferson County	9,740	**87.0**	13.1	**86.5**	0.1	0.1	0	0	0.2	0.7	**36.0**
Lincoln County	33,166	**31.1**	69.4	**29.7**	0.2	0.2	0	0.2	0.4	0.7	**19.2**
Wilkinson County	10,312	**68.9**	31.2	**68.2**	0.1	0	0	0.1	0.4	0.4	**37.7**
State of Mississippi	*2,844,658*	*39.3*	*61.4*	*36.3*	*0.4*	*0.7*	*0*	*0.5*	*0.7*	*1.4*	*19.9*
Baton Rouge city	227,818	**56.0**	45.7	**50.0**	0.2	2.6	0	0.5	1.0	1.7	**24.0**
Port Allen city	5,278	**55.6**	45.0	**54.0**	0.2	0	0	0.3	0.5	1.0	**24.2**
East Baton Rouge Parish	412,852	**44.9**	56.2	**40.1**	0.2	**2.1**	0	0.5	0.9	1.8	**17.9**
East Feliciana Parish	21,360	**48.6**	51.8	**47.1**	0.2	0.2	0	0.2	0.5	0.7	**23.0**
West Baton Rouge Parish	21,601	**38.0**	62.8	**35.5**	0.2	0.2	0	0.5	0.8	1.4	**17.0**
West Feliciana Parish	15,111	**51.9**	48.6	**50.5**	0.2	0.2	0	0.0	0.4	1.0	**19.9**
State of Louisiana	*4,468,976*	*37.5*	*63.9*	*32.5*	*0.6*	*1.2*	*0*	*0.7*	*1.1*	*2.4*	*19.6*
United States	*281,421,906*	*30.9*	*75.1*	*12.3*	*0.9*	*3.6*	*0.1*	*5.5*	*2.4*	*12.5*	*12.4*

Source: U.S. Census Bureau 2000a; U.S. Census Bureau 2000b.
[a] Data for poverty levels is for 1999.
[b] Census Tract 9503 contains both Port Gibson and Bruinsburg. Data for Bruinsburg only is not available.

Table J-2: Demographic Overview of Chacahoula Site Project Area

Location	Total Population	Percent Minority (%)	White (%)	Black or African American (%)	American Indian or Alaska Native (%)	Asian (%)	Native Hawaiian or Other Pacific Islander (%)	Persons Reporting Some Other Race (%)	Persons Reporting Two or More Races (%)	Percentage of Individuals of Hispanic or Latino Origin (any race) (%)	Percent Below Poverty Level[a] (%)
Houma city	32,393	**33.4**	67.5	**26.1**	**3.5**	0.7	0	0.7	**1.6**	1.8	**20.8**
Thibodaux city	14,431	**36.5**	64.0	**33.8**	0.4	0.6	0	0.3	0.9	1.0	**25.1**
Lafourche Parish	89,974	17.8	82.9	**12.6**	**2.3**	0.7	0	0.6	1.0	1.4	**16.5**
St James Parish	21,216	**50.3**	50.0	**49.4**	0.1	0	0	0.1	0.4	0.6	**20.7**
Terrebonne Parish	104,503	26.8	74.1	**17.8**	**5.3**	0.8	0	0.5	1.5	1.6	**19.1**
State of Louisiana	*4,468,976*	*37.5*	*63.9*	*32.5*	*0.6*	*1.2*	*0*	*0.7*	*1.1*	*2.4*	*19.6*
United States	*281,421,906*	*30.9*	*75.1*	*12.3*	*0.9*	*3.6*	*0.1*	*5.5*	*2.4*	*12.5*	*12.4*

Source: U.S. Census Bureau 2000a; U.S. Census Bureau 2000b.
[a] Data for poverty levels is for 1999.

Table J-3: Demographic Overview of Clovelly Site Project Area

Location	Total Population	Percent Minority (%)	White (%)	Black or African American (%)	American Indian or Alaska Native (%)	Asian (%)	Native Hawaiian or Other Pacific Islander (%)	Persons Reporting Some Other Race (%)	Persons Reporting Two or More Races (%)	Percentage of Individuals of Hispanic or Latino Origin (any race) (%)	Percent Below Poverty Level[a] (%)
Cut Off CDP	5,635	9.4	91.4	1.1	**3.8**	**1.3**	0	1.1	1.3	2.1	7.9
Galliano CDP	7,356	8.6	92.3	0.7	**4.5**	0.8	0	0.6	1.1	1.7	**15.9**
Lafourche Parish	89,974	17.8	82.9	**12.6**	**2.3**	0.7	0	0.6	1.0	1.4	**16.5**
State of Louisiana	*4,468,976*	*37.5*	*63.9*	*32.5*	*0.6*	*1.2*	*0*	*0.7*	*1.1*	*2.4*	*19.6*
United States	*281,421,906*	*30.9*	*75.1*	*12.3*	*0.9*	*3.6*	*0.1*	*5.5*	*2.4*	*12.5*	*12.4*

Source: U.S. Census Bureau 2000a; U.S. Census Bureau 2000b.
[a] Data for poverty levels is for 1999.

Table J-4: Demographic Overview of Clovelly-Bruinsburg Site Project Area

Location	Total Population	Percent Minority (%)	White (%)	Black or African American (%)	American Indian or Alaska Native (%)	Asian (%)	Native Hawaiian or Other Pacific Islander (%)	Persons Reporting Some Other Race (%)	Persons Reporting Two or More Races (%)	Percentage of Individuals of Hispanic or Latino Origin (any race) (%)	Percent Below Poverty Level[a] (%)
Brookhaven city	9,861	**52.9**	47.6	**50.9**	0.1	0.6	0	0.2	0.7	0.8	**26.9**
Census Tract 9503[b]	6,335	**89.6**	9.8	**89.5**	0.1	0.1	0	0.1	0.4	0.9	**34.7**
Port Gibson city	1,840	**80.6**	19.4	**80.0**	0.1	0.2	0	0.1	0.3	0.7	**31.3**
Claiborne County	11,831	**84.9**	15.2	**84.1**	0.1	0.1	0	0.1	0.4	0.8	**32.4**
Hinds County	250,800	**63.0**	37.3	**61.1**	0.1	0.6	0	0.2	0.6	0.8	**19.9**
Jefferson County	9,740	**87.0**	13.1	**86.5**	0.1	0.1	0	0	0.2	0.7	**36.0**
Vicksburg city	26,407	**62.6**	37.8	**60.4**	0.2	0.6	0	0.4	0.6	1.0	**23.0**
Warren County	49,644	**45.5**	55.0	**43.2**	0.2	0.6	0	0.3	0.7	1.0	**18.7**
State of Mississippi	*2,844,658*	*39.3*	*61.4*	*36.3*	*0.4*	*0.7*	*0*	*0.5*	*0.7*	*1.4*	*19.9*
Cut Off CDP	5,635	9.4	91.4	1.1	**3.8**	**1.3**	0	1.1	1.3	2.1	7.9
Galliano CDP	7,356	8.6	92.3	0.7	**4.5**	0.8	0	0.6	1.1	1.7	**15.9**
Lafourche Parish	89,974	17.8	82.9	**12.6**	**2.3**	0.7	0	0.6	1.0	1.4	**16.5**
State of Louisiana	*4,468,976*	*37.5*	*63.9*	*32.5*	*0.6*	*1.2*	*0*	*0.7*	*1.1*	*2.4*	*19.6*
United States	*281,421,906*	*30.9*	*75.1*	*12.3*	*0.9*	*3.6*	*0.1*	*5.5*	*2.4*	*12.5*	*12.4*

Source: U.S. Census Bureau 2000a; U.S. Census Bureau 2000b.
[a] Data for poverty levels is for 1999.

Table J-5: Demographic Overview of Richton Site Project Area

Location	Total Population	Percent Minority (%)	White (%)	Black or African American (%)	American Indian or Alaska Native (%)	Asian (%)	Native Hawaiian or Other Pacific Islander (%)	Persons Reporting Some Other Race (%)	Persons Reporting Two or More Races (%)	Percentage of Individuals of Hispanic or Latino Origin (any race) (%)	Percent Below Poverty Level[a] (%)
Columbia city	6,603	**37.8**	62.6	**35.6**	0.4	0.4	0	0.2	0.8	0.8	**29.7**
Hattiesburg city	46,664	**51.4**	49.9	**47.3**	0.2	**1.2**	0	0.5	0.8	1.4	**28.3**
McComb city	13,337	**60.1**	40.1	**58.4**	0.1	0.5	0	0.4	0.5	0.8	**31.0**
Pascagoula city	26,200	**34.8**	67.2	**29.0**	0.2	**1.0**	0	1.7	1.0	**3.9**	**20.7**
Richton town	1,038	24.1	76.0	**21.2**	**0.7**	0.2	**0.5**	0.5	1.0	1.0	**31.9**
Tylertown town	1,910	**43.8**	56.3	**41.4**	0.2	**0.8**	0	0.5	0.8	1.1	**32.3**
Amite County	13,418	**43.8**	56.4	**42.7**	0.1	0.1	0	0.2	0.5	0.8	**22.6**
Forrest County	72,604	**36.3**	64.3	**33.6**	0.2	0.7	0	0.4	0.8	1.3	**22.5**
George County	19,144	11.3	89.4	8.8	0.2	0.2	0	0.8	0.6	**1.6**	**16.7**
Greene County	13,299	27.5	72.8	**26.2**	0.2	0.1	0	0.3	0.4	0.8	**19.6**
Jackson County	131,420	25.8	75.4	**20.9**	0.3	**1.6**	0	0.7	1.1	**2.1**	**12.7**
Lamar County	39,070	15.3	85.3	**12.9**	0.2	0.7	0	0.3	0.6	1.1	**13.3**
Marion County	25,595	**33.3**	67.0	**31.9**	0.2	0.2	0	0.1	0.6	0.6	**24.8**
Perry County	12,138	24.3	76.2	**22.6**	0.3	0.1	0	0.3	0.5	1.0	**22.0**
Pike County	38,940	**49.0**	51.2	**47.5**	0.2	0.3	0	0.2	0.5	0.7	**25.3**
Walthall County	15,156	**45.8**	54.6	**44.1**	0.1	0.2	0	0.3	0.7	1.3	**27.8**
State of Mississippi	*2,844,658*	*39.3*	*61.4*	*36.3*	*0.4*	*0.7*	*0*	*0.5*	*0.7*	*1.4*	*19.9*
United States	*281,421,906*	*30.9*	*75.1*	*12.3*	*0.9*	*3.6*	*0.1*	*5.5*	*2.4*	*12.5*	*12.4*

Source: U.S. Census Bureau 2000a; U.S. Census Bureau 2000b.
[a] Data for poverty levels is for 1999.

Table J-6: Demographic Overview of Stratton Ridge Site Project Area

Location	Total Population	Percent Minority (%)	White (%)	Black or African American (%)	American Indian or Alaska Native (%)	Asian (%)	Native Hawaiian or Other Pacific Islander (%)	Persons Reporting Some Other Race (%)	Persons Reporting Two or More Races (%)	Percentage of Individuals of Hispanic or Latino Origin (any race) (%)	Percent Below Poverty Level[a] (%)
Clute city	10,424	**57.6**	64.2	7.7	**0.8**	1.0	0	23.0	3.4	**48.1**	**18.2**
Freeport city	12,708	**66.8**	61.6	**13.4**	0.6	0.4	0	20.9	3.2	**52.0**	**22.9**
Oyster Creek city	1,192	24.1	87.0	3.6	**1.6**	0.4	0	5.3	2.1	**16.9**	**19.2**
Texas City	41,521	**49.9**	60.7	**27.5**	0.5	0.9	0	8.2	2.1	**20.5**	**14.9**
Brazoria County	241,767	**34.6**	77.1	8.5	0.5	2.0	0	9.6	2.2	**22.8**	10.2
Galveston County	250,158	**36.9**	72.7	**15.4**	0.5	2.1	0	7.2	2.1	**18.0**	**13.2**
State of Texas	*20,851,820*	*47.6*	*71.0*	*11.5*	*0.6*	*2.7*	*0.1*	*11.7*	*2.5*	*32.0*	*15.4*
United States	*281,421,906*	*30.9*	*75.1*	*12.3*	*0.9*	*3.6*	*0.1*	*5.5*	*2.4*	*12.5*	*12.4*

Source: U.S. Census Bureau 2000a; U.S. Census Bureau 2000b.
[a] Data for poverty levels is for 1999.

Table J-7: Demographic Overview of Bayou Choctaw Expansion Site Project Area

Location	Total Population	Percent Minority (%)	White (%)	Black or African American (%)	American Indian or Alaska Native (%)	Asian (%)	Native Hawaiian or Other Pacific Islander (%)	Persons Reporting Some Other Race (%)	Persons Reporting Two or More Races (%)	Percentage of Individuals of Hispanic or Latino Origin (any race) (%)	Percent Below Poverty Level[a] (%)
Addis town	2,238	24.7	76.1	**23.0**	0.2	0.1	0	0	0.5	1.0	**17.5**
Plaquemine city	7,064	**51.3**	49.3	**49.6**	0.2	0.3	0	0.1	0.6	1.1	**24.4**
Iberville Parish	33,320	**51.4**	49.3	**49.7**	0.2	0.3	0	0.1	0.5	1.0	**23.1**
State of Louisiana	*4,468,976*	*37.5*	*63.9*	*32.5*	*0.6*	*1.2*	*0*	*0.7*	*1.1*	*2.4*	*19.6*
United States	*281,421,906*	*30.9*	*75.1*	*12.3*	*0.9*	*3.6*	*0.1*	*5.5*	*2.4*	*12.5*	*12.4*

Source: U.S. Census Bureau 2000a; U.S. Census Bureau 2000b.
[a] Data for poverty levels is for 1999.

Table J-8: Demographic Overview of Big Hill Expansion Site Project Area

Location	Total Population	Percent Minority (%)	White (%)	Black or African American (%)	American Indian or Alaska Native (%)	Asian (%)	Native Hawaiian or Other Pacific Islander (%)	Persons Reporting Some Other Race (%)	Persons Reporting Two or More Races (%)	Percentage of Individuals of Hispanic or Latino Origin (any race) (%)	Percent Below Poverty Level[a] (%)
Winnie CDP	2,914	16.6	87.3	5.3	**0.7**	0.3	0	5.6	0.9	10.1	**14.3**
Stowell CDP	1,572	**42.5**	59.8	**30.9**	0.6	0	0	7.8	0.8	10.4	**18.8**
Port Arthur city	57,755	**68.2**	39.0	**43.7**	0.5	**5.9**	0	8.9	2.1	**17.5**	**25.2**
Jefferson County	252,051	**48.2**	57.2	**33.7**	0.3	**2.9**	0	4.3	1.5	10.5	**17.4**
State of Texas	*20,851,820*	*47.6*	*71.0*	*11.5*	*0.6*	*2.7*	*0.1*	*11.7*	*2.5*	*32.0*	*15.4*
United States	*281,421,906*	*30.9*	*75.1*	*12.3*	*0.9*	*3.6*	*0.1*	*5.5*	*2.4*	*12.5*	*12.4*

Source: U.S. Census Bureau 2000a; U.S. Census Bureau 2000b.
[a] Data for poverty levels is for 1999.

Table J-9: Demographic Overview of West Hackberry Expansion Site Project Area

Location	Total Population	Percent Minority (%)	White (%)	Black or African American (%)	American Indian or Alaska Native (%)	Asian (%)	Native Hawaiian or Other Pacific Islander (%)	Persons Reporting Some Other Race (%)	Persons Reporting Two or More Races (%)	Percentage of Individuals of Hispanic or Latino Origin (any race) (%)	Percent Below Poverty Level[a] (%)
Hackberry	1,699	3.0	97.5	0.5	0.3	0.7	0	0.5	0.5	1.1	9.2
Cameron Parish	9,991	7.5	93.7	3.9	0.4	0.4	0	0.9	0.7	2.2	12.3
Calcasieu Parish	183,577	27.2	73.6	**24.0**	0.3	0.6	0	0.4	1.0	1.3	**15.4**
State of Louisiana	*4,468,976*	*37.5*	*63.9*	*32.5*	*0.6*	*1.2*	*0*	*0.7*	*1.1*	*2.4*	*19.6*
United States	*281,421,906*	*30.9*	*75.1*	*12.3*	*0.9*	*3.6*	*0.1*	*5.5*	*2.4*	*12.5*	*12.4*

Source: U.S. Census Bureau 2000a; U.S. Census Bureau 2000b.
[a] Data for poverty levels is for 1999.

Table J-10: Summary of Potential Environmental Justice Populations

Proposed Site	Potentially Affected States	Overall Minority	Black or African American	American Indian or Alaska Native	Asian	Native Hawaiian or Other Pacific Islander	Hispanic or Latino Origin	Low Income
Bruinsburg	Louisiana & Mississippi	✓	✓		✓			✓
Chacahoula	Louisiana	✓	✓	✓				✓
Clovelly	Louisiana		✓	✓	✓			✓
Clovelly-Bruinsburg	Louisiana & Mississippi	✓	✓	✓	✓			✓
Richton	Mississippi	✓	✓	✓	✓	✓	✓	✓
Stratton Ridge	Texas	✓	✓	✓			✓	✓
Bayou Choctaw	Louisiana	✓	✓					✓
Big Hill	Texas	✓	✓	✓	✓		✓	✓
West Hackberry	Louisiana		✓					✓

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Appendix K
Consultations with Agencies

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LIST OF TABLES

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Appendix K
Consultations with Agencies

This appendix contains DOE's consultation correspondence with federal, state, and local agencies. Table K-1 lists the correspondence sent by DOE or its contractors in chronological order. Table K-2 lists all of the agencies with whom DOE has corresponded and the dates of correspondence. Copies of any correspondence received from the agencies listed are included in this appendix. Table K-3 lists the names and addresses of the government officials that DOE or its contractors contacted.

Table K-4 lists the sample outgoing correspondence included in this appendix and the page number where each letter or email can be found. Table K-5 lists the return correspondence received by DOE or ICF Consulting that is included in this appendix, as well as the page numbers where each letter or email can be found.

Tables K-2 and K-4 are organized the same way. First, the correspondence is organized by level of government (Tribe, Federal, State, local). Within the State and local categories, the correspondence is further organized by State (LA, MS, TX). Within each of these categories and subcategories, the correspondence is arranged alphabetically by agency name.

Table K-1: Dates of Correspondence from U.S. DOE or Its Contractors

Addressees	Purpose of Letter	Dates Sent
Federal, State, and local agencies in TX	Request comments and assistance during the scoping period.	9/9/05
Federal, State, and local agencies in LA and MS	Request comments and assistance during the scoping period.	9/13/05, 9/27/05
SHPOs in LA, MS, and TX	Request the views of the SHPOs on further actions to identify potentially affected historic properties; Request indications of interest in developing Programmatic Agreements for post-ROD activities.	9/9/05, 9/27/05
Tribal Entities in LA, MS, and TX	Initiate government-to-government consultation regarding the proposed expansion of the SPR.	11/21/05
Federal, State, and local agencies in LA, MS, and TX	Announce reopening of scoping period until 12/19/05.	11/21/05
USDA Natural Resources Conservation Service offices in LA, MS, and TX	Submission of information regarding potential conversion of farmland.	2/22/06
U.S. Army Corps of Engineers, Mobile District	Request comments and assistance regarding potential wetland impacts.	3/22/06
U.S. Fish and Wildlife Service offices in LA, MS, and TX	Explain proposed approach for evaluating potential impacts to species protected under the Endangered Species Act.	4/13/06
SHPOs in LA, MS, and TX	Provide suggested language for Programmatic Agreements to address effects to historic properties that cannot be known prior to ROD.	5/12/06

SHPOs = State Historic Preservation Officers; ROD = Record of Decision

Table K-2: Agencies Contacted and Date of Correspondence

Agency	Dates of Correspondence from U.S. DOE or ICF Consulting	Dates of Return Correspondence
Tribal Entities		
Alabama-Coushatta Tribes of Texas	11/21/05	
Biloxi Chitimacha Confederation of Muskogees	11/21/05	
Chitimacha Tribe of Louisiana	11/21/05	12/19/05
Choctaw Nation of Oklahoma	11/21/05	12/1/05
Coushatta Indian Tribe	11/21/05	
Jena Band of Choctaw Indians	11/21/05	
Mississippi Band of Choctaw Indians	11/21/05	
Point au Chien Tribe	11/21/05	
Tunica-Biloxi Tribe	11/21/05	
United Houma Nation	11/21/05	
Federal		
Minerals Management Service	9/13/05, 11/21/05	12/19/05
National Marine Fisheries Service	9/9/05, 9/13/05, 11/21/05	10/6/05, 12/1/05
National Ocean Service	9/13/05, 11/21/05	
National Park Service	9/27/05, 11/21/05	12/9/05
Natural Resources Conservation Service	9/9/05, 9/13/05, 11/21/05	10/11/05, 11/7/05, 11/16/05, 12/13/05, 12/16/05, 3/16/06, 3/27/06
U.S. Army Corps of Engineers	9/9/05, 9/13/05, 11/21/05, 3/22/06	12/16/05
U.S. Coast Guard	9/13/05, 11/21/05	1/28/06
U.S. Environmental Protection Agency	9/9/05, 9/13/05, 11/21/05	12/22/05
U.S. Fish and Wildlife Service	9/9/05, 9/13/05, 11/21/05, 4/13/06	9/29/05, 10/3/05, 10/20/05, 12/5/05, 12/8/05, 12/13/05, 12/14/05
U.S. Forest Service	11/21/05	12/23/05
States		
Louisiana		
Louisiana Department of Agriculture and Forestry	11/21/05	
Louisiana Department of Environmental Quality	9/13/05, 11/21/05	10/20/05, 12/21/05, 1/11/06
Louisiana Department of Health and Hospitals	9/13/05, 11/21/05	9/28/05
Louisiana Department of Natural Resources	9/13/05, 11/21/05	12/9/05, 12/12/05
Louisiana Department of Transporation and Development	9/13/05, 11/21/05	10/7/05
Louisiana Department of Wildlife and Fisheries	9/13/05, 11/21/05	10/3/05, 3/8/06

Table K-2: Agencies Contacted and Date of Correspondence

Agency	Dates of Correspondence from U.S. DOE or ICF Consulting	Dates of Return Correspondence
Louisiana Office of Culture, Recreation, and Tourism	9/13/05, 9/27/05, 11/21/05	10/13/05, 5/12/06
Mississippi		
Mississippi Department of Archives and History	9/13/05, 9/27/05, 11/21/05	9/19/05, 10/4/05, 5/12/06
Mississippi Department of Environmental Quality	9/13/05, 11/21/05	
Mississippi Department of Marine Resources	11/21/05	
Mississippi Department of Transportation	9/13/05, 11/21/05	
Mississippi Department of Wildlife, Fisheries, and Parks	9/13/05, 11/21/05	3/2/06
Mississippi Secretary of State	11/21/05	
Texas		
Railroad Commission of Texas	9/9/05, 11/21/05	
Texas Commission on Environmental Quality	9/9/05, 11/21/05	10/28/05
Texas Department of Highways and Public Transporation	9/9/05, 11/21/05	
Texas General Land Office	9/9/05, 11/21/05	10/4/05
Texas Health and Human Services Commission	11/21/05	1/3/06
Texas Historical Commission	9/9/05, 11/21/05	10/18/05, 5/12/06
Texas Parks and Wildlife Department	9/9/05, 11/21/05	11/1/05
Texas State Health Services	9/9/05, 11/21/05	
Texas State Soil and Water Conservation Board	11/21/05	
Texas Water Commission	9/9/05, 11/21/05	
Texas Water Development Board	11/21/05	
Local		
Louisiana		
Cameron Parish Health Services	9/13/05, 11/21/05	
Cameron Parish Office of Emergency Preparedness	9/13/05, 11/21/05	
Iberville Office of Emergency Preparedness	9/13/05, 11/21/05	
Iberville Parish Parks and Recreation	9/13/05, 11/21/05	
Iberville Parish Permit and Inspection Department	9/13/05, 11/21/05	
Iberville Parish Planning Commission	9/13/05, 11/21/05	
Lafourche Parish Coastal, Energy and Environment	9/13/05, 11/21/05	
Lafourche Parish Department of Public Works	9/13/05, 11/21/05	
Lafourche Parish Emergency Preparedness Office	9/13/05, 11/21/05	11/1/05
Lafourche Parish Parks, Recreation and Public Facilities	9/13/05, 11/21/05	
Mississippi		
Jackson County Board of Supervisors	9/13/05	
Perry County Board of Supervisors	9/13/05	
Texas		
Brazoria County Parks Department	9/13/05, 11/21/05	
Houston Galveston Area Council	11/21/05	

Table K-2: Agencies Contacted and Date of Correspondence

Agency	Dates of Correspondence from U.S. DOE or ICF Consulting	Dates of Return Correspondence
Jefferson County Emergency Management Office	9/13/05, 11/21/05	
Jefferson County Environmental Control	9/13/05, 11/21/05	
South East Texas Regional Planning Commission	11/21/05	
Texas Association of Regional Councils	11/2105	

Table K-3: Addresses of Agencies Consulted

Tribal Entities	
Mr. Ronnie Thomas Chairman Alabama-Coushatta Tribes of Texas 571 State Park Road 56 Livingston, TX 77351	Mr. Randy P. Verdun Chairman Biloxi Chitimacha Confederation of Muskogees P.O. Box 856 Zachary, LA 70791
Mr. Alton D. LeBlanc Chairman Chitimacha Tribe of Louisiana P.O. Box 661 Charenton, LA 70523	Mr. Kevin Sickey Chairman Coushatta Indian Tribe P.O. Box 818 Elton, LA 70832
Ms. Christine Norris Principal Chief Jena Band of Choctaw Indians P.O. Box 14 Jena, LA 71342	Mr. Phillip Martin Chief Mississippi Band of Choctaw Indians P.O. Box 6010 Philadelphia, MS 39350
Mr. Charles Verdin Chairman Point au Chien Tribe 177 Aragon Road Montegut, LA 70377	Mr. Earl J. Barbry, Sr. Chairman Tunica-Biloxi Tribe P.O. Box 1589 Marksville, LA 71351
Ms. Brenda Dardar Robichaux Principal Chair United Houma Nation 20986 Highway 1 Golden Meadow, LA 70357	Mr. Gregory E. Pyle Chief Choctaw Nation of Oklahoma P.O. Drawer 1210 Durant, OK 74702-1210
Federal	
Mr. Chris Oynes Minerals Management Service Gulf of Mexico OCS Region U.S. Department of Interior 1201 Elmwood Park Blvd. New Orleans, LA 70123	Mr. Richard Hartman National Marine Fisheries Service c/o Louisiana State University Baton Rouge, LA 70803
Mr. Russell Swafford Fishery Biologist National Marine Fisheries Service Habitat Conservation Branch 4700 Avenue U Galveston, TX 77551	Mark Thompson National Marine Fisheries Service 3500 Delwood Beach Road Panama City, FL 32408-7499

Table K-3: Addresses of Agencies Consulted

John R. King, Chief Coastal Programs Division Office of Ocean and Coastal Resource Management, National Ocean Service U.S. Department of Commerce 1305 East West Highway Silver Spring, MD 20910-3281	Mr. Jerry Eubanks Superintendent Gulf Islands National Seashore National Park Service 1081 Gulf Breeze Parkway Gulf Breeze, FL 32561
Mr. Wendell Simpson Superintendent Natchez Trace Parkway National Park Service 2680 Natchez Trace Parkway Tupelo, MS 38804-9715	Mr. Larry Butler Natural Resource Conservation Service U.S. Department of Agriculture W.R. Poage Federal Building 101 South Main Street Temple, TX 76501-7602
Mr. Donald W. Gomert Attn: Steve Carmichael Natural Resources Conservation Service U.S. Department of Agriculture 3737 Government Street Alexandria, LA 71302	Mr. James Greenwade Natural Resources Conservation Service U.S. Department of Agriculture W. R. Poage Federal Building 101 South Main St. Temple, TX 76501-7602
Mr. Charles Guillory Natural Resources Conservation Service U.S. Department of Agriculture 3737 Government Street Alexandria, LA 71302	Mr. Mike Lilly Natural Resources Conservation Service U.S. Department of Agriculture Suite 1321, Federal Building 100 West Capitol Street Jackson, MS 39269
Mr. Delmer Stamps Natural Resources Conservation Service U.S. Department of Agriculture 100 West Capitol Street Federal Building Suite 1321 Jackson, MS 39269	Mr. Homer L. Wilkes Natural Resources Conservation Service U.S. Department of Agriculture 100 W. Capital Street Suite 1321 Federal Building Jackson, MS 39269
Mr. William R. Bunkley U.S. Army Corps of Engineers Mobile District P.O. Box 2288 Mobile, AL 36628-0001	Brigadier General Robert Crear U.S. Army Corps of Engineers Mississippi Valley Division P.O. Box 80 Vicksburg, MS 39181
Mr. Harold Lee U.S. Army Corps of Engineers Vicksburg District 4155 E. Clay St., Vicksburg, MS 39183	Dr. Lloyd Saunders U.S. Army Corps of Engineers Galveston District P.O. Box 1229 Galveston, TX 77553
Ms. Denise Sloan U.S. Army Corps of Engineers Galveston District P.O. Box 1229 Galveston, TX 77553	Mr. Ronald Ventola U.S. Army Corps of Engineers New Orleans District 7400 Leak Ave. New Orleans, LA 70118
Colonel Richard P. Wagenaar Commander and District Engineer U.S. Army Corps of Engineers New Orleans District P.O. Box 60267 New Orleans, LA 70160	Commander Natalie Valley U.S. Coast Guard, District 8 500 Camp Street, Suite 1341 New Orleans, LA 70130
Mr. Michael Jansky Environmental Review Coordinator U.S Environmental Protection Agency -Region VI 1445 Ross Avenue Dallas, TX 75202-2733	Mr. Heinz Mueller NEPA Compliance Coordinator U.S. Environmental Protection Agency - Region IV 61 Forsyth Street, SW Atlanta, GA 30303

Table K-3: Addresses of Agencies Consulted

Mr. Ray Aycock U.S. Fish and Wildlife Service 6578 Dogwood View Parkway, Suite A Jackson, MS 39213	Mr. Andy Loranger U.S. Fish and Wildlife Service Texas Chenier Plain Refuges Complex P.O. Box 278 Anahuac, TX 775145-0278
Ms. Tracey McDonnell U.S. Fish and Wildlife Service Texas Mid-Coast NWR Complex 1212 North VelascoSuite 200 Angleton, TX 77515	Mr. Carlos Mendoza U.S. Fish and Wildlife Service 17629 El Camino Road Suite 211 Houston, TX 77058
Mr. Phillip Siragusa U.S. Fish and Wildlife Service 825 Kaliste Saloom Road Brandywine Building. II, Suite 102 Lafayette, LA 70508	Mr. Russell Watson U.S. Fish and Wildlife Service 646 Cajundome Boulevard, Suite 400 Lafayette, LA 70506
Mr. Hunter Howell Homochitto National Forest U.S. Forest Service 1200 Hwy 184 E. Meadville, MS 39653	Mr. Don Neal U.S. Forest Service 100 W. Capital Street, Suite 1141 Jackson, MS 39269-1199
States	
Louisiana	
Mr. Bob Odom Commissioner Louisiana Department of Agriculture and Forestry P.O. Box 631 Baton Rouge, LA 70821-0631	Dr. Mike McDaniel Secretary Louisiana Department of Environmental Quality P.O. Box 4301 Baton Rouge, LA 70821-4301
Mr. Bobby Savoie Director Center for Environmental Health Office of Public Health Louisiana Department of Health and Hospitals 6867 Bluebonnet Blvd. Baton Rouge, LA 70810	Mr. Scott Angelle Secretary Louisiana Department of Natural Resources P.O. Box 94396 Baton Rouge, LA 70804
Mr. Myles Herbert Louisiana Department of Natural Resources P.O. Box 1280 Cameron, LA 70631	Mr. Johnny Bradberry Secretary Louisiana Department of Transporation and Development P.O. Box 94245 Baton Rouge, LA 70804-9245
Mr. Mike Carloss Louisiana Department of Wildlife and Fisheries P.O. Box 98000 Baton Rouge, LA 70898	Ms. Pamela Breaux Louisiana Division of Historic Preservation Louisiana Office of Culture, Recreation, and Tourism P.O. Box 44247 Baton Rouge, LA 70804
Mississippi	
Mr. H. T. Holmes State Historic Preservation Officer Mississippi Department of Archives and History P.O. Box 571 Jackson, MS 39205-0571	Mr. Jerry Cain Mississippi Dept. of Environmental Quality P.O. Box 20305 Jackson, MS 39289
Mr. Charles Chisholm Executive Director Mississippi Department of Environmental Quality P.O. Box 20305 Jackson, MS 39289	Dr. William Walker Executive Director Mississippi Department of Marine Resources 1141 Bayview Ave., Suite 101 Biloxi, MS 39530

Table K-3: Addresses of Agencies Consulted

Mr. Claiborne Barnwell Environmental Division Mississippi Department of Transportation P.O. Box 1850 Jackson, MS 39215	Mr. Andrew Whitehurst Mississippi Dept. of Wildlife, Fisheries and Parks Mississippi Museum of Natural Science 2148 Riverside Drive Jackson, MS 39202
Mr. Eric Clark Mississippi Secretary of State P.O. Box 136 Jackson, MS 39205-0136	
Texas	
Mr. Steve Seni Railroad Commission of Texas 1701 North Congress Street P.O. Box 12967 Austin, TX 78711-2967	Ms. Leigh Ann Brunson Texas Commission on Environmental Quality 12100 Park 35 Circle Austin, TX 78753
Mr. Gary Trietsch Texas Dept. of Highways and Public Transporation P.O. Box 1386 Houston, TX 77251	Mr. Sam Webb Deputy Commissioner Texas General Land Office P.O. Box 12873 Austin, TX 78711
Mr. Albert Hawkins Executive Commissioner Texas Health and Human Services Commission Office of the Ombudsman, MC H-700 P.O. Box 13247 Austin, TX 78711-3247	Mr. F. Lawerence Oaks State Historic Preservation Officer Texas Historical Commission P.O. Box 12276 Austin, TX 78711-2276
Mr. Robert Cook Texas Parks and Wildlife Department 4200 Smith School Rd. Austin, TX 78744	Mr. Eduardo Sanchez Commissioner Texas State Health Services 1100 West 49th Street Austin, TX 78756-3199
Mr. Rex Isom Executive Director Texas State Soil and Water Conservation Board P.O. Box 658 Temple , TX 76503	Mr. Daniel Burke Texas Water Commission P.O. Box 13087 MC205 Austin, TX 78711-3087
Mr. Kevin Ward Texas Water Development Board 1700 North Congress Avenue P.O. Box 13231 Austin, TX 78711-3231	
Local	
Louisiana	
Cameron Parish Health Services P.O. Box 930 Cameron, LA 70631	Mr. Freddie Richard, Jr. Cameron Parish Office of Emergency Preparedness P.O. Box 1280 Cameron, LA 70631
Ms. Laurie Doiron Director Iberville Office of Emergency Preparedness 58030 Meriam Street Plaquemine, LA 70764	Mr. Michael Markins Executive Director Iberville Parish Parks and Recreation P.O. Box 1060 Plaquemine, LA 70765

Table K-3: Addresses of Agencies Consulted

Mr. David Dupont Iberville Parish Permit and Inspection Department 58050 Meriam Street Plaquemine, LA 70765	Ms. Renee Edwards Chair Iberville Parish Planning Commission 58050 Meriam Street Plaquemine, LA 70764
Windell Curole Coastal Zone Administrator Lafourche Parish Coastal, Energy and Environment 17904 Highway 3235 Galliano, LA 70354	Terry Arabie Parishwide Operations Manager Lafourche Parish Department of Public Works P.O. Box 1661 Raceland, LA 70394
Mr. Ray J. Cheramie Director of Public Works Lafourche Parish Department of Public Works P.O. Box 1661 Raceland, LA 70394	Mr. Chris Boudreaux Lafourche Parish Emergency Preparedness Office 400 Green Street Thibodaux, LA 70301-3133
Mr. Brennan Matherne Director Lafourche Parish Parks, Recreation and Public Facilities P.O. Drawer 320 Raceland, LA 70394	
Mississippi	
Mr. Manly Barton Jackson County Board of Supervisors P.O. Box 998 Pascagoula, MS 39568	Mr. John Anderson Perry County Board of Supervisors P.O. Box 345 New Augusta, MS 39462
Texas	
Mr. Ron McCulley Brazoria County Parks Department 313 W. Mulberry Angleton, TX 77515	Mr. Jack Steele Director Houston Galveston Area Council 3555 Timmons Lane, Suite 120 Post Office Box 22777 Houston, TX 77227-2777
Mr. John Cascio Emergency Management Coordinator Jefferson County Emergency Management Office 7933 Viterbo Rd., Suite 6 Beaumont, TX 77705	Mr. Michael Melancon Director Jefferson County Environmental Control 7933 Viterbo Rd. Suite 402 Beaumont, TX 77705
Mr. Chester R. Jourdan, Jr. Director South East Texas Regional Planning Commission 2210 Eastex Freeway Beaumont, TX 77703	Ms. Penny Redington Executive Director Texas Association of Regional Councils 701 Brazos Street Suite 780 Austin, TX 78701

Table K-4: Sample Outgoing Correspondence

Recipient	Date of Correspondence	Page Number
Mr. Robert L. Cook, Texas Parks and Wildlife Department	9/9/05	K-13
Mr. Delmer Stamps, Natural Resources Conservation Service, U.S. Department of Agriculture (USDA)	9/13/05	K-14
Ms. Pamela Breaux, Louisiana Office of Culture and Recreation and Tourism	9/27/05	K-15
Mr. Larry Butler, National Resources Conservation Service, USDA	11/21/05	K-16
Mr. James Greenwade, Natural Resources Conservation Service, USDA	2/22/06	K-17
Mr. William R. Bunkley, U.S. Army Corps of Engineers, Mobile District	3/2/06	K-19
Ms. Angela Trahan, U.S. Fish and Wildlife Service, U.S. Department of Interior	4/13/06	K-20

Table K-5: Incoming Correspondence

Sender	Date of Correspondence	Page Number
Tribal Entities		
Ms. Kimberly S. Walden, Cultural Department, Chitimacha Tribe of Louisiana	12/19/05	K-22
Terry D. Cole, Choctaw Nation of Oklahoma	12/1/05, 12/27/05	K-23
Federal Agencies		
Mr. Joseph A. Christopher, Minerals Management Service, Gulf of Mexico OCS Region	12/19/05	K-25
Mr. Miles M. Croom, National Marine Fisheries Service (NMFS), U.S. Department of Commerce	10/6/05	K-26
Mr. Mark Thompson, NMFS, U.S. Department of Commerce	12/1/05	K-27
Mr. Jerry A. Eubanks, National Park Service, U.S. Department of Interior	10/28/05	K-28
Mr. Wendell A. Simpson, National Park Service, U.S. Department of Interior	12/9/05	K-29
Mr. Tom Kilpatrick, U.S. Department of Agriculture	10/11/05	K-29
Mr. Homer L. Wilkes, NRCS	11/7/05	K-30
Mr. E.J. Giering III, NRCS	11/16/05	K-30
Mr. Homer L. Wilkes, NRCS	12/13/05	K-31
Mr. Donald W. Gohmert, NRCS	12/16/05	K-31
Mr. Rex Chandler, NRCS	3/16/06	K-32
Mr. James M. Greenwade, NRCS	3/27/06	K-33
Mr. Ronnie Duke, New Orleans District, U.S. Army Corps of Engineers	12/16/05	K-33
Ms. Nathalie Valley, Eighth District, U.S. Coast Guard	1/28/06	K-36
Mr. Heinz Mueller, NEPA Program Office, U.S. Environmental Protection Agency	12/22/05	K-36
Mr. Frederick T. Werner, Fish and Wildlife Service (USFWS), U.S. Department of Interior	9/29/05	K-38
Mr. Russell C. Watson, USFWS	10/3/05	K-40
Mr. Curtis B. James, USFWS	10/20/05	K-42

Table K-5: Incoming Correspondence

Sender	Date of Correspondence	Page Number
Mr. Ray Aycock, USFWS	12/5/05	K-44
Ms. Tracey McDonnell, USFWS	12/8/05	K-46
Ms. Angela C. Trahan, USFWS	12/13/05	K-46
Mr. Andy Loranger, USFWS	12/14/05	K-47
Mr. Richard D. (Don) Neal, Forest Service, U.S. Department of Agriculture	12/23/05	K-47
State Agencies, Louisiana		
Teri F. Lanoue, Air Quality Assessment Division, LA Department of Environmental Quality	10/20/05	K-49
Mr. Albert E. Hindrichs, Water Quality Assessment Division, LA Department of Environmental Quality	12/21/05	K-49
Ms. Lisa L. Miller, LA Department of Environmental Quality	1/11/06	K-50
Ms. Rosalind M. Green, LA Department of Health and Hospitals	9/28/05	K-51
Mr. James H. Welsh, LA Department of Natural Resources	12/9/05	K-51
Mr. Scott Angelle, LA Department of Natural Resources	12/12/05	K-52
Mr. Johnny Bradberry, LA Department of Transportation and Development	10/7/05	K-53
Mr. Michael Carloss, LA Department of Wildlife and Fisheries	10/3/05	K-54
Mr. Gary Lester, LA Department of Wildlife and Fisheries	3/8/06	K-55
Ms. Pamela Breaux, Louisiana Office of Culture, Recreation and Tourism	10/13/05	K-57
State Agencies, Mississippi		
H.T. Holmes, MS Department of Archives and History	9/19/05	K-58
H.T. Holmes, MS Department of Archives and History	10/4/05	K-58
Mr. Tom Mann, Ms. Heather Sullivan, and Ms. Melanie Caudill, Natural Heritage Program, MS Department of Wildlife, Fisheries, and Parks	3/2/06	K-59
State Agencies, Texas		
Mr. David C. Schanbacher, TX Commission on Environmental Quality	10/28/05	K-63
Mr. Albert Hawkins, TX Health and Human Services Commission	1/3/06	K-63
Mr. Jarrett (Woody) Woodrow, Coastal Fisheries Division, TX Parks and Wildlife	11/1/05	K-65
Mr. Sam Webb, Coastal Resources, TX General Land Office	10/4/05	K-77
Mr. F. Lawrence Oaks, TX Historical Commission	10/18/05	K-78
Local Agencies, Louisiana		
Mr. Chris Boudreaux, Lafourche Parish Emergency Preparedness Office	11/1/05	K-79

Sample Outgoing Correspondence

from U.S. DOE or Its Contractors

Department of Energy
Washington, DC 20585

September 9, 2005

Mr. Robert L. Cook
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, TX 78744

Re: Proposed Expansion of the Strategic Petroleum Reserve (Big Hill and Stratton Ridge, Texas)

Dear Mr. Cook:

The U.S. Department of Energy is proposing to expand the Strategic Petroleum Reserve (SPR) to its 1 billion-barrel authorized capacity. The Strategic Petroleum Reserve Office of the U.S. Department of Energy (DOE) has determined that this project is subject to the National Environmental Policy Act (NEPA). The purpose of this letter is to request information from the Texas Parks and Wildlife Department on natural resources that the project could potentially affect, as well as any permits and approvals required for construction. Two sites being considered for the proposed project in Texas are: (1) Big Hill (Jefferson County), an existing SPR facility that would be expanded under the proposal; and (2) Stratton Ridge (Brazoria County), which would be a candidate for a new SPR facility.

Maps are enclosed which show the location of the proposed project. Additional attachments include a narrative description of the proposed action and figures of the proposed action from the 1992 Draft Environmental Impact Statement for the Expansion of the Strategic Petroleum Reserve.

As indicated in the attached narrative, a number of surface buildings and structures would be constructed for a new storage site at Stratton Ridge, and additional pumping systems would be constructed for the existing site at Big Hill. Construction of these facilities would entail ground disturbance and might have effects on endangered or threatened species in the area. Both the new storage site and expansion of the existing storage site would require construction of buried pipelines that would entail ground disturbance and might affect endangered or threatened species, should there be any present.

DOE has initiated preparation of an Environmental Impact Statement with publication of a Notice of Intent (70 FR 52088) on September 1, 2005. The Energy Policy Act of 2005 (EPACT), enacted on August 8, 2005, requires the Secretary of Energy to select sites necessary to expand the SPR to 1 billion barrel capacity no later than one year after enactment. This requires an extremely fast NEPA review process in order to provide decision makers with information for a Record of Decision in early August of 2006.

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To assist in this effort, we are requesting a list of state listed and proposed threatened, endangered, and rare species for the area as well as instructions for any further coordination. Information on any other additional issues or concerns that you consider appropriate would also be appreciated. We request that you respond by October 10, 2005, so that we may schedule meetings, site visits or surveys, conduct any necessary follow-up activities, and incorporate your response into the scope of study, as appropriate. We, or our contractor ICF Consulting, may contact you prior to this date to discuss the project and schedule a meeting.

Thank you for your assistance in this matter. If you require further information to complete this request, please do not hesitate to contact Donald Silawsky, Office of Petroleum Reserves, U.S. Department of Energy by phone at (202) 586–1892 or via mail:

Sincerely,

for Mr. Donald Silawsky
Office of Petroleum Reserves
1000 Independence Avenue S.W.
Washington, DC 20585–0301

Enclosures 2

Department of Energy
Washington, DC 20585

September 13, 2005

Mr. Delmer Stamps
Natural Resource Conservation Service
100 West Capitol Street Federal Building
Suite 1321
Jackson, MS 39269

Re: Proposed Expansion of the Strategic Petroleum Reserve (Richton and Pascagoula, Mississippi)

Dear Mr. Stamps:

The U.S. Department of Energy is proposing to expand the Strategic Petroleum Reserve (SPR) to its 1 billion-barrel authorized capacity. The Strategic Petroleum Reserve Office of the U.S. Department of Energy (DOE) has determined that this project is subject to the National Environmental Policy Act (NEPA) and the Farmland Protection Policy Act. The purpose of this letter is to request information from the Natural Resource Conservation Service on natural resources that the project could potentially affect, as well as any permits and approvals required for project construction. One site being considered for the proposed project in Mississippi is a candidate for a new SPR facility near the town of Richton.

Maps are enclosed which show the location of the proposed project sites. Additional attachments include a narrative description of the proposed action and figures of the proposed action from the 1992 Draft Environmental Impact Statement for the Expansion of the Strategic Petroleum Reserve.

As indicated in the attached narrative, a number of surface buildings and structures, pipes, and pump stations would be constructed for a new storage site at Richton. A new marine terminal in Pascagoula, MS would also need to be constructed to support the storage facility in Richton. The new storage site at Richton and the marine terminal would require construction of buried pipelines that would entail ground disturbance and might affect prime and unique farmland.

DOE has initiated preparation of an Environmental Impact Statement with publication of a Notice of Intent (70 FR 52088) on September 1, 2005. The Energy Policy Act of 2005 (EPACT), enacted on August 8, 2005, requires the Secretary of Energy to select sites necessary to expand the SPR to 1 billion barrel capacity no later than one year after enactment. This requires an extremely fast NEPA review process in order to provide decision makers with information for a Record of Decision (ROD) in early August of 2006.

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We are requesting your comments on the proposal regarding impacts to any prime and unique farmland as well as instructions for any further coordination. Information on any additional issues or concerns that you consider appropriate would be appreciated. We request that you respond by October 13, 2005, so that we may schedule any meetings, site visits or surveys, conduct any necessary follow-up activities, and incorporate your response into the scope of study as appropriate. We, or our contractor ICF Consulting, may contact you prior to this date to discuss the project and try to schedule a meeting.

Thank you for your assistance in this matter. If you require further information to complete this request, please contact Donald Silawsky, Office of Petroleum Reserves, U.S. Department of Energy by phone at (202) 586–1892, mail, or e-mail (Donald.Silawsky@hq.doe.gov).

Sincerely,

Donald Silawsky

Donald Silawsky
Office of Petroleum Reserves, (FE-47)
1000 Independence Avenue, S.W.
Washington, DC 20585–0301

Enclosures: 2

Department of Energy
Washington, DC 20585

September 27, 2005

Ms. Pamela Breaux
State Historic Preservation Officer
Louisiana Office of Culture
Recreation and Tourism
P.O. Box 44247
Baton Rouge, Louisiana 70804

Re: Follow-up to Letter of September 13, 2005, regarding Proposed Expansion of the Strategic Petroleum Reserve (West Hackberry, Bayou Choctaw, Clovelly, and Chacahoula, Louisiana)

Dear Ms. Breaux:

This letter follows-up in more detail on an earlier letter that we sent to you. The U.S. Department of Energy (DOE) is proposing to expand the Strategic Petroleum Reserve (SPR) to its 1 billion-barrel authorized capacity. The Strategic Petroleum Reserve Office of DOE has determined this project is subject to the requirements of the National Historic Preservation Act (NHPA) and the National Environmental Policy Act (NEPA).

Four sites being considered for the proposed project in Louisiana are: (1) West Hackberry (Cameron and Calcasieu Parishes), an existing SPR facility that would be expanded under the proposal; (2) Bayou Choctaw (Iberville Parish), an existing SPR facility that would be expanded under the proposal; (3) Clovelly (Lafourche Parish), which would be a candidate for a new SPR facility; and (4) Chacahoula (Lafourche Parish), which would be a candidate site for a new SPR facility. A narrative description of the proposed action and maps that show general project locations are enclosed with this letter.

As indicated in the attached narrative, construction activities at West Hackberry and Bayou Choctaw would be limited to new access roads and new onsite pipelines to connect the existing facility to the new SPR caverns. Neither site would require any additional offsite pipelines or significant facility upgrades. DOE would construct a number of above-ground buildings and structures for a new storage site at either Clovelly or Chacahoula. The Clovelly storage facility would be co-located with an existing petroleum storage facility; therefore, the site would utilize the existing facilities and would not require the construction of any new offsite pipelines. At Chacahoula, DOE would construct up to 136 miles of new pipeline for brine and oil transport. Construction of these facilities would entail ground disturbance and might have effects on significant archaeological sites or other historic properties in the area, should there be any present.

DOE proposes to conduct a search of Louisiana records, National Historic Landmarks, and the National Register of Historic Places to identify historic properties and to determine whether all of the project area has previously been inventoried for historic properties. DOE will also attempt to identify Indian tribes, archaeological and historical societies, and other organizations that may have information or concerns about historic properties in or near the project area.

DOE has initiated preparation of an Environmental Impact Statement (EIS) with publication of a Notice of Intent (70 FR 52088) on September 1, 2005. The agency intends to use the process and documentation required for preparation of the EIS to comply with Section 106 of NHPA, and is hereby notifying you of that intent.

As indicated in the Notice of Intent, the Energy Policy Act of 2005 (EPACT), enacted on August 8, 2005, requires the Secretary of Energy to select sites necessary to expand the SPR to 1 billion barrel capacity no later than one year after enactment. This requires an extremely fast process of NHPA and NEPA review in order to provide decision makers with information for a Record of Decision (ROD) in early August of 2006.

Pursuant to 36 CFR 800.4(a)(ii), DOE is requesting the views of the State Historic Preservation Officer on further actions to identify historic properties that may be affected by this undertaking, including information about Indian tribes and other organizations that may have information. In addition, DOE requests the SHPO to indicate whether it would be possible and appropriate for DOE staff and contractors to begin work with SHPO on a Programmatic Agreement. The Programmatic Agreement would provide for post-ROD archaeological surveys for identification of historic properties and would stipulate post-ROD measures for identified adverse effects, should one or more of the evaluated sites in Louisiana be selected for SPR capacity expansion. The goal would be a signed Programmatic Agreement no later than March 2006.

We request that you respond by October 28, 2005 so that we may schedule meetings, complete the record search, conduct any necessary follow-up activities, and incorporate your response into the scope of study, as appropriate. We, or our contractor ICF Consulting, may contact you prior to this date to discuss the project and schedule a meeting.

Thank you for your assistance in this matter. If you require further information to complete this request, please contact Donald Silawsky, Office of Petroleum Reserves, U.S. Department of Energy by phone at (202) 586-1892, mail, or e-mail (Donald.Silawsky@hq.doe.gov).

Sincerely,

Donald Silawsky

Donald Silawsky
Office of Petroleum Reserves (FE-47)
1000 Independence Avenue, S.W.
Washington, DC 20585-0301

2 Enclosures

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Department of Energy
Washington, DC 20585

November 21, 2005

Mr. Larry Butler
National Resource Conservation Service
101 South Main
Temple , TX 76501-7682

Re: Proposed Expansion of the Strategic Petroleum Reserve – Reopening Scoping Comment Period and New Site Proposal

Dear Mr. Butler:

The U.S. Department of Energy (DOE) is reopening the scoping comment period for the Proposed Expansion of the Strategic Petroleum Reserve (SPR). The Strategic Petroleum Reserve Office of DOE has determined that this project is subject to the National Environmental Policy Act (NEPA). Reopening the scoping comment period will allow the public and agencies an opportunity to comment on the scope of the issues to be addressed on all candidate sites and aid in identifying other environmental review and consultation requirements associated with the new candidate site proposed by the Governor of Mississippi. On October 27, 2005, in accordance with the Energy Policy Act of 2005, the Governor of Mississippi requested that the Secretary of Energy consider a new candidate site at the Bruinsburg Salt Dome along the Mississippi River in Claiborne County, Mississippi. Enclosed are brief descriptions of all candidate and expansion sites.

On September 1, 2005, DOE initiated the scoping period and the preparation of an Environmental Impact Statement (EIS) with publication of a Notice of Intent (70 FR 52088). In response to the hurricanes that affected the Gulf Coast, DOE extended the scoping period from September 30 to October 28, 2005 (70 FR 56649; September 28, 2005). The reopening of the scoping period to accommodate the new candidate site will be announced in the Federal Register by November 23, 2005. The new scoping comment period will close on December 19, 2005.

Per the letter that was previously sent to your office, DOE has determined that the proposed expansion of the SPR is potentially subject to the Farmland Protection Policy Act (FPPA). The purpose of this letter is to request information from your office on prime and unique farmland that the project could potentially affect.

DOE intends to use the process and documentation required for preparing the EIS to comply with the Farmland Protection Policy Act, and is hereby notifying you of that intent. To assist in this environmental review, please identify any instructions for future coordination and consultation with your office and any permits and approvals required by the FPPA for construction and operation.

To aid in identifying the issues to be addressed in the EIS, DOE has enclosed maps of the new candidate site and an updated version of the candidate and expansion site maps previously sent to your Agency. The maps include the general facility layout for each candidate and expansion site, and the proposed location of new pipelines and existing pipelines that would require refurbishment.

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We request that you submit your comments by the end of the scoping comment period on December 19, 2005. We, or our contractor, ICF Consulting, may contact you prior to this date to discuss the project and schedule a meeting.

Thank you for your assistance in this matter. If you require further information to complete this request, please contact Donald Silawsky, Office of Petroleum Reserves, U.S. Department of Energy by phone at (202) 586–1892, mail at the address below, or e-mail to Donald.Silawsky@hq.doe.gov.

Sincerely,

Donald Silawsky

Mr. Donald Silawsky
Office of Petroleum Reserves (FE-47)
1000 Independence Avenue, S.W.
Washington, DC 20585-0301

Enclosure

ICF CONSULTING

February 22, 2006

Mr. James Greenwade
Natural Resources Conservation Service
101 South Main St.
Temple, Texas

SUBJECT: Proposed Expansion of the Strategic Petroleum Reserve
AD-1006 and NRCS-CPA-106: Farmland Conversion Impact Rating Forms

Dear Mr. Greenwade:

Please find the attached AD-1006 Farmland Conversion Impact Rating forms, NRCS CPA-106 Farmland Conversion Impact Rating forms for Corridor Type Projects, and documentation containing supporting data prepared for the above referenced project. We will be coordinating the identification of Prime Farmlands and completion of the USDA NRCS forms AD-1006 and NRCS CPA-106.

For the Strategic Petroleum Reserve expansion in Texas, the U.S. Department of Energy is evaluating one potential expansion site, Big Hill, and one potential new site, Stratton Ridge. The U.S. Department of Energy has not made final decisions about site selection and development and may change aspects of the potential sites. We will notify you if changes are made to the potential sites in Texas.

The information in the impact rating forms includes the following data:

Proposed Big Hill SPR Site and Associated Infrastructure: AD-1006 Form # 1

Acres Converted Directly

Structure	Acres	Files
Big Hill site	139.8	Attached shapefiles in folder: BigHill\Big Hill Proposed Site

Structure	Acres	Files
Big Hill site 300ft buffer	53.7	Attached shapefiles in folder: BigHill\Big Hill Proposed Site 300ft Buffer

Proposed Big Hill SPR Site and Associated Infrastructure: NRCS-CPA-106 Form # 1

Acres Converted Directly

Structure	Acres	Files
Brine pipeline to be replaced	16.1	Attached shapefiles in folder: BigHill\Brine Pipeline to be Replaced

Structure	Acres	Files
Crude oil pipeline to Nederland	211.0	Attached shapefiles in folder: BigHill\Crude Oil Pipeline to Nederland

Proposed Stratton Ridge SPR Site and Associated Infrastructure: AD-1006 Form # 2

Acres Converted Directly

Structure	Acres	Files
Stratton Ridge site	273.5	Attached shapefiles in folder: StrattonRidge\Stratton Ridge Site

Structure	Acres	Files
Stratton Ridge site 300ft buffer	109.4	Attached shapefiles in folder: StrattonRidge\Stratton Ridge Site 300ft buffer

Structure	Acres	Files
Raw water intake structure buffer	1.1	Attached shapefiles in folder: StrattonRidge\Raw water intake structure buffer

Acres Converted Indirectly

Structure	Acres	Files
Access Road	3.8	Attached shapefiles in folder: StrattonRidge\Access Road

Structure	Acres	Files
Power line	22.3	Attached shapefiles in folder: StrattonRidge\Powerline

Proposed Stratton Ridge SPR Site and Associated Infrastructure: NRCS-CPA-106 Form # 2

Acres Converted Directly

Structure	Acres	Files
Crude oil pipeline to Texas City	455.0	Attached shapefiles in folder: StrattonRidge\Crude oil pipeline to Texas City

Structure	Acres	Files
Raw water intake pipeline	124.7	Attached shapefiles in folder: StrattonRidge\Raw water intake pipeline

Structure	Acres	Files
Brine pipeline to beach	9.2	Attached shapefiles in folder: StrattonRidge\Brine pipeline to beach

Structure	Acres	Files
Exit pipeline ROW	2.0	Attached shapefiles in folder: StrattonRidge\Exit pipeline ROW

Please contact me at (703) 934-3079 if you have any questions about this information.

Sincerely,

Emily Small
Research Assistant

Attachments: AD-1006 Farmland Conversion Impact Rating forms
NRCS CPA-106 Farmland Conversion Impact Rating forms for Corridor Type Projects
Supporting documentation for calculations

[This page intentionally left blank]

From: Gibson, Will
Sent: Thursday, March 02, 2006 10:24 AM
To: 'william.r.bunkley@sam.usace.army.mil'
Cc: 'ifrost@eee-consulting.com'; 'Deborah.j.shumake@sam.usace.army.mi'
Subject: FW: Proposed Expansion of the Strategic Petroleum Reserve (Richton, Mississippi)

Dear Mr. Bunkley,

I understand from Ms. Shumake that you are the appropriate person to contact regarding this issue--please see the letter and attachment below.
I was told by you colleague that we might be able to reach you for an initial conversation at 1pm CST today.

Please let me know if that works for you.

Until then,

All Best,

Will Gibson, Ph.D. | ICF Consulting | 1725 Eye Street NW | Washington, DC 20006 | t: 202.862.1583 |
m: 202.210.3797 | WGibson@icfconsulting.com

From: Gibson, Will
Sent: Tuesday, February 28, 2006 11:00 AM
To: ''Deborah.j.shumake@sam.usace.army.mil'
Subject: FW: Proposed Expansion of the Strategic Petroleum Reserve (Richton, Mississippi)

February 27, 2006

Ms. Debbie Shumake
USACE Mobile District
Deborah.j.shumake@sam.usace.army.mi

RE: Proposed Expansion of the Strategic Petroleum Reserve (Richton, Mississippi)

Dear Ms. Shumake:

The U.S. Department of Energy (DOE) is proposing to expand the Strategic Petroleum Reserve (SPR) to its 1 billion barrel authorized capacity. The Strategic Petroleum Reserve Office of DOE has determined that this project is subject to the National Environmental Policy Act (NEPA). The purpose of this email is to request information from the U.S. Army Corps of Engineers on the natural resources that the project could potentially affect, as well as any permits and approvals required for construction at one site being considered near the town of Richton, Mississippi. Pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899, we are requesting your comments on the proposal as well as instructions for any further coordination.

DOE has initiated preparation of an Environmental Impact Statement with publication of a Notice of Intent (70 FR 52088) on September 1, 2005. The Energy Policy Act of 2005 (EPACT), enacted on August 8, 2005, requires the Secretary of Energy to select sites necessary to expand the SPR to 1 billion barrel capacity no later than one year after enactment. This requires an extremely fast NEPA review process in order to provide decision-makers with information for a Record of Decision in early August of 2006.

DOE currently operates four underground crude oil storage facilities in salt domes along the Gulf Coast as the Strategic Petroleum Reserve (SPR). The combined storage capacity is 727 million barrels. The Proposed Action is to expand the SPR storage capacity to one billion barrels by developing a new storage site with associated infrastructure at one of the following: Bruinsburg, Mississippi (160 million barrels); Chacahoula, Louisiana (160 million barrels); Clovelly, Louisiana (120 million barrels); a combination of Clovelly (80 million barrels) and Bruinsburg (80 million barrels); Richton, Mississippi (160 million barrels); or Stratton Ridge, Texas (160 million barrels). In addition, the existing site at Bayou Choctaw, Louisiana could be expanded by either 20, 30, or 108 million barrels; and the existing site at West Hackberry, Louisiana could be expanded by either 15 million barrels or not at all. Expansions at existing sites would require developing new caverns and purchasing existing caverns.

Included as an attachment to this email is an outline of the background to the proposed action at Richton, a map providing a regional view of proposed new SPR sites and existing SPR site along the Gulf Coast, and a description and maps of the location, layout, and pipelines of the proposed new SPR storage site at Richton.

We look forward to talking with you briefly on Wednesday morning, March 1, about our approach to minimizing wetland impacts. During that conversation we would like to arrange teleconference to for the following week to speak in more detail about least environmental damaging alternatives with maps, which we will have sent you, in hand.

Thank you for your assistance in this matter. Please call or email me if you have questions or need further information.

Sincerely,

Will Gibson

Attachment

Will Gibson, Ph.D. | ICF Consulting | 1725 Eye Street NW | Washington, DC 20006 | t: 202.862.1583 |
m: 202.210.3797 | WGibson@icfconsulting.com

Department of Energy
Washington, DC 20585

April 13, 2006

Ms. Angela Trahan
U.S. Fish and Wildlife Service
646 Cajundome Boulevard, Suite 400
Lafayette, LA 70506

Subject: Evaluation of Threatened and Endangered Species for the Expansion of the Strategic Petroleum Reserve Environmental Impact Statement (EIS)

Dear Ms. Trahan:

Based on our meeting with you and your colleagues on February 3, 2006, the Department of Energy (DOE) developed an approach to be used in the subject EIS to evaluate species protected under the Endangered Species Act (ESA). The approach is designed to present relevant information to the public and decision makers in accordance with the National Environmental Policy Act, and to document DOE's evaluation process in accordance with Section 7 of the ESA and the Final Endangered Species Act Section 7 Consultation Handbook (Consultation Handbook) dated March 1998. The approach also takes into account that in the Record of Decision, DOE would only select:

- One new site out of the six potential new sites - (1) Stratton Ridge, Texas; (2) Chacahoula, Louisiana; (3) Clovelly, Louisiana; (4) Bruinsburg, Mississippi; (5) Richton, Mississippi; or (6) a combination of Bruinsburg and Clovelly; and
- Two or three of the expansion sites - (1) Big Hill, Texas; (2) Bayou Choctaw, Louisiana; and possibly (3) West Hackberry, Louisiana.

The approach includes a threatened and endangered species evaluation with the results presented in the EIS, followed by site- and species-specific surveys and informal and/or formal consultation with the U.S. Fish and Wildlife Service, as appropriate, after DOE has issued the Record of Decision for the EIS. The specifics of this approach are outlined below.

DOE will prepare and submit to your office with the draft EIS an Evaluation of Special Status Species by state (Texas, Louisiana, and Mississippi). DOE is preparing these evaluations to review and document its findings of "no effect" and "may affect" in accordance with the definitions found in the Consultation Handbook and a letter from U.S. Fish and Wildlife Service dated September 29, 2005, as presented below. For the purpose of the evaluation, DOE has defined "may effect" to include "is not likely to adversely affect" or "is likely to adversely affect."

- **No effect.** The proposed action will not affect Federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area).

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- **Is not likely to adversely affect.** The proposed action may affect listed species and/or critical habitat; however, the effects would be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effect.
- **Is likely to adversely affect.** Adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. If the overall effect of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species.

For the finding of "may affect," DOE acknowledges that it has not completed onsite surveys to support a finding of "is not likely to adversely affect" or "is likely to adversely affect." Therefore, DOE can reach only a finding of "may affect" in the EIS. Once DOE has issued a Record of Decision and selected a specific new site and expansion sites for development, DOE would perform site- and species-specific surveys for all the species that received a finding of "may affect" under that alternative. DOE would evaluate the impacts on the Federally listed species in consultation with U.S. Fish and Wildlife Service and in accordance with the Consultation Handbook.

DOE is proposing this approach for your review and to coordinate among all three U.S. Fish and Wildlife offices involved in the preparation of this EIS. If you have any comments or concerns regarding this approach, please contact me at the addresses listed below or by telephone at any time.

Sincerely,

Donald Silawsky

Donald Silawsky
U. S. Department of Energy
Office of Petroleum Reserves (FE-47)
1000 Independence Avenue, SW
Washington, DC 20585-0301
E-mail: donald.silawsky@hq.doe.gov
Telephone: 202-586-1892

cc: Mr. Lloyd E. Inmon, U.S. Fish and Wildlife Service, Jackson, MS
Ms. Catherine Yeargan, U.S. Fish and Wildlife Service, Houston, TX

Attachments

Correspondence from

Federal, State, and Local Agencies

S0068

CHITIMACHA
TRIBE OF LOUISIANA

CULTURAL DEPARTMENT

December 19, 2005

Mr. Donald Silawsky
Office of Petroleum Reserves (FE-47)
1000 Independence Avenue, S.W.
Washington, DC 20585-0301

Re: Proposed Expansion of the Strategic Petroleum Reserve,
West Hackberry, Bayou Choctaw, Clovelly, and Chacahoula,
Cameron, Calcasieu, Iberville, and LaFourche Parishes, Louisiana

We are in receipt of your letter, dated November 22, 2005, concerning the above-referenced project. The parish where the proposed project is to take place is part of the aboriginal Chitimacha homeland. That is, historically and prehistorically the Chitimacha Tribe of Louisiana was located in this area. This homeland contains many village sites, religious/sacred sites, and burial sites, which must be taken into account in the planning process.

Our records and oral traditions do not indicate that a specific Chitimacha archaeological site or Traditional Cultural Property is in the immediate vicinity of your project, therefore we have no objection to the implementation of the proposed activity. However, if archaeological remains representing a village site and/or burial site are discovered during the process of construction you should stop and contact the tribe and the State Historic Preservation Office immediately, in order to begin consultation regarding the encountered remains.

The Chitimacha Tribe of Louisiana appreciates your compliance with federal and state laws concerning Native American notification and consultation. Should you have any questions, do not hesitate to contact me at (337) 923-9923.

Sincerely,

Kimberly S. Walden,
Director, Cultural Department

KW: JE

105 Houma Drive P.O. Box 661 Charenton, LA 70523 (337) 923-9923

S0058

Fadely, Karen

From: Silawsky, Donald [Donald.Silawsky@hq.doe.gov]
Sent: Thursday, December 01, 2005 4:37 PM
To: Fadely, Karen; Summerville, Alan; Johnson, David
Subject: FW: Proposed Expansion of the Strategic Petroleum Reserve(Richton and Bruinsburg, Mississippi)

KAREN: Another SPR EIS comment.

ALL: Who should contact Mr./Ms. Cole to discuss the meeting that is being requested?

DON SILAWSKY

-----Original Message-----
From: Terry Cole [mailto:tcole@choctawnation.com]
Sent: Thursday, December 01, 2005 11:18 AM
To: Donald.Silawsky@hq.doe.gov.
Subject: Proposed Expansion of the Strategic Petroleum Reserve(Richton and Bruinsburg, Mississippi)

Dear Mr. Silawsky: Regarding your request dated November 22, 2005, the project is within the

Boundaries of the homelands of the Choctaw people of Oklahoma, therefore we are very concerned

that ground disturbance may affect significant archaeological sites or historic sites. We are requesting

a meeting with you to discuss the project. Thank you

K-22

Terry D. Cole, THPO

Choctaw Nation of Oklahoma

Unknown

From: Terry Cole [tcole@choctawnation.com]
Sent: Wednesday, December 28, 2005 9:54 AM
To: Quick, Polly
Subject: RE: Polly Quick notes on phone conversation re Strategic Petroleum Reserve Expansion

Dear Polly,

I concur with the following report submitted on December 27, 2005. If there is anything I can do, please feel free to call my office. Thank you.

Terry Cole, THPO
Choctaw Nation of Oklahoma

-----Original Message-----
From: Quick, Polly [mailto:PQuick@icfconsulting.com]
Sent: Tuesday, December 27, 2005 1:44 PM
To: tcole@choctawnation.com
Subject: Polly Quick notes on phone conversation re Strategic Petroleum Reserve Expansion

Hello Terry, thanks for returning my call today. Below are my notes, which I'll use as a basis for words in the Draft Environmental Impact Statement that we are preparing for the Department of Energy.

We talked because you had sent an email December 1 to Don Silawsky at Department of Energy expressing indicateing that project boundaries of the Richton MS and Bruinsburg MS sites fall within the traditional homeland of the Choctaw Nation of Oklahoma and that the tribe has concerns that ground disturbance might affect archaeological sites.

You said that you do not have site records in your office, that the MS SHPO has those. You asked if we had been in contact with Ken Carleton from the MS Band of Choctaw or with the Jena Band. I said we had written both groups but had received no response. You said that it is difficult for you in Oklahoma to cover the state of MS, but someone needs to do it, and that your concerns extend from the ancestral homelands along the Trail of Tears to your present location. You said this includes portions of Louisiana and Texas as well as Mississippi.

I explained that DOE will be selecting one of five locations to develop a new facility (I actually said six, but I am correcting that here). DOE is considering two sites in MS, two in Louisiana and one in Texas. Because only one of five will be selected, DOE is preparing Programmatic Agreements with the three state SHPOs that will stipulate that DOE will do on-the-ground survey for the facility that is selected, including associated pipeline routes. I am attaching a map that shows locations of the five possible new facility sites as well as existing locations being evaluated for expansion.

You said that what you require, once on-the-ground-survey is done, is copies of the survey reports and prior investigation reports that provide information on archaeological sites that might be affected. Your office will review those and then can discuss concerns, if any, with DOE. You indicated that you are comfortable with the Programmatic Agreement approach, waiting for selection of a specific site before on-the-ground survey is done.

I said that I would provide you with a list of the other tribes that received consultation letters, so you can let us know if others should be contacted. This is the list:

Alabama Coushatta Tribe, Chickasaw Nation of Oklahoma, Chitimacha Tribe, Choctaw Nation of Oklahoma, Coushatta Tribe, Jena Band of Choctaw Indians, Mississippi Band of Choctaw Indians, Quapaw, Tunica-Biloxi Tribe of Louisiana; as well as the following state-recognized tribes: United Houma Nation, Point Au Chien Tribe, and Biloxi Chitimacha Confederation of Muskogee.

If you can reply to me to confirm these notes or provide corrections, it would assist me in moving forward with text for the Draft Environmental Impact Statement. Thanks for your help.

Polly

Polly McW. Quick, Ph.D.
Principal
ICF Consulting
60 Broadway
San Francisco, CA 94111
+1 415 677-7115 47115
+1 415 677-7177 fax
+1 510 703-7396 cell
pquick@icfconsulting.com

NOTICE:

This message is for the designated recipient only and may contain privileged or confidential information. If you have received it in error, please notify the sender immediately and delete the original. Any other use of this e-mail by you is prohibited.

Federal Agencies

S0057

Fadely, Karen

From: Donald Silawsky [silawsky@cfl.rr.com]
Sent: Monday, December 19, 2005 8:18 PM
To: Fadely, Karen
Subject: FW: MMS Comments on the Proposed Expansion of the StrategicPetroleum Reserve

KAREN: SPR EIS comments. Be sure to check this against the e-mail message from Dec. 16 and delete that.

DON SILAWSKY

------ Forwarded Message
From: "Christopher, Joseph" <Joseph.Christopher@mms.gov>
Date: Mon, 19 Dec 2005 10:12:16 -0500
To: silawsky@cfl.rr.com
Subject: MMS Comments on the Proposed Expansion of the Strategic Petroleum Reserve

Dear Mr. Silawsky,

[On December 16, we inadvertently sent you an email message with comments on this project. Please consider the following to be our official comments.]

The Minerals Management Service (MMS) Gulf of Mexico OCS Region has reviewed the proposal by the U.S. Department of Energy (DOE) for expansion of the Strategic Petroleum Reserve (SPR) and is providing the following scoping comments. The proposed action includes expansion of three existing SPR sites at West Hackberry and Bayou Choctaw in Louisiana, and Big Hill in Texas, and a new site would be selected from Chacahoula and Clovelly in Louisiana, Richton and Bruinsburg in Mississippi, and Stratton Ridge, Texas. The DOE would develop new caverns in salt domes to store additional crude oil. The proposed action also indicates that during the development of new cavern in the salt domes, the displaced brine would either be disposed on-site or carried by a pipeline and discharged through a diffuser in the Gulf of Mexico. The MMS has no objection to this proposed action. However, if DOE decides to allow discharge of brine in the Gulf, we would appreciate an opportunity to evaluate the specifics of this disposal method for potential conflicts with existing oil and gas infrastructure.

If you have any questions regarding our comments, please contact me.

Thanks,

12/20/2005

Joseph A. Christopher

Regional Supervisor

Office of Leasing and Environment

Minerals Management Service

Gulf of Mexico OCS Region

New Orleans, LA 70123

(504) 736-2759

joseph.christopher@mms.gov <mailto:joseph.christopher@mms.gov> .

------ End of Forwarded Message

12/20/2005

S0016

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701

October 6, 2005 F/SER46/RH:jk
225/389-0508

Mr. Donald Silawsky
Office of Petroleum Reserves, (FE-47)
1000 Independence Avenue, S.W.
Washington, DC 20585-0301

Dear Mr. Silawsky:

NOAA's National Marine Fisheries Service (NMFS) has reviewed your letters dated September 13, 2005, to our field offices in Baton Rouge, Louisiana, Galveston, Texas and Panama City, Florida related to the proposed expansion of the strategic petroleum reserves (SPR) at West Hackberry and Bayou Choctaw, Louisiana, and Big Hill, Texas. Additionally, one new site would be developed at Clovelly or Chacahoula, Louisiana; Richton, Mississippi, or Stratton Ridge, Texas. The expansion is planned to increase the current capacity of the SPR system from 727 million barrels to 1 billion barrels. Your letters transmitted limited information regarding potential project features, as well as maps identifying the general location of the existing and proposed SPR facilities. You indicated in your letters that the Department of Energy intended to prepare an Environmental Impact Statement (EIS) for this action and that they intended to use the National Environmental Policy Act (NEPA) process to comply with coordination requirements of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and the Marine Mammal Protection Act.

According to your letters and the information they transmitted, expansion activities would include the creation of oil storage caverns located from 1,000 to 6,000 feet underground, the release of concentrated brine via diffusers in the Gulf of Mexico, construction of surface buildings, and the installation of pipelines to move brine and crude oil from the SPR sites to various distribution points. Some aquatic and tidally influenced wetland habitats potentially impacted by SPR expansion activities are designated as essential fish habitat (EFH) for postlarval, juvenile and subadult life stages of white shrimp, brown shrimp, and red drum; juvenile Spanish mackerel; and juvenile and adult bluefish. Categories of EFH in the project area include estuarine emergent wetlands; mud, sand and shell substrates; submerged aquatic vegetation, and estuarine and marine water column. Detailed information on federally managed fisheries and their EFH is provided in the 1998 generic amendment of the Fishery Management Plans for the Gulf of Mexico prepared by the Gulf of Mexico Fishery Management Council (GMFMC). The generic amendment was prepared as required by the Magnuson-Stevens Act.

To fully address EFH and associated fisheries in the project area, NMFS recommends the EIS include sections titled "Essential Fish Habitat" and "Marine Fishery Resources" that identify fisheries resources of the project area and describe the potential adverse impacts associated with

the proposed expansion activities. The recommended EFH section of the document should describe and quantify the potential impacts of the proposed alternatives on EFH sub-categories (e.g., marsh edge, marsh ponds, submerged aquatic vegetation, mud bottoms, tidal creeks, water column, etc.). In addition, this section should describe the potential impacts of the proposed project on the utilization of these sub-categories of EFH by each fishery species and life stage listed above.

In addition to being designated as EFH for the species listed above, waterbodies and wetlands in tidally-influenced portions of the project areas provide nursery and foraging habitats supportive of a variety of economically important marine fishery species, such as striped mullet, Atlantic croaker, gulf menhaden, spotted and sand seatrout, southern flounder, black drum, and blue crab. Some of these species also serve as prey for other fish species managed under the Magnuson-Stevens Act by the GMFMC (e.g., mackerels, snappers, and groupers) and highly migratory species managed by NMFS (e.g., billfishes and sharks). We recommend the EIS fully describe the use of the various project areas by these species and evaluate the potential impacts of project implementation on marine fishery utilization of wetlands and water bottoms at each SPR site and pipeline construction zone.

No information was provided with your memorandum regarding the likely routes of all pipelines that would be used to discharge brine into the Gulf of Mexico or transport crude oil to distribution hubs. The exact alignment of all pipelines and locations of discharge outfalls should be coordinated with NMFS and other natural resource and regulatory agencies to ensure impacts to wetlands and fishery species are avoided and minimized to the maximum extent practicable. In addition, wetland restoration projects constructed under the auspices of the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) are located in the vicinity of the various SPR sites in Louisiana. All expansion activities should be planned to avoid impacting constructed features of any CWPPRA project. For more information on CWPPRA projects that may be adversely impacted by SPR expansion activities, you may want to review the CWPPRA web site at www.lacoast.gov. Any EIS developed for this project should include those alternatives that best avoid and minimize adverse wetland impacts.

The NMFS recommends the EIS include a section titled "Mitigation" that discusses sequential measures to avoid, minimize, and offset impacts to wetlands. Section 1508.20 of the Council on Environmental Quality's regulations implementing NEPA defines mitigation as a sequencing process that should first attempt to avoid and minimize wetland impacts prior to developing compensatory mitigation options. Any compensatory mitigation plan to offset adverse impacts should be developed, in consultation with NMFS, and included in the EIS. The mitigation plan should include monitoring components, success criteria, and an identification of additional steps that might be necessary to ensure mitigation success.

The comments contained in this letter respond only to the portion of your request regarding EFH and the federally managed marine fishery resources for which EFH has been designated in the project area. This letter does not address threatened or endangered marine species or marine mammals, consultations for which are handled by the Protected Resources Division of NMFS'

Southeast Regional Office. The Protected Resources Division can be contacted at the following address and phone number:

David Bernhart
Assistant Regional Administrator
Protected Resource Division
Southeast Regional Office
National Marine Fisheries Service
263 13th Avenue, South
St. Petersburg, Florida 33701
(727) 551-5789

We appreciate your consideration of our comments. If you wish to discuss this project further or have questions concerning our recommendations, please contact Richard Hartman at (225) 389-0508, extension 203.

Sincerely,

Richard Hartman

for Miles M. Croom
Assistant Regional Administrator
Habitat Conservation Division

cc:
FWS, Lafayette
EPA, Dallas
LA DWF
LA DNR
F/SER4, Bernhart
F/SER46, Ruebsamen
Files

S0044

Fadely, Karen

From: Silawsky, Donald [Donald.Silawsky@hq.doe.gov]
Sent: Thursday, December 01, 2005 5:57 PM
To: Fadely, Karen
Subject: FW: Reopening scoping comment period and new site proposal of SPR expansion

Attachments: Mark.Thompson.vcf

Mark.Thompson.vcf
(560 B)

KAREN: Another SPR EIS comment.

DON SILAWSKY

--- Original Message ----
From: Mark Thompson [mailto:Mark.Thompson@noaa.gov]
Sent: Thursday, December 01, 2005 5:41 PM
To: Silawsky, Donald
Cc: Rusty Swafford; Richard Hartman
Subject: Reopening scoping comment period and new site proposal of SPR expansion

Dear Mr. Silawsky,

N0AA, National Marine Fisheries Service (NMFS), Habitat Conservation Division (HCD), has reviewed your letters dated November 21, 2005, to our field offices in Panama City, Galveston, and Baton Rogue regarding the reopening of the scoping comment period for the proposed expansion of the strategic petroleum reserve sites in Mississippi, Louisiana, and Texas. This request also includes a new site at Bruinsburg, Mississippi.

NMFS, HCD, by letter dated October 6, 2005, provided comments on your original request and those comments continue to be applicable to the current proposal. Accordingly, we have no further comments to make at this time.

We appreciate you coordinating with us. If you have any questions, please call me at 850-234-5061.

Sincerely,

/W. Mark Thompson/
Team Leader
Panama City Office
Habitat Conservation Division

United States Department of the Interior

National Park Service
Gulf Islands National Seashore
1801 Gulf Breeze Parkway
Gulf Breeze, Florida 32563

IN REPLY REFER TO

N16(GUIS-RM)

October 28, 2005

Mr. Donald Silawsky
Office of Petroleum Reserves
1000 Independence Avenue, SW
Washington, DC 20585-0301

RE: Proposed Expansion of the Strategic Petroleum Reserve (Richton, Mississippi)

Dear Mr. Silawsky:

Thank you for the opportunity to review and comment on the Department of Energy (DOE) proposal to expand the Strategic Petroleum Reserve (SPR), specifically the Richton, Mississippi alternative. Our review of the alternatives revealed that potential effects on Gulf Islands National Seashore would result from the Richton expansion site only and would be associated with the construction of the outfall pipeline and brine disposal in the Gulf of Mexico. The brine is a result of solution mining in the salt dome to create SPR storage caverns. Since the other alternative sites are far removed from the park, they appear to pose no park resource protection concerns.

Gulf Islands National Seashore was authorized by Congress in 1971 (P.L. 91-660, 84 Stat. 1967, 16 U.S.C. 459h) "to preserve for public use and enjoyment certain areas possessing outstanding natural, historic, and recreational values". As part of the coastal barrier island system, the gulf islands are among the last surviving portions of a natural ecological continuum that once extended from Cape Cod to Mexico.

The natural resources of the Seashore are, in and of themselves, highly significant. The water areas are exceptional and, in conjunction with the salt marshes, bayous, and submerged grassbeds, play a crucial role in the economy and ecology of the entire area. Of particular significance, the Mississippi islands are among the most pristine examples of intact coastal barrier ecosystems remaining. The significance of these resources is only amplified by the loss of similar habitats in the adjacent areas through development. Open space, accessible to the public, is at a premium.

In the Richton alternative, it appears the DOE is considering diffused brine disposal approximately thirteen miles offshore. In pursuing this disposal alternative, it appears that DOE would seek to locate the outfall pipeline across Gulf Islands National Seashore to reach waters of the Gulf of Mexico. While the Secretary of Interior has clear authority under the park's enabling statute to consider allowing new rights-of-way or easements for the transport of oil and gas pipelines to cross the park, this authority may not extend to a brine/waste disposal pipeline. The pertinent park enabling provision is as follows:

TAKE PRIDE IN AMERICA

> Any acquisition of lands, waters, or interests therein shall not diminish any existing rights-of-way or easements which are necessary for the transportation of oil and gas minerals through the seashore which oil and gas minerals are removed from outside the boundaries thereof; and, the Secretary, subject to appropriate regulations for the protection of the natural and recreational values for which the seashore is established, shall permit such additional rights-of-way or easements as he deems necessary and proper. (16 U.S.C. §459h-3; P.L. 91-660 §4)

Further, an examination of 16 U.S.C. §79 regarding rights-of-way for public utilities leads us to conclude that the brine pipeline does not fit under this public utility provision.

If a right-of-way could be issued for the disposal pipeline to cross the park, National Park Service permitting and consent would be necessary. This permitting would be in addition to full analysis under the National Environmental Policy Act and other statutes. Regulations found in 36 CFR Parts 9 and 14 provide standards which must be used in the determination of necessary and proper. Specifically, in order for the Secretary to grant a permit, sufficient justification must be provided to make a reasonable determination that it is necessary for this operation to pass through the boundaries of the Seashore and that the procedures utilized in construction and operation are proper, in that they provide adequate protection to the resources of the area. Most, if not all, of the natural resources and visitor use values for which the park was established have the potential to be impacted by construction of an outfall line and brine disposal in the vicinity of the seashore.

In 1978, Horn and Petit Bois Islands were designated wilderness by Congress in P.L. 95-625 through the establishment of the Gulf Islands Wilderness Area. The islands are managed to maintain their primeval character in accordance with the Wilderness Act of 1964 (P.L. 88-577) whose purpose is to establish an enduring and unimpaired wilderness resource, where nature predominates, for public use and enjoyment. Wilderness status places significant restraints on possible developments on or near the two islands and requires substantial measures be taken to guarantee an undisturbed, wilderness experience for visitors.

In addition to wilderness values, other barrier island functions and resources must be taken into consideration. These include but are not limited to:

1. Geological processes: littoral drift, inlet formation, and island migration
2. Threatened and endangered species and species of management concern: marine sea turtles, Gulf sturgeon, nesting bald eagles and osprey, shorebirds, and migratory birds
3. Marine environment and fisheries
4. Submerged aquatic vegetation and benthic communities
5. Marine mammals
6. Water quality and clarity
7. Visitor use and recreation
8. Nationally designated historic sites

If further analysis of the Richton alternative becomes necessary, we will provide additional detail information concerning resources which may be impacted by the proposed pipeline and brine disposal.

Sincerely,

Jerry A. Eubanks
Superintendent

S0072

United States Department of the Interior

NATIONAL PARK SERVICE
Natchez Trace Parkway
2680 Natchez Trace Parkway
Tupelo, Mississippi 38804

IN REPLY REFER TO
L76 (NATR), L30
X3-R,S,T,U

DEC 0 9 2005

Mr. Donald Silawsky
U.S. Department of Energy
Office of Petroleum Reserves (FE-47)
1000 Independence Ave., S.W.
Washington, DC 20585-0301

Dear Mr. Silawsky:

This is in response to your letter dated November 29, 2005, regarding the proposed expansion of the Strategic Petroleum Reserve. The Department of Energy has determined the proposed pipeline associated with the Bruinsburg candidate site would cross the Natchez Trace Parkway at a location yet to be determined in Claiborne County, Mississippi.

Without a specific crossing location, impacts to Parkway resources and values cannot be determined. However, after a review of the proposal, Parkway staff offers some recommendations that may assist in your scoping efforts. Utility corridors cross the Parkway at numerous points in Claiborne County. Locating the proposed pipeline underground, and within one of these corridors, would minimize ground and vegetative disturbance and the likelihood that archeological resources would be encountered. Moreover, visual impacts to Parkway visitors would be negligible once the site was reseeded back to pre-disturbance conditions. Should the location of the proposed pipeline be in a location not within an existing utility right of way, or within a previously disturbed site, a greater level of impact would be expected. There would also be a greater potential for adverse effect on Parkway resources and values.

The National Park Service appreciates the opportunity to participate in this project of national and regional importance. Should you have any further requests or questions concerning these comments, please feel free to contact Natural Resource Specialist Bill Whitworth at (662) 680-4004, or by electronic mail at bill_whitworth@nps.gov.

Sincerely,

Wendell Simpson

Wendell A. Simpson
Superintendent

TAKE PRIDE IN AMERICA

S0006

Fadely, Karen

From: Silawsky, Donald [Donald.Silawsky@hq.doe.gov]
Sent: Wednesday, October 12, 2005 11:40 AM
To: Fadely, Karen
Subject: FW: SPR-Richton, MS

KAREN: Please log this into the SPR EIS scoping comment tracking system and send me a short reply that you received this message. I have not gotten any read receipts from the messages I sent to you previosuly.
Thanx.

Hope you enjoyed the trip to Texas.

DON SILAWSKY

Original Message
From: Kilpatrick, Tom - Jackson, MS [mailto:tom.kilpatrick@ms.usda.gov]
Sent: Tuesday, October 11, 2005 12:07 PM
To: Silawsky, Donald
Subject: SPR Pichton, MS

Dear Mr Silawsky,

I have looked at the proposed SPR project and there will be no prime farmland converted along the pipeline and at Pascagoula. The site at Richton could involve a possible conversion of farmland. A determination may need to be made there. The currnet ownership of the site will determine if a FPPA determination is necessary. If the site is owned by a government entity and has been designated for this or a similar purpose, then no FPPA determination will be necessary. This would speed up the entire process and would only require a letter from our State Soil Scientist. If not then the proper forms will need to be completed by DOE and our agency.

Please advise me on this and we will take the necessary actions here.

If you wish, you may contact me at (601)965 5209 ext 245.

Thanks

Tom Kilpatrick

1

S0046

UNITED STATES DEPARTMENT OF AGRICULTURE

Natural Resources Conservation Service
Suite 1321, Federal Building
100 West Capitol Street
Jackson, MS 39269
COM (601)965-5205 FAX (601) 965-4940

November 7, 2005

Mr. Donald Silawsky
Office of Petroleum Reserves, (FE-47)
Department of Energy 1000
Independence Avenue, S.W. Washington,
DC 20585-030!

Dear Mr. Silawsky:

Thank you for the opportunity to review and comment on the proposed expansion of the Strategic Petroleum Reserve at Richton, Perry County, Mississippi. The Natural Resources Conservation Service (NRCS) is responsible for insuring compliance with the Farmland Protection Policy Act.

In accordance with the Farmland Protection Policy Act (FPPA) of 1981, federal programs that contribute to the necessary and irreversible conversion of farmland to nonagricultural uses will be minimized. It follows that federal programs shall be administered in a manner that, as practicable, will be compatible with state and local government and private programs and policies to protect farmland.

Based on the limited data provided, NRCS was unable to determine if the Richton, Mississippi storage site and associated pipelines to the Gulf of Mexico would impact prime farmland In order to properly evaluate the impacts of the proposed project on prime farmland, a "Farmland Conversion Impact Rating for Corridor Type Projects", Form No. NRCS-CPA--106 should be completed

Please contact Mr, Wesley Kerr, Area Conservationist, Hattiesburg, MS by phone at
(601) 296-1173 or email (Wesley.Kerr@ms.usda.gov) for assistance in preparing Form No. NRCS-CPA-106. Mr. Kerr's area encompasses the 24 most southern counties within the state of Mississippi.

If you have any questions or need additional assistance, please let me know.

Sincerely,

Homer L. Wilkes State
Conservationist

cc: Kim Harris, State Conservation Engineer, NRCS, Jackson, MS
Wesley Ken, Area Conservationist, NRCS, Hatttesburg, MS

S0045

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
3737 Government Street Alexandria, LA
71302

November 16. 2005

Mr. Donald Silawsky Office of
Petroleum Reserves, (FE-47) 1000
Independence Avenue, S.W.
Washington, DC 20585-0301

Dear Mr. Silawsky:

PROPOSED EXPANSION OF THE STRATEGIC PETROLEUM RESERVE
CLOVELLV, CHACAHOULA, WEST **HACKBERRY,** AND BAYOU **CHOCTAW**
CAMERON, **CALCASIEU, IBERVILLE, & LAFOURCHE** PARISHES

Thank you for providing our agency with the opportunity to respond to your letter regarding the above project.

NRCS has no objection to this project and it does not appear that it will affect any of our work in the immediate vicinity.

Should you have questions regarding the above comments, please feel free to contact Jerry Hall District Conservationist in our Addis Field Office, at (225) 687-2184, Mike Trusclair, District Conservationist in our Thibodaux Field Office, at (985) 447-3871, or Charles Starkovich, District Conservationist in our Lake Charles Field Office, at (337) 436-5020.

E.J. Giering III. P.E.
State Conservation Engineer

cc: Jerry Hall, District Conservationist, Addis Field Office
Mike Trusclair, District Conservationist, Thibodaux Field Office Charles
Starkovich, District Conservationist, Lake Charles Field Office

S0071

UNITED STATES DEPARTMENT OF AGRICULTURE

NRCS
Natural Resources Conservation Service
Suite 1321, Federal Building
100 West Capitol Street
Jackson, MS 39269
COM: (601) 965-5205 FAX: (601) 965-4940

December 13, 2005

Mr. Donald Silawsky
Office of Petroleum Reserves, (FE-47)
Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585-0301

Dear Mr. Silawsky:

Thank you for the opportunity to review and comment on the proposed expansion of the Strategic Petroleum Reserve at Richton, Perry County, Mississippi and the Bruinsburg Salt Dome in Claiborne County, Mississippi. The Natural Resources Conservation Service (NRCS) is responsible for insuring compliance with the Farmland Protection Policy Act.

In accordance with the Farmland Protection Policy Act (FPPA) of 1981, federal programs that contribute to the necessary and irreversible conversion of farmland to nonagricultural uses will be minimized. It follows that federal programs shall be administered in a manner that, as practicable, will be compatible with state and local government and private programs and policies to protect farmland.

As stated in my November 7, 2005 letter to you concerning the proposed project, NRCS was unable to determine if the project would impact prime farmland based on the limited data provided. In order to properly evaluate the impacts of the proposed project on prime farmland, a "Farmland Conversion Impact Rating for Corridor Type Projects", Form No. NRCS-CPA-106 should be completed.

Please contact Mr. Wesley Kerr, Area Conservationist, Hattiesburg, MS by phone at (601) 296-1173 or email (Wesley.Kerr@ms.usda.gov) and Mr. Maurice Manning, Area Conservationist, Pearl, MS by phone at (601) 965-4559, Extension 235 or email (Maurice.Manning@ms.usda.gov) for assistance in preparing Form No. NRCS-CPA-106. Mr. Kerr's area encompasses the 24 most southern counties within the state of Mississippi which includes Perry County. Mr. Manning's area encompasses the 21 central counties within the state of Mississippi which includes Claiborne County.

If you have any questions or need additional assistance, please let me know.

Sincerely,

acting

Homer L. Wilkes
State Conservationist

cc: Kim Harris, State Conservation Engineer, NRCS, Jackson, MS
Wesley Kerr, Area Conservationist, NRCS, Hattiesburg, MS

S0074

United States Department of Agriculture

NRCS
Natural Resources Conservation Service
3737 Government Street
Alexandria, LA 71302

December 16, 2005

Mr. Donald Silawsky
Office of Petroleum Reserves (FE-47)
1000 Independence Avenue, S.W.
Washington, DC 20585-0301

RE: Proposed Expansion of the Strategic Petroleum Reserve-Reopening Scoping Comment Period and New Site Proposal

Dear Mr. Silawsky:

As per your request, my office has reviewed the soils information for the project areas in Louisiana concerning prime farmlands. We have also addressed hydric soils as they may pertain to wetland issues. The results are as follows:

The new proposed Chacahoula site is in Lafourche parish. The enclosed soil survey indicates the soils at this site to be the BB--Barbary-Fausse association. This map unit is not prime farmland. The soils are hydric and wetlands may be present if there is a prevalence of hydrophytic vegetation and wetland hydrology. Deposition of fill material in wetland areas is subject to Section 404 of the Clean Water Act. You should contact the U.S. Army Corps of Engineers concerning wetland matters. The new crude oil pipeline from the Chacahoula site to Clovelly was also reviewed. This 50-mile pipeline crosses several prime farmland and hydric soils. See the nine enclosed interpretative farmland classification soils maps and nine hydric classification soil maps for location of soils affected. The brine disposal pipeline to the Gulf of Mexico and the oil distribution pipeline to the St. James terminal were not evaluated due to the imagery indicating existing pipelines. If existing pipeline right-of-ways are used, then no additional land use changes or prime farmlands should be affected.

The new proposed Clovelly site is also in Lafourche parish. The enclosed soil survey indicates the soils at this site to be the LA—Lafitte-Clovelly Association. This map unit is also not prime farmland. They are hydric and wetland issues may have to be addressed through the Corps.

The proposed expansion of the existing West Hackberry site is in Cameron parish. The enclosed soil survey indicates the soils at this site to be the Cw—Crowley-Vidrine silt loams (prime farmland), Mt—Mowata-Vidrine silt loams (prime farmland), GC—Gentilly muck (not prime farmland), and CO—Clovelly muck (not prime farmland). The Mt, GC, and CO map units are hydric and may be subject to wetland issues.

The proposed expansion of the existing Bayou Choctaw site is in Iberville parish. The enclosed soil survey indicates the soils at this site to be the Sg—Sharkey clay (prime farmland), Tu—Tunica clay (prime farmland), and Se—Schriever clay, frequently flooded (not prime farmland). The Sg and Se map units are hydric and may be subject to wetland issues. The Tu map unit is not hydric.

If these proposed projects are approved and federal funding is involved with the construction, then the enclosed forms AD-1006 (Farmland Conversion Impact Rating) and NRCS-CPA-106 (Farmland Conversion Impact Rating for Corridor Type Projects) will have to completed. Part 1 and 3 are done by the federal agency making the request, and part 2, 4, and 5 are done by NRCS.

If additional information is needed, please contact Charles Guillory, Assistant State Soil Scientist, at 318-473-7789 or charles.guillory@la.usda.gov.

Sincerely,

Donald W. Gohmert
State Conservationist

Cc: Jerry J. Daigle, State Soil Scientist
Charles M. Guillory, Assistant State Soil Scientist

Enclosures

United States Department of Agriculture

NRCS
Natural Resources Conservation Service
Pearl Area Office
311 Airport Road
Pearl, MS 39208

16 March 2006

Ms. Emily Smail
ICF Consulting
9300 Lee Highway
Fairfax, VA 22031

Ms. Smail:

Please find attached an AD-1006 and a NRCS-CPA-106. It should be noted that on both forms the no prime, unique or statewide important farmland block has been checked. There are reasons for this.

With regard to the NRCS-CPA-106, the decision was made by our State and Area Soils Staff that once the pipe was laid and recovered the land had not actually been converted.

With regard to storage site near Bruinsburg (AD-1006), land to be converted is not considered prime or unique due to frequent flooding. There are however, other concerns at this site. An interview was conducted with the operator of this tract where I learned a pump and water line are to be installed to move water from either the Mississippi River or Bayou Pierre. An Army COE 404 permit will be required for this. There are at least two wetland areas that will be impacted; this too will require an Army COE 404 permit. There may also be an archeological site adjacent to Bayou Pierre.

Should you require further information or assistance, I may be contacted by phone at 601-965-4559 ext. 239.

Rex H. Chandler

Rex H. Chandler
Area Resource Soil Scientist, Pearl Area Office

cc: Mike Lilly, Acting Area Conservationist, Pearl A.O.
Tom Kilpatrick, Soil Scientist, Jackson S.O.
file

The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.

An Equal Opportunity Provider and Employer

United States Department of Agriculture

NRCS
Natural Resources Conservation Service
101 South Main Street
Temple, TX 76501-7602

March 27, 2006

ICF Consulting
7300 Lee Highway
Fairfax, VA 22031-1207

Attention: Emily Smail, Research Assistant

Subject: LNU-Farmland Protection-
Expansion of Strategic Petroleum Reserve
Brazoria and Jefferson Counties, Texas

We have reviewed the information provided concerning the proposed expansion of the Strategic Petroleum Reserve Texas City Tank Farm at Texas City in Galveston County, Texas as outlined in your letter of March 23, 2006. This is part of NEPA evaluation for the U. S. Department of Energy. We have evaluated the proposed site as required by the Farmland Protection Policy Act (FPPA).

The proposed project does contain soils classified as Important Farmland and is subject to the FPPA. We have developed a composite rating for the soils at the SPR Texas City Tank Farm Site and completed the AD-1006 form. The total points in Part VII are 63 for the Stratton Ridge Texas City Tank Farm Site. The FPPA law states that sites that score less than 160 will need no further consideration. The Rating is low because most of the area around the site is already converted and most of the soils are not classified as Important Farmland soils. We know of no other environmental concerns.

I have attached the completed AD-1006 (Farmland Conversion Impact Rating) form for this project indicating the approval status. Thanks for the resource materials you submitted to evaluate this project. If you have any questions please call James Greenwade at (254)-742-9960, Fax (254)-742-9859.

Thanks,

James M Greenwade

James M. Greenwade
Soil Scientist
Soil Survey Section
USDA-NRCS, Temple, Texas

The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.

An Equal Opportunity Provider and Employer

S0056

December 16,2005

Mr. Donald Silawsky:

Please find attached comments from the Corps of Engineers, Regulatory Branch, New Orleans District in response to the scoping period for the proposed expansion of the Strategic Petroleum Reserve. For further information and/or clarification of comments please feel free to contact Ronnie W. Duke at (504) 862-2261 or Martin Mayer at (504) 862-2276. Thanks for giving us the opportunity to participate in the scoping process,

Proposed New Sites Chacahoula

Facility encompasses approximately 285 acres of semi-permanently flooded bald **cypress**-tupelogum freshwater swamp in Lafourche Parish, Louisiana. Essential infrastructure includes approx. 139 miles of new pipeline.

Issues:

- Direct, secondary, cumulative impacts, short- and long-term, to high quality forested wetlands that provide vital wildlife habitat, fisheries support, floodwater storage, tidal buffer, recreation, aesthetics and water quality maintenance;
- Environmental threat from accidental brine/petroleum discharges into highly sensitive wetland areas necessitates contingency plans;
- High potential for ESA and/or cultural resource issues;
- Highly complex permitting involvement for proposed project and support facilities, with particularity to the practicability of leas environmentally damaging alternative locations, pipeline alignments and facility designs;
- Extensive compensatory mitigation anticipated to offset impacts to high value wetland resources due to acreage affected and high environmental quality at the project site and proposed pipeline corridors;
- Impacts to essential transportation infrastructure {US Hwy 90, Hwy 2 0 and railroads) from proposed pipeline facilities;
- Support infrastructure may encroach on existing and planned hurricane protection and coastal restoration activities;
- Maritime impacts on navigation channels (GIWW, Bayou Lafourche, etc.).

Proposed New Sites Clovelly

Project proposes collocation at the present Louisiana Offshore Oil Port (LOOP) petroleum storage terminal, utilizing existing LOOP infrastructure (i.e., caverns and pipelines) *near* Galliano, Louisiana, in Lafourche Parish.

Issues:

Potential direct, secondary, cumulative impacts, short- and long term, to high quality intertidai brackish marsh from activities occurring primarily outside existing LOOP facilities. Resource concerns include wildlife habitat, EFH, tidal buffer, recreation, aesthetics and water quality maintenance;

Environmental threat from brine/petroleum discharges into sensitive wetland areas necessitates contingency plans;

Potential for ESA and/or cultural resource issues;

The^availability and practicability of alternatives that avoid and minimize environmental impacts muat be addressed,-Compensatory mitigation will be required to offset impacts to important wetland resources at the project site;

Project/support infrastructure may encroach *on* existing and planned hurricane protection and coastal restoration activities;

Proximity of the proposed site to the gulf coast makes it extremely vulnerable to being directly impacted by tropical storm and hurricane landfall.

Local maritime interests may be affected by construction activities and facilities.

Proposed Expansion of the Existing Bayou Choctaw Site

Project proposes expansion of an existing SPR storage facility by on-site infrastructure upgrades at the location near Plaquemine, Louisiana, in Iberville Parish.

Issues;

Potential direct, secondary, cumulative impacts, short- and long-term, to high quality bald cypress-tupelogum swamp associated with activities occurring within the footprint of the existing SPR facility. Resource concerns include fish and wildlife habitat, floodwater storage, recreation, aesthetics and water quality maintenance;
Environmental threat from brine/petroleum discharges into highly extremely sensitive wetland areas necessitates contingency plans;
Potential for ESA/cultural resource issues;
The availability and practicability of alternatives that avoid and minimize environmental impacts must be **addressed**;
Compensatory mitigation will be required to offset impacts to important wetland resources at the project site;
Project/support infrastructure may encroach on existing and planned navigation and flood control projects;
Local maritime interests may be affected *hy* construction activities.

WEST HACKBERRY SPR STORAGE SITE

It appears from the drawings provided that the proposed Hackberry expansion would result in adversely impacting emergent wetlands that serve as habitat for numerous species of fish and wildlife species. Mitigation would be required for impacts to wetland resources.

Black Lake has been identified as an area capable of supporting various Coastal Restoration Projects. The proposed expansion of the Hackberry site into Black Lake could affect implementation of such restoration projects.

A less damaging alternative may be to consider storing the 15 million barrels targeted for Hackberry at another storage facility that could accommodate the 15 million barrels and will have to be constructed anyway in order to achieve additional storage of 273 million barrels,

With implementation of improvements as proposed, could the Hackberry site be capable of storing future reserves in excess of the 15 million barrel target capacity if necessary without further impacts to wetland resources?

TOTAL P. 86

Fadely, Karen

From: Silawsky, Donald [Donald.Silawsky@hq.doe.gov]
Sent: Monday, January 30, 2006 8:58 AM
To: Fadely, Karen
Subject: FW: Proposed expansion of the SPR-new site proposal

Another straggler.

DON SILAWSKY

-----Original Message-----
From: NValley@d8.uscg.mil [mailto:NValley@d8.uscg.mil]
Sent: Saturday, January 28, 2006 2:00 PM
To: Silawsky, Donald
Subject: Proposed expansion of the SPR-new site proposal

Mr. Silawsky: I have made available the information about the subject proposal (described in your letter to me dated Nov 21, 2005) to the applicable CG Federal On-Scene Coordinators. There is no comment at this time from the CG about this project although we are available at any time during the project to offer comment in areas that may affect our jurisdiction.

Thank you for allowing me time to comment. Do you need anything in writing more formal than an email?

Nathalie Valley, CDR
Eighth CG District
Chief, Response Branch
(504) 589-3656
Fax: (504) 589-4999

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

December 22, 2005

Mr. Donald Silawsky
Office of Petroleum Reserve
Department of Energy
1000 Independence Avenue S.W.
Washington, DC 20585-0031

RE: Proposed Expansion of the Strategic Petroleum Reserve Scoping Comments Bruinsburg and Richton, Mississippi sites

Dear Mr. Silawsky:

In accordance with Section 309 of the Clean Air Act and the National Environmental Policy Act (NEPA), the U.S. Environmental Protection Agency (EPA) Region 4 reviewed the information you provided regarding the proposed Expansion of the Strategic Petroleum Reserve (SPR) regarding the Richton, Mississippi and Bruinsburg Salt Dome sites. The purpose of this letter is to provide you with our comments

We completed our review of the project information you provided, and also met with your staff and contractors at their request for a briefing regarding the Richton, MS site. We appreciate their efforts to meet with us in our office in Atlanta.

We appreciate the opportunity to comment on the proposed project, and look forward to reviewing the Draft EIS. If you have any questions, please contact Ramona McConney of my staff at (404) 562-9615.

Sincerely,

Heinz Mueller

Heinz Mueller, Chief
NEPA Program Office

cc: EPA Region 6

EPA Region 4 Scoping Comments
Strategic Petroleum Reserve Expansion
Bruinsburg and Richton, Mississippi sites

General:

EPA Region 4 appreciates your early coordination and briefing with us regarding this proposed project. The presentation and illustrations you provided were helpful. Due to the new infrastructure that would be required if the Richton or Bruinsburg site were selected as a SPR site, EPA has concerns regarding several aspects of the project. The EIS should fully describe and discuss anticipated environmental impacts, both direct and cumulative. Also, the criteria for site selection should be fully described.

Impacts should be avoided/minimized to the maximum extent feasible. We appreciate that the potential pipeline locations would follow existing corridors. Placement of brine diffusers and pipelines need to avoid/minimize impacts to critical habitats and wetlands. The site selection for the brine diffusers should avoid areas with live bottoms such as hard/soft corals, seagrasses and other significant benthic assemblages. The extent of such areas with limited non-mobile organisms (sessile benthos) should encompass the area below the salinity plume. In contrast, areas with good flushing for the good mixing should be selected. The salinity plume should also be described in terms of its areal extent and salinities (including maximum salinities predicted and comparisons to ambient salinities). The continuous or intermittent nature of the brine discharges should also be documented. The overall timeframe for these discharges should also be discussed, to help assess the magnitude of the increased salinities. The EIS should describe mitigation plans for unavoidable impacts.

Alternatives:

Concerns exist regarding the quantity of surface water withdrawals which would be necessary for the project. The EIS should evaluate potential sources of water for the project, including surface water, groundwater, and other possible sources.

Relative to hurricane influences, the Bruinsburg and Richton sites have the advantage of being further inland than the other considered sites (aggregation of *all* SPR sites along coastal areas has obvious disadvantages). Conversely, Richton has the disadvantage of requiring longer brine and oil pipelines, which could have environmental impacts -- even if collocated -- and be more expensive. The Bruinsburg site would require a long oil distribution pipeline, but the brine disposal pipeline to wells located along the Baton Rouge crude oil pipeline would be shorter.

Identification of a preferred alternative in the DEIS may facilitate review and comment of the DEIS. Also, various environmental permits for this project will be required, and the permitting processes need to be given early consideration.

Environmental Justice & Endangered Species Act:

These impacts should be assessed as part of the pipeline studies. Emphasis should be placed on collocating new brine and oil pipelines in existing ROWs if these utilities are compatible. EPA will defer to FWS for ESA issues.

Secondary and Cumulative Impacts:

These impacts relate to those effects that would not occur but for the project (secondary or induced impacts) and those proposed or existing projects within the project area that are reasonably foreseeable. Emphasis would be for those projects with similar impacts to the proposal (e.g., if a desalinization plant was located nearby that also had a brine disposal impact). CEQ provides guidance for the cumulative impacts assessment at: ceq.eh.doe.gov/nepa/ccenepa/ccenepa.htm.

Intake Water:

If surface waters are used as source water, the entrainment of fish eggs and larvae need to be considered. Also, if these surface waters are contaminated, the disposal of these contaminants must be considered as part of the NPDES permit for the brine discharge. For both surface or groundwater use, the volume and effects of such withdrawals should be discussed -- particularly since these waters would be consumed, i.e., used and discharged to sea rather than returned to the source. Consumptive use could lower water tables, drain wetlands, and limit agriculture.

NPDES Discharges:

Construction of the disposal and distribution pipelines will need to be considered for NPDES coverage under the Mississippi's General Permit for Storm Water Discharges from Construction Activities.

The EIS should fully describe anticipated NPDES discharges. DOE will need to coordinate NPDES Permitting activities with MSDEQ for proposed point source discharges in to waters of the State of Mississippi, and with EPA for proposed discharges into federal waters in the Gulf of Mexico (if the Richton MS site were selected). If the Bruinsburg MS site were selected, brine disposal would take place offsite in underground injection wells.

Discuss alternative operational and disposal options, including no discharge, and the economic impact on the community for each.

Particular attention should be given to identify pollutants of concern in the source of raw water intakes.

Assess potential impacts on live bottoms in the vicinity of brine water discharge in the Gulf of Mexico.

Hydrocarbon Storage and Underground Injection Control (UIC) Wells:

The MS State Oil and Gas Board has regulations for the drilling, construction and permitting of hydrocarbon storage and UIC disposal wells and the DOE will need to coordinate with the Oil and Gas Board at various stages should any of the MS candidate sites be selected.

Air Quality:

The EIS should fully describe anticipated air emissions, measures to avoid/mitigate impacts, and compliance with air quality regulations. Air emissions should be discussed in the EIS, and related to the attainment status of the area. Emission sources include the oil blanket used during solution mining, construction equipment, and compressor stations along pipelines.

Land Use:

To the extent feasible, the land use surrounding the selected site should be controlled. EPA defers to DOE regarding site security.

Section 106:

We are aware that there are significant concerns regarding historic preservation at the Bruinsburg Salt Dome site. EPA recommends that the DOE coordinate with the State Historic Preservation Office regarding cultural resources and historic preservation. Therefore, EPA defers to the parties involved in the Section 106 consultation to consider and to address those potential effects associated with the proposed project.

S0012

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Division of Ecological Services
17629 El Camino Real #211
Houston, Texas 77058-3051
281/286-8282 / (FAX) 281/488-5882

September 29, 2005

Donald Silawsky
Office of Petroleum Reserves
Department of Energy
1000 Independence Avenue S.W.
Washington, DC 20585-0301

Dear Mr. Silawsky:

This responds to your September 9, 2005 letter requesting threatened and endangered species information for the proposed expansion of the Strategic Petroleum Reserve (SPR) to its 1-billion barrel authorized capacity. Two Texas sites are being considered as part of the proposed project. The first site is the expansion of the existing SPR facility at Big Hill in Jefferson County. The second involves the construction of a new SPR facility at Stratton Ridge in Brazoria County.

U.S. Fish and Wildlife Service files indicate that a pair of bald eagles *Haliaeetus leucocephalus* is known to nest to the northwest of the proposed Stratton Ridge site. The approximate location of the nest is N 29.04140 W 95.38071.

Once a suitable nesting territory is established, the eagle pair will return to the same area year after year, though they may use alternate nests within the territory during different breeding years. If a given nest or nest tree is lost, the pair often returns to the same territory to begin another. Nesting territories can even be inherited by subsequent generations. Additional information on bald eagles is enclosed.

Individual bald eagles exhibit considerable variation in their responses to human activity, depending upon the type, frequency, and duration of activity; the extent of environmental modification; the point in time of the bird's reproductive cycle; and various other factors not well understood. Although it cannot be predicted with absolute certainty the effects a given disturbance might have on a specific eagle or eagle pair, certain activities are known to disturb bald eagles more than others. The enclosed habitat management guidelines address some of these concerns and identify recommended restrictions that may avoid potential impact to bald eagles if they should occur at or near the proposed project site.

Our records of known threatened and endangered species are limited. You should also use the county by county listing of federally listed threatened and endangered species, available at http://ifw2es.fws.gov/endangeredspecies/lists/ListSpecies.cfm , and other current species information to determine whether suitable habitat for a listed species is present at each project site. If suitable habitat is present, a qualified individual should conduct surveys to determine whether a listed species is present.

After completing a habitat evaluation and/or any necessary surveys, you should evaluate the project for potential effects to listed species and make one of the following determinations:

No effect – the proposed action will not affect federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area). No

TAKE PRIDE IN AMERICA

coordination or contact with the Service is necessary. However, if the project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.

Is not likely to adversely affect – the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effects. You should seek written concurrence from the Service that adverse effects have been eliminated. Be sure to include all of the information and documentation you used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.

Is likely to adversely affect – adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. If the overall effect of the proposed action is beneficial to the listed species but also is likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires formal Section 7 consultation with this office.

Regardless of your determination, the Service recommends that you maintain a complete record of the evaluation, including steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related articles.

Finally, a concern with major projects is the length of time that passes between environmental review, project planning and then construction. During this time, new locations of threatened and endangered species can be established and/or discovered or new species can be listed. Therefore, it is important that a mechanism be included in project planning so that updated threatened and endangered species information is gathered and reviewed periodically up until initiation of construction.

If you have any questions, or if we can be of further assistance, please contact Edith Erfling or Catherine Yeargan at 281/286-8282.

Sincerely,

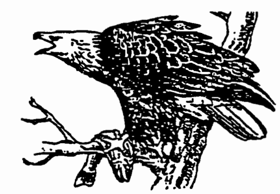
Frederick T. Werner
Assistant Field Supervisor, Clear Lake ES Field Office

Enclosures

STATUS: Endangered (32 FR 4001-March 11, 1967; 43 FR 6233-February 14, 1978) without critical habitat in all but five of the contiguous 48 states (listed as threatened in Washington, Oregon, Minnesota, Wisconsin, and Michigan)

DESCRIPTION: Large hawk-like bird with 6-7 feet wingspan and unfeathered feet. Adult has white head, neck, and tail. While gliding or soaring it keeps wings flat, not uplifted like vultures. Immatures are mostly dark, and may be confused with immature golden eagles. However, golden eagles have a more sharply defined white pattern on underside of wings and tail.

HABITAT: In Texas, preferred nesting habitat is along river systems, or within 1-2 miles of some other large body of water, such as a lake or reservoir. Nests are often located in areas where forest, marsh, and water meet. Large, tall (40-120 ft.) trees are used for nesting and roosting (taller than the general forest canopy, providing an unobstructed flight path to nest). Tree species used for nesting in Texas include loblolly pine, bald cypress, oak, cottonwood, and sycamore. Nearby (within 0.5 miles) wetland areas are necessary for feeding. Fish is generally the primary food, but eagles in Texas also prey on waterfowl, turtles, small mammals, and carrion.



DISTRIBUTION:

Present: Nesting populations are gradually increasing in Texas, with territories located primarily along rivers, near reservoirs, and along the Gulf Coast. Wintering eagles may occur statewide on rivers, streams, reservoirs and other areas of open water where fish, waterfowl,and carrion are available for food. See Bald Eagle Wintering Areas in Texas on the following page.

Historic: Found throughout the contiguous United States, Canada, and northern Mexico.

THREATS AND REASONS FOR DECLINE: Past threats include reproductive failure caused by pesticides, loss of riparian habitat, and unrestricted killing by humans (including shooting, poisoning, and trapping). Current threats are habitat loss, human encroachment on nesting sites, and lead poisoning (even low levels can cause neurological dysfunction, behavioral abnormalities, anemia, and increased susceptibility to disease).

OTHER INFORMATION: In Texas, bald eagle nesting typically occurs from October to July. Clutch size varies from 1 to 3, dull white eggs are incubated for approximately 35 days. Young generally fledge in April, after 10-12 weeks of growth, but parental care continues for another 4-6 weeks. Northern migration begins in May; occasionally, a pair will remain within a territory year-round. Wintering Bald eagles may arrive in north Texas as early as October and return north February through March. Bald eagles are particularly vulnerable to disturbance during the nesting period. Bald eagles are protected by the Endangered Species Act, Bald Eagle Protection Act and Migratory Bird Treaty Act.

REFERENCES:

Lish, J.W. 1975. Status and Ecology of Bald Eagles and Nesting Golden Eagles in Oklahoma. Unpubl. Thesis, Oklahoma State University, Stillwater, Oklahoma.

Texas Parks and Wildlife Department. 1993. Job No. 30: Bald eagle nest survey and management. Performance report, Federal Aid Project No. W-125-R-4. TPWD, Austin, TX.

Texas Parks and Wildlife Department. 1993. Job No. 59: Bald eagle post-fledging survival and dispersal. Final report, Federal Aid Project No. W-125-R-4. TPWD, Austin, TX.

U.S. Fish and Wildlife Service (USFWS). 1983. Northern States Bald Eagle Recovery Plan. USFWS, Endangered Species Office, Twin Cities, MN.

——. 1989. Southeastern States Bald Eagle Recovery Plan. USFWS, Endangered Species Office, Atlanta, GA.

REV. DATE 6/95

HABITAT MANAGEMENT GUIDELINES for BALD EAGLES in Texas (March 1993)

The following management guidelines were developed for the purpose of helping landowners and managers maintain or improve their land for the benefit of bald eagles, if the species occurs on their property, by protecting the environmental conditions the species requires. Emphasis is placed on providing information so that landowners may recognize and avoid or minimize those human-related activities which may adversely affect bald eagles, particularly nesting pairs. Bald eagles are protected by a number of Federal and State laws and regulations (including the Endangered Species Act, Bald Eagle Protection Act, and Migratory Bird Protection Act) which prohibit such acts as harassing, harming, disturbing, pursuing, etc. bald eagles, or destroying their nests. Individual bald eagles exhibit considerable variation in their responses to human activity, depending upon the type, frequency, and duration of activity; the extent of environmental modification; the point in time of the bird's reproductive cycle; and various other factors not well understood. Although it cannot be predicted with absolute certainty the effects a given disturbance might have on a specific eagle or eagle pair, certain activities are known to disturb bald eagles more than others. ALTHOUGH ADVISORY ONLY, the following guidelines address some of these concerns and identify recommended restrictions that should avoid potential impact to bald eagles (and avoid conflict with protective regulations). FOR ADDITIONAL INFORMATION, PLEASE CONTACT THE CLEAR LAKE OFFICE OF THE U.S. FISH AND WILDLIFE SERVICE (FWS) AT 713-286-8282, OR THE TEXAS PARKS AND WILDLIFE DEPARTMENT (512-389-4505 or 512-448-4311).

NESTING: GENERAL INFORMATION: Due to surveys carried out annually by the Texas Parks and Wildlife Department, bald eagle nest sites are currently known to occur in 27 southeastern Texas counties, although only a portion of these are active or successful each year. THE BALD EAGLE NESTING PERIOD IN TEXAS IS NORMALLY OCTOBER TO JULY, with peak egg-laying in December and hatching primarily in January. The young generally fledge in April after 10-12 weeks of growth, but parental care continues for another 4-6 weeks. Adults and young begin to migrate north in May, with a pair sometimes remaining within a territory all year. EAGLES ARE VULNERABLE TO DISTURBANCE THROUGHOUT THE NESTING PERIOD, but particularly during the first 12 weeks (during courtship, nest building, egg-laying, incubation, and brooding). Disturbance at this time may cause nest abandonment and chilled or overheated eggs or young. However, human activity even late in the nesting cycle may cause premature fledging and reduce the young's chances for survival.

Not only is protection of an actual NEST important; so is protection of the NEST SITE itself and all the component factors that attracted the pair to the area in the first place. Once a suitable breeding territory is found, breeding pairs will return to the same area year after year, often using alternate nests within the territory during different breeding years. Although a given nest may be lost due to weather or age of the tree, a pair often returns to the same territory to begin another. In cases where one member of a pair dies, the nest may go unused for several years but then be recolonized by the surviving member returning with a new mate. Nesting territories can even be inherited by subsequent generations. Therefore, guidelines intended to protect a nesting territory should apply to an "abandoned" nest site for at least five consecutive years of documented non-use.

MANAGEMENT ZONES FOR NESTING HABITAT: THE FOLLOWING HABITAT MANAGEMENT GUIDELINES, DEVELOPED BY THE FWS AND TPWD FOR NESTING BALD EAGLES IN TEXAS, ARE BASED ON THE IDENTIFICATION OF TWO MANAGEMENT ZONES SURROUNDING EACH NEST SITE, WITH CERTAIN RECOMMENDED RESTRICTIONS APPLYING TO EACH ZONE.

A. PRIMARY MANAGEMENT ZONE FOR NEST SITES:

THIS ZONE SHOULD ENCOMPASS AN AREA EXTENDING 750 TO 1,500 FEET OUTWARD IN ALL DIRECTIONS FROM THE NEST SITE. THE FWS RECOMMENDS THAT THE FOLLOWING ACTIVITIES NOT OCCUR WITHIN THIS ZONE:

1. Alteration of habitat or change in land use, such as would result from residential, commercial, or industrial development; construction projects; or mining activities.
2. Tree-cutting, logging, or removal of trees, either living or dead.
3. Use of chemicals toxic to wildlife.
4. Placement of above-ground electrical transmission or distribution lines. (Collision with powerlines and electrocution on powerline structures remain important causes of raptor mortality. Placement of underground lines is strongly recommended near bald eagle nests and winter concentration sites.)
5. Helicopter or fixed-wing aircraft operation within 500 feet vertical distance or 1,000 feet horizontal distance of the nest site, except during the non-nesting season (about late-July to early-October).
6. Human entry, except as described below (or as otherwise specifically allowed):
   a) Minimal-disturbance activities (such as hiking, fishing, camping, bird-watching), and certain land-use activities (such as farming, ranching, hunting) which are existing practices and have occurred historically on the site, can be carried out safely during the non-nesting period if no physical alteration of the primary zone is involved.
   b) The activities mentioned in (a) above which are existing practices and have occurred historically on the site during the nesting season, and do not appear to be adversely impacting the success of the nest site, can be carried out safely during the nesting season as well (late-October to early-July) if:

(continued)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
646 Cajundome Blvd.
Suite 400
Lafayette, Louisiana 70506

October 3, 2005

Mr. Donald Silawsky
U.S. Department of Energy
Office of Petroleum Reserves
1000 Independence Avenue S. W.
Washington, DC 20585-0301

Dear Mr. Silawsky:

Please reference your September 13, 2005, letter requesting review of the U.S. Department of Energy's proposal to expand the Strategic Petroleum Reserve (SPR) to its 1 billion-barrel authorized capacity. Four sites are being considered throughout Louisiana including the existing West Hackberry SPR facility in Cameron and Calcasieu Parishes, the existing Bayou Choctaw SPR facility in Iberville Parish, and two candidate sites in Lafourche Parish, the proposed Clovelly and Chacahoula SPR facilities. The U.S. Fish and Wildlife Service (Service) has reviewed the information you provided, and offers the following comments in accordance with the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.), the Migratory Bird Treaty Act (40 Stat. 755, as amended; 16 U.S.C. 703 et seq.), and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

Project-area forested wetlands associated with each proposed facility site may provide habitat for nesting bald eagles (*Haliaeetus leucocephalus*), which are federally listed as a threatened species, and our records indicate that a bald eagle nest is located within the proposed Chacahoula facility project area. Bald eagles nest in Louisiana from October through mid-May. Eagles typically nest in bald cypress trees near fresh to intermediate marshes or open water in the southeastern Parishes. Areas with high numbers of nests include the Lake Verret Basin south to Houma, the southern marsh/ridge complex from Houma to Bayou Vista, the north shore of Lake Pontchartrain, and the Lake Salvador area. Eagles also winter and infrequently nest near large lakes in central, southwestern, and northern Louisiana. Major threats to the species include habitat alteration, human disturbance, and environmental contaminants (i.e., organochlorine pesticides and lead).

Breeding bald eagles occupy "territories" that they will typically defend against intrusion by other eagles, and that they likely return to each year. A territory may include one or more alternate nests that are built and maintained by the eagles, but which may not be used for nesting in a given year. Potential nest trees within a nesting territory may, therefore, provide important alternative bald eagle nest sites. In forested areas, bald eagles often select the tallest trees with limbs strong enough to support a nest that may weigh more than 1,000 pounds. Nest sites typically include at least one perch with a clear view of the water or area where the eagles usually forage. Shoreline trees or snags located near large waterbodies provide the visibility and accessibility needed to locate aquatic prey. Bald eagles are most vulnerable to disturbance during courtship, nest building, egg laying, incubation, and brooding (roughly the first 12 weeks of the nesting cycle). Disturbance during this critical period may lead to nest abandonment, cracked and chilled eggs, and exposure of small young to the elements. Human activity near a nest late in the nesting cycle may also cause flightless birds to jump from the nest tree, thus reducing their chance of survival. Should the proposed project or associated work activities encroach within 1,500 feet of an eagle nest during the nesting season (October through mid-May), further consultation with this office will be necessary. We further caution that the proposed project should not damage any portion of bald eagle nest trees, including their root systems (i.e., through soil compaction or disturbance).

The proposed project sites are located within areas where colonial nesting waterbirds may be present. Colonies may be present that are not currently listed in the database maintained by the Louisiana Department of Wildlife and Fisheries. That database is updated primarily by monitoring the colony sites that were previously surveyed during the 1980s. Until a new, comprehensive coast-wide survey is conducted to determine the location of newly-established nesting colonies, we recommend that a qualified biologist inspect the proposed work site for the presence of undocumented nesting colonies during the nesting season. To minimize disturbance to colonial nesting birds (i.e., herons, egrets, night-herons, ibis, and roseate spoonbills, anhingas, and/or cormorants), all activity occurring within 1,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 1 through February 15, depending on species present). In addition, we recommend that on-site contract personnel be informed of the need to identify colonial nesting birds and their nests, and should avoid affecting them during the breeding season.

Finally, activities associated with expansion of the SPR may also impact wetlands. For a complete jurisdictional wetland delineation of the proposed project, please contact Mr. John Bruza (504/862-1288) at the New Orleans District, U.S. Army Corps of Engineers (Corps). If the Corps determines that the proposed project is within their regulatory jurisdiction, official Service comments will be provided in response to the corresponding Public Notice.

We appreciate the opportunity to provide comments in the early planning stages of this proposed activity, and we look forward to providing additional assistance as the project progresses. If you need further assistance, please contact Angela C. Trahan (337/291-3137) of this office.

Sincerely,

Russell C. Watson
Supervisor
Louisiana Field Office

cc: U.S. Army Corps of Engineers, New Orleans, LA
LDWF, Natural Heritage Program, Baton Rouge, LA

S0030

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Mississippi Field Office
6578 Dogwood View Parkway, Suite A
Jackson, Mississippi 39213

October 20, 2005

Mr. Donald Silawsky
Office of Petroleum Reserves (FE-47)
Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0301

Dear Mr. Silawsky:

The U.S. Fish and Wildlife Service (Service) received your letter dated September 13, 2005, concerning the preparation of an Environmental Impact Statement (EIS) regarding the expansion of the Strategic Petroleum Reserve (SPR) per the Energy Policy Act of 2005 (EPACT), enacted on August 8, 2005. One site proposed as a storage facility is the subterranean salt domes found near Richton, Perry County, Mississippi. The Department of Energy has initiated preparation of the EIS by publication of a Notice of Intent at 70 FR 52099 on September 1, 2005. Our comments are submitted in accordance with the Fish and Wildlife Coordination Act (16 U.S.C. 661-667c) and the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

The proposed construction site is salt dome caverns found to the northwest of Richton and north of Mississippi Highway 42. The approximately 30 acre project site would function as a new oil storage area with up to 160 million barrels of storage capacity. Also, a raw water system for leaching and oil drawdown, a brine setting and disposal system, a crude oil injection/distribution system, a fire protection system, a central control system, and multiple above-ground buildings would be constructed onsite.

Offsite impacts would include a raw water intake in the Leaf River; pipelines for water supply; a 96-mile brine disposal pipeline and an 83-mile oil distribution pipeline to the Gulf of Mexico via Jackson County; a 118-mile oil distribution pipeline to Liberty, Mississippi; and marine oil distribution facilities at the Port of Pascagoula.

Several federally listed threatened or endangered species and their habitats could be adversely impacted by the proposed construction or operation of the oil storage facility. Potential impacts to the following species should be considered during the environmental assessment and addressed in the EIS.

Forrest, George, Greene, Jackson, Lamar, Marion, Perry, and Walthall Counties

The threatened gopher tortoise (*Gopherus polyphemus*) inhabits well-drained sandy soils, especially in areas of longleaf pine. The gopher tortoise digs a burrow used as a shelter and nesting area. Groups of these tortoises dig burrows in the same location forming a colony. Gopher tortoises are attracted to the low growing vegetation normally found on utility ROWs. In addition, the threatened eastern indigo snake (*Drymarchon corais couperi*) is known to inhabit gopher tortoise burrows.

Amite, Forrest, George, Greene, Jackson, and Perry Counties

The endangered red-cockaded woodpecker (*Picoides borealis*) excavates nesting cavities in mature pine trees (60+ years old). A mated pair of birds and all helper birds form a clan. A cluster of cavity trees where the clan nests and roosts is called a colony. All cavity trees, active and inactive, are important to the colony and should therefore be avoided. Also, older (30+ years) pine stands within a half-mile of a colony should be considered foraging habitats and should not be disturbed.

Forrest, George, Marion, and Perry Counties

The black pine snake (*Pituophis melanoleucus* ssp. *lodingi*), a Candidate Species, prefers uplands with well-drained sandy soils in areas of longleaf pine and hardwood tree species. Candidates are those species currently under review for possible addition to the federal listed of threatened or endangered species. All efforts should be made to avoid harm or harassment to this species.

Forrest, George, Greene, Jackson, and Perry Counties

The endangered plant Louisiana quillwort (*Isoetes louisianensis*) is a nonflowering grasslike plant that lives in water or in very wet habitats. Mature plants are six to ten inches long, mostly evergreen, with spore-bearing structures below ground.

The threatened yellow-blotched map turtle (*Graptemys flavimaculata*) is found in the Chickasawhay, Leaf, and Pascagoula Rivers. The yellow-blotched map turtle prefers river stretches with moderate currents, abundant basking sites, and sand bars. Stream modification and changes in water quality have significantly contributed to the decline of the species.

Marion County

The threatened ringed map turtle (*Graptemys oculifera*) is found in the Pearl River. It prefers river stretches with moderate currents, abundant basking sites, and sand bars for nesting. Stream modification in the Pearl River, such as flood control and urban development, has significantly contributed to the decline of the species. Also, water quality degradation has posed a serious problem for the turtle.

Forrest, George, Greene, Jackson, Perry, Pike, and Marion Counties
Mississippi Sound

The threatened Gulf sturgeon (*Acipenser oxyrhynchus desotoi*) is found in the Pearl, Leaf, and Pascagoula Rivers. Gulf sturgeons are primitive, anadromous fish that annually migrate from the Gulf of Mexico into freshwater streams. Subadults and adults spend eight to nine months each year in rivers. Although Gulf sturgeon activity is not well documented, the species has been found in the river as far north as the Hattiesburg metropolitan area. The decline of the Gulf sturgeon is primarily due to limited access to migration routes and historic spawning areas, habitat modification, and water quality degradation.

Forrest, George, Jackson, Jones, and Perry Counties

The pearl darter *(Percina aurora)*, a Candidate Species, is found only in the Pascagoula River system. The darter prefers stable gravel riffles or sandstone exposures with large-sized gravel or rock. Habitat loss or degradation has been a major contributor to the reduction in pearl darter numbers. Candidates are those species currently under review for possible addition to the federal listed of threatened or endangered species. All efforts should be made to avoid harm or harassment to this species.

Amite, Forrest, George, Greene, Jackson, Lamar, Marion, Perry, Pike, and Walthall Counties

The Louisiana black bear *(Ursus a. luteolus)* is one of 16 subspecies of the American black bear. Historically, it occurred throughout southern Mississippi, all of Louisiana, and eastern Texas. Currently, there are only two known breeding bear subpopulations: the Tensas River basin and the Atchafalaya River basin. Although, there have been reported sightings along the Mississippi River corridor in Mississippi and Louisiana. While Louisiana black bear habitat consists mostly of bottomland hardwood forests, they are opportunistic omnivores and will frequent agricultural areas. Historical habitat has been reduced by 80% throughout its range. The remaining habitat has been reduced by forest fragmentation and human encroachment.

Jackson County

The endangered Brown pelican *(Pelecanus occidentalis)* nests mostly on offshore islands, but has been known to nest in onshore estuaries. Nesting areas are usually in low shrubs, trees or on the ground, and contain groups of 25-250 birds. They also congregate to feed near coastal wharves and pilings. Disturbance of nesting areas should be avoided.

The threatened Piping Plover *(Charadrius melodus)* does not nest in Mississippi but winters along the coastal beaches and barrier islands. These feeding areas have been threatened by urban development. Hence, Critical Habitat has been designated along several areas of the Mississippi Gulf Coast.

The endangered Mississippi Sandhill Crane *(Grus canadensis pulla)* is found only in a small area west of the Pascagoula River in Jackson County. Critical Habitat has been established on and adjacent to the Mississippi Sandhill Crane National Wildlife Refuge.

The endangered Alabama red-bellied turtle *(Pseudemys alabamensis)* is found in the lower Pascagoula River and its tributaries: Bluff Creek and the Escatawpa River. It is also found in Old Fort Bayou, the Tchoutacabouffa River, the Biloxi River, and the Back Bay of Biloxi. Destruction of nesting areas along river banks and feeding areas of submerged aquatic vegetation, and reduced water quality have impacted this species.

Green turtle *(Chelonia mydas)*
Kemp's ridley turtle (*Lepidochelys kempii)*
Loggerhead turtle *(Caretta caretta)*

Potential impacts to these sea turtles and their habitats are overseen by the National Marine Fisheries Service (NMFS). The Service will coordinate with NMFS during the environmental assessment phase.

Statewide

The threatened bald eagle (*Haliaeetus leucocephalus*) is the only species of "sea eagle" regularly occurring on the North American continent. The bald eagle is predominantly a winter migrant in the southeast; however, increasing occurrences of nesting have been observed. The bald eagle nests in the transitional area between forest and water. They construct their nests in dominant living pines or bald cypress trees. Eagles often use alternate nests in different years with nesting activity occurring between September and January of each year. Young are usually fledged by midsummer.

Summary

Surveys for many of the above species must be conducted on the storage facility site as well as along the pipeline routes. Areas surveyed should also include ingress and egress areas, equipment storage areas, and staging areas.

Assumption of presence can be made for many of the aquatic species eliminating the need for surveys. Presently it is our opinion that changes in water levels and flow in the Leaf, Chickasawhay, and Pearl Rivers will likely impact all of the listed species in these water bodies; therefore, further consultation with the Service will be necessary at a minimum on these species.

We appreciate the opportunity to comment on the subject project, and we look forward to being a part of the environmental process. If you have any additional questions, please feel free to contact Kathy W. Lunceford in this office, telephone: (601) 321-1132.

Sincerely,

Curtis B. James

Curtis B. James
Assistant Field Supervisor

Cc: USFWS, Atlanta, GA
Attn: Jeff Weller
NMFS, St. Petersburg. FL
Attn: David Keys
MDWFP, Jackson, MS
Attn: Andrew Whitehurst, Tom Mann
EPA, Atlanta, GA

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Mississippi Field Office 6578 Dogwood View Parkway, Suite A
Jackson, Mississippi 39213

December 5, 2005

Mr. Donald Silawsky
Office of Petroleum Reserves (FE-47)
Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585-0301

Dear Mr. Silawsky:

This is in regard to your November 21, 2005, letter concerning reopening the scoping period for the preparation of an Environmental Impact Statement (EIS) for the Proposed Expansion of the Strategic Petroleum Reserve (SPR). The U.S. Department of Energy is considering sites for storage of crude oil in underground salt domes. Our October 20, 2005, letter supplied comments on a proposed site near Richton, Mississippi, during the first scoping period. A new candidate site at the Bruinsburg Salt Dome along the Mississippi River in Claiborne County, Mississippi, is proposed for the new scoping period. Our comments are submitted in accordance with the Fish and Wildlife Coordination Act (16 U.S.C. 661-667e) and the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C 1531 et seq.).

The proposed 285 acre site is located a few miles north of Port Gibson along the Mississippi River in Claiborne County. The proposed construction includes developing caverns in salt domes to provide up to 100 million barrels of crude oil storage. Also, a raw water system for leaching and oil drawdown, a brine setting and disposal system, a crude oil injection/distribution system, a fire protection system, a central control system, and multiple above-ground buildings would be constructed onsite.

Offsite construction would include a 2.5 mile raw water pipeline to the Mississippi River; raw water lift pumps on the bank of the river; 43 mile oil distribution pipeline to Capline Pipeline's Peetsville Pump Station; 105 mile oil distribution pipeline to Baton Rouge accessing refinery and marine facilities; and a 15 mile brine disposal pipeline to wells located along the Baton Rouge crude oil pipeline. In addition, 60 brine disposal wells would be constructed along the brine and crude oil pipeline right-of-way. The wells would be placed 1,000 feet apart.

Several federally listed threatened or endangered species and their habitats could be adversely impacted by the proposed construction and operation of the crude oil storage facility. Potential impacts to the following species should be considered during the environmental assessment and addressed in the EIS.

Adams, Claiborne. Jefferson, and Wilkins Counties

The endangered pallid sturgeon *(Scaphirhynchus albusj* is one of the largest fish found in the Mississippi River. This bottom-dwelling fish has a distinctive flattened, shovel-shaped snout. It spawns in the main channel during late spring through early summer over substrates of rock, rubble, or gravel This species has experienced a dramatic decline because its habitat has been modified through river channelization, construction of impoundments, and related changes in flow regimes. Operation of the raw water intake during spawning and nursery season could result in loss of larval and juvenile pallid sturgeons through entrainment and impingement.

Claiborne and Copiah Counties

The threatened Bayou darter *(Etheostoma rubrum)* is found only in Bayou Pierre and its tributaries, White Oak Creek, Foster Creek, and Turkey Creek. The darter prefers stable gravel riffles or sandstone exposures with large sized gravel or rock. Habitat loss or degradation has been a major contributor to the reduction in bayou darter numbers.

Amite, Franklin, and Wilkinson Counties

The endangered red-cockaded woodpecker *(Picoides borealis)* excavates nesting cavities in mature pine trees (60+ years old). A mated pair of birds and all helper birds forms a clan. A cluster of cavity trees where the clan nests and roosts is called a colony. All cavity trees, active and inactive, are important to the colony and should therefore be avoided. Also, older (30+ years) pine stands within a half-mile of a colony should be considered foraging habitats and should not be disturbed.

Claiborne County

The endangered interior least tern *(Sterna antillarum)* may potentially be found along the Mississippi River in the proposed project area. It migrates up the Mississippi River and lays its egg directly on the sandbars associated with the river. Hundreds of these birds may nest together to form a colony.

The breeding season for terns is approximately May through July. Avoidance of nesting areas during the above time would prevent adverse impacts to the species. The species can change nesting areas from year to year, so an onsite survey for the species before start of construction and operation is recommended.

Jefferson County

The endangered fat pocketbook mussel *(Potamilus capax)* is found in the Mississippi River and associated tributaries. It is broad, rounded, and slightly angular mussel with a smooth, yellowish, and frequently clouded with brown, exterior color. Fat pocketbooks occur primarily in sand and mud substrates, although fee species has been found in fine gravel and hard clay occasionally. Water depth ranges from a few inches to several feet. The fish host for this species is primarily the freshwater chum.

Adams, Amite. Claibome. Copiah, Franklin, Jeffersocu and Wilkinson Counties

The threatened Louisiana black bear *(Urus a. luteolus)* occurs primarily in bottomland hardwoods and floodplain forests along the Mississippi River and the southern part of the state. Although the bear is capable of surviving under a range of habitat types, some necessary habitat requirements include hard mast, soft mast, escape cover, denning sites, forested corridors, and limited human access. Forest management practices, agricultural, commercial and industrial development, and highways can cause adverse impacts to bear habitat by increasing human disturbance, fragmenting forests, and removing den trees.

Franklin County

The Natchez and Chucko stoneflies are species of interest. They occur in small streams with stable sandy bottoms and good water quality.

Statewide

The threatened bald eagle *(Haliaeetus leucocephalus)* is the only species of "sea eagle" regularly occurring on the North American continent. The bald eagle is predominantly a winter migrant in the southeast; however, increasing occurrences of nesting have been observed The bald eagle nests in the transitional area between forest and water. They construct their nests in dominant living pines or bald cypress trees. Eagles often use alternate nests in different years with nesting activity beginning between September and January of each year. Young are usually fledged by midsummer.

All of the above species are very sensitive to human disturbance. Therefore, before construction of onsite facilities and offsite pipeline right-of-ways, the Service recommends a qualified biologist conduct a visual survey for these species. Areas surveyed should also include ingress and egress areas, equipment storage areas, and staging areas. If any of these species or their habitats is identified, further consultation with the Service will be necessary.

In addition, proposed onsite and offsite construction activities may result is loss of wetland habitats. Wetlands support an abundant variety of wildlife species and provide energy rich foods for song birds. They also provide resting and nesting areas. Wetland trap sediment and pesticide residues, recharge ground water, and control flooding by temporarily holding flood waters and releasing them slowly. The environmental values of wetlands are well documented and widely recognized. Presidential executive orders require that federal projects result in no net loss of wetlands. The Service mitigation policy requires that unavoidable loss of wetlands be fully mitigated inland.

If you have any questions, please contact Mr. Lloyd Inmon of this office staff at (601) 321-1134.

Sincerely,

Ray Aycock

Cc: Robert Seyfarth, Mississippi Department of Environmental Quality, Jackson, MS.
Jeff Weller, USFWS, Atlanta, GA Tom Mann, Natural Science Museum, Jackson, MS

S0049

Fadely, Karen

From: Silawsky, Donald [Donald.Silawsky@hq.doe.gov]
Sent: Thursday, December 08, 2005 5:10 PM
To: Fadely, Karen
Subject: FW: Proposed expansion of the strategic petroleum reserve Stratton Ridge Texas Site

KAREN: SPR EIS comment.

DON SILAWSKY

--- Original Message -----
From: Tracey_McDonnell@fws.gov [mailto:Tracey McDonnell@fws.gov]
Sent: Thursday, December 08, 2005 3:20 PM
To: Silawsky, Donald
Subject: Proposed expansion of the strategic petroleum reserve Stratton Ridge Texas Site

Dear Mr. Silawsky,

Thank you for the opportunity to provide any comments concerning the proposed expansion of the SPR at the Stratton Ridge site in Texas.
Because this existing site does not currently impact our refuges, in addition, based on the map you provided in your November 21, 2005 letter, we believe that the expansion will not effect us as well, we will not be submitting any comments. However, I would be interested in being included on any future mailings concerning this site.

Thank you again,
Tracey McDonnell

Tracey McDonnell
Project Leader
Texas Mid-Coast NWR Complex
1212 N. Velasco, Suite 200
Angleton, TX 77515
(979) 849-7771, ext. 25
(979) 849-5118 fax

S0050

Fadely, Karen

From: Silawsky, Donald [Donald.Silawsky@hq.doe.gov]
Sent: Tuesday, December 13, 2005 9:32 AM Fadely,
To: Karen FW: FWS JACKSON
Subject:

KAREN: SPR EIS comment, below. DON

SILAWSKY

----Original Message ----
From: Angela_Trahan@fws.gov [mailto:Angela_Trahan@fws.gov]
Sent: Tuesday, December 13, 2005 9:23 AM To: Silawsky, Donald
Subject: Re: FWS JACKSON

Thanks, Don.

Since the additional site is located in Mississippi, we will not be providing additional comments for the new site proposal. We look forward to reviewing the forthcoming EIS.

Have a great day,
Angela

Angela C. Trahan
U.S. Fish and Wildlife Service
Lafayette Field Office
337/291-3137 ph
337/291-3139 fax

"Silawsky, Donald" <Donald.Silawsky®hq.doe.gov>
12/12/2005 04:37 PM

To angela_trahan@fws.gov
cc
Subject FWS JACKSON

S0052

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Texas Chenier Plain Refuge Complex
P.O. Box 278
Anahuac, Texas 77514
Phone: (409) 267-3337 Fax: (409)267-4314

December 14, 2005

Mr. Donald Silawsky Office of
Petroleum Reserves (FE-47) 1000
Independence Avenue, S.W.
Washington, D.C. 20585-0301

Dear Mr. Silawsky:

Thank you for your letter of November 21, 2005 announcing the reopening of the Scoping Comment Period and New Site Proposal for the Proposed Expansion of the Strategic Petroleum Reserve, and requesting comments and identification of issues to be addressed in the Environmental Impact Statement for this project.

The brine line associated with the Big Hill SPR site in Jefferson County, Texas crosses the McFaddin National Wildlife Refuge, a unit of the National Wildlife Refuge System (NWRS) administered by the U.S. Fish and Wildlife Service (Service). Potential environmental issues with work in this pipeline corridor include impacts to jurisdictional wetlands and other refuge habitats, and to certain Service trust resources including several migratory bird species. If the project requires any work not covered by the existing legal Right-of-Way for the brine line, additional R-O-W permitting by the Service may be required. Finally, all new uses on NWRS lands and waters must be reviewed for compatibility with refuge establishment purposes and the NWRS mission prior to being permitted.

Thank you again or this opportunity to comment. Please contact me if I can be of further assistance.

Sincerely,

Andy Loranger
Project Leader

cc: Aaron Archibeque, USFWS, Albuquerque, NM
Carlos Mendoza, USFWS, Clear Lake Ecological Services FO, Houston, TX

S0060

Fadely, Karen

From: Donald Silawsky [silawsky@cfl.rr.com]
Sent: Saturday, December 24, 2005 8:12 AM
To: Fadely, Karen
Subject: FW: Department of Energy SPR - Dec. 19th Meeting
Attachments: SPR Expansion EIS -- agency meetings MS-DEQ v2.ppt

KAREN: Another SPR EIS comment, below.

DON SILAWSKY

------ Forwarded Message
From: Don R Neal <donneal@fs.fed.us>
Date: Fri, 23 Dec 2005 13:49:51 -0500
To: silawsky@cfl.rr.com
Subject: Re: Department of Energy SPR - Dec. 19th Meeting

Elizabeth,

We were not able to provide a representative for the Dec. 19th meeting due to scheduled annual leave this time of year. I have reviewed the package sent by Donald Silawsky and discussed this proposal with our Forest Minerals Specialist - Hunter Howell.

The proposed Bruinsburg site location is located well off Forest Service land. The proposed general pipeline alignment associated with this project crosses the Homochitto National Forest. The map is of such a scale that specific environmental/social concerns or impacts can not be addressed. If this proposal is selected, we would need to be involved with the planning of the site specific placement of the pipeline location. Some of the issues we need to address would be - impacts to T&E secies, impacts to water quality, impacts to wildlife, impacts to cultural resources, impacts to recreational visitors, impacts to existing special use permits and easements, etc..

The Raw Water Intake Structure on the proposed Richton site borders the northern boundary of the De Soto National Forest. The scale of the map makes it hard to determine if it actually lies on National Forest land. If any of the project lies on National Forest land we would need to coordinate with you on similar issues as mentioned on the Bruinsburg site.

We appreciate the opportunity to comment and the information you have provided. If you have any further site specific information on the location of the Bruinsburg pipelines or the Richton Raw Intake Structure please contact me.

Richard D. (Don) Neal

12/27/2005

Staff Officer
Engineering/Lands/Minerals/Special Uses
100 W. Capitol St.
Suite 1141
Jackson, MS 39269
(601) 965-4391 Voice
(601) 965-5519 Fax
donneal@fs.fed.us
U.S. Forest Service

"Zelasko, Elizabeth" <EZelasko@icfconsulting.com>

12/16/2005 12:42 PM

To: <donneal@fs.fed.us>

cc:

Subject: Department of Energy SPR - Dec. 19th Meeting

Don,

On Wednesday, I sent you an email with more details on the Department of Energy meeting on Monday, December 19th in Jackson, MS. In case you are unable to attend the meeting and wish to participate through conference call, I have attached a copy of the presentation.

Please contact me if you have any questions regarding the meeting.

Thank you and have a nice weekend.

Elizabeth

From: Zelasko, Elizabeth
Sent: Wednesday, December 14, 2005 4:20 PM
To: 'Andrew.Whitehurst@mmns.state.ms.us'; 'Lloyd_inmon@fws.gov'; 'Harold.lee@mvk02.usace.army.mil'; 'Richard.Hartman@noaa.gov'; 'mark.thompson@noaa.gov'; 'Alice.taylor@dmr.state.ms.us'; 'GMcWhorter@sos.state.ms.us'; 'pdukes@sos.state.ms.us'; 'Gary_hopkins@nps.gov'; 'Riley_hoggard@nps.gov'; 'Rick.clark@nps.gov'; 'donneal@fs.fed.us'; 'bill_whitwoth@nps.gov'; 'curtis_james@fws.gov'; 'ronald.j.ventola@mvn02.usace.army.mil'
Cc: 'Maya_Rao@deq.state.ms.us'; Stribley, Todd
Subject: Department of Energy SPR - Dec. 19th Meeting

12/27/2005

Louisiana State Agencies

S0031

State of Louisiana

Department of Environmental Quality

KATHLEEN BABINEAUX BLANCO
GOVERNOR

October 20, 2005

MIKE D. McDANIEL, Ph.D.
SECRETARY

Donald Silawsky
U.S. Department of Energy
Office of Petroleum Reserves (FE-47)
1000 Independence Avenue, S.W.
Washington, DC 20585-0301

RE: Proposed Expansion of the Strategic Petroleum Reserve
West Hackberry (AI# 9002), Bayou Choctaw (AI# 9005), Clovelly and
Chacahoula, Louisiana

Dear Mr. Silawsky:

The Office of Environmental Assessment, Air Quality Assessment Division, acknowledges receipt of a copy of your letter dated September 13, 2005, addressed to Secretary Mike McDaniel and containing information relative to proposed expansion of two existing Strategic Petroleum Reserve (SPR) sites and the possible development of a new SPR site in southern Louisiana. We understand that this proposed DOE action is in response to a 2005 Energy Policy Act mandate to expand oil storage capacity of the SPR from 727 million barrels to 1 billion barrels.

Please be advised that with the exception of the Bayou Choctaw site, all other proposed sites are located in parishes that are in attainment of the national ambient air quality standards (NAAQS). However, modifications to the existing Bayou Choctaw storage site in Iberville Parish will require compliance with the State's general conformity regulations (LAC 33:III.14.A). General conformity applies to the proposed expansion of the Bayou Choctaw site because Iberville Parish is currently designated by US EPA as an 8-hour ozone nonattainment parish and is classified as marginal. For this marginal nonattainment area, ozone-precursor *de minimis* levels are set at 100 tons per year per pollutant (volatile organic compounds and nitrogen oxides). Accordingly, LDEQ requests that DOE address these general conformity issues in the forthcoming draft Environmental Impact Statement.

Should you have any questions regarding state rules and regulations pertaining to general conformity, please contact me directly at (225) 219-3556, or Mr. Ron Rebouche of my staff at (225) 219-3561. Thank you for affording us the opportunity to comment on this proposed DOE action.

Sincerely,

Teri F. Lanoue

Teri F. Lanoue
Environmental Scientist Manager
Air Quality Assessment Division

TFL:RR
c: Dr. Chuck Carr Brown, OES
Wilbert Jordan, OEA
Peggy Wade, EPA Region 6

OFFICE OF ENVIRONMENTAL ASSESSMENT
P. O. BOX 4314 • BATON ROUGE, LOUISIANA 70821-4314 • TELEPHONE: (225) 219-3236 • FAX: (225) 219-3239
AN EQUAL OPPORTUNITY EMPLOYER

S0059

Fadely, Karen

From: Donald Silawsky [silawsky@cfl.rr.com]
Sent: Thursday, December 22, 2005 8:00 AM
To: Fadely, Karen
Subject: FW: Strategic Petroleum Reserve comments

KAREN: SPR EIS comment. Note that the sender is asking for additional info.

DON SILAWSKY

------ Forwarded Message
From: Al Hindrichs <Al.Hindrichs@LA.GOV>
Date: Wed, 21 Dec 2005 18:35:14 -0500
To: silawsky@cfl.rr.com
Subject: Strategic Petroleum Reserve comments

Mr. Silawsky,
I was asked to comment on a series of proposed expansions of the Strategic Petroleum Reserve, in particular the proposed Bruinsburg, Mississippi; Richton, Mississippi; and Bayou Choctaw, Louisiana sites. These sites are described in your letter and attachments dated November 21, 2005.

The proposed Bruinsburg site is located in the aquifer recharge area for Baton Rouge and many other communities in southern Mississippi and Louisiana. The Richton and Bayou Choctaw sites may not be as much of a problem but are still in the vicinity of this aquifer. Due to this concern I would like to request additional information regarding the design of these proposed caverns, in particular their depth and the depth of the proposed brine disposal wells. Both the storage of oil and the disposal of brine underground in this region could severely impact water quality in communities served by this aquifer. Therefore, I require additional information before making a determination.

You can provide the information either by email or by U.S. Postal mail. My mailing address is:

Albert Hindrichs
Water Quality Assessment Division
P.O. Box 4314
Baton Rouge, LA 70821-4314

Please let me know if you have any questions.

Sincerely,

Albert E. Hindrichs, Environmental Scientist Staff
Louisiana Department of Environmental Quality
Water Quality Assessment Division

12/23/2005

S0075

State of Louisiana

Department of Environmental Quality

KATHLEEN BABINEAUX BLANCO
GOVERNOR

MIKE D. McDANIEL, Ph.D.
SECRETARY

January 11, 2006

Mr. Donald Silawsky
Department of Energy
Office of Petroleum Reserves (FE-47)
1000 Independence Ave., S.W.
Washington, DC 20585-0301

RE: DEQ0612060082; Lafourche, Cameron, Calcasieu and Iberville Parishes
Proposed Expansion of the Strategic Petroleum Reserve - Reopening Scoping Comment Period and New Site Proposal

Dear Mr. Silawsky:

The Department of Environmental Quality, Office of Environmental Assessment and Office of Environmental Services has received your request for comments on the above referenced project.

There were no objections based on the limited information submitted to us. However, the following comments have been included and/or attached. Should you encounter a problem during the implementation of this project, please make the appropriate notification to this Department.

The Office of Environmental Services recommends that you investigate the following requirements that may influence your proposed project:

1. If your project results in a discharge to waters of the state, submittal of a Louisiana Pollutant Discharge Elimination System (LPDES) application may be necessary.
2. If the project results in a discharge of wastewater to an existing wastewater treatment system, that wastewater treatment system may need to modify their LPDES permit before accepting the additional wastewater.
3. LDEQ has stormwater general permits for construction areas equal to or greater than one acre. It is recommended that you contact Aaron Cox at (225) 219-3092 to determine if your proposed improvements require one of these permits.
4. All precautions should be observed to control nonpoint source pollution from construction activities.

recycled paper

OFFICE OF MANAGEMENT AND FINANCE • P.O. BOX 4303 • BATON ROUGE, LOUISIANA 70821-4303

AN EQUAL OPPORTUNITY EMPLOYER

CONTAINS SOYOIL

5. If any of the proposed work is located in wetlands or other areas subject to the jurisdiction of the U.S. Army Corps of Engineers, you should contact the Corps to inquire about the possible necessity for permits. If a Corps permit is required, part of the application process may involve a Water Quality Certification from LDEQ.

6. All precautions should be observed to protect the groundwater of the region (SEE ATTACHMENT).

Currently, Iberville Parish is classified as nonattainment with the National Ambient Air Quality Standards.

Currently, Lafourche, Cameron, and Calcasieu Parishes are classified as attainment parishes with the National Ambient Air Quality Standards for all criteria air pollutants.

Please forward all future requests to the Louisiana Department of Environmental Quality, Office of Management and Finance, Contracts & Grants, P. O. Box 4303, Baton Rouge, LA 70821-4303, and we will expedite your request as quickly as possible. Should you need any additional information please call me at (225) 219-3815.

Sincerely,

Lisa Miller

Lisa L. Miller
Contracts & Grants

llm:vhn
Enclosure

[redacted]

Fadely, Karen

From: Silawsky, Donald [Donald.Silawsky@hq.doe.gov]
Sent: Thursday, October 06, 2005 9:57 AM
To: Fadely, Karen
Subject: FW: Proposed expansion of the Strategic Petroleum Reserve

KAREN: Another EIS comment.

DON SILAWSKY

-----Original Message-----
From: Rosalind Green [mailto:rmgreen@dhh.la.gov]
Sent: Wednesday, September 28, 2005 9:14 AM
To: Silawsky, Donald
Cc: Dianne Dugas
Subject: Re: Proposed expansion of the Strategic Petroleum Reserve

An important issue that should be addressed is the impact of the construction of new oil storage caverns and placement of underground injection wells on local aquifers. This would fall under the analysis of the impact on water resources, as listed in the "Notice of Intent to Prepare and Environmental Impact Statement and Conduct Public Scoping Meetings: Site Selection for the Expansion of the Strategic Petroleum Reserve" document at the following website:

http://www.fe.doe.gov/programs/reserves/spr/spr_noi_090105.pdf

Hackberry residents have previously expressed concerns about cancer rates in their community to the Louisiana DHH. The US DOE needs to be prepared to address such health-related concerns in the communities in which they've planned expansion/new storage sites.

For each community, a flier/brochure/presentation should be made available to address community concerns about the stability of these sites, what salt dome storage involves, how extensive construction would be at a given site, and why these particular sites are being considered.

A proposed timeline should be estimated for the analyses of potential environmental impacts. The public needs a sense of the progression from environmental study to implementation of construction plans.

Rosalind M Green, Sc.D.
Environmental Health Scientist Coordinator Louisiana DHH/OPH/SEET
325 Loyola Ave. Room 210
New Orleans, LA 70112
email: rmgreen@dhh.la.gov
phone: (504) 568 8537
fax: (504) 568-7035

KATHLEEN BABINEAUX BLANCO
GOVERNOR

Scott A. Angelle
SECRETARY

JAMES H. WELSH
COMMISSIONER OF CONSERVATION

DEPARTMENT OF NATURAL RESOURCES

OFFICE OF CONSERVATION

December 9, 2005

Mr. Donald Silawsky Office of Petroleum
Reserves (FE-47) United States
Department of Energy 1000 Independence
Ave, S.W.
Washington, DC 20583-0301

Re; Proposed Expansion of the Strategic Petroleum Reserve - Reopening Scoping Comment Period and New Site Proposal

Dear Mr. Silawsky:

The Louisiana Office- of Conservation appreciates the additional opportunity to comment on the U.S. Department of Energy's proposed expansion of the Strategic Petroleum Reserve. (SPR). We are pleased that four of the eight candidate sites are in the State of Louisiana. Louisiana's association with the Strategic Petroleum Reserve goes back to its near beginnings when, on December 22,1975, the Energy Policy and Conservation Act (Public Law 94-163) was signed into law. Since then, we have been home to four separate SPR sites, of which two are still operating, in addition to the Department of Energy owned St. James Marine Terminal on the Mississippi River.

Bayou Choctaw and West Hackberry, two existing Louisiana SPR candidate sites for expansion, are both strong candidates. With existing infrastructures already in place and needing only minor upgrades to support expansion, either of these two facilities are persuasive in terms of cost effectiveness, ease of satisfying regulatory permit requirements, minimal environmental impact, and affording timely expansion and operational startup.

A proposed new SPR site at the Clovelly salt dome has its own unique possibilities. In place at the salt dome are several solution-mined salt caverns presently used by the Louisiana Offshore Oil Port (LOOP) for crude oil storage. The advantages of this site are identical to the existing SPR sites mentioned above with the additional advantage of having access to the only port in the United States capable of offloading the largest, deep draft tankers. An SPR site at the Clovelly salt dome would provide potential access to over 50 percent of the United States refinery capacity.

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State of Louisiana

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SCOTT A. ANGELLE
SECRETARY

DEPARTMENT OF NATURAL RESOURCES
OFFICE OF THE SECRETARY

December 12,2005

Donald Silawsky
U. S. Dept of Energy
Office of Petroleum Reserves (FE-47)
1000 Independence Avenue, S. W.
Washington, DC 20585-0301

RE: C20050552, Solicitation of Views
U. S. Dept. of Energy (DOE), Direct Federal Action
Request for Scoping Comments for the Proposed Expansion of the Strategic Petroleum Reserve (SPR)

Dear Mr. Silawsky:

I have received your letter of November 21, 2005, requesting input regarding issues which should be addressed in the Environmental Impact Statement (EIS) being prepared for the proposed expansion of the Strategic Petroleum Reserve. Review of the scoping document indicates that the proposed expansion is a Direct Federal Action that will require submittal of a Consistency Determination for the Louisiana Costal Zone *in* accordance with the approved Louisiana Coastal Resources Program (LCRP) as required by Section 307 of the Coastal Zone Management Act of 1972, as amended. Issues of concern to Louisiana that need to be addressed in the EIS and the Consistency Determination are discussed below.

The construction and operation of new or expanded SPR facilities that will adversely affect wetlands within the Louisiana Coastal Zone are a primary concern of the State of Louisiana as we have a "no net loss of wetland" policy in which the applicant must provide compensatory mitigation for any wetland losses resulting from those proposed activities. These include direct impacts from expansion of facilities into wetland areas, such as pipeline routing or facility siting, or indirect or cumulative impacts of the proposed activities on wetlands or wetland resources such as raw water removal from surface water bodies in areas prone to saltwater intrusion, or brine disposal in offshore areas. For sites with proposed brine wells, precaution must be taken to avoid contamination of drinking water aquifers.

Another concern is safety or potential safety hazards resulting from construction or operation of the facilities. There needs to be a spill response plan with provisions for precluding or

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As a new SPR site, the Chacahoula salt dome would require the building of more infrastructure than the other three previously discussed Louisiana sites. Any additional costs should be comparable, if not somewhat less, than some proposed SPR sites in neighboring states. Yet, Chacahoula's relatively short tie-in access to existing oil distribution facilities makes this proposed site practicable.

After reviewing the conceptual plan submitted by the State of Mississippi for the Bruinsburg salt dome, we are unable to ascertain the location of the 15-mile brine pipeline and final location of the proposed 60 offsite brine disposal wells to be spaced 1,000 feet apart. Please provide additional detail regarding the location of the brine pipeline and the offsite brine disposal wells in relation to the candidate facility. Our concern is the appearance that the disposal wells may be located in Louisiana while the storage facility is proposed in Mississippi.

Please contact Mr. Joe Ball at 225-342-5569 or joe.ball@la.gov with additional information or if you have questions.

Sincerely,

'James H. Welsh Commissioner
of Conservation

cc; Scott A, Angelle, Secretary
Louisiana Department of Natural Resources

addressing oil or brine spills from pipelines. Also, a thorough geologic and geophysical investigation of the proposed cavern sites needs to be undertaken to identify, address, and make and design provisions for any potential sources of cavern failure or leakage, in order to avoid a repeat of the Week Bay abandonment.

I want to thank you for the opportunity to comment on the proposed expansion of SPR facilities, which are not only of concern to the State of Louisiana, but are of National Energy Policy interest and concern. I look forward to the upcoming EIS on the SPR expansion, and can be reached at 225-342-2710 if I can be of assistance in any way on this matter.

Very truly yours,

Scot L Angelle
Secr

cc: Governor Kathleen Babineaux Blanco

S0017

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
P.O. Box 94245
Baton Rouge, Louisiana 70804-9245
www.dotd.louisiana.gov
LA. Offshore Terminal Authority
225-379-1247

KATHLEEN BABINEAUX BLANCO
GOVERNOR

JOHNNY B. BRADBERRY
SECRETARY

October 7, 2005

Mr. Donald Silawsky
Office of Petroleum Reserves (FE-47)
1000 Independence Avenue
Washington, DC 20585-0301

Dear Mr. Silawsky:

Your letter of September 13, 2005, states that the U.S. Department of Energy is proposing to expand the Strategic Petroleum Reserve (SPR) to one billion barrels. I believe this is a prudent step by the Department of Energy as the United States' dependency on foreign oil continues to increase. With country's demand for petroleum products at around 20 million-barrels per day, and our domestic production hovering between five to 5.5 million barrels per day, our energy supply and our economy are at the whim of foreign governments. Increasing the strategic reserve will protect the United States against supply interruptions from foreign governments, and additionally, will help mitigate the impact of supply interruptions from storms like hurricanes Katrina and Rita.

Your letter states that two existing SPR sites located within Louisiana will be expanded and a third site remains to be selected. Of the new sites under consideration, Clovelly and Chacahoula, I believe the Clovelly site, co-located with LOOP (Louisiana Offshore Oil Port), is the logical choice.

The proposed site at Chacahoula would require a 58-mile pipeline for brine disposal to the Gulf of Mexico and a 50-mile pipeline for oil distribution to LOOP at Clovelly and/or a 21-mile pipeline to the marine facilities located at St. James, Louisiana. The pipeline route to the Gulf will be through Louisiana's marsh and wetlands. Although the State of Louisiana supports the expansion of the SPR as it will provide both security of supply to the nation and create additional jobs for the state, if the infrastructure already exists at LOOP, why would we build new pipelines through Louisiana's marsh and wetlands?

All of the infrastructure requirements to build additional storage for the SPR already exist at LOOP. I believe use of the existing LOOP infrastructure will reduce construction time, save taxpayer money, and will do less damage to Louisiana's marsh and wetlands. I also understand LOOP's distribution system is connected to nearly 50 percent of the nation's refining capacity, which would be difficult to duplicate at the other proposed locations.

The framework for oversight and coordination of regulatory and environmental issues associated with locating the proposed SPR expansion project at the Clovelly site are already in place by virtue of the Louisiana Offshore Terminal Authority (LOTA) Act. This statute created LOTA as an office within the Department of Transportation and Development and provides for a "clearing house" approach to permitting of deepwater port activities. This coordinated approach is designed to prevent duplication of effort by regulatory authorities with complementary or overlapping jurisdiction. This has significantly streamlined the federal, state and local permitting process for deepwater port construction and operations without compromising environmental standards. The same process would be used to modify and update LOOP's construction and operating permits to incorporate additional air emissions, storage wells, etc. However, a permit modification would not require the extensive procedures associated with permitting a new facility.

An environmental monitoring program under the direction of LOTA is in place to determine any impacts associated with the construction and operation of the deepwater port. Extensive baseline, construction and post construction data has been gathered and analyzed to capture and quantify such impacts. The results of this program have shown that there were no long-term adverse impacts associated with the construction or operation of the LOOP facility. A major component of this monitoring program included studies on the effects of discharging large volumes of brine to the Gulf of Mexico over an extended period of time. These studies indicated no long term harmful effects on the fisheries in the area of the brine discharge.

Another important consideration relative to the Clovelly site is that an extensive Environmental Impact Statement (EIS) was prepared prior to construction of this facility which thoroughly addressed all potential impacts of the construction, operation and potential expansion of the complex. The leaching of additional storage caverns at Clovelly should only require an update of that EIS. The data collected in the extensive environmental monitoring program discussed above will provide pertinent information in updating the EIS. With significant data in place to facilitate that update, the NEPA process should be significantly expedited.

The Clovelly site has an extensive security and emergency response capability in place. As a facility subject to the Maritime Transportation Security Act, detailed procedures are in place to insure facility and operational security. A surveillance system, monitored on a 24-hour basis by trained security personnel is in place throughout the complex. LOOP maintains a close relationship with local, state and federal intelligence and enforcement personnel who are positioned to assist in the event of a threatened or actual security or other emergency situation. LOOP conducts routine emergency response training on a regular basis with its Emergency Response Team and numerous federal, state and local agencies to insure the safety and security of this facility.

Based upon the information you provided, I endorse, and the great state of Louisiana supports, an expansion of the strategic reserve facilities at the existing Louisiana sites and at Clovelly co-located with LOOP.

Sincerely,

Johnny Bradberry, Secretary
Louisiana Department of Transportation and Development
P.O. Box 942545
Baton Rouge, Louisiana 70804-9245

State of Louisiana
DEPARTMENT OF WILDLIFE AND FISHERIES

KATHLEEN BABINEAUX BLANCO
GOVERNOR

DWIGHT LANDRENEAU
SECRETARY

October 3, 2005

Mr. Donald Silawsky
Office of Petroleum Reserves, (FE-47)
Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585-0301

Re: Proposed Expansion of the Strategic Petroleum Reserve (West Hackberry, Bayou Choctaw, Clovelly and Chacahoula, LA)

Dear Mr. Silawsky:

The professional staff of the Office of Wildlife reviewed your letter of September 13, 2005 concerning the above referenced project. The following has been determined:

Chacahoula Site - *Ceratopteris pteridoides* may potentially be impacted by the proposed project. *Ceratopteris pteridoides* is a native fern which usually floats on the water surface. It is considered imperiled in the State of Louisiana with a Natural heritage ranking of S2. It occurs in cypress-tupelo swamps and in and along sluggish bayous and canals. The Chacahoula populations were last observed in the fall of 2003.

Two bald eagle nests may potentially be affected by the proposed project. No major activities should occur during the nesting period (October 1- May 15) within one mile of the nest tree. We recommend that, to protect the nesting area, there be no activity within a 1,500-foot radius of the nest tree at any time. All bald eagle nests (active, inactive or seemingly abandoned) should be protected. Within the nesting area, no large trees should be removed. Within the buffer zone, a minimum of three to five large trees should be saved for potential roost and perch trees. For specific location information applicant should contact the Louisiana Natural Heritage Program [LNHP] zoologist at 225-765-2823 and reference EOR#135 and EOR#102.

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West Hackberry Site - LNHP database indicates observations of Mississippi diamondback terrapin (*Malaclemys terrapin)* in the project vicinity. The diamondback terrapin is considered imperiled in the state of Louisiana, and is currently ranked S2. Barrier island marshes and sea-grass beds on the bayside of islands are important habitats for this species. Females use mud and sandbars for nesting. Work activities should be completed in such manner as to minimize the impacts on these habitats. If active nests are found contact the LNHP at 225-765-2820 to coordinate activities.

Clovelly - Colonial nesting bird species are known to occur in the project vicinity. If active or inactive nests are found within 400 m (700 m for Brown Pelicans) of the project site, applicant must contact LNHP at 225-765-2820 or 2823 to coordinate activities. Colonial nesters include terns, gulls, skimmers, ibises, herons, egrets, cormorants, anhingas, spoonbills and pelicans.

The proposed project lies within the designated coastal management zone. Contact Rocky Hinds or Bill Pittman with the Department of Natural Resources Coastal Management Division at 225-342-7591 or 1-800-267-4019 concerning coastal use permits.

Each of the proposed project sites has wetlands occurring in them. We strongly recommend that you contact Mr. Ronnie W. Duke of the Corps of Engineers New Orleans District at (504) 862-2261 concerning wetland permit issues.

Mr. Fred Dunham of my staff is assigned to this project and can be reached at (225) 765-2367 and at fdunham@wlf.louisiana.gov. The Department of Wildlife and Fisheries seeks to work with you in a facilitative manner on this and future such endeavors. Please call my staff should you need further assistance.

Sincerely,

Michael Carloss

Michael Carloss
Biologist Program Manager

C: LNHP, Venise Ortego

State of Louisiana

DWIGHT LANDRENEAU
SECRETARY

DEPARTMENT OF WILDLIFE & FISHERIES
POST OFFICE BOX 98000
BATON ROUGE, LA 70898-9000
(225) 765-2800

KATHLEEN BABINEAUX BLANCO
GOVERNOR

Date	March 8, 2006
Name	Karen M. Fadely
Company	ICF Consulting
Street Address	9300 Lee Highway
City, State, Zip	Fairfax, VA 22031
Project	Dept. of Energy: Proposed Oil Reserve Expansion and Pipeline Installation
Invoice Number	06030801

Personnel of the Habitat Section of the Fur and Refuge Division have reviewed the preliminary data for the captioned project.

Our records indicate the proposed project may potentially impact 9 bald eagle (Haliaeetus leucocephalus) nesting sites. This species is listed as threatened under the Endangered Species Act. No major activities should occur during the nesting period (October 1- May 15) within one mile of the nest tree. To protect the core nesting area, there should be no activity within a 1,500-foot radius of the nest tree at any time. All bald eagle nests (active, inactive or seemingly abandoned) should be protected. Within the core nesting area, no large tree should be removed. For specific location information applicant should contact the LNHP zoologist at 225-765-2823 or 2820 and reference EOR #'s 362, 364, 135, 363, 304, 287, 399, 305, and 435. For consideration of exceptions, applicant must contact Brigette Firmin with USFWS to coordinate activities at 225-291-3108.

The proposed project may impact two ground-nesting birds of concern in Louisiana. The Louisiana Waterthrush (Seiurus motacilla) and Worm-eating Warbler (Helmitheros vermivorus) are known to nest in East and West Felician Parishes of Louisiana. Breeding habitat for these birds include wet forested areas along streams and creeks flowing through hilly terrain. We recommend a qualified biologist conduct a survey along the proposed right way if activity takes place during the breeding season. Results of the survey should be sent to the above address care of LNHP. The breeding season for these two species is generally mid-April through July.

The proposed project may potentially impact the long-tailed weasel (Mustela frenata). This species is found in a wide variety of habitats, usually near water. Favored habitats include brushland and open woodlands, field edges, riparian grasslands, swamps, and marshes. Dens are in abandoned burrows of other mammals, rock crevice, brushpiles, stump hollows, or spaces among tree roots; one individual may use multiple dens. Research indicates that long-tailed weasels may be sensitive to agriculturally induced fragmentation of habitat and the importance of maintaining landscape connectivity for species conservation.

The proposed project may impact Southern Shield Wood-fern (Dryopteris ludoviciana) and Rooted Spike-rush (Eleocharis radicans). Both of these plants are considered extremely imperiled in Louisiana due to extreme rarity. A forested seep with large populations of these plants is located in the direct path of the proposed pipeline right of way extending north from Baton Rouge. The area is located at the following lat./lon. Location: [redacted] Please contact LNHP botanist Chris Ried at (225) 765-2828 to discuss measures to avoid impacts to these rare plants.

Our database indicates the presence of many waterbird nesting colonies within the proposed project area or within one mile of the proposed project. Please keep in mind that rookeries can move from year to year and no current information is available on the status of these rookeries. We recommend that a qualified biologist inspect the proposed worksite for the presence of nesting colonies during the nesting season. We recommend that on-site contract personnel be informed of the need to identify colonial nesting birds and their nests and should avoid disturbing them during the breeding season. No activity is permitted within 400 meters (700 meters for Brown Pelicans) around rookeries during the breeding season, which is generally March 15-July 15. Contact the US Fish and Wildlife Service at (337) 291-3100 to discuss impacts on rookeries. To minimize disturbance to colonial nesting birds, the following restrictions on activity should be observed:

- For colonies containing nesting wading birds (i.e., herons, egrets, night-herons, ibis, roseate spoonbills, anhingas, and/or cormorants), all activity occurring within 300 meters of a rookery should be restricted to the non-nesting period (i.e., September 1 through February 15, depending on species present).

- For colonies containing nesting gulls, terns, and/or black skimmers, all activity occurring within 400 meters of a rookery should be restricted to the non-nesting period (i.e., September 16 through April 1, depending on species present).

The Louisiana Natural Heritage Program has compiled data on rare, endangered, or otherwise significant plant and animal species, plant communities, and other natural features throughout the state of Louisiana. Heritage reports summarize the existing information known at the time of the request regarding the location in question. The quantity and quality of data collected by the LNHP are dependent on the research and observations of many individuals. In most cases, this information is not the result of comprehensive or site-specific field surveys; many natural areas in Louisiana have not been surveyed. This report does not address the occurrence of wetlands at the site in question. Heritage reports should not be considered final statements on the biological elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. The Louisiana Natural Heritage Program requires that this office be acknowledged in all reports as the source of all data provided here. If you have any questions or need additional information, please call Louisiana Natural Heritage Program at 225-765-2357.

Sincerely,

Gary Lester

Gary Lester, Coordinator
Natural Heritage Program

Mississippi State Agencies

S0026

Department of Energy
Washington, DC 20585

September 13, 2005

Date: 10-13-05
No known archaeological sites or historic properties will be affected by this undertaking. This effect determination could change should new information come to our attention.
Pam Breaux: Pam Breaux
State Historic Preservation Officer

Ms. Pamela Breaux
Louisiana Office of Culture
Recreation and Tourism
P.O. Box 44247
Baton Rouge, Louisiana 70804

Re: Proposed Expansion of the Strategic Petroleum Reserve (West Hackberry, Bayou Choctaw, Clovelly and Chacahoula, LA)

Dear Ms. Breaux:

The U.S. Department of Energy is proposing to expand the Strategic Petroleum Reserve (SPR) to its 1 billion-barrel authorized capacity. The Strategic Petroleum Reserve Office of the U.S. Department of Energy (DOE) has determined that this project is subject to the National Environmental Policy Act (NEPA). The purpose of this letter is to request information from the Louisiana Office of Culture, Recreation and Tourism on resources that the project could potentially affect, as well as any permits and approvals required for construction. Four sites being considered for the proposed project in Louisiana are:
(1) West Hackberry (Cameron and Calcasieu Parishes), an existing SPR facility that would be expanded under the proposal; (2) Bayou Choctaw (Iberville Parish), an existing SPR facility that would be expanded under the proposal; (3) Clovelly (east of Galliano, LA), which would be a candidate for a new SPR facility; and (4) Chacahoula (Lafourche Parish), which would be a candidate site for a new SPR facility.

Maps are enclosed which show the location of the proposed project sites. Additional attachments include a narrative description of the proposed action and figures of the proposed action from the 1992 Draft Environmental Impact Statement for the Expansion of the Strategic Petroleum Reserve.

DOE has initiated preparation of an Environmental Impact Statement with publication of a Notice of Intent (70 FR 52088) on September 1, 2005. The Energy Policy Act of 2005 (EPACT), enacted on August 8, 2005, requires the Secretary of Energy to select sites necessary to expand the SPR to 1 billion barrel capacity no later than one year after enactment. This requires an extremely fast NEPA review process in order to provide decision makers with information for a Record of Decision (ROD) in early August of 2006.

Information on any additional issues or concerns that you consider appropriate would also be appreciated. We request that you respond by October 13, 2005, so that we may schedule meetings, site visits or surveys, conduct any necessary follow-up activities, and

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September 19, 2005

Mr. Donald Silawsky
Office of Petroleum Reserves, (FE-47)
1000 Independence Avenue, S.W.
Washington, DC 20585-0301

RE: Proposed Expansion of the Strategic Petroleum Reserve
(Richton, Mississippi)

Dear Mr. Silawsky:

We have reviewed the documents you provided in your letter of September 13, 2005, concerning the proposed expansion of the Strategic Petroleum Reserve and the preparation of an Environmental Impact Statement (EIS). We have also received a phone call from ICF Consulting regarding this matter. Our understanding is that, in the interest of a speedy completion of the EIS, the consultants would obtain all known information regarding the Richton, Mississippi alternative, but that a cultural resources survey would only be conducted once the preferred alternative was selected and only of that alternative.

This plan is agreeable to us and we anticipate working with the consultants in due course in providing information on file in our records. Should the Richton site be selected as the preferred alternative, we would anticipate working with you and your consultants in evaluating a cultural resources survey and providing appropriate comments.

If you have questions or need additional information, please let us know.

Sincerely,

H. T. Holmes
State Historic Preservation Officer

Thomas H. Waggener

BY: Thomas H. Waggener
Review and Compliance Officer

Board of Trustees: William F. Winter, president / Arch Dalrymple III / Kane Ditto / Lynn Crosby Gammill / E. Jackson Garner
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S0015

MISSISSIPPI Department of
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October 4, 2005

Mr. Donald Silawsky
Office of Petroleum Reserves
1000 Independence Avenue SW
Washington, DC 20585-0301

Re: Proposed Expansion of the Strategic Petroleum Reserve
Richton, Mississippi

Dear Mr. Silawsky:

We have reviewed your follow-up letter of September 27, 2005, providing more detail concerning the identification of cultural resources potentially affected should the Richton, Mississippi site be the preferred alternative selected for the proposed expansion of the Strategic Petroleum Reserve. Our records are available for the use of your representatives to locate National Historic Landmarks and/or properties or sites listed or eligible for listing in the National Register of Historic Places which could potentially be affected by this proposal.

Native American tribes which may have cultural affiliations in the area of this project known to us are the Choctaw Nation of Oklahoma, the Jena Band of Choctaw Indians, the Mississippi Band of Choctaw Indians, and the Tunica-Biloxi Tribe of Louisiana.

We will be happy to begin working with staff of the Department of Energy on a Programmatic Agreement to be in effect should the Richton site be selected, with a view of having a signed Programmatic Agreement no later than March 2006, the date you specified.

If you have any further questions or need additional information, please contact Tom Waggener, our Review and Compliance Officer, at 601-6940 or by email at twag@mdah.state.ms.us.

Sincerely,

H. T. Holmes
State Historic Preservation Officer

Kenneth H. P'Pool

BY: Kenneth H. P'Pool
Deputy State Historic Preservation Officer

Board of Trustees: William F. Winter, president / Arch Dalrymple III / Kane Ditto / Lynn Crosby Gammill / E. Jackson Garner
Gilbert R. Mason, Sr. / Duncan M. Morgan / Martis D. Ramage, Jr. / Rosemary Taylor Williams / *Department Director: H. T. Holmes*

2 March 2006
Karen M. Fadely
Associate
ICF Consulting
9300 Lee Highway
Fairfax, VA 22031
Regarding: Comments on Potential Mississippi-Based Components of Strategic Petroleum Reserve

Dear Ms. Fadely:

Below we provide specific observations, recommendations, and corrections regarding the EIS provided us; a summary of some of the plant communities found along the proposed Bruinsburg pipeline corridor and the Richton pipeline corridors (Liberty to Richton and Richton to Pascagoula), and a list (via attachment) of special concern animals and plants within the provided buffer of each element of the project alternatives. Included with each community is its Heritage State Rank, the typical species that define each type and the associated plant species of concern.

The Mississippi Natural Heritage Program (MNHP) has compiled a database that is the most complete source of information about Mississippi's rare, threatened, endangered, or otherwise significant plants, animals, plant communities, and natural features. The quantity and quality of data collected by MNHP are dependent on the research and observations of many individuals and organizations. In many cases, this information is not the result of comprehensive or site-specific field surveys; most natural areas in Mississippi have not been thoroughly surveyed and new occurrences of plant and animal species are often discovered. Heritage reports summarize the existing information known to the MNHP at the time of the request and cannot always be considered a definitive statement on the presence, absence, or condition of biological elements on a particular site.

Bruinsburg comments:
The Bruinsburg site lies entirely within the floodplain of the Mississippi River at its confluence with the Bayou Pierre. The biological assessment indicates that choice of the Bruinsburg alternative would have no impact on the federally and state listed Bayou Darter (*Etheostoma rubrum*). This claim may be in error. Placement of this facility, presumably protected with dikes, within the floodplain could result in altered high water flow patterns. This could induce changes in the channel morphology of the nearby Bayou Pierre and initiate another round of destabilizing channel adjustments upstream. In addition to the Bayou Darter, the state endangered Crystal Darter (*Crystallaria asprella*) occurs in Bayou Pierre, and both would be negatively affected by channel destabilization.

The dike wall around the Bruinsburg site could be breached by flood or earthquake, potentially leading to the contamination of the Mississippi River with oil and/or brine. This would be potentially catastrophic, for all of the listed and unlisted species in and along the Mississippi River downstream.

Pipelines under Bruinsburg Option 3 should be directionally drilled beneath the Big Black, Bayou Pierre and Baker's Creek. The Big Black contains two state endangered species, the Pyramid Pigtoe Mussel (*Pleurobema rubrum*) and Rabbitsfoot Mussel (*Quadrula cylindrica*). Bayou Pierre contains one federally threatened species, the Bayou Darter, and two state endangered species, the Bayou Darter, and Crystal Darter. Baker's Creek drains into Fourteen Mile Creek, which drains into the Big Black River at the site where the Rabbitsfoot Mussel occurs.

The new oil pipeline to Baton Rouge should be directionally drilled beneath major streams along its transect, including Cole's and Fairchild Creeks.
The pipeline from Bruinsburg to Baton Rouge will intersect an NRCS project in Adams County. Please contact this federal agency regarding any complications this might generate.

Oil and brine pipelines, and brine disposal wells on each of the alternatives, should have contingency plans for timely detection of leaks and deployment of effective containment measures.

Richton Site Comments:
Because of the importance of the Leaf River near Hattiesburg to spawning and juvenile sturgeon, it is recommended that water withdrawals be discontinued if discharge from the Leaf reaches 30% of mean daily discharge, a percentage determined by Evans and England (1995) to protect fisheries in Georgia's unregulated, warm-water streams. This is well above the 7Q10 level, which is mainly intended to preserve the ability of a stream to assimilate organic material, not for conservation of fisheries. Given the relatively short interval when solution mining will be implemented, this limitation may not become an issue.

Although we have provided known centroid localities of tortoise occurrences, these animals are mobile, and move away from habitat degraded by fire suppression, heavy site preparation, and/or excessive tree stocking densities, and will move toward more open habitat maintained by fire, thinning, or mowing along ROWs. All proposed and existing pipeline ROW and other facility footprints associated with the Richton alternative from Walthall County to points east should be surveyed for tortoises and their burrows if on moderately well-drained to excessively well-drained sandy soils. If tortoises or their burrows are found, contact Tom Mann (601-354-6367, ext. 116; Mississippi Dept. of Wildlife, Fisheries, and Parks (MDWFP)) and Will McDearman (601-321-1126; U.S. Fish and Wildlife Service (USFWS)) regarding measures which will need to be taken to avoid harm to this federally threatened, state endangered species. Tortoises may be relocated only with concurrence of the USFWS and MDWFP, and according to strict protocols and within seasonal windows specified by these agencies. The Richton to Liberty ROW is largely on a new location (although we advocate co-location within existing ROWs), so there is the potential for avoiding burrows, particularly relatively large clusters of burrows.

Tallahala Creek probably supports the state endangered Pearl Darter and drains into the Leaf River, critical habitat for the Gulf Sturgeon, so it is recommended that it be directionally drilled.

Cogon grass should be mapped along ROWs within the range of the tortoise and should be selectively sprayed with materials approved for use around tortoises (contact Will McDearman, USFWS) prior to soil disturbance. Care should be taken to avoid indiscriminate spraying which can poison plants important as food for tortoises. Also, care should be taken to avoid spreading cogon grass during pipeline installation. It would be prudent to spray it once or twice prior to ground disturbing activities. Care should be taken to avoid moving cogon grass propagules from sites where it is present to those where it isn't yet established.

The pipeline from Richton to Liberty passes through a portion of Percy Quinn State Park, not apparently on an existing ROW. We recommend use of an existing ROW in the Percy Quinn area if available.

Corrections—
Pseudemys alabamensis is listed as endangered by the state of Mississippi (page 5)

The following is a summary of some of the plant communities found along the proposed Bruinsburg pipeline (Anchorage to Bruinsburg and Bruinsburg to Jackson) corridors. Included with each community is its Heritage State Rank, the typical species that define each type and the associated plant species of concern.

Community: Sweetgum - mixed oak bottomland forest
State Rank: S4
Typal Species: Liquidambar styraciflua – Ulmus americana – Quercus sp.
Associated plant species of concern within the buffered areas:
Carya leiodermis
Spiranthes ovalis

Community: Coastal Plain Loess Forest
State Rank: S4
Typal Species: Quercus (pagoda, alba) – Fraxinus americana – Acer barbatum – Lindera benzion
Associated plant species of concern within the buffered areas:
Athyrium pycnocarpon
Carya leiodermis
Celastrus scandens
Erythrodes querceticola
Hexalectris spicata
Panax quinquefolius
Physalis carpenteri
Schisandra glabra
Spiranthes ovalis
Trillium foetidissimum

Community: Beech - Magnolia Forest
State Rank: S1
Typal Species: Fagus grandifolia – Magnolia sp.
Associated plant species of concern within the buffered areas:
Celastrus scandens
Hexalectris spicata
Panax quinquefolius
Schisandra glabra
Spiranthes ovalis

The following is a summary of some of the plant communities found along the proposed Richton pipeline (Liberty to Richton and Richton to Pascagoula) corridors. Included with each community is its Heritage State Rank, the typical species that define each type and the associated plant species of concern

Community: Subxeric Longleaf Pine - Saw Palmetto Woodland
State Rank: S1
Typal Species: Pinus palustris - Serenoa repens
Associated plant species of concern within the buffered areas:
Aristida spiciformis
Stylisma pickeringii

Community: Bayhead Forest
State Rank: S3
Typal Species: Nyssa biflora - Magnolia virginiana - Acer rubrum
Associated plant species of concern within the buffered areas:

Agalinis aphylla	Paronychia erecta
Chamaecyparis thyoides	Peltandra sagittifolia
Dryopteris ludoviciana	Pinguicula primuliflora
Macranthera flammea	Rhynchospora stenophylla
Melanthium virginicum	Utricularia purpurea
Parnassia grandifolia	

Community: Wet Slash Pine Savanna/Forest
State Rank: S2
Typal Species: Pinus (palustris, elliotii) - Andropogon sp. - Wetland Herbs
Wet low flat coastal areas; acidic, nutrient poor, loamy soils with impervious clayey subhorizon.
Associated plant species of concern within the buffered areas:

Agalinis aphylla	Ilex cassine
Agalinis filicaulis	Lachnocaulon digynum
Andropogon perangustatus	Lobelia boykinii
Aristida spiciformis	Pieris phillyreifolia
Calopogon barbatus	Pinguicula primuliflora
Carex striata var. striata	Platanthera integra
Carex verrucosa	Polygala crenata
Chamaecyparis thyoides	Polygala hookeri
Cladium mariscoides	Rhynchospora globularis var. pinetorum
Dichanthelium erectifolium	Rhynchospora macra
Eulophia ecristata	Rhynchospora stenophylla
Hypericum myrtifolium	Ruellia noctiflora

Sabatia bartramii
Sarracenia leucophylla
Sarracenia rosea
Scleria reticularis
Spiranthes longilabris
Stylisma aquatica
Utricularia purpurea
Xyris drummondii

Community: Wet Pine - Pond Cypress Savanna
State Rank: S2
Typal Species: Taxodium ascendens - Pinus elliotii - Woodwardia virginica
Wet coastal depressions and flats, or gentle lower slopes which receive subsurface lateral flow from adjacent areas; acidic, nutrient poor soils.
Associated plant species of concern within the buffered areas:

Agalinis aphylla	Ilex cassine
Agalinis filicaulis	Lobelia boykinii
Andropogon perangustatus	Pieris phillyreifolia
Calopogon barbatus	Polygala crenata
Carex striata var. striata	Polygala hookeri
Carex verrucosa	Sabatia bartramii
Cladium mariscoides	Sarracenia leucophylla
Dichanthelium erectifolium	Stylisma aquatica
Dichanthelium wrightianum	Utricularia purpurea
Hypericum myrtifolium	

Community: Wet Pond Cypress Depression
State Rank: S2
Typal Species: Taxodium ascendens - Saururus cernuus - Cladium mariscus spp. jamaicense
Depressions that receive runoff from upslope and collect water during the winter and spring seasons; areas normally remain saturated throughout most of the growing season; abandoned stream channels that have silted in are good examples.
Associated plant species of concern within the buffered areas:

Agalinis aphylla	Ilex cassine
Agalinis filicaulis	Lobelia boykinii
Andropogon perangustatus	Pieris phillyreifolia
Calopogon barbatus	Polygala crenata
Carex striata var. striata	Polygala hookeri
Carex verrucosa	Sabatia bartramii
Cladium mariscoides	Sarracenia leucophylla
Dichanthelium erectifolium	Stylisma aquatica
Dichanthelium wrightianum	Utricularia purpurea
Hypericum myrtifolium	

Community: Pine Seepage Slope
State Rank: S2
Typal Species: Pinus (palustris, elliotii) - Sarracenia alata - Wetland Herbaceous
Associated plant species of concern within the buffered areas:

Agalinis aphylla	Parnassia grandifolia
Agalinis filicaulis	Pinguicula primuliflora
Andropogon capillipes	Platanthera blephariglottis
Aristida simpliciflora	Platanthera integra
Aristida spiciformis	Polygala crenata
Calopogon barbatus	Polygala hookeri
Eriocaulon texense	Rhynchospora macra
Lachnocaulon digynum	Rhynchospora stenophylla
Lindera subcoriacea	Sarracenia rosea
Macranthera flammea	Xyris drummondii
Melanthium virginicum	Xyris scabrifolia
Panicum nudicaule	

Community: Pitcher Plant Flat/Bog/Wet Savanna
State Rank: S2
Typal Species: Sarracenia alata - Sarracenia psittacina, Rhynchospora sp., Stokesia laevis, Lophiola aurea, Eriocaulon compressum
Consistently wet infertile, acidic lowlands or seepage slopes, often receiving subsurface lateral moisture flow from uplands.
Associated plant species of concern within the buffered areas:

Agalinis aphylla	Peltandra sagittifolia
Agalinis filicaulis	Pinguicula primuliflora
Andropogon perangustatus	Platanthera blephariglottis
Aristida simpliciflora	Platanthera integra
Calopogon barbatus	Polygala hookeri
Coreopsis helianthoides	Rhynchospora macra
Eriocaulon texense	Rhynchospora stenophylla
Hypericum myrtifolium	Ruellia noctiflora
Lachnocaulon digynum	Ruellia pedunculata spp. pinetorum
Lindera subcoriacea	Sabatia campestris
Lycopodium cernuum	Sarracenia leucophylla
Macranthera flammea	Sarracenia rosea
Melanthium virginicum	Xyris drummondii
Panicum nudicaule	Xyris scabrifolia

Community: Quaking Bog
State Rank: S1
Typal Species: Lindera subcoriacea - Carex exilis - Sphagnum sp.
Associated plant species of concern within the buffered areas:
- Andropogon capillipes
- Eriocaulon texense
- Lachnocaulon digynum
- Lindera subcoriacea
- Panicum nudicaule
- Peltandra sagittifolia
- Pinguicula primuliflora
- Platanthera integra
- Sarracenia leucophylla
- Sarracenia rosea
- Xyris scabrifolia

Community: Coastal Plain Small Stream Swamp Forest
State Rank: S3
Typal Species: Magnolia virginiana - Acer rubrum - Nyssa biflora - Pinus elliotii
Wetlands adjacent to small streams, on dark loamy soils; these usually remaining wet throughout the year,
Associated plant species of concern within the buffered areas:
- Andropogon capillipes
- Chamaecyparis thyoides
- Dryopteris ludoviciana
- Epidendrum conopseum
- Lindera subcoriacea
- Lycopodium cernuum
- Macranthera flammea
- Melanthium virginicum
- Parnassia grandifolia
- Paronychia erecta
- Peltandra sagittifolia
- Pinguicula primuliflora
- Platanthera integra
- Sarracenia leucophylla
- Utricularia purpurea

Community: White Cedar Swamp Forest
State Rank: S1
Typal Species: Chamaecyparis thyoides (Atlantic white cedar)
Associated plant species of concern within the buffered areas:
- Chamaecyparis thyoides

Community: Maritime Live Oak Forest
State Rank: S1
Typal Species: Quercus virginiana - Quercus hemisphaerica
Mesic sandy coastal uplands, usually adjacent to estuarine marshes; often situated on old beach ridges, most of which have been extensively developed.
Associated plant species of concern within the buffered areas:
- Juniperus silicicola
- Quercus myrtifolia

Community: Shell Midden Shrub/Woodland
State Rank: S1
Typal Species: Juniperus virginiana var. silicicola - Sideroxylon lanuginosum
Estuarine, Supra-tidal, Shrub/Woodland, Coarse Shell Substrates, Partially Enclosed, Mixohaline; Native American Shell Midden Sites.
Associated plant species of concern within the buffered areas:
- Juniperus silicicola
- Lycium carolinianum
- Sageretia minutiflora
- Sapindus marginatus

Community: Coastal Plain Loess Forest
State Rank: S4
Typal Species: Quercus (pagoda, alba) - Fraxinus americana - Acer barbatum - Lindera benzoin
Associated plant species of concern within the buffered areas:
- Trillium foetidissimum
- Schisandra glabra
- Solidago auriculata

Community: Beech - Magnolia Forest
State Rank: S1
Typal Species: Fagus grandifolia - Magnolia sp.
Associated plant species of concern within the buffered areas:
- Trillium foetidissimum
- Schisandra glabra
- Solidago auriculata

Please contact us if we can be of additional assistance.
Sincerely,
Tom Mann, Zoologist,
Heather Sullivan, Botanist, and
Melanie Caudill, Database Manager

Mississippi Natural Heritage Program,
Mississippi Museum of Natural Science
2148 Riverside Drive, Jackson, MS 39202-1353

Texas State Agencies

Kathleen Hartnett White, Chairman
R. B. "Ralph" Marquez, Commissioner
Larry R. Soward, Commissioner
Glenn Shankle, Executive Director

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

October 28, 2005

Mr. Donald Silawsky
Office of Petroleum Reserves (FE-47)
U.S. Department of Energy
1000 Independence Ave SW
Washington, D.C. 20585-0301

Re: Strategic Petroleum Reserves Expansion

Dear Mr. Silawsky:

The Texas Commission on Environmental Quality (TCEQ) appreciates the opportunity to comment on the September 1, 2005, *Federal Register* notice concerning the intent of the U.S. Department of Energy to prepare an Environmental Impact Statement (EIS) for the expansion of the Strategic Petroleum Reserve (SPR). The notice indicates that the existing Big Hill SPR site will be expanded and that Stratton Ridge, Texas is being considered as a one of the four alternative locations for a new SPR site. The TCEQ offers comments on the applicability of the general conformity regulations to this project and on the construction and operational emissions.

General Conformity

The existing Big Hill SPR site is located in Jefferson County, Texas, which is designated as a marginal nonattainment area for ozone, while Stratton Ridge is located in Brazoria County, Texas, which is designated as a moderate nonattainment area for ozone. In nonattainment areas, major federal actions are subject to the general conformity rule. The general conformity rule was created to help ensure that major federal activities would not jeopardize a state's ability to achieve national ambient air quality standards.

The emissions that will result from the expansion of the Big Hill site will need to be documented in the EIS, and if the total volatile organic compounds (VOC) or oxides of nitrogen emissions (NOx) are estimated to be above 100 tons per year, then a general conformity determination will be required. Emissions will also need to be estimated for the new Stratton Ridge SPR site only, if it is the preferred alternative for the new location of a SPR site in the EIS. If the proposed new Stratton Ridge SPR site's estimated total emissions of either VOC or NOx are greater than 100 tons per year, then another general conformity determination will be required for that site.

P.O. Box 13087 • Austin, Texas 78711-3087 • 512/239-1000 • Internet address: www.tceq.state.tx.us

Construction Emissions

Please estimate the emissions for the following construction activities and include them in the EIS:

- All nonroad and onroad equipment used for the construction of all onsite infrastructure needed for the water supply, brine disposal, and oil distribution systems
- The pumps needed for the cavern leaching process
- The construction of water supply, brine disposal, and oil distribution pipelines

Operational Emissions

Please estimate the emissions for the following operational activities and include them in the EIS:

- The initial filling of the caverns with crude oil
- Any future fills and drawdowns that are reasonably foreseeable.

The TCEQ will continue to monitor this project and will provide comments as needed throughout the development of this project. If you have questions about this information, please feel free to contact Ms. Candice Garrett, Director of the Air Quality and Implementation Division, at (512) 239-2376.

Sincerely,

David C. Schanbacher, P.E., Chief Engineer
Texas Commission on Environmental Quality

S0070

TEXAS HEALTH AND HUMAN SERVICES COMMISSION

ALBERT HAWKINS
EXECUTIVE COMMISSIONER

January 3, 2006

Mr. Donald Silawsky
U.S. Department of Energy
Office of Petroleum Reserves (FE-47)
1000 Independence Avenue S.W.
Washington, D.C. 20585-0301

Dear Mr. Silawsky:

Thank you for your letter notifying this agency that the U.S. Department of Energy is reopening the scoping comment period for the proposed expansion of the Strategic Petroleum Reserve sites located in Big Hill and Stratton Ridge, Texas. We have reviewed our files and determined that on September 19, 2005, the Department of State Health Services (DSHS) received a similar letter requesting comments and information regarding permit and approval requirements for project construction. A DSHS staff member, Ms. Punita Patel, was assigned to review the regulatory issues and provide a response.

Ms. Patel determined that the Railroad Commission (RRC) of Texas is the state agency with regulatory authority over oil storage caverns. She contacted you to provide this information and to notify you that your letter would be forwarded to Mr. Steve Seni of the Environmental and Underground Storage Services Section of the RRC. We then followed up with Mr. Seni to assure he received the documents. Mr. Seni advised us that he had reviewed the proposed expansion and provided comments from his agency.

Please let me know if you have any questions or need additional information. Ms. Annabelle Dillard is serving as the lead staff on this matter and can be reached at 512-834-6608 or by e-mail at Annabelle.Dillard@dshs.state.tx.us.

Sincerely,

Albert Hawkins

P. O. Box 13247 • Austin, Texas 78711 • 4900 North Lamar, Austin, Texas 78751

TEXAS PARKS & WILDLIFE

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Mr. Donald Silawsky
Department of Energy
Office of Petroleum Reserves
1000 Independence Avenue, S.W.
Washington, DC 20585-0301

Re: Proposed Expansion of the Strategic Petroleum Reserve

Mr. Silawsky:

This letter is in response to your request via letter dated September 9, 2005 for natural resource information and potential Texas Parks & Wildlife Department (TPWD) concerns regarding the potential Texas sites for expansion of the Strategic Petroleum Reserve. These sites include a potential new site in Stratton Ridge in Brazoria County and expansion of the Big Hill site in Jefferson County. Department staff met with your representatives from ICF Consulting on October 5, 2005 and therefore these comments may reiterate Department concerns expressed in that meeting.

The information provided to TPWD regarding the Stratton Ridge site at this point has been preliminary; with no defined pipeline routes and no current site information. It is the understanding of TPWD staff that the expansion of the Big Hill site may require new pipeline installation or replacement. Due to the preliminary nature of the information provided, Department concerns expressed herein are preliminary and the Department of Energy should continue ongoing coordination with TPWD as new information is made available. The following comments will fall into two broad categories; rare natural resources and general natural resource concerns.

<u>Rare Natural Resources</u>

Given the small proportion of public versus private land in Texas, the TPWD Natural Diversity Database (NDD) (formerly the Biological and Conservation Data System) does not include a representative inventory of rare resources in the state. Although it is based on the best data available to TPWD regarding rare species, the data from the NDD does not provide a definitive statement as to the presence, absence, or condition of special species, natural communities, or other significant features within your project areas. This data cannot substitute for an on-site evaluation by your qualified biologists. The NDD information is intended to assist you in avoiding harm to species that may occur on your sites.

Currently in the NDD, the following species, special features, natural communities, and managed areas have been documented in the general area of the petroleum reserve sites and their estimated pipeline routes:

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To manage and conserve the natural and cultural resources of Texas and to provide hunting, fishing and outdoor recreation opportunities for the use and enjoyment of present and future generations.

Big Hill Site

Federal and State Listed Threatened
Piping Plover (*Charadrius melodus*)

Species of Concern
Pig frog (*Rana grylio*)
Gulf saltmarsh snake (*Nerodia clarkii*)
Texas diamondback terrapin (*Malaclemys terrapin littoralis*)
Correll's false dragon-head (*Physostegia correllii*)

Special Features and Natural Communities
Colonial Waterbird Rookeries
Migratory Songbird Fallout Areas
Coastal Live Oak-Pecan (*Quercus virginiana-Carya illinoinensis*) Series
Little Bluestem-Brownseed Paspalum (*Schizachyrium scoparium-Paspalum plicatulum*) Series
Marshhay Cordgrass (*Spartina patens*) Series
Rush-Sedge (*Juncus* spp.) Series
Seacoast Bluestem-Gulfdune Paspalum (*Schizachyrium scoparium* var. *littoralis-Paspalum monostachyum*) Series
Sea Oats-Bitter Panicum (*Uniola paniculata-Panicum amarum*) Series
Smooth Cordgrass (*Spartina alterniflora*) Series

Managed Areas
JD Murphree Wildlife Management Area
Sea Rim State Park
McFaddin National Wildlife Refuge
Anahuac National Wildlife Refuge

Stratton Ridge Site

Federal and State Listed Endangered
Attwater's Greater Prairie Chicken (*Tympanuchus cupido attwateri*)
Whooping Crane (*Grus americana*)
Jaguarundi (*Herpailurus yaguarondi*)
Kemp's ridley sea turtle (*Lepidochelys kempii*)

Federal and State Listed Threatened (Federal Proposed for Delisting)
Bald Eagle (*Haliaeetus leucocephalus*)

Federal and State Listed Threatened
Piping Plover (*Charadrius melodus*)

Species of Concern
Texas diamondback terrapin (*Malaclemys terrapin littoralis*)

Gulf saltmarsh snake (*Nerodia clarkii*)
Coastal gay-feather (*Liatris bracteata*)
Grand Prairie evening primrose (*Oenothera pilosella* ssp. *sessilis*)
Houston daisy (*Rayjacksonia aurea*)
Runyon's water-willow (*Justicia runyonii*)
Texas windmill-grass (*Chloris texensis*)
Threeflower broomweed (*Thurovia triflora*)

Special Features and Natural Communities
Colonial Waterbird Rookeries
Migratory Songbird Fallout Areas
Coastal Live Oak-Pecan (*Quercus virginiana-Carya illinoinensis*) Series
Glasswort-Saltwort (*Salicornia bigelovii/S. virginica-Batis maritima*) Series
Little Bluestem-Brownseed Paspalum (*Schizachyrium scoparium-Paspalum plicatulum*) Series
Marshhay Cordgrass (*Spartina patens*) Series
Saltgrass-Cordgrass (*Distichlis spicata-Spartina* spp.) Series
Seacoast Bluestem-Gulfdune Paspalum (*Schizachyrium scoparium* var. *littoralis-Paspalum monostachyum*) Series
Sea Oats-Bitter Panicum (*Uniola paniculata-Panicum amarum*) Series
Smooth Cordgrass (*Spartina alterniflora*) Series
Water Oak-Coastal Live Oak (*Quercus nigra-Quercus virginiana*) Series

Managed Areas
Brazoria National Wildlife Refuge
Peach Point Wildlife Management Area
San Bernard National Wildlife Refuge

The proposed Stratton Ridge site is located within a Bald Eagle nesting territory. A printout for this occurrence record is included for your planning reference. **Please do not include NDD occurrence printouts in your draft or final documents.** Because some species are especially sensitive to collection or harassment, this record is for your reference only. Brent Ortego, TPWD regional biologist, may be contacted at (361) 576-0022 for information on the current season's nesting activities for Bald Eagles.

Please note that because the exact pipeline routes were not shown on the maps provided, species occurrences along the pipeline routes are not known. However, this response includes occurrences in the general area of estimated pipeline routes. The pipeline from the Big Hill site to Nederland could potentially run across or adjacent to the JD Murphree Wildlife Management Area (WMA) and the raw water intake and/or brine disposal pipelines could cross the McFaddin National Wildlife Refuge. Occurrences on or within 1.5 miles of the estimated route of the Stratton Ridge pipelines in Brazoria and Galveston counties include the Whooping Crane, Jaguarundi, Coastal gay-feather, Runyon's water willow,

Threeflower broomweed, Colonial Waterbird Rookeries, Marshhay Cordgrass Series, Little Bluestem-Brownseed Paspalum Series, and the Seacoast Bluestem-Gulfdune Paspalum Series. This route could also cross the Brazoria National Wildlife Refuge, and Bryan Mound is less than .75 mile from Peach Point Wildlife Management Area. For more site-specific data, please include a map of any crude oil distribution, brine disposal, and raw water pipelines that are proposed to be constructed or replaced, as well as any proposed ponds, in the Environmental Impact Statement (EIS). Additionally, should the proposed pipeline routes cross or run adjacent to any of the Department's holdings, you will need to address the routes with Dennis Gissell, TPWD WMA coordinator, at (512) 389-4407.

Enclosed are updated TPWD lists of rare, threatened, and endangered species for Brazoria, Galveston, and Jefferson Counties. When additional information becomes available, please use these lists and the enclosed Rare Resources Review Request form for your analysis and as guidance during preparation of your EIS.

General Natural Resource Concerns

Big Hill Site
The major potential impact regarding the Big Hill site expansion arises from the need to replace the 24 mile long crude oil distribution pipeline between the Big Hill site and refineries in Nederland, Texas. Permanent wetland impacts from pipeline installation has been well documented (Polasek, 1997). Although the proposed pipeline will follow existing rights-of-way, there will likely be additional wetland impacts from installation. TPWD recommends proposed rights-of-way and work corridors be minimized for all pipeline installation through wetlands and other sensitive habitat. TPWD also recommends the use of the enclosed pipeline monitoring procedures that were developed in concert with the United States Fish and Wildlife Service and the National Marine Fisheries Service.

Stratton Ridge
Aerial photography and National Wetland Inventory data regarding the Stratton Ridge site indicate the presence of the forested wetlands throughout the site. All wetland impacts should be minimized to the greatest extent practicable. Also, all proposed pipeline corridors should be coordinated with TPWD staff when that information becomes available. The selected route should be monitored utilizing the monitoring criteria referenced in the above section. All wetland impacts should be adequately compensated for to ensure a no net loss of wetland functions. This should include all wetlands that may be deemed "isolated" by the Galveston District of the United States Army Corps of Engineers. These wetlands play a critical role maintaining water quality in streams by intercepting and assimilating pollutants, sediments and excess nutrients prior to their entrance into downstream receiving waters. These wetlands are also critical wildlife habitat

and play a crucial role in various animal life histories including that of the endemic mottled duck (*Anas fulvigula*). Upon finalization of wetland impact assessment, TPWD staff is willing to assist Department of Energy representatives to formulate a mitigation plan that adequately compensates all unavoidable wetland impacts.

TPWD recommends that the Department of Energy explore the use of water from Dow Energy Plant outfall in Freeport as a raw water source for cavern leaching. This may minimize habitat impacts with the proposed raw water uptake facility and pipeline that appears to cross the Brazoria National Wildlife Refuge.

The development of the Environmental Impact Statements should include a thorough cumulative impact analysis that considers the impacts from the proposed action and past and future similar actions. Similar actions in the region of the proposed sites should include all pipeline installations and development of liquid natural gas import terminals and associated pipelines in the vicinity of these sites.

Texas Parks and Wildlife staff appreciates the opportunity to provide input into the early stage of this project and looks forward to continued coordination to ensure impacts to Texas natural resources are adequately mitigated. Questions can be directed to Jamie Schubert of the Upper Coast Conservation Program in Dickinson at (281) 534-0135.

Sincerely,

Jarrett (Woody) Woodrow.
Director of Coastal Conservation Program
Coastal Fisheries Division

JOW:WJS

Enclosures 2

JEFFERSON COUNTY

***** DRAFT ***** DRAFT ***** DRAFT***** DRAFT ***** DRAFT ***** DRAFT*****
UNDER CONSTRUCTION **** SPECIES MIGHT BE ADDED/DELETED DURING QUALITY CONTROL

	Federal Status	State Status
***** AMPHIBIANS *****		
Pig Frog (*Rana grylio*) – prefers permanent bodies of open water with emergent vegetation; actively mainly at night; eats insects and crustaceans; mating and egg-laying March-September; male vocalization a pig-like grunt		
***** BIRDS *****		
Arctic Peregrine Falcon (*Falco peregrinus tundrius*) - potential migrant	DL	T
Bachman's Sparrow (*Aimophila aestivalis*) - inhabits mature open pine forests with grassy understory, regenerating pine clear-cuts (1-7 years post re-planting), or open habitats with a dense ground cover of grasses and forbs, or palmetto scrub; in Texas, known to occur only in the far eastern portion of the state; most abundant in forests south of Angelina National Forest		T
Bald Eagle (*Haliaeetus leucocephalus*) - found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds	LT-PDL	T
Brown Pelican (*Pelecanus occidentalis*) - largely coastal and near shore areas, where it roosts on islands and spoil banks	LE	E
Henslow's Sparrow (*Ammodramus henslowii*) – wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking		
Piping Plover (*Charadrius melodus*) - wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats	LT	T
Reddish Egret (*Egretta rufescens*) - resident of the Texas Gulf Coast; brackish marshes and shallow salt ponds and tidal flats; nests on ground or in trees or bushes, on dry coastal islands in brushy thickets of yucca and prickly pear		T
Snowy Plover (*Charadrius alexandrinus*) – wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats		
Sooty Tern (*Sterna fuscata*) – predominately "on the wing"; does not dive, but snatches small fish and squid with bill as it flies or hovers over water; breeding April-July		T
Swallow-tailed Kite (*Elanoides forficatus*) - lowland forested regions, especially swampy areas, ranging into open woodland; marshes, along rivers, lakes, and ponds; nests high in tall tree in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees		T
White-faced Ibis (*Plegadis chihi*) - prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats		T
Wood Stork (*Mycteria americana*) - forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960		T

	Federal Status	State Status
***** BIRDS-RELATED *****		
Colonial waterbird nesting areas - many rookeries active annually		
Migratory songbird fallout areas - oak mottes and other woods/thickets provide foraging/roosting sites for neotropical migratory songbirds		
*****FISHES*****		
American Eel (*Anguilla rostrata*) - most aquatic habitats with access to ocean; spawns January-February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries		
***** MAMMALS *****		
Black Bear (*Ursus americanus*) - within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA; NL	T
Louisiana Black Bear (*Ursus americanus luteolus*) - possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas	LT	T
Plains Spotted Skunk (*Spilogale putorius interrupta*) – catholic; in habitat; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie		
Rafinesque's Big-eared Bat (*Corynorhinus rafinesquii*) - roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures		T
Red Wolf (*Canis rufus*) (extirpated) - formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies	LE	E
Southeastern Myotis Bat (*Myotis austroriparius*) - roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures		
*****MOLLUSKS*****		
Creeper (Squawfoot) (*Strophitus undulatus*) - small to large streams, prefers gravel or gravel and mud in flowing water; Colorado, Guadalupe, San Antonio, Neches (historic), and Trinity (historic) River basins		
Fawnsfoot (Common) (*Truncilla donaciformis*) - small and large rivers especially on sand, mud, rocky mud, and sand and gravel, also silt and cobble bottoms in still to swiftly flowing waters; Red (historic), Cypress (historic), Sabine (historic), Neches, Trinity, and San Jacinto River basins.		
Little Spectaclecase (*Villosa lienosa*) - creeks, rivers, and reservoirs, sandy substrates in slight to moderate current, usually along the banks in slower currents; east Texas, Cypress through San Jacinto River basins		
Louisiana Pigtoe (*Pleurobema riddellii*) - streams and moderate-size rivers, usually flowing water on substrates of mud, sand, and gravel; not generally known from impoundments; Sabine, Neches, and Trinity (historic) River basins		
Pistolgrip (*Tritogonia verrucosa*) - stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins		

	Federal Status	State Status
Rock-pocketbook (*Arcidens confragosus*) - mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins		
Sandbank Pocketbook (*Lampsilis satura*) - small to large rivers with moderate flows and swift current on gravel, gravel-sand, and sand bottoms; east Texas, Big Cypress Bayou south through San Jacinto River basins; Neches River		
Southern Hickorynut (*Obovaria jacksoniana*) - medium sized gravel substrates with low to moderate current; Neches, Sabine, and Cypress river basins		
Texas Heelsplitter (*Potamilus amphichaenus*) - quiet waters in mud or sand and also in reservoirs. Sabine, Neches, and Trinity River basins		
Texas Pigtoe (*Fusconaia askewi*) - rivers with mixed mud, sand, and fine gravel in protected areas associated with fallen trees or other structures; east Texas River basins, Sabine through Trinity rivers as well as San Jacinto River		
Wabash Pigtoe (*Fusconaia flava*) – creeks to large rivers on mud, sand, and gravel from all habitats except deep shifting sands; found in moderate to swift current velocities; east Texas River basins, Red through San Jacinto River basins; elsewhere occurs in reservoirs and lakes with no flow		
Wartyback (*Quadrula nodulata*) - gravel and sand-gravel bottoms in medium to large rivers and on mud; Red, Sabine, Neches River basins		
***** REPTILES *****		
Alligator Snapping Turtle (*Macrochelys temminckii*) - deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October		T
Atlantic Hawksbill Sea Turtle (*Eretmochelys imbricata*) - Gulf and bay system	LE	E
Green Sea Turtle (*Chelonia mydas*) – Gulf and bay system	LT	T
Gulf Saltmarsh Snake (*Nerodia clarkii*) - saline flats, coastal bays, & brackish river mouths		
Kemp's Ridley Sea Turtle (*Lepidochelys kempii*) - Gulf and bay system	LE	E
Leatherback Sea Turtle (*Dermochelys coriacea*) - Gulf and bay system	LE	E
Loggerhead Sea Turtle (*Caretta caretta*) - Gulf and bay system	LT	T
Northern Scarlet Snake (*Cemophora coccinea copei*) - mixed hardwood scrub on sandy soils; feeds on reptile eggs; semi-fossorial; active April-September		T
Texas Diamondback Terrapin (*Malaclemys terrapin littoralis*) - coastal marshes, tidal flats, coves, estuaries, and lagoons behind barrier beaches; brackish and salt water; burrows into mud when inactive; may venture into lowlands at high tide		
Texas Horned Lizard (*Phrynosoma cornutum*) - open, arid and semi-arid regions with sparse vegetation, which could include grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September		T
Timber/Canebrake Rattlesnake (*Crotalus horridus*) - swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto		T

***** VASCULAR PLANTS *****

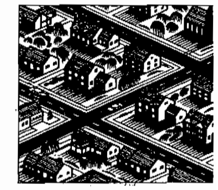
	Federal Status	State Status
Chapman's orchid (*Platanthera chapmanii*) - in Texas, restricted to wetland pine savannas, one of the states most endangered habitats; flowering July-August		

Status Key:

- LE, LT - Federally Listed Endangered/Threatened
- PE, PT - Federally Proposed Endangered/Threatened
- E/SA, T/SA - Federally Listed Endangered/Threatened by Similarity of Appearance
- C1 - Federal Candidate for Listing, Category 1; information supports proposing to list as endangered/threatened
- DL, PDL - Federally Delisted/Proposed for Delisting
- NL - Not Federally Listed
- E, T - State Listed Endangered/Threatened
- "blank" - Rare, but with no regulatory listing status

Species appearing on these lists do not all share the same probability of occurrence. Some species are migrants or wintering residents only, or may be historic or considered extirpated.

TEXAS PARKS AND WILDLIFE



Wildlife Habitat Assessment Program
Threatened and Endangered Species
3000 S. IH-35, Suite 100
Austin, Texas 78704
512/912-7011 phone
512/912-7058 fax
www.tpwd.state.tx.us

Rare Resources Review Requests
(Including Threatened and Endangered Species)

This service includes an analysis of your site-specific assessment of environmental information and potential impacts to threatened, endangered, and other rare species, natural communities, and special features presently known or potentially occurring in the vicinity of a project. **If you need only state or county rare species lists for preliminary project planning, in lieu of submitting this form please contact our administrative staff at (512) 912-7011.**

Review requests for this analysis should include all the information listed on Page 2 below and be sent to the attention of Celeste Brancel at the above address. We will provide you an analysis based on the most current information available to Texas Parks and Wildlife Department regarding sensitive natural resources. Please expect our response to take on average 4 to 6 weeks from receipt, depending on the size of your request. Note the more pertinent information you provide, the more customized our review, and the faster our turnaround. Review requests submitted without adequate project detail may cause a delay in our response while we contact you and wait for supplemental information. The potential for adverse impacts to rare resources from project activities varies based on the type of activity; location; season; vegetation; present physical features (both natural and man-made); degree of disturbance; planned avoidance, minimization, mitigation, enhancement, and restoration measures; and species-specific tolerance levels. Current site color photographs and aerial photographs greatly facilitate the review process. More information allows us to more accurately assess a project's potential impacts as well as assists in narrowing the list of species or impacts you and we would need to address.

TPWD charges for this review service. Since TPWD is largely a self-funded agency, this revenue allows for additional staff to provide more timely responses to review requests. The charges are based on a flat fee (minimum charge of $50/project site), except when the project is unusually large ($25/additional hour). An invoice will accompany the TPWD response letter for the review request, which will be due upon receipt; please do not prepay. Government agencies are exempted from these charges. Private consultants performing work under contract for government entities are not exempt.

This analysis does not include a review of general fish and wildlife habitat impacts (such as impacts to wetlands, water bodies, other fish and wildlife species, forests, parklands, etc.). Should you need such a review, a separate request should be sent to Kathy Boydston, TPWD Wildlife Division, Wildlife Habitat Assessment Program, 4200 Smith School Road, Austin, TX 78744-3291.

- Rare Resources Review Requests
- (Including Threatened and Endangered Species), cont'd. -

If this form is filled out electronically, please use a font or style that will contrast with the text below. If sending in a separate attachment, it is not necessary to return the blank form, providing all the information below is included on the attachment.

Name:	Date:
Your Company:	Phone:
Your Company Address:	Fax:
City, State, Zip:	E-Mail:
Project Title & Site Location:	County(ies):

1) **Scope of Project**
   a) What regulations will this review help you to comply with? OR If not regulatory, why is the review being requested?
   b) What activities will be conducted at the site? (Especially activity types, extent, and acreage of ground, waterway, and vegetation disturbance and total acreage of site)
   c) Schedule of activities – Approximately when will the project be active on the site?

2) **Vegetation** - Species, structure and composition, vegetation layers, height of layers, natural vegetation community type

3) **Other Natural Resources/Physical Features**
   a) Soils and geology
   b) Habitat, watercourses, animals, etc.

4) **Existing Site Development** - Extent of pavement, gravel, shell, or other cover; buildings, landscaped, xeriscaped, drainage system, etc).

5) **Historic Use/Function of Site –** Pasture, forest, urban, row crops, rangeland, wetland, etc.

6) **Has a threatened and endangered species survey or assessment already been performed? (In general, TPWD recommends an on-site habitat assessment be performed).**
   a) If yes, provide surveyor name, qualifications, methods or protocols, acreage surveyed, level of effort, weather conditions, time of day, and dates the survey was performed.
   b) If yes, please provide results and copy of survey/assessment report.

7) **Could current on-site or adjacent habitat support rare species?** Specifically, explain why or why not.

8) **Brief description of potential negative impacts** from project activities and avoidance, minimization, and mitigation measures planned.

9) **Brief description of planned beneficial enhancements** or restoration efforts.

10) **Clearly delineate exact location of site** on original or photocopy of relevant portion of USGS 7.5' topographic quadrangle (most preferable) or best map available. Topographic map should show name of quadrangle. The map must contain identifiable features and a scale that allows us to accurately pinpoint your site.

11) **Originals or color-copy photographs** of site and surrounding area with captions or narratives.

12) **Aerial photographs** when available. Aerials should show the year photograph was taken.

TEXAS PARKS & WILDLIFE

Notes for County Lists of Texas' Special Species

TEXAS PARKS & WILDLIFE

The Texas Parks and Wildlife (TPWD) county lists **include**:

Vertebrates, Invertebrates, and Vascular Plants on the special species lists of the TPWD, Non-game and Rare Species Program, Natural Diversity Database (NDD) (formerly the Biological and Conservation Data System). These special species lists are comprised of all species, subspecies, and varieties that are federally listed; proposed to be federally listed; have federal candidate status; are state listed; or carry a global conservation status indicating a species is imperiled, very rare, vulnerable to extirpation; and some species ranked rare or uncommon.

Colonial Waterbird Nesting Areas and Migratory Songbird Fallout Areas are included on the county lists for coastal counties only.

The TPWD county lists **exclude**:

Natural Plant Communities such as Little Bluestem-Indiangrass Series (native prairie remnant), Water Oak-Willow Oak Series (bottomland hardwood community), Saltgrass-Cordgrass Series (salt or brackish marsh), Sphagnum-Beakrush Series (seepage bog).

Other Significant Features such as non-coastal bird rookeries, comprehensive migratory bird information, bat roosts, bat caves, invertebrate caves, and prairie dog towns.

These lists are not all inclusive for all rare species distributions. The lists were developed and are updated based on field guides, NDD occurrences data, staff expertise, and scientific publications. In order to keep the lists to a reasonable length, historic ranges for some state extirpated species, full historic distributions for some extant species, accidentals and irregularly appearing species, and portions of migratory routes for particular species are not included.

The **revised date** on each county list reflects the last date any changes or revisions were made for that county and reflects current listing statuses and taxonomy.

Species that appear on county lists do not all share the same probability of occurrence within a county. Some species are migrants or wintering residents only. Additionally, a few species may be historic or considered extirpated within a county. Species considered extirpated within the state are so flagged on each list.

This information is for your assistance only; due to continuing data updates, **please do not reprint or redistribute the information, instead refer all requesters to our office to obtain the most current information available.**

The Natural Diversity Database

The Texas Parks and Wildlife Department (TPWD), Natural Diversity Database (NDD) (formerly the Biological and Conservation Data System), established in 1983, is the Department's most comprehensive source of information on rare, threatened, and endangered plants and animals, exemplary natural communities, and other significant features. Though it is not all-inclusive, the NDD is constantly updated, providing current or additional information on statewide status and locations of these unique elements of natural diversity.

The NDD gathers biological information from museum and herbarium collection records, peer reviewed publications, experts in the scientific community, organizations, qualified individuals, and on-site field surveys conducted by TPWD staff on public lands or private lands with written permission. TPWD staff botanists, zoologists, and ecologists perform field surveys to locate and verify specific occurrences of high-priority biological elements and collect accurate information on their condition, quality, and management needs.

The NDD can be used to help evaluate the environmental impacts of routing and siting options for development projects. It also assists in impact assessment, environmental review, and permit review.

Given the small proportion of public versus private land in Texas, the NDD does not include a representative inventory of rare resources in the state. Although it is based on the best data publicly available to TPWD regarding rare species, these data cannot provide a definitive statement as to the presence, absence, or condition of special species, natural communities, or other significant features in any area. Nor can these data substitute for on-site evaluation by qualified biologists. The NDD information is intended to assist the user in avoiding harm to species that may occur.

Please use the following citation to credit the source for this county level information:

> Texas Parks and Wildlife Department, Wildlife Division, Non-game and Rare Species and Habitat Assessment programs. County Lists of Texas' Special Species. [county name(s) and revised date(s)].

For information on obtaining a project review form or a site-specific review of a project area for rare species, and for updated county lists, please call (512) 912-7011.

Last Revision : 17 Dec 2004

Code Key for Printouts from Texas Parks and Wildlife Department Natural Diversity Database (NDD)

This information is for your assistance only; due to continuing data updates, vulnerability of private land to trespass and of species to disturbance or collection, **please do not publish in public documents or otherwise reprint or redistribute the information, instead refer all requesters to our office to obtain the most current information available.**

LEGAL STATUS AND CONSERVATION RANKS

	FEDERAL STATUS (as determined by the US Fish and Wildlife Service)
LE	Listed Endangered
LT	Listed Threatened
PE	Proposed to be listed Endangered
PT	Proposed to be listed Threatened
PDL	Proposed to be Delisted (Note: Listing status retained while proposed)
E/SA, T/SA	Listed Endangered on basis of Similarity of Appearance, Listed Threatened on basis of Similarity of Appearance
DL	Delisted Endangered/Threatened
C1	Candidate, Category 1. USFWS has substantial information on biological vulnerability and threats to support proposing to list as threatened or endangered. Data are being gathered on habitat needs and/or critical habitat designations.
C1*	C1, but lacking known occurrences
C1**	C1, but lacking known occurrences, except in captivity/cultivation
XE	Essential Experimental Population
XN	Non-essential Experimental Population
Blank	Species is not federally listed
	TX PROTECTION (as determined by the Texas Parks and Wildlife Department)
E	Listed Endangered
T	Listed Threatened
Blank	Species not state-listed
	GLOBAL RANK (as determined by NatureServe)
G1	Critically imperiled globally, extremely rare, typically 5 or fewer viable occurrences
G2	Imperiled globally, very rare, typically 6 to 20 viable occurrences
G3	Very rare and local throughout range or found locally in restricted range, typically 21 to 100 viable occurrences
G4	Apparently secure globally
G5	Demonstrably secure globally,
GH	Of historical occurrence through its range
GU	Possibly in peril range-wide, but status uncertain
G#G#	Ranked within a range as status uncertain
GX	Apparently extinct throughout range
Q	Rank qualifier denoting taxonomic assignment is questionable
#?	Rank qualifier denoting uncertain rank
C	In captivity or cultivation only
G#T#	"G" refers to species rank; "T" refers to variety or subspecies rank
	STATE (SUBNATIONAL) RANK (as determined by the Texas Parks and Wildlife Department)
S1	Critically imperiled in state, extremely rare, vulnerable to extirpation, typically 5 or fewer viable occurrences
S2	Imperiled in state, very rare, vulnerable to extirpation, typically 6 to 20 viable occurrences
S3	Rare or uncommon in state, typically 21 to 100 viable occurrences
S4	Apparently secure in State
S5	Demonstrably secure in State
S#S#	Ranked within a range as status uncertain
SH	Of historical occurrence in state and may be rediscovered
SU	Unrankable – due to lack of information or substantially conflicting information
SX	Apparently extirpated from State
SNR	Unranked – State status not yet assessed
SNA	Not applicable – species id not a suitable target for conservation activities
?	Rank qualifier denoting uncertain rank in State

Revised 24 Nov 2004

ELEMENT OCCURRENCE RECORD

Element Occurrence Record (EOR)	Spatial and tabular record of an area of land and/or water in which a species, natural community, or other significant feature of natural diversity is, or was, present and associated information; may be a single contiguous area or may be comprised of discrete patches or subpopulations
Occurrence #	Unique number assigned to each occurrence of each element when added to the NDD

LOCATION INFORMATION

Watershed Code	Eight digit numerical code determined by US Geological Survey (USGS)
Watershed	Name of watershed as determined by USGS
Quadrangle	Name of USGS topographical map
Directions	Directions to geographic location where occurrence was observed, as described by observer or in source

SURVEY INFORMATION

First/Last Observation	Date a particular occurrence was first/last observed; refers only to species occurrence as noted in source and does not imply the first/last date the species was present
Survey Date	If conducted, date of survey

EO Type State rank qualifiers:

- **M** Migrant – species occurring regularly on migration at staging areas, or concentration along particular corridors; status refers to the transient population in the State
- **B** Qualifier indicating basic rank refers to the breeding population in State
- **N** Qualifier indicating basic rank refers to the non-breeding population in State

EO Rank

A	Excellent	**AI**	Excellent, Introduced
B	Good	**BI**	Good, Introduced
C	Marginal	**CI**	Marginal, Introduced
D	Poor	**DI**	Poor, Introduced
E	Extant/Present	**EI**	Extant, Introduced
H	Historical/No Field Information	**HI**	Historical, Introduced
X	Destroyed/Extirpated	**XI**	Destroyed, Introduced
O	Obscure	**OI**	Obscure, Introduced

EO Rank Date	Latest date EO rank was determined or revised
Observed Area	Acres, unless indicated otherwise

COMMENTS

Description	General physical description of area and habitat where occurrence is located, including associated species, soils, geology, and surrounding land use
Comments	Comments concerning the quality or condition of the element occurrence at time of survey
Protection Comments	Observer comments concerning legal protection of the occurrence
Management Comments	Observer comments concerning management recommendations appropriate for occurrence conservation

DATA

EO Data	Biological data; may include number of individuals, vigor, flowering/fruiting data, nest success, behaviors observed, or unusual characteristic, etc.

SITE

Site Name	Title given to site by surveyor

MANAGED AREA INFORMATION

Managed Area Name	Place name or (on EOR printout) name of area when the EO is located within or partially within an area identified for conservation, such as State or Federal lands, nature preserves, parks, etc.
Alias	Additional names the property is known by
Acres	Total acreage of property, including non-contiguous tracts
Manager	Contact name, address, and telephone number for area or nearest area land steward

Please use the following citation to credit the source for the printout information:

Texas Parks and Wildlife Department, Wildlife Division, Science, Research, and Diversity Program, Natural Diversity Database [date(s) posted on printouts].

Revised 24 Nov 2004

BRAZORIA COUNTY

*** BIRDS ***

	Federal Status	State Status
Arctic Peregrine Falcon (*Falco peregrinus tundrius*) - potential migrant	DL	T
Attwater's Greater Prairie-chicken (*Tympanuchus cupido attwateri*) - county within historical distribution; open prairies of mostly thick grass one to three feet tall; from near sea level to 200 feet along coastal plain on upper two-thirds of Texas coast; males form communal display flocks during late winter-early spring; booming grounds important; breeding February-July	LE	E
Bald Eagle (*Haliaeetus leucocephalus*) - found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds	LT-PDL	T
Black Rail (*Laterallus jamaicensis*) - salt, brackish, and freshwater marshes, pond borders, wet meadows, & grassy swamps; nests in or along edge of marsh, sometimes on damp ground, but usually on mat of previous year's dead grasses; nest usually hidden in marsh grass or at base of Salicornia		
Brown Pelican (*Pelecanus occidentalis*) - largely coastal and near shore areas, where it roosts on islands and spoil banks	LE	E
Henslow's Sparrow (*Ammodramus henslowii*) - wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking; likely to occur, but few records within this county		
Mountain Plover (*Charadrius montanus*) - shortgrass plains and plowed fields (bare, dirt fields); primarily insectivorous; winter resident in this area		
Piping Plover (*Charadrius melodus*) - wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats	LT	T
Reddish Egret (*Egretta rufescens*) - resident of the Texas Gulf Coast; brackish marshes and shallow salt ponds and tidal flats; nests on ground or in trees or bushes, on dry coastal islands in brushy thickets of yucca and prickly pear		T
Snowy Plover (*Charadrius alexandrinus*) - wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats		
Sooty Tern (*Sterna fuscata*) - predominately "on the wing"; does not dive, but snatches small fish and squid with bill as it flies or hovers over water; breeding April-July		T
Swallow-tailed Kite (*Elanoides forficatus*) - lowland forested regions, especially swampy areas, ranging into open woodland; marshes, along rivers, lakes, and ponds; nests high in tall tree in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees		T
White-faced Ibis (*Plegadis chihi*) - prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats		T
White-tailed Hawk (*Buteo albicaudatus*) - near coast on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March-May		T
Whooping Crane (*Grus americana*) - potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	LE	E

BRAZORIA COUNTY, cont'd

	Federal Status	State Status
Wood Stork (*Mycteria americana*) - forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960		T
***** BIRDS-RELATED *****		
Colonial waterbird nesting areas - many rookeries active annually		
Migratory songbird fallout areas - oak mottes and other woods/thickets provide foraging/roosting sites for neotropical migratory songbirds		
*****FISHES*****		
American Eel (*Anguilla rostrata*) - most aquatic habitats with access to ocean; spawns January-February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries		
Sharpnose Shiner (*Notropis oxyrhynchus*) – endemic to Brazos River drainage; also, apparently introduced into adjacent Colorado River drainage; large turbid river, with bottom a combination of sand, gravel, and clay-mud	C1	
***** MAMMALS *****		
Black Bear (*Ursus americanus*) - within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA; NL	T
Jaguarundi (*Herpailurus yaguarondi*) - thick brushlands, near water favored; six month gestation, young born twice per year in March and August	LE	E
Louisiana Black Bear (*Ursus americanus luteolus*) - possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas	LT	T
Ocelot (*Leopardus pardalis*) - dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November	LE	E
Plains Spotted Skunk (*Spilogale putorius interrupta*) – catholic in habitat; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie		
West Indian Manatee (*Trichechus manatus*) – Gulf and bay system; opportunistic, aquatic herbivore	LE	E
*****MOLLUSKS*****		
False Spike Mussel (*Quincuncina mitchelli*) - substrates of cobble and mud, with water lilies present; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins		
Pistolgrip (*Tritogonia verrucosa*) - stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins		
Rock-pocketbook (*Arcidens confragosus*) - mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins		

BRAZORIA COUNTY, cont'd

	Federal Status	State Status
Smooth Pimpleback (*Quadrula houstonensis*) - small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins		
Texas Fawnsfoot (*Truncilla macrodon*) - little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins		
***** REPTILES *****		
Atlantic Hawksbill Sea Turtle (*Eretmochelys imbricata*) - Gulf and bay system	LE	E
Green Sea Turtle (*Chelonia mydas*) - Gulf and bay system	LT	T
Gulf Saltmarsh Snake (*Nerodia clarkii*) - saline flats, coastal bays, & brackish river mouths		
Kemp's Ridley Sea Turtle (*Lepidochelys kempii*) - Gulf and bay system	LE	E
Leatherback Sea Turtle (*Dermochelys coriacea*) - Gulf and bay system	LE	E
Loggerhead Sea Turtle (*Caretta caretta*) - Gulf and bay system	LT	T
Smooth Green Snake (*Liochlorophis vernalis*) - Gulf Coastal Plain; mesic coastal shortgrass prairie vegetation; prefers dense vegetation		T
Texas Diamondback Terrapin (*Malaclemys terrapin littoralis*) - coastal marshes, tidal flats, coves, estuaries, and lagoons behind barrier beaches; brackish and salt water; burrows into mud when inactive; may venture into lowlands at high tide		
Texas Horned Lizard (*Phrynosoma cornutum*) - open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September		T
Timber/Canebrake Rattlesnake (*Crotalus horridus*) - swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto		T
***** VASCULAR PLANTS *****		
Coastal gay-feather (*Liatris bracteata*) - endemic; black clay soils of prairie remnants; flowering in fall		
Texas windmill-grass (*Chloris texensis*) - endemic; sandy to sandy loam soils in open to sometimes barren areas in prairies and grasslands, including ditches and roadsides; flowering in fall		
Threeflower broomweed (*Thurovia triflora*) - endemic; black clay soils of remnant grasslands, also tidal flats; flowering July-November		

Status Key:
LE,LT - Federally Listed Endangered/Threatened
PE,PT - Federally Proposed Endangered/Threatened
E/SA,T/SA - Federally Endangered/Threatened by Similarity of Appearance
C1 - Federal Candidate, Category 1; information supports proposing to list as endangered/threatened
DL,PDL - Federally Delisted/Proposed for Delisting
NL - Not Federally Listed
E,T - State Endangered/Threatened
"blank" - Rare, but with no regulatory listing status

Species appearing on these lists do not all share the same probability of occurrence. Some species are migrants or wintering residents only, or may be historic or considered extirpated.

GALVESTON COUNTY

	Federal Status	State Status
***** BIRDS *****		
Arctic Peregrine Falcon (*Falco peregrinus tundrius*) - potential migrant	DL	T
Attwater's Greater Prairie-chicken (*Tympanuchus cupido attwateri*) - open prairies of mostly thick grass one to three feet tall; from near sea level to 200 feet along coastal plain on upper two-thirds of Texas coast; males form communal display flocks during late winter-early spring; booming grounds important; breeding February-July	LE	E
Bald Eagle (*Haliaeetus leucocephalus*) - found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds	LT-PDL	T
Black Rail (*Laterallus jamaicensis*) - salt, brackish, and freshwater marshes, pond borders, wet meadows, & grassy swamps; nests in or along edge of marsh, sometimes on damp ground, but usually on mat of previous year's dead grasses; nest usually hidden in marsh grass or at base of Salicornia		
Brown Pelican (*Pelecanus occidentalis*) - largely coastal and near shore areas, where it roosts on islands and spoil banks	LE	E
Henslow's Sparrow (*Ammodramus henslowii*) - wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking; likely to occur, but few records within this county		
Mountain Plover (*Charadrius montanus*) - shortgrass plains and plowed fields (bare, dirt fields); primarily insectivorous; winter resident in this area		
Piping Plover (*Charadrius melodus*) - wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats	LT	T
Reddish Egret (*Egretta rufescens*) - resident of the Texas Gulf Coast; brackish marshes and shallow salt ponds and tidal flats; nests on ground or in trees or bushes, on dry coastal islands in brushy thickets of yucca and prickly pear		T
Snowy Plover (*Charadrius alexandrinus*) - wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats		
Sooty Tern (*Sterna fuscata*) - predominately "on the wing"; does not dive, but snatches small fish and squid with bill as it flies or hovers over water; breeding April-July		T
Swallow-tailed Kite (*Elanoides forficatus*) - lowland forested regions, especially swampy areas, ranging into open woodland; marshes, along rivers, lakes, and ponds; nests high in tall tree in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees		T
White-faced Ibis (*Plegadis chihi*) - prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats		T
White-tailed Hawk (*Buteo albicaudatus*) - near coast on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March-May		T
Whooping Crane (*Grus americana*) - potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	LE	E

GALVESTON COUNTY Cont'd

	Federal Status	State Status
Wood Stork (*Mycteria americana*) - forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960		T
***** BIRDS-RELATED *****		
Colonial waterbird nesting areas - many rookeries active annually		
Migratory songbird fallout areas - oak mottes and other woods/thickets provide foraging/roosting sites for neotropical migratory songbirds		
*****FISHES*****		
American Eel (*Anguilla rostrata*) - most aquatic habitats with access to ocean; spawns January-February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries		
***** MAMMALS *****		
Black Bear (*Ursus americanus*) - within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA; NL	T
Louisiana Black Bear (*Ursus americanus luteolus*) - possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas	LT	T
Plains Spotted Skunk (*Spilogale putorius interrupta*) – catholic in habitat; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie		
West Indian Manatee (*Trichechus manatus*) – Gulf and bay system; opportunistic, aquatic herbivore	LE	E
***** MOLLUSKS *****		
Pistolgrip (*Tritogonia verrucosa*) - stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins		
***** REPTILES *****		
Alligator Snapping Turtle (*Macrochelys temminckii*) - deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October		T
Atlantic Hawksbill Sea Turtle (*Eretmochelys imbricata*) - Gulf and bay system	LE	E
Green Sea Turtle (*Chelonia mydas*) - Gulf and bay system	LT	T

GALVESTON COUNTY Cont'd

Species	Federal Status	State Status
Gulf Saltmarsh Snake (*Nerodia clarkii*) - saline flats, coastal bays, & brackish river mouths		
Kemp's Ridley Sea Turtle (*Lepidochelys kempii*) – Gulf and bay system	LE	E
Leatherback Sea Turtle (*Dermochelys coriacea*) - Gulf and bay system	LE	E
Loggerhead Sea Turtle (*Caretta caretta*) - Gulf and bay system	LT	T
Smooth Green Snake (*Liochlorophis vernalis*) - Gulf Coastal Plain; mesic coastal shortgrass prairie vegetation; prefers dense vegetation		T
Texas Diamondback Terrapin (*Malaclemys terrapin littoralis*) - coastal marshes, tidal flats, coves, estuaries, and lagoons behind barrier beaches; brackish and salt water; burrows into mud when inactive; may venture into lowlands at high tide		
Texas Horned Lizard (*Phrynosoma cornutum*) - open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September		T
Timber/Canebrake Rattlesnake (*Crotalus horridus*) – swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto		T

*** VASCULAR PLANTS ***

Coastal gay-feather (*Liatris bracteata*) - endemic; black clay soils of prairie remnants; flowering in fall

Correll's false dragon-head (*Physostegia correllii*) – wet soils including roadside ditches and irrigation channels; flowering June-July

Grand Prairie evening primrose (*Oenothera pilosella* ssp. *sessilis*) known in Texas from a single collection made in the 1850's from Galveston Island; elsewhere known from sandy soils in low rises in Mississippi Delta; flowering May-June

Houston daisy (*Rayjacksonia aurea*) - endemic; seasonally wet, saline barren areas, around the base of mima mounds in coastal prairies, or barren to somewhat vegetated openings in grasslands, including pastures and roadsides, on loamy to sandy loam soils; flowering October-November

Texas windmill-grass (*Chloris texensis*) - endemic; sandy to sandy loam soils in open to sometimes barren areas in prairies and grasslands, including ditches and roadsides; flowering in fall

Threeflower broomweed (*Thurovia triflora*) - endemic; black clay soils of remnant grasslands, also tidal flats; flowering July-November

Status Key:

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Element Occurrence Record

Scientific Name: Haliaeetus leucocephalus **Occurrence #:** 120 **Eo Id:** 4018
Common Name: Bald Eagle **TX Protection Status:** T
Global Rank: G4 **State Rank:** S3B,S3N **Federal Status:** LT-PDL

Location Information:

Watershed:
12040205 - Austin-Oyster

County Name:	State:	Mapsheet:
Brazoria	TX	29095-A3, Oyster Creek
		29095-A4, Lake Jackson
		28095-H3, Freeport
		28095-H4, Jones Creek

Directions
TERRITORY EAST-NORTHEAST OF CLUTE ON OYSTER CREEK AND BIG SLOUGH

Survey Information:

First Observation: 2000 **Survey Date:** **Last Observation:** 2001
Eo Type: **Eo Rank:** **Eo Rank Date:**
Observed Area:

Comments:

General Description:

Comments: TPWD NEST #020-8A

Protection Comments:

Management Comments:

Data:

EO Data: NEST #020-8A: 2000, ACTIVE NEST WITH ONE YOUNG FLEDGED; 2001, ACTIVE NEST WITH TWO YOUNG FLEDGED

Site:

Site Name:
BRAZOS-SAN BERNARD-COLORADO RIVERS MEGASITE

Element Occurrence Record

Managed Area:

Managed Area Name

Reference:

Citation:

ORTEGO, BRENT. 2001. PERFORMANCE REPORT. PROJECT NO. 10: BALD EAGLE NEST SURVEY AND MANAGEMENT. FEDERAL AID GRANT NO. W-125-R-12. SEPTEMBER 30, 2001.

ORTEGO, BRENT. 2002. MAPS CLARIFYING QUESTIONS ABOUT BALD EAGLE TERRITORY LOCATIONS FROM THE 2001 SURVEY. RECEIVED JUNE 13, 2002.

POLASEK, LEN G. 2000. PERFORMANCE REPORT. PROJECT NO. 10: BALD EAGLE NEST SURVEY AND MANAGEMENT. FEDERAL AID GRANT NO. W-125-R-11. AUGUST 31, 2000.

Specimen:

K-75

TPWD Pipeline Monitoring Protocol

The permittee will use aerial photography with GIS analysis to monitor the entire pipeline construction corridor and an additional 200 meter buffer zone (100 meters paralleling each side of the construction corridor). The purpose of the GIS analysis is to quantify habitat conversion, particularly emergent marsh to open water. The resource agencies recommend the following GIS/ Remote Sensing method and standard be used in order to produce accurate and consistent results.

The pipeline corridor will be monitored by providing pre- and post- construction aerial photography, (taken 24 months after construction completion to allow for vegetative re-grow) at a scale of 1: 4800 or 1 inch to 400 feet. The applicant will then be required to utilize GIS and Remote Sensing techniques to conduct an analysis of change to determine the amount of vegetated marsh impacted by pipeline construction activities. Monitoring reports should be submitted by the applicant that includes at a minimum:

1) a pre-project GIS analysis assessing the existing emergent marsh to open water ratio, in acres, within the permitted corridor (which includes the construction corridor and the 200 meter buffer zone).
2) a post -project GIS analysis assessing the emergent marsh to open water ratio, in acres, within the entire permitted corridor (which includes the construction corridor and the 200 buffer zone),
3) Ortho corrected imagery covering the construction corridor and buffer zone, maximum of 6 inch pixel size and CIR imagery, +/- 2 meters spatial accuracy, 4) All vector deliverable to be in Arcview Shapefile format with FGDC compliant metadata and all raster imagery in GEoTiff format with FGDC compliant metadata. A binary classification system should be used consisting of open water and vegetated areas. The classified data should meet or exceed 90% attribute accuracy as determined by industry standard and be verified by statistically valid ground truth sampling techniques, this can include GPS based ground surveys.

S0014

TEXAS GENERAL LAND OFFICE

JERRY PATTERSON, COMMISSIONER

October 4, 2005

Mr. Donald Silawsky
Department of Energy
Office of Petroleum Reserves
1000 Independence Avenue S. W.
Washington, DC 20585-0301

Re: Proposed Expansion of the Strategic Petroleum Reserve (SPR) in Texas

Dear Mr. Silawsky:

Thank you for the opportunity to review the proposed project listed above. The Texas sites under consideration are: (1) Big Hill, Jefferson County, an existing SPR facility to be expanded; and (2) Stratton Ridge, Brazoria County, which is a candidate for a new SPR facility.

K-76 The General Land Office (GLO) staff is concerned about potential adverse impacts to Coastal Natural Resource Areas (CNRAs), as defined in 31 TAC §501.3(b). It appears that at least part of the proposed project is in the Coastal Management Program (CMP) boundary. The CMP requires that, if practicable, the project should avoid and/or minimize any adverse impacts to CNRAs in the CMP boundary, as delineated in 31 TAC §503.1. Information on the Texas CMP can be found at the following website: http://www.glo.state.tx.us/coastal/cmp.htm/.

Based on the information provided, it also appears that there may be impacts to coastal wetlands. A wetland delineation may be conducted by the U.S. Army Corps of Engineers (Corps) or a qualified consultant to determine if the wetlands are jurisdictional and a Corps permit is required. Also, a Texas Commission on Environmental Quality (TCEQ) Section 401 water-quality certification may also be needed.

Because part of the proposed project may be on state-owned submerged lands and a GLO coastal lease or easement may be required, I have forwarded the information on the proposed expansion to Mr. Garry McMahan, GLO Asset Inspections in La Porte, Texas at (281) 470-1191 or at garry.mcmahan@glo.state.tx.us.

Also, Mr. Dolan Dunn, Chief, Regulatory Branch, Corps – Galveston District, can be contacted at (409) 766-3930, and Mr. Mark Fisher, TCEQ, is at (512) 239-4586.

Stephen F. Austin Building • 1700 North Congress Avenue • Austin, Texas 78701-1495
Post Office Box 12873 • Austin, Texas 78711-2873
512-463-5001 • 800-998-4GLO
www.glo.state.tx.us

Please contact Mr. Thomas Calnan if you have any questions or concerns at (512) 463-5100 or thomas.calnan@glo.state.tx.us.

Sincerely,

Sam Webb

Sam Webb
Deputy Commissioner
Coastal Resources

cc: Louis Renaud, Deputy Commissioner, Energy Resources
Rene Truan, Deputy Commissioner, Asset Inspections

TEXAS HISTORICAL COMMISSION
The State Agency for Historic Preservation

RICK PERRY, GOVERNOR
JOHN L. NAU, III, CHAIRMAN
F. LAWERENCE OAKS, EXECUTIVE DIRECTOR

S0029

October 18, 2005

Donald Silawsky
Department of Energy
Office of Petroleum Reserves
1000 Independence Avenue S.W.
Washington, DC 20585-0301

Re: Project review under Section 106 of the National Historic Preservation Act of 1966
Expansion of the Strategic Petroleum Reserve (Big Hill and Stratton Ridge, Texas)
(DOE)

Dear Mr. Silawsky:

Thank you for contacting us about the proposed expansion of the Strategic Petroleum Reserve. This letter serves as comment on the proposed undertaking from the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission.

The Big Hill facility has never been surveyed for cultural resources. Since the facility was not constructed until 1987, none of the buildings associated with its operation would be old enough to be considered historic properties. Although no archeological sites are recorded in the surrounding vicinity, the unique nature of the Big Hill landform may have attracted prehistoric populations. We believe that any previously undisturbed areas should be surveyed for archeological sites.

The Stratton Ridge location has not been surveyed for cultural resources, aside from a pipeline right-of-way that parallels the road about 100 m north of Oyster Creek. One prehistoric shell midden site is recorded on the south side of Oyster Creek immediately across from the project area. It is possible that additional sites are present along the northern bank of Oyster Creek within the proposed project area. This entire area should be surveyed.

We would be happy to work with the Department of Energy to develop a Programmatic Agreement that will satisfy your Section 106 responsibilities if either of these proposed expansion areas are selected for expansion. Thank you for your cooperation in this federal review process, and for your efforts to preserve the irreplaceable heritage of Texas. **If we may be of further assistance, please call Bill Martin of our staff at 512/463-5867.**

Sincerely,

William A. Martin

for
F. Lawerence Oaks, State Historic Preservation Officer

FLO/wam

P.O. BOX 12276 · AUSTIN, TX 78711-2276 · 512/463-6100 · FAX 512/475-4872 · TDD 1-800/735-2989
www.thc.state.tx.us

Louisiana Local Agencies

Donald Silawsky
Office of Petroleum Reserves, (FE-47)
1000 Independence Avenue, S.W.
Washington, DC 20585-0301

Re: Proposed Expansion of the Strategic Petroleum Reserve (SPR) within Lafourche Parish.

Dear Mr. Silawsky:

You identified two new proposed SPR sites within Lafourche Parish, Chacahoula and Clovelly. The enclosures indicate that Chacahoula would be a completely new site that is somewhat remote with no existing infrastructure. New pipelines will have to be built through our marsh and wetlands plus new buildings, roads etc.

The site at Clovelly would be located within the existing facilities of the Louisiana Offshore Oil Port (LOOP). This would eliminate the need for new pipelines, roads and other infrastructure. The Lafourche Parish Emergency Preparedness Office has worked with LOOP for a number of years. We are able to share resources and we participate in drills to prepare for local emergencies. With LOOP's existing infrastructure no new pipelines or roads would have to be built through our marsh or wetlands and therefore I favor building any new SPR facilities within Lafourche Parish at the Clovelly/LOOP location.

Because of our longstanding work relationship with LOOP, we do not expect any negative effects on public resources due to this proposed expansion. Rather, we see this as a positive step in the economy of this area. LOOP has demonstrated that it is committed to protecting public health and safety through its daily operations and emergency response plans that are in place.

Sincerely,

Chris Boudreaux

Chris Boudreaux
Lafourche Parish Emergency
Preparedness Office
1612 Hwy 182
Raceland, Louisiana 70394

\\Noelh\executive\LOOP LLC\Business Development\SPR Storage\Chris Boudreaux to DOE 10-6-05.doc

Appendix L
Applicable Laws, Regulations, Executive Orders, and DOE Orders

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LIST OF TABLES

Page

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Appendix L
Applicable Laws, Regulations, Executive Orders, and DOE Orders

Permits and approvals are required for the expansion of the storage capacity of the SPR from 727 million to 1.0 billion barrels by expanding existing Strategic Petroleum Reserve (SPR) storage sites in Texas, Louisiana, or both, and creating one new site in Texas, Mississippi, or Louisiana. Permits regulate many aspects of facility construction and operations, including the quality of construction, fugitive dust control requirements, and discharges of effluents to the environment. These permits would be obtained, as required, from the appropriate Federal, State, and local agencies.

Table L-1 identifies the major Federal and State laws, regulations, Executive Orders, and other compliance actions that apply to the proposed projects. The Department of Energy (DOE) would conduct its operations in an environmentally safe manner and in compliance with all applicable statutes, regulations, and standards.

Table L-2 lists the DOE Orders that are potentially relevant. DOE Orders are part of the DOE Directives, which are official communications of policies, requirements, and procedures and encompass the Orders, Policies, Orders, Notices, Manuals, and Guides that are intended to direct, guide, inform, and instruct employees in the performance of their jobs and enable them to work effectively within DOE and with agencies, contractors, and the public.

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Table L-1 Applicable Federal and State Laws, Regulations, and Executive Orders[a]

Resource Category	Statute/Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Air Resources (Federal)	CAA	42 U.S.C. 7401 et seq.	EPA	Requires sources to meet standards and obtain permits to satisfy NAAQS, SIPs, NSPS, NESHAPs, and NSR.
	CAA: NAAQS SIP	42 U.S.C. 7409 et seq.	EPA	Requires compliance with primary and secondary ambient air quality standards governing SO_2, NOx, CO, O_3, Pb, and particulate matter, and emission limits/reduction measures as designated in each state's SIP.
Air Resources (Louisiana)	Chapter 2, Rules and Regulations for the Fee System of the Air Quality Control Programs	LAC Title 33 Part 3	LDEQ	Establishes fees for DEQ air emissions permits, including for major sources. Covers both application fess and annual fees. Lists in table 1 the fee schedule with fees 1340 to 1368 covering petroleum storage and pipelines, fees 2200 through 2310 covering AT fees, and fees 2600 through 2630 covering accident prevention program annual fees.
	Chapter 5, Permit Procedures	LAC Title 33 Part 3	LDEQ	Contains permit rules for all sources of air pollution in the State. Covers major (and other) sources and pipelines. Contains insignificant activities list. Establishes in section 504, table 1, threshold levels for major sources. Establishes in section 509, table A, "Stationary Sources of Air Pollutants," including "petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels." Matches the Federal definition of major sources. Establishes in section 515 specific pipeline requirements.
	Chapter 6, Regulations on Control of Emissions through the Use of Emissions Reductions Credit Banking	LAC Title 33 Part 3	LDEQ	Establishes an emissions credit banking program for major sources to allow for offsets of emissions.

Table L-1 Applicable Federal and State Laws, Regulations, and Executive Orders[a]

Resource Category	Statute/Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
	Chapter 7, Ambient Air Quality	LAC Title 33 Part 3	LDEQ	Establishes ambient air quality standards for the State. Includes provisions for sulfur dioxide.
	Chapter 9, General Regulations on Control of Emissions and Emissions Standards	LAC Title 33 Part 3	LDEQ	Establishes requirements for new sources, reporting, and data requirements including emissions inventories.
	Chapter 15, Emission Standards for Sulfur Dioxide	LAC Title 33 Part 3	LDEQ	Contains emission regulations for sulfur dioxide and hydrogen sulfide.
	Chapter 21, Control of Emission of Organic Compounds	LAC Title 33 Part 3	LDEQ	Sets standards for VOC emission levels, mostly covering standards for above-ground storage tanks. Covers in section 2104 crude oil and condensate; in section 2107, loading requirements; in section 2109, oil and water separation; in section 2111, pumps and compressors; in section 2115, waste gas disposal; in section 2122, fugitive emissions; and sets controls in the parishes of Ascension, Calcasieu, East Baton Rouge, Iberville, Livingston, Point Coupee, and West Baton Rouge. Covers in section 2153 emissions from industrial wastewater.
	Chapter 29, Odor Regulations	LAC Title 33 Part 3	LDEQ	Establishes odor regulations and testing procedures for all odor sources.

Table L-1 Applicable Federal and State Laws, Regulations, and Executive Orders[a]

Resource Category	Statute/Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
	Chapter 30, Standards for New Stationary Sources (NSPS)	LAC Title 33 Part 3	LDEQ	Establishes NSPS standards. Incorporates by reference, for the most part, 40 CFR 60.
	Chapter 51, Comprehensive Toxic Air Pollutant Emission Control Plan	LAC Title 33 Part 3	LDEQ	Establishes AT program for owners of major sources in Louisiana, including MACT standards and reporting requirements.
	Chapter 59, Chemical Accident Prevention and Minimization of Consequences	LAC Title 33 Part 3	LDEQ	Contains accidental release requirements as well as risk management requirements. Incorporates 40 CFR 68 by reference.
Air Resources (Mississippi)	APC-S-1, Air Emission Regulations for the Prevention, Abatement, and Control of Air Contaminants, Section 4.	MSC 49-17-01 et seq.	MDEQ	Contains specific criteria for sources of sulfur compounds, including odor and opacity requirements.
	APC-S-1, Air Emission Regulations for the Prevention, Abatement, and Control of Air Contaminants, Section 5.	MSC 49-17-01 et seq.	MDEQ	Contains criteria for sources of chemical emissions not otherwise regulated.
	APC-S-1, Air Emission Regulations for the Prevention, Abatement, and Control of Air Contaminants, Section 6.	MSC 49-17-01 et seq.	MDEQ	Embodies regulations for new sources of air emissions. Incorporates by reference 40 CFR 60.

Table L-1 Applicable Federal and State Laws, Regulations, and Executive Orders[a]

Resource Category	Statute/Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
	APC-S-1, Air Emission Regulations for the Prevention, Abatement, and Control of Air Contaminants, Section 8.	MSC 49-17-01 et seq.	MDEQ	Contains regulations concerning the production of HAPs. Incorporates by reference 40 CFR 61 and 40 CFR 63. Also incorporates Federal MACT requirements by reference.
	APC-S-2: Permit Regulation for the Construction and/or Operations of Air Emissions Equipment	MSC 49-17-01 et seq.	MDEQ	Establishes permitting requirements for new sources of air pollution sources in Mississippi. Establishes that the Permit Board will issue two types of air pollution control permits, a permit to construct air emissions equipment and a State Permit to Operate such equipment. A State Permit to Operate is required for synthetic minor sources, major Title V sources, and significant minor sources.
	APC-S-3: Mississippi Regulations for the Prevention of Air Pollution Emergency Episodes	MSC 49-17-01 et seq.	MDEQ	Requires notification of appropriate state agencies in an emissions event. Establishes alert levels for different emissions events and pollutants including sulfur dioxide. Lists emissions reductions objectives for hydrocarbons in table 4.
	APC-S-4: Ambient Air Quality Standards	MSC 49-17-01 et seq.	MDEQ	States that except for odor (covered below), the ambient air quality standards for Mississippi shall be the Primary and Secondary National Ambient Air Quality Standards as duly promulgated by the U.S. Environmental Protection Agency in (or to be printed in) 40 CFR Part 50, pursuant to the Federal Clean Air Act, as amended. States that no odorous substances shall be released into the ambient air in concentrations sufficient to adversely and unreasonably: (1) affect human health and well-being; (2) interfere with the use or enjoyment of property; or (3) affect plant or animal life.

Table L-1 Applicable Federal and State Laws, Regulations, and Executive Orders[a]

Resource Category	Statute/Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
	APC-S-5: Mississippi Regulations for the Prevention of the Significant Deterioration (PSD) of Air Quality	MSC 49-17-01 et seq.	MDEQ	Establishes PSD criteria for Mississippi air. Incorporates by reference 40 CFR 52.21.
	APC-S-6: Air Emissions Operating Permit Regulations for the Purposes of Title V of the Clean Air Act	MSC 49-17-01 et seq.	MDEQ	Defines requirements for Title V permits, including major source categories and levels, permit applications, issuance, fees, and insignificant activities. Includes in the definitions of major sources: "petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels," which matches the Federal definition of major sources.
	APC-S-8: Air Toxics Regulations	MSC 49-17-01 et seq.	MDEQ	Regulates case-by-case maximum achievable control technology (MACT) applicable to facilities affected by the requirements of section 112(g) of the Federal Clean Air Act as those regulations duly promulgated by the United States Environmental Protection Agency in (or to be printed in) Subpart B of Part 63 of Title 40 of the Code of Federal Regulations (CFR).
Air Resources (Texas)	Emissions Events and Scheduled Maintenance, Startup and Shutdown Activities	30 TAC Chapter 101	TCEQ	Requires notification of appropriate state agencies in an emissions event. Contains "nuisance odor" rule in section 101.4.
	Control of Pollution from Volatile Organic Compounds	30 TAC Chapter 115	TCEQ	States in subchapter C the requirements for transfer operations.

Table L-1 Applicable Federal and State Laws, Regulations, and Executive Orders[a]

Resource Category	Statute/Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
	Control of Hydrogen Sulfide: Allowable off property concentrations (ambient standards) and Calculation methods	30 TAC Chapter 112	TCEQ	Establishes emission rates for sulfur dioxide emissions. Also contains provision for odor controls related to hydrogen sulfite (sections 112.31 to 112.34).
	Permits by Rule: Control of Air Pollution by Permits for New Construction or Modification	30 TAC Chapter 116	TCEQ	Controls the permission to construct and contains definitions for how non-attainment areas are handled, as well as PSD review definitions. Contains rules in subchapter O, sections 106.351 to 106.355 for oil and gas facilities.
	Air GOP No. 511: Oil and Gas General Operating Permit	30 TAC Chapter 122	TCEQ	Contains provisions for obtaining an Oil and Gas General Operating Permit for Brazoria, Chambers, Collin, Dallas, Denton, El Paso, Fort Bend, Galveston, Hardin, Harris, Jefferson, Liberty, Montgomery, Orange, Tarrant, and Waller Counties.
	Air GOP No. 514: Oil and Gas General Operating Permit	30 TAC Chapter 122	TCEQ	Contains provisions for obtaining an Oil and Gas General Operating Permit for all Texas Counties except Aransas, Bexar, Brazoria, Calhoun, Chambers, Collin, Dallas, Denton, El Paso, Fort Bend, Galveston, Gregg, Hardin, Harris, Jefferson, Liberty, Matagorda, Montgomery, San Patricio, Tarrant, Travis, Victoria, and Waller.
	Air GOP No. 515: Bulk Fuel Terminal General Operating Permit	30 TAC Chapter 122	TCEQ	Issues Bulk Fuel Terminal General Operating Permit Number 515, developed for use by petroleum bulk stations and terminals industry sites. Petroleum bulk stations and terminals industry sites are primarily engaged in the wholesale distribution of crude petroleum and petroleum products, including liquefied petroleum gas from bulk liquid storage facilities. The permit holders of GOP No. 515 were required to submit an application for a site operating permit on or before September 1, 2004.

Table L-1 Applicable Federal and State Laws, Regulations, and Executive Orders[a]

Resource Category	Statute/Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
	Routine Maintenance, Startup and Shutdown of Facilities, and Temporary Maintenance Facilities	30 TAC 106.263	TCEQ	Authorizes routine maintenance, start-up and shutdown of facilities, and specific temporary maintenance facilities if operations meet certain conditions.
Biological Resources (Federal)	Bald and Golden Eagle Protection Act	16 U.S.C. 668 et seq.	USFWS	Consultations should be conducted to determine if any protected birds are found to inhabit the area. If so, DOE must obtain a permit that may be required because of construction or operation of project facilities before moving any nests.
	Clean Water Act, as amended	33 U.S.C. 1313 (Section 404)	U.S. Army Corps of Engineers	Requires permits for discharge or fill placed in jurisdictional waters, including wetlands. Requires alternatives analysis including practicable alternatives that avoid impacts (404b(1) guidelines).
	Endangered Species Act	16 U.S.C. 1531 et seq.	USFWS	Requires consultation to identify endangered or threatened species and their habitats, assess impacts, obtain necessary biological opinions, and, if necessary, develop mitigation measures to reduce or eliminate adverse effects of construction or operations.
	E.O. 13112: Invasive Species	64 FR 6183 February 8, 1999	Federal agencies	Requires agencies, to the extent practicable and permitted by law, to prevent the introduction of invasive species; to provide for their control; and to minimize the economic, ecological, and human health impacts that invasive species cause.
	E.O. 13186, Responsibilities of Federal Agencies to Protect Migratory Birds	66 FR 63349 December 6, 2001	Federal agencies	Requires Federal agencies to avoid or minimize the negative impacts of their actions on migratory birds and to take active steps to protect birds and their habitats.
	Fish and Wildlife Coordination Act	16 U.S.C. 661-667e March 10, 1934	USFWS	Provides the basic authority for USFWS involvement in evaluating impacts to fish and wildlife from proposed water resource development projects.

Table L-1 Applicable Federal and State Laws, Regulations, and Executive Orders[a]

Resource Category	Statute/Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
	Forest Service Manual: Title 2600 – Wildlife, Fish, and Sensitive Plant Habitat Management	Amendment No. 2600-91-5, July 19, 1991	U.S. Forest Service	Provides a process and standard by which to ensure that threatened and endangered, proposed, and sensitive species receive full consideration; requires Federal agencies to comply with requirements for critical habitat of federally listed species; and ensures that Forest Service actions do not contribute to loss of viability of any native or desired non-native plant and do not contribute to animal species or trends towards Federal listing of any species.
	Magnuson-Stevens Fishery Conservation and Management Act	16 U.S.C. 1801 et seq.	NOAA-NMFS	Requires consultation with NMFS and assessment of impacts from activities that may affect Essential Fish Habitat and managed species.
	Marine Mammal Protection Act	16 U.S.C. 1361-1421h	Department of Commerce and Department of Interior, USFWS	Establishes a Federal responsibility to conserve marine mammals, with management vested in the Department of Commerce for cetaceans and pinnipeds other than walrus. The Department of the Interior is responsible for all other marine mammals, including sea otter, walrus, polar bear, dugong, and manatee. The act generally assigns identical responsibilities to the secretaries of the two departments.
	Migratory Bird Treaty Act	16 U.S.C. 703 et seq.	USFWS	Requires consultation to determine whether construction or operation of project facilities has any impacts on migrating bird populations.
Biological Resources (Louisiana)	Chapter 3, Statewide Flood Control Program	LAC Title 56 Part 3	Louisiana Wildlife and Fisheries Commission	States that subchapter C contains requirements for determining the effects of projects on threatened and endangered species; these regulations appear to apply primarily to flood control projects, but may have applicability to projects that otherwise affect water flow.

Table L-1 Applicable Federal and State Laws, Regulations, and Executive Orders[a]

Resource Category	Statute/Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
	Chapter 3, Special Powers and Duties	LAC Title 76 Part 1	Louisiana Wildlife and Fisheries Commission	States that subchapter E lists threatened and endangered species in Louisiana.
Biological Resources (Mississippi)	Non-Game and Endangered Species Conservation	MSC 49-5-101 et seq.	Mississippi Commission on Wildlife, Fisheries and Parks	Establishes Mississippi regulations concerning the handling of nongame and endangered species; chapter 111 grants specific permissions permission to remove, capture, or destroy endangered species.
	Mississippi Natural Heritage	MSC 49-5-141 et seq.	Mississippi Commission on Wildlife, Fisheries and Parks	Allows Mississippi to establish natural heritage areas including those containing threatened and endangered species.
Biological Resources (Texas)	Subchapter G. Threatened and Endangered Non-Game Species	31 TAC Chapter 65	Texas Parks and Wildlife Department	Contains lists of threatened and endangered species and other provisions, as well as regulations and penalties concerning such listed species.
	Subchapter A. Endangered, Threatened and Protected Native Plants	31 TAC Chapter 69	Texas Parks and Wildlife Department	Contains lists of threatened, endangered, and protected plants and other provisions including permitting requirements. Contains penalties concerning unauthorized removal or destruction of plants.
Cultural Resources (Federal)	American Antiquities Act	16 U.S.C. 431 et seq.	Each Federal land managing agency	Requires the agency to protect historic and prehistoric ruins, monuments, and objects of antiquity including vertebrate paleontological resources, on lands owned or controlled by the Federal Government.
	American Indian Religious Freedom Act	42 U.S.C 1996	Each Federal agency	Establishes Federal policy to protect and preserve the right of American Indians to believe, express, and exercise their religions. Requires agencies to prepare a report evaluating how their actions might interfere with these beliefs, expressions, and actions.

Table L-1 Applicable Federal and State Laws, Regulations, and Executive Orders[a]

Resource Category	Statute/Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
	Archeological and Historic Preservation Act	16 U.S.C. 469 et seq.	Each Federal agency	Authorizes all Federal agencies to expand program or project funds to evaluate, protect, or recover archeological and historical data jeopardized by their projects; explicitly calls for analysis and publication of data.
	Archaeological Resources Protection Act	16 U.S.C. 470aa et seq.	Each Federal land managing agency (in this case, DOE, DOI, USDA)	Requires a permit for excavation or removal of archaeological resources from publicly held or Native American lands.
	Executive Order 13007	61 FR 26771	All Federal agencies	Directs Federal agencies to avoid adverse effects to sacred sites and provide access to those sites for religious practices, and to plan projects to provide protection for and access to sacred sites.
	Native American Graves Protection and Repatriation Act	25 U.S.C. 3001	DOI	Requires the development of procedures to address unexpected discoveries of Native American graves or cultural items during activities on Federal or tribal land.
	National Historic Preservation Act, as amended	16 U.S.C. 470 et seq.	Each Federal agency (in this case, DOE)	States that for a Federal undertaking, section 106 requires consultation with State historic preservation officers, federally recognized tribes, and other consulting parties to evaluate effects on historic properties (properties eligible for listing in the National Register of Historic Places), and consider ways to avoid effects or reduce them to the level of no adverse effect.
	Protection of Historic Properties	36 CFR 800	Advisory Council on Historic Preservation	Lists implementing regulations that specify process for above-listed requirements of section 106 of National Register of Historic Places.
Cultural Resources (Louisiana)	Archeological Treasures Act	Louisiana Revised Statutes 41:1601-1613	Louisiana Departments of Archaeology and Historic Preservation	Declares State policy to protect and preserve archaeological sites that have scientific value and are of historic interest to the public.

Table L-1 Applicable Federal and State Laws, Regulations, and Executive Orders[a]

Resource Category	Statute/Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
	Louisiana Unmarked Human Burial Sites Act	Louisiana Revised Statutes 8:673	Louisiana Department of Culture, Recreation, and Tourism	Protects unmarked human burials on both public and private lands.
Cultural Resources (Mississippi)	Antiquities Law of Mississippi	Title 39 Chapter 7, Mississippi Code of 1972 as amended	Board of Trustees of the Mississippi Department of Archives and History	Declares State policy to protect and preserve archaeological sites that have scientific value and are of historic interest to the public. Provides for a State landmark program; requires permits for excavations or alterations of State landmarks; prohibits disturbance of Native American human burials
Cultural Resources (Texas)	Antiquities Code of Texas	Title 9 Chapter 191, Texas Natural Resources Code	Texas Historical Commission	Requires archeological surveys ahead of ground disturbance on State or local public lands; requires permits that authorize archeological studies before construction.
Land Use (Federal)	Coastal Zone Management Act, as amended	16 U.S.C. 1451 et seq.	Various state agencies	Protects the coastal environment from growing demands associated with residential, recreational, commercial, and industrial uses. Provisions help States develop Coastal Zone Management Plans to manage and balance competing uses of the coastal zone. For major projects, requires consultation with the state agency delegated to administer the CZMA and requires securing a determination of consistency with a state's Coastal Management Plan.
	Farmland Protection Policy Act	7 U.S.C. 4201 et seq.	NRCS, USDA	Minimizes any adverse effects to prime and unique farmlands.
Noise (Federal)	Noise Control Act	42 U.S.C. 4901 et seq.	EPA	Requires facilities to maintain noise levels that do not jeopardize the health and safety of the public. Applicable to construction noise.

Table L-1 Applicable Federal and State Laws, Regulations, and Executive Orders[a]

Resource Category	Statute/Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Water Resources (Federal)	Clean Water Act, as amended	33 U.S.C. 1251 et seq. (Sections 401 and 402)	State agencies	Requires EPA or state-issued permits, NPDES permits, and compliance with provisions of permits regarding discharge of effluents to surface waters and additional wetland protection requirements.
	Clean Water Act, as amended	33 U.S.C. 1313 (Section 404)	U.S. Army Corps of Engineers	Requires permits for discharge or fill placed in jurisdictional waters, including wetlands. Requires alternatives analysis including practicable alternatives that avoid impacts (404b(1) guidelines).
	E.O. 11988: Floodplain Management; E.O. 11990: Protection of Wetlands Management	42 FR 26951 May 24, 1977 42 FR 26961 May 24, 1977 10 CFR 1022 (implementing regulations)	Federal agencies	Requires that where there is no practicable alternative to development in floodplains and wetlands, Federal agencies are required to prepare a floodplains and wetlands assessment, design mitigation measures, and provide public review. For floodplain involvement, Federal agencies must issue a Floodplain Statement of Findings. DOE will coordinate its review with other appropriate Federal agencies. Where applicable, DOE will combine floodplains and wetlands assessments, public review, and statement of findings with the NEPA process.
	Safe Drinking Water Act	42 U.S.C 300j-9(i) Dec 12, 1974	EPA	Establishes a Federal program to monitor and increase the safety of the nation's drinking water supply. The Act instructs EPA to establish a national program to prevent underground injections of contaminated fluids that would endanger drinking water sources. Applicable to underground injection wells used for brine disposal.
Water Resources (Louisiana)	Chapter 3, Permits	LAC Title 33 Part 9	LDEQ	Prescribes procedures and guidelines for implementation and operation of the Louisiana Water Discharge Permit System (LWDPS). Requires that an LWDPS permit be obtained before any construction begins that may introduce pollutants to the waters of Louisiana.

Table L-1 Applicable Federal and State Laws, Regulations, and Executive Orders[a]

Resource Category	Statute/Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
	Chapter 9, Spill Prevention and Control	LAC Title 33 Part 9	LDEQ	Sets spill prevention requirements for facilities operating in Louisiana.
	Chapter 11, Surface Water Quality Standards	LAC Title 33 Part 9	LDEQ	Sets surface water quality standards for Louisiana waters.
	Subchapter B (Chapters 31 through 47), The Louisiana Pollutant Discharge Elimination System (LPDES) Program	LAC Title 33 Part 9	LDEQ	Defines the requirements for the Louisiana LPDES program, which applies to all facilities that come under the jurisdiction of the Federal NPDES program.
Water Resources (Mississippi)	LW-2: Surface Water and Groundwater Use and Protection	MSC 49-17-01 et seq.	MDEQ	Establishes that all water, whether occurring on the surface of the ground or underneath the surface of the ground, is subject to the provisions of the regulation.
	WPC-1: Wastewater Regulations for National Pollutant Discharge Elimination System (NPDES) Permits, Underground Injection Control (UIC) Permits, State Permits, Water Quality Based Effluent Limitations and Water Quality Certification	MSC 49-17-01 et seq.	MDEQ	Provides Mississippi's implementation of the Federal NPDES system. Regulates the use of wetlands, both natural and artificial, when they receive a discharge stream from a source. The text of the regulation states that "Unless otherwise provided by these regulations, natural wetlands shall not be used to meet a facility's final effluent limits or to achieve pollutant levels necessary to meet the State's Water Quality Criteria in the waterbody immediately downstream."
	WPC-2: Water Quality Criteria for Intrastate, Interstate, and Coastal Waters	MSC 49-17-01 et seq.	MDEQ	Sets State policy to "protect water quality existing at the time these water quality standards were adopted and to upgrade or enhance water quality within the State of Mississippi." States that "Waters shall be free from floating debris, oil, scum, and other floating materials attributable to municipal, industrial, agricultural, or other discharges in amounts sufficient to be unsightly or deleterious."

Table L-1 Applicable Federal and State Laws, Regulations, and Executive Orders[a]

Resource Category	Statute/Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Water Resources (Texas)	General Permits for Waste Discharges	30 TAC Chapter 205	TCEQ	Provides that the commission may issue a general permit to authorize the discharge of waste into or adjacent to water in the state depending on the nature of the discharge and the surrounding water bodies.
	Criteria and Standards for the National Pollutant Discharge Elimination System	30 TAC Chapter 308	TCEQ	Defines the requirements for the Texas Pollutant Discharge Elimination System (TPDES), the Texas implementation of the NPDES program. This applies to all facilities that fall under the jurisdiction of the Federal NPDES program.
	Spill Prevention and Control	30 TAC Chapter 327	TCEQ	Contains requirements for spill prevention and control, including oil- related spills.
Worker Safety and Health (Federal)	Occupational Safety and Health Act	29 U.S.C. 651 et seq.	OSHA	Requires agencies to comply with all applicable work safety and health legislation (including guidelines of 29 CFR 1960) and prepare, or have available, Material Safety Data Sheets.
	Hazard Communication Standard	29 CFR 1910.1200	OSHA	Requires DOE to ensure that workers are informed of all chemical hazards in the DOE workplace and are trained to handle them.
Other (Federal)	NEPA	42 U.S.C. 4321 et seq. 40 CFR 1500−1508	CEQ	Follows 40 CFR 1500−1508, which directs all Federal agencies in the implementation of NEPA; DOE NEPA regulations are in 10 CFR Part 1021.
	E.O. 12088: Federal Compliance with Pollution Control Standards	43 FR 47707 October 17, 1978	Office of Management and Budget	Requires Federal agencies to consult with the EPA and state agencies regarding the best techniques and methods for the prevention, control, and abatement of environmental pollution.
	Hazardous materials transportation law	49 U.S.C. 51015127 et seq.	DOT	Requires compliance with the requirements governing hazardous materials and waste transportation. Applies primarily to the construction phase.

Table L-1 Applicable Federal and State Laws, Regulations, and Executive Orders[a]

Resource Category	Statute/Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
	Marine Transportation Security Act of 2002	46 U.S.C. 70101 et seq.	U.S. Coast Guard	Specifies that all U.S. port facilities deemed at risk for a transportation security incident such as fossil fuel processing and storage facilities, must prepare and implement security plans for deterring such incidents to the "maximum extent practicable."
	Oil Pollution Prevention and Response; Non-Transportation-Related Onshore and Offshore Facilities	40 CFR 112	EPA	Establishes procedures, methods, equipment, and other requirements to prevent discharges of oil from vessels and facilities and contain such discharges. Requires Spill Prevention, Control, and Countermeasure Plans, and Facility Response Plans. Regulations apply to non-transportation-related onshore facilities.
	Toxic Substances Control Act	42 U.S.C. 2601 et seq.	EPA	Requires compliance with inventory reporting requirements and chemical control provisions of TSCA to protect the public from the risks of exposure to chemicals. TSCA imposes strict limitations on the use and disposal of PCB-contaminated equipment. Applicable primarily to the construction phase.
	E.O. 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	59 FR 7629 February 16, 1994	EPA	Requires Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.
	Proposed Construction or Alteration of Objects That May Affect the Navigable Airspace	FAA AC No. 70/460-2K	FAA	Requires that each proponent of a project that could pose an aviation hazard must file a "Notice of Proposed Construction or Alteration" (Form 7640) with the FAA. Applies to electricity transmission lines.
	Obstruction Marking and Lighting	FAA AC No. 70/460-1K	FAA	States that objects that may pose a navigation hazard must be marked and lighted according to FAA standards established using the criteria in 14 CFR 77. Applies to electricity transmission lines.

Table L-1 Applicable Federal and State Laws, Regulations, and Executive Orders[a]

Resource Category	Statute/Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Other (Texas)	Texas Administrative Code: Underground Storage of Liquid or Liquefied Hydrocarbons in Salt Formations	16 TAC 3.95 (d) (1)	Railroad Commission of Texas	Establishes policy that an underground hydrocarbon storage facility may be created, operated, or maintained only in an impermeable salt formation in a manner that will prevent waste of the stored hydrocarbons, uncontrolled escape of hydrocarbons, pollution of fresh water, and danger to life or property.

[a] Abbreviations: AC = Advisory Circular; AT = air toxics; CAA = Clean Air Act; CEQ = Council on Environmental Quality; CFR = *Code of Federal Regulations*; CO = carbon monoxide; CWA = Clean Water Act; CZMA = Coastal Zone Management Act; DOE = U.S. Department of Energy; DOI = U.S. Department of Interior; DOT = U.S. Department of Transportation; E.O. = Executive Order; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; et seq. = *et sequentes*, which means "and the following"; FAA = Federal Aviation Administration; FR = *Federal Register*; HAP = hazardous air pollutant; LAC = Louisiana Administrative Code; LDEQ = Louisiana Department of Environmental Quality; LWDPS = Louisiana Water Discharge Permit System; MACT = maximum achievable control technology; MDEQ = Mississippi Department of Environmental Quality; MSC = Mississippi State Code; NAAQS = National Ambient Air Quality Standards; NEPA = National Environmental Policy Act; NESHAP = National Emission Standards for Hazardous Air Pollutants; NHPA = National Historic Preservation Act; NMFS = National Marine Fisheries Service; NOAA = National Oceanic and Atmospheric Administration; NOx = nitrogen oxides; NPDES = National Pollutant Discharge Elimination System; NRCS = Natural Resources Conservation Service; NRHP = National Register of Historic Places; NSPS = New Source Performance Standard(s); NSR = New Source Review; O_3 = ozone; OSHA = Occupational Safety and Health Administration; Pb = lead; PCB = polychlorinated biphenyl; PSD = prevention of significant deterioration; ROW = right-of-way; SHPO = State Historic Preservation Officer; SIP = State Implementation Plan; SO_2 = sulfur dioxide; TAC = Texas Administrative Code; TCEQ = Texas Commission on Environmental Quality; TMDL = total maximum daily load; TPDES = Texas Pollutant Discharge Elimination System; TSCA = Toxic Substances Control Act; U.S.C. = *United States Code*; USDA = U.S. Department of Agriculture; USFWS = U.S. Fish and Wildlife Service; VOC = volatile organic compound.

Table L-2: DOE Orders Potentially Relevant to the Expansion and Operation of the Storage Capacity of the SPR[a]

Order	Subject	Description
151.1C	Comprehensive emergency management	Establishes policy and assigns and describes roles and responsibilities for the DOE Emergency Management System, which provides the framework for development, coordination, control, and direction of all emergency planning, preparedness, readiness assurance, response, and recovery actions.
231.1A	Environment, safety, and health reporting	Establishes the requirements and procedures for information with environmental protection, safety, or protection significance for DOE operations.
252.1	Technical standards	Promotes the use of voluntary consensus standards by DOE, provides DOE with the means to develop needed technical standards, and manages overall technical standards information, activities, issues, and interactions.
413.3	Project management	Demonstrates that DOE will support the development of documentation for the critical-decision process.
414.1C	Quality assurance	Establishes an effective quality assurance management system using the performance requirements of this order, coupled with technical standards, where appropriate.
420.1B	Facilities Safety	Establishes facility and programmatic safety requirements for DOE facilities, including nuclear and explosives safety design criteria, fire protection, criticality safety, natural phenomena hazards mitigation, and the System Engineer Program.
430.1B	Real property asset management	Defines life-cycle asset management, building codes, and value engineering. Establishes procedures to follow in all phases of the management of DOE facilities.
430.2A	Energy management	Requires designs for facilities to be consistent with the Energy Management Plan, sustainable design, and water efficiency required by this Order.
440.1A	Worker protection management for DOE Federal and contractor employees	Establishes a comprehensive worker protection program that ensures that DOE and its contractor employees have an effective worker protection program to reduce or prevent injuries, illnesses, and accidental losses by providing DOE, Federal, and contractor workers with a safe and healthful workplace.
450.1	Environmental protection program	Establishes DOE policy to conduct its operations in an environmentally safe and sound manner and to conduct its activities in compliance with applicable laws and regulations through implementation of environmental management systems at DOE sites.
451.1B	National Environmental Policy Act compliance program	Establishes DOE requirements and responsibilities for implementing the NEPA, Council on Environmental Quality regulations, for implementing the procedural provisions of NEPA, and for the DOE procedures that implement NEPA.

Table L-2: DOE Orders Potentially Relevant to the Expansion and Operation of the Storage Capacity of the SPR[a]

Order	Subject	Description
470.2B	Independent oversight and performance assurance program	Enhances the DOE safeguards and security; cyber security; emergency management; and environment, safety, and health programs by providing an independent evaluation of the adequacy of DOE policy and the effectiveness of line management performance.
5480.4	Environmental protection, safety, and health protection standards	Specifies and provides requirements for the application of the mandatory environmental protection, safety, and health standards applicable to all DOE and DOE contractor operations, provides a listing of reference safety and health standards, and identifies the sources of the mandatory and reference safety and health standards.
5480.19	Conduct of operations requirements for DOE facilities	Provides requirements and guidelines for departments to use in developing directives, plans, and procedures for conducting operations at DOE facilities that should result in improved quality and uniformity of operations.

[a] Abbreviations: DOE = U.S. Department of Energy; NEPA = National Environmental Policy Act; SPR = Strategic Petroleum Reserve.

Appendix M:
Contractor Disclosure Statement

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Appendix M
Contractor Disclosure Statements

CEQ regulations at 40 CFR 1506.5(c), which have been adopted by DOE (10 CFR 1021), require contractors who prepare an EIS to execute a disclosure specifying that they have no financial or other interest in the outcome of the project. The term "financial interest or other interest in the outcome of the project" is defined for the purposes of this disclosure in Question 17 of the guidance *"Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations"* (46 FR 18026-18038):

> "Financial or other interest in the outcome of the project" includes "any financial benefit such as a promise of future construction or design work on the project, as well as indirect benefits the contractor is aware of (e.g., if the project would aid proposals sponsored by the firm's other clients)."

The proposed action analyzed in this EIS entails the development of a plan for expanding the Strategic Petroleum Reserve from its current 727 million barrel capacity to a 1 billion barrel capacity pursuant to Congressional directive in the Energy Policy Act of 2005 (P.L. 109-58). Storage capacity would be developed by expanding two or three of the existing Strategic Petroleum Reserve sites and creating one new site or a combination of two new sites. In accordance with these requirements, ICF Consulting hereby certifies that it has no financial or other interest in the outcome of the project.

Certified by:

Signature

Robert Lyke
Name

COI Manager
Title

8 March 2006
Date

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Contractor Disclosure Statement

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Certified by:

Robert E. Randall
Signature

Robert E. Randall
Name

Consultant
Title

March 2, 2006
Date

Contractor Disclosure Statement

CEQ regulations at 40 CFR 1506.5(c), which have been adopted by DOE (10 CFR 1021), require contractors who will prepare an EIS to execute a disclosure specifying that they have no financial or other interest in the outcome of the project. The term "financial interest or other interest in the outcome of the project" is defined for the purposes of this disclosure in Question 17 of the guidance *"Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations"* (46 FR 18026-18038):

> "Financial or other interest in the outcome of the project" includes "any financial benefit such as a promise of future construction or design work on the project, as well as indirect benefits the contractor is aware of (e.g., if the project would aid proposals sponsored by the firm's other clients)."

The proposed action analyzed in this EIS entails the development of a plan for expanding the Strategic Petroleum Reserve from its current 727 million barrel capacity to a 1 billion barrel capacity pursuant to Congressional directive in the Energy Policy Act of 2005 (P.L. 109-58). Storage capacity would be developed by expanding two or three of the existing Strategic Petroleum Reserve sites and creating one new site or a combination of two new sites. In accordance with these requirements, EEE Consulting, Inc. hereby certifies that it has no financial or other interest in the outcome of the project.

Certified by:

Ian Frost

Signature

Ian Frost

Name

President

Title

2/2/06

Date

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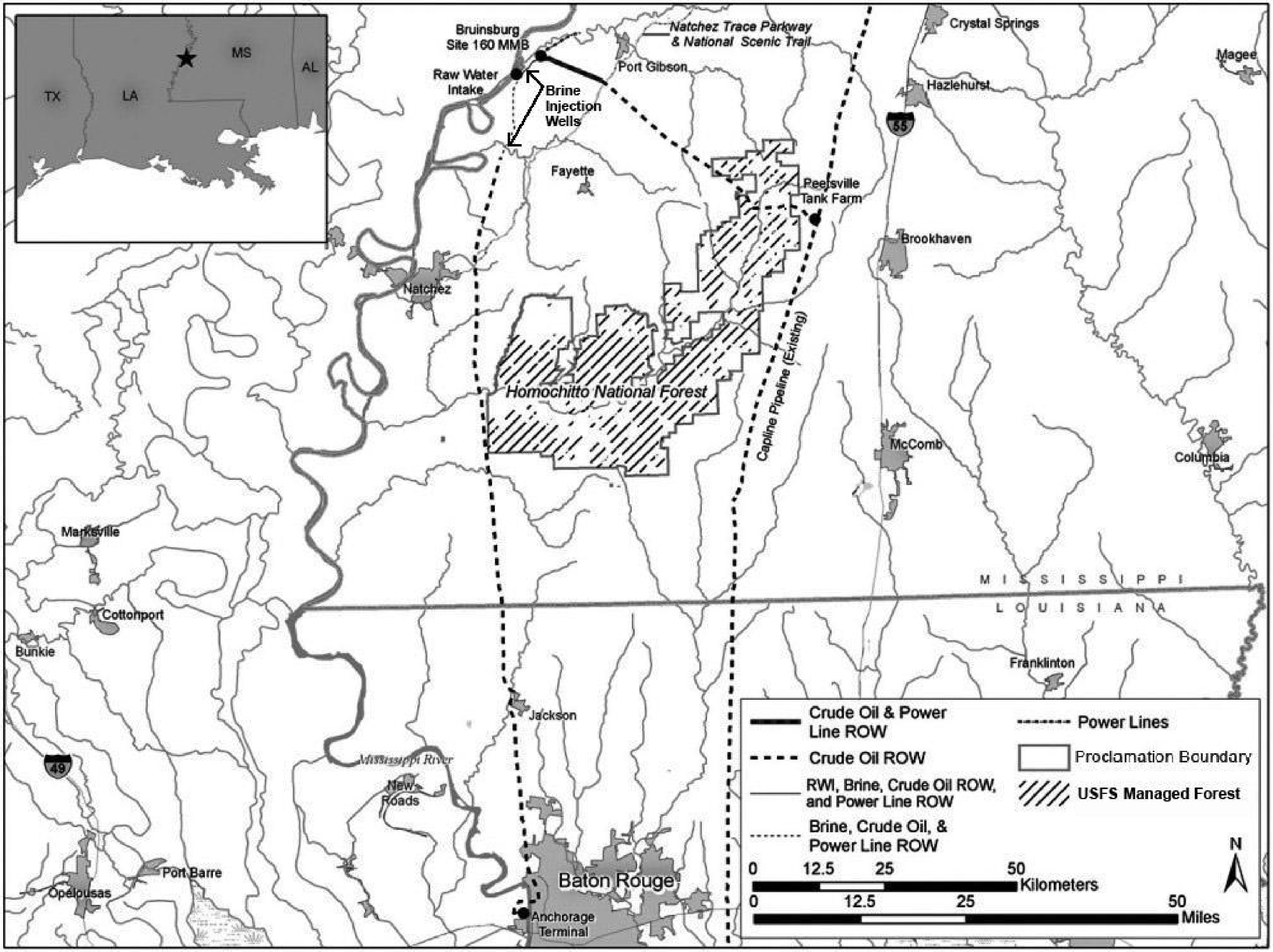
Figure B.6.1-1: Proposed Bruinsburg Storage Site and Associated Facilities



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Note: A 15-mile (24-kilometer) brine disposal pipeline with brine injection wells spaced 1,000 feet (305 meters) apart would be located along the crude oil pipeline to Baton Rouge, LA.

Figure B.6.1-2: Floodplain Map for Proposed Bruinsburg 160 MMB Storage Site

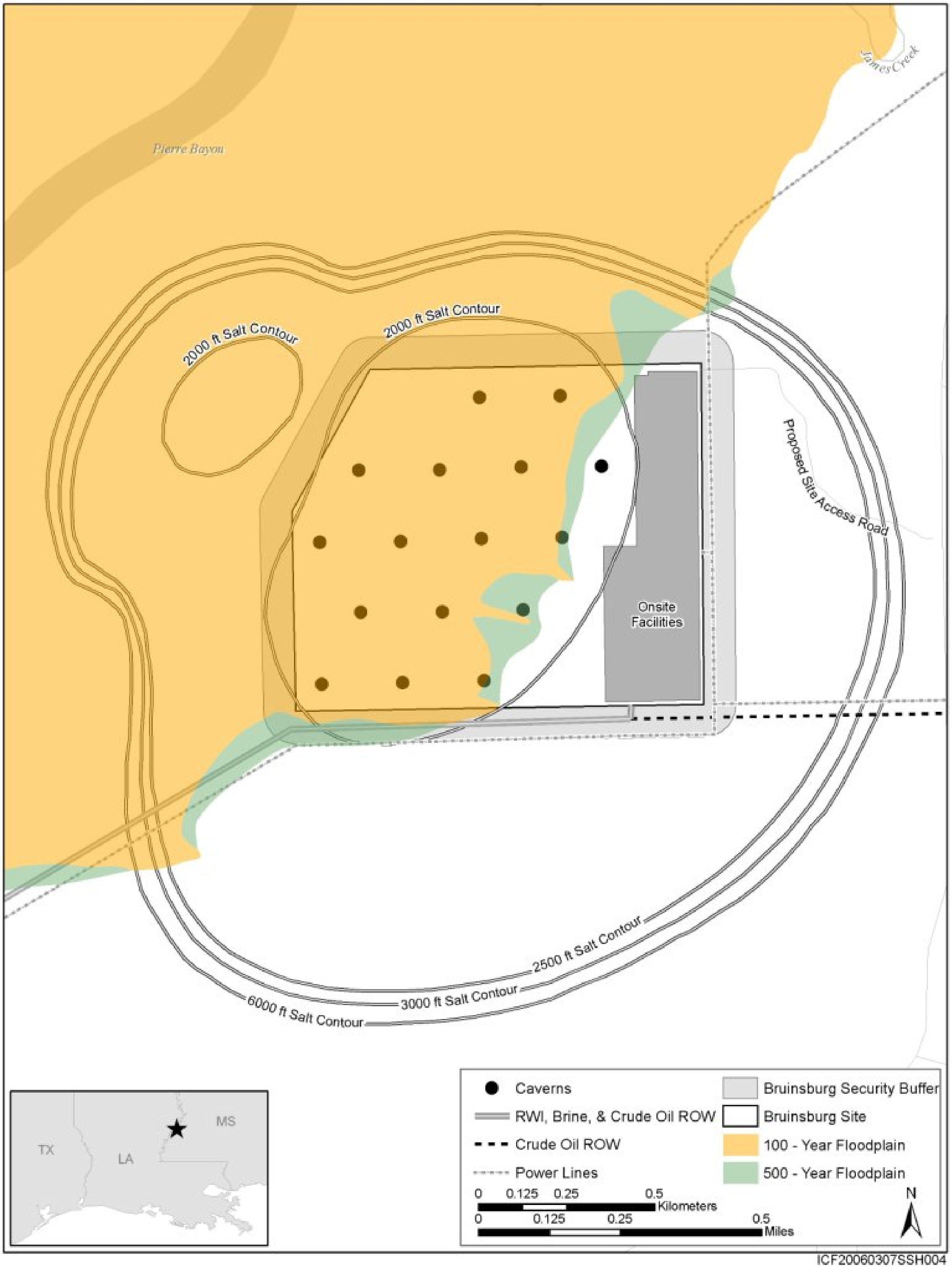

Figure B.6.1-3: Floodplain Map for Anchorage Terminal

Figure B.6.1-4: Floodplain Map for Peetsville Terminal

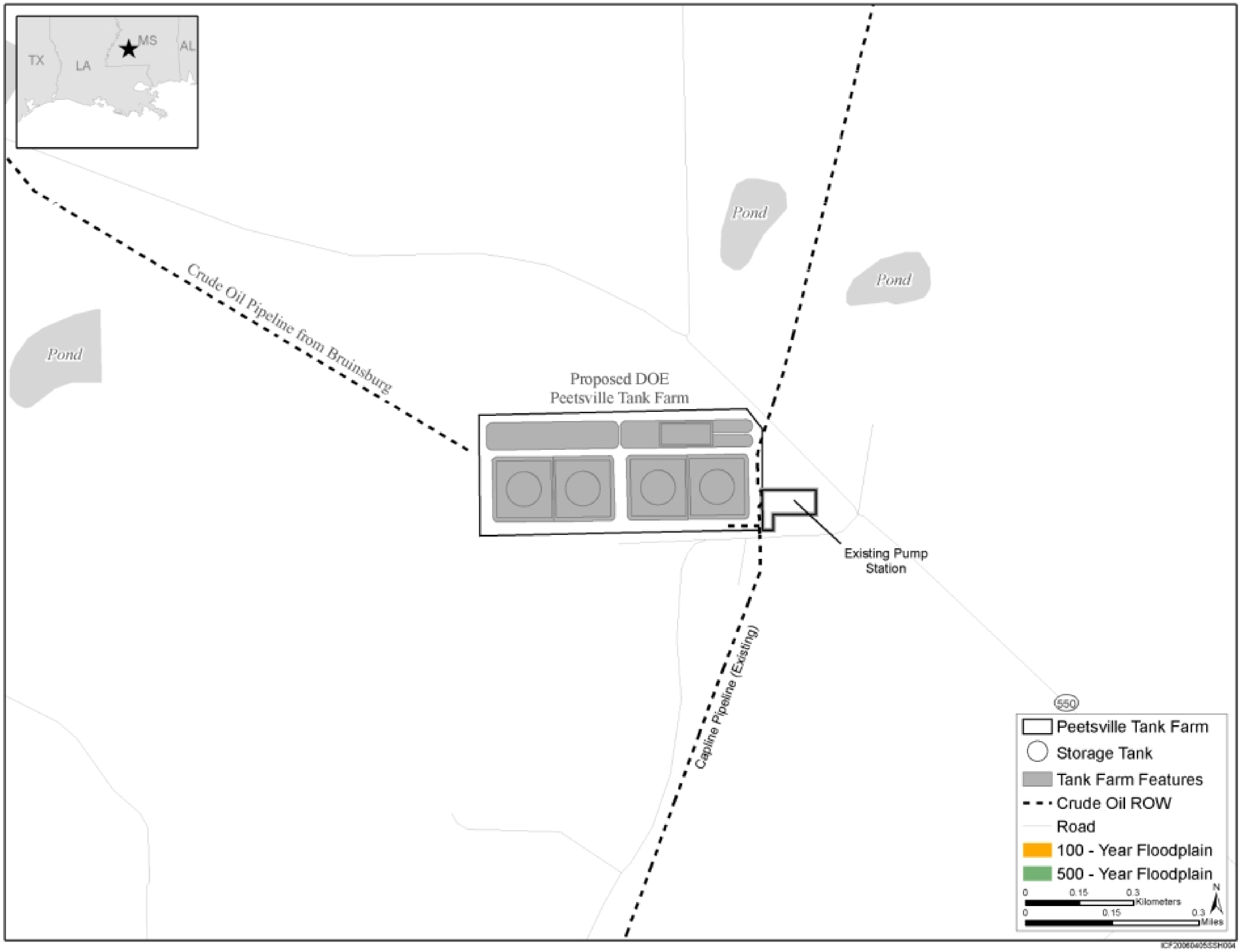

Figure B.6.1-5: NWI Wetlands at the Proposed Bruinsburg 160 MMB Storage Site

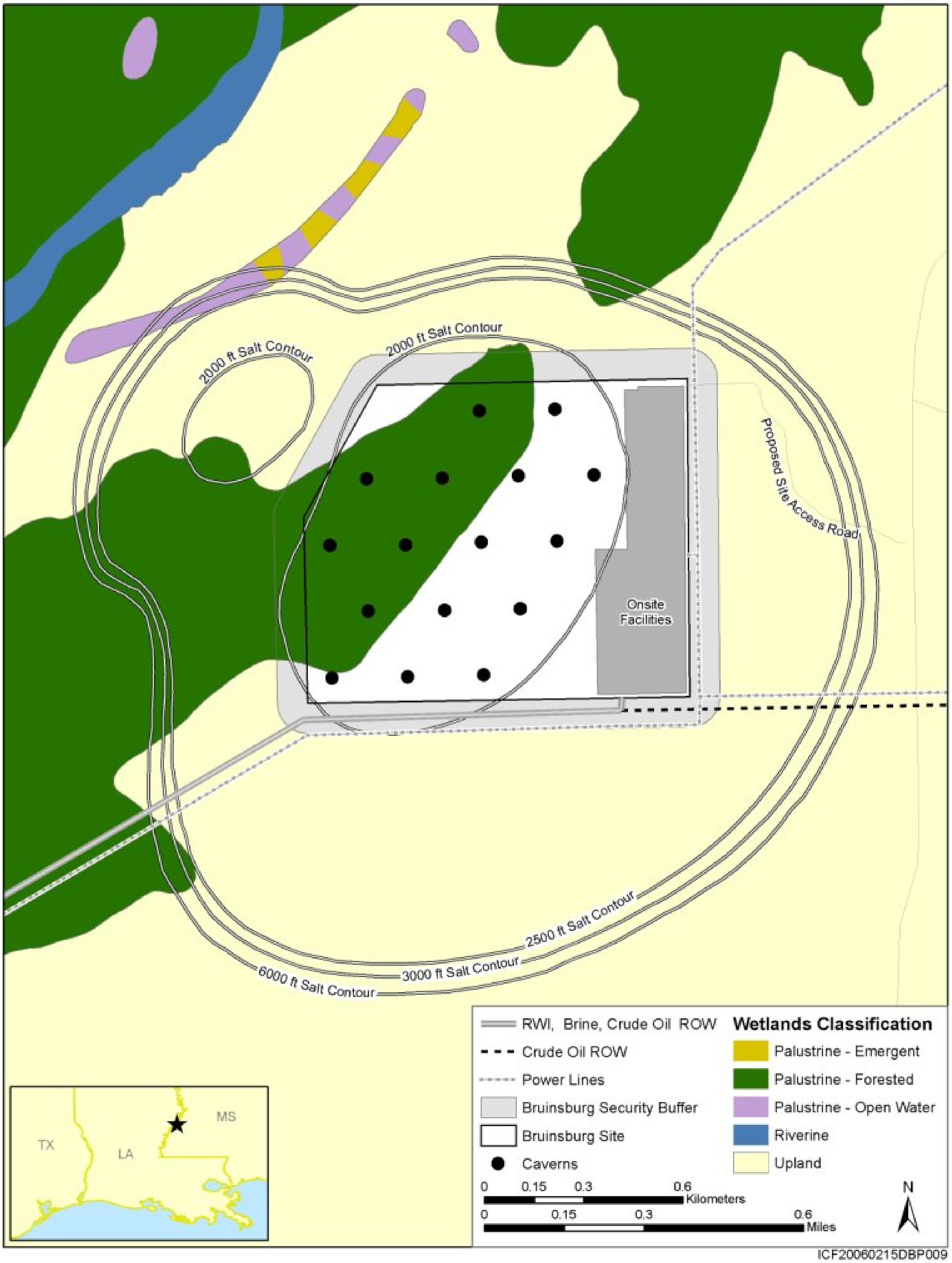

Figure B.6.1-6: NWI Wetlands at the Proposed Peetsville Terminal

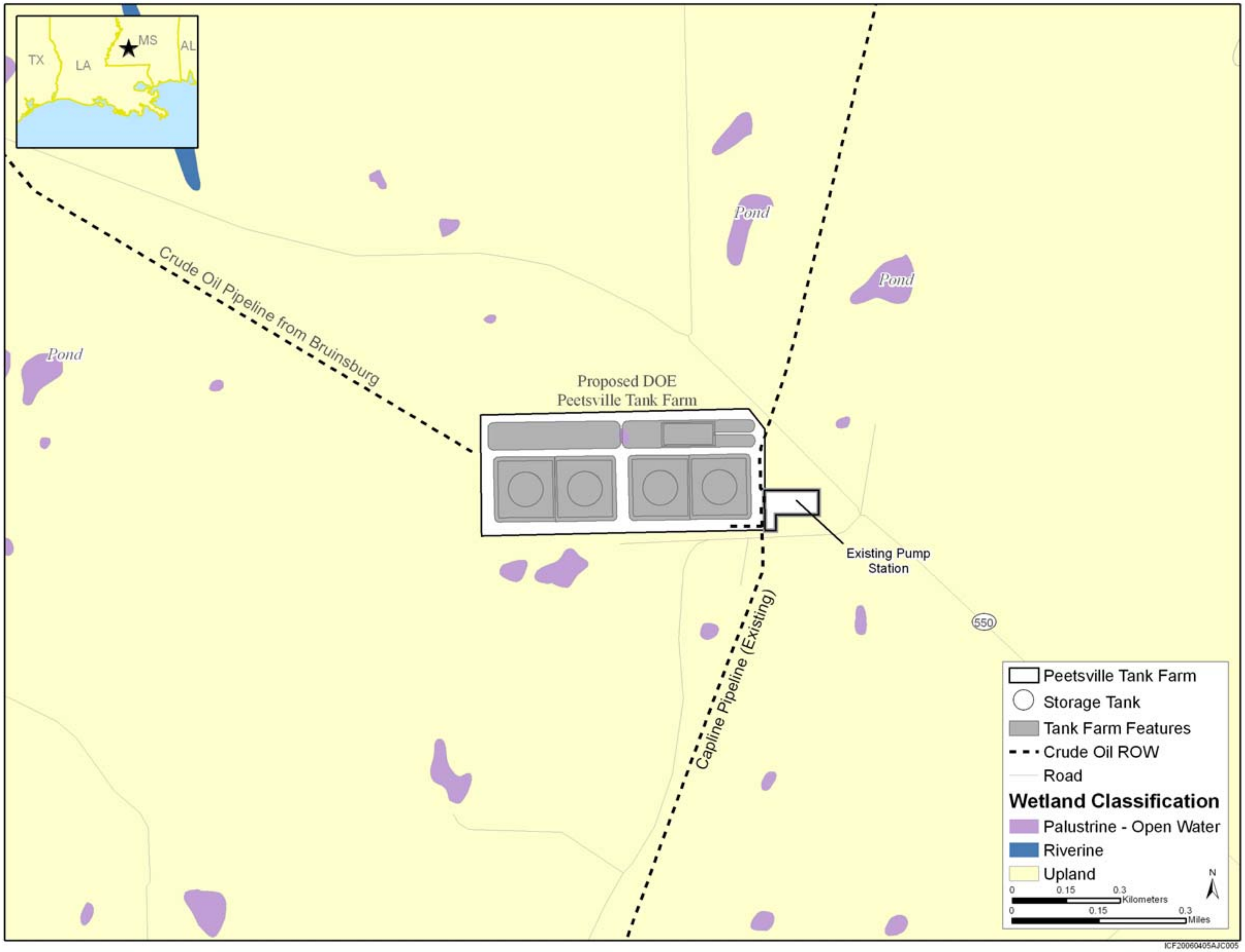

Figure B.6.1-7: NWI Wetlands at the Proposed Anchorage Tank Farm

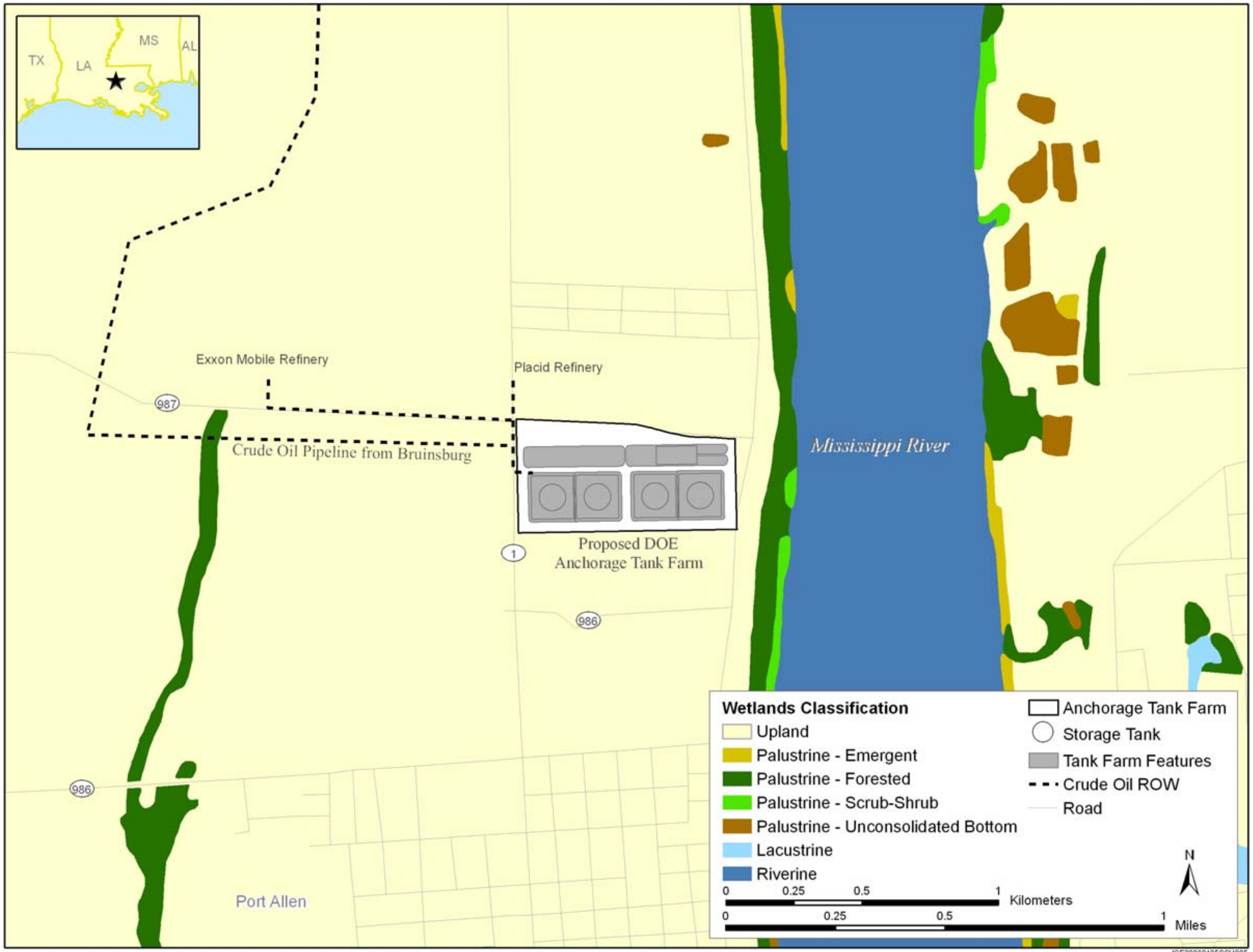

Figure B.6.2-1: Proposed Chacahoula Storage Site and Associated Facilities

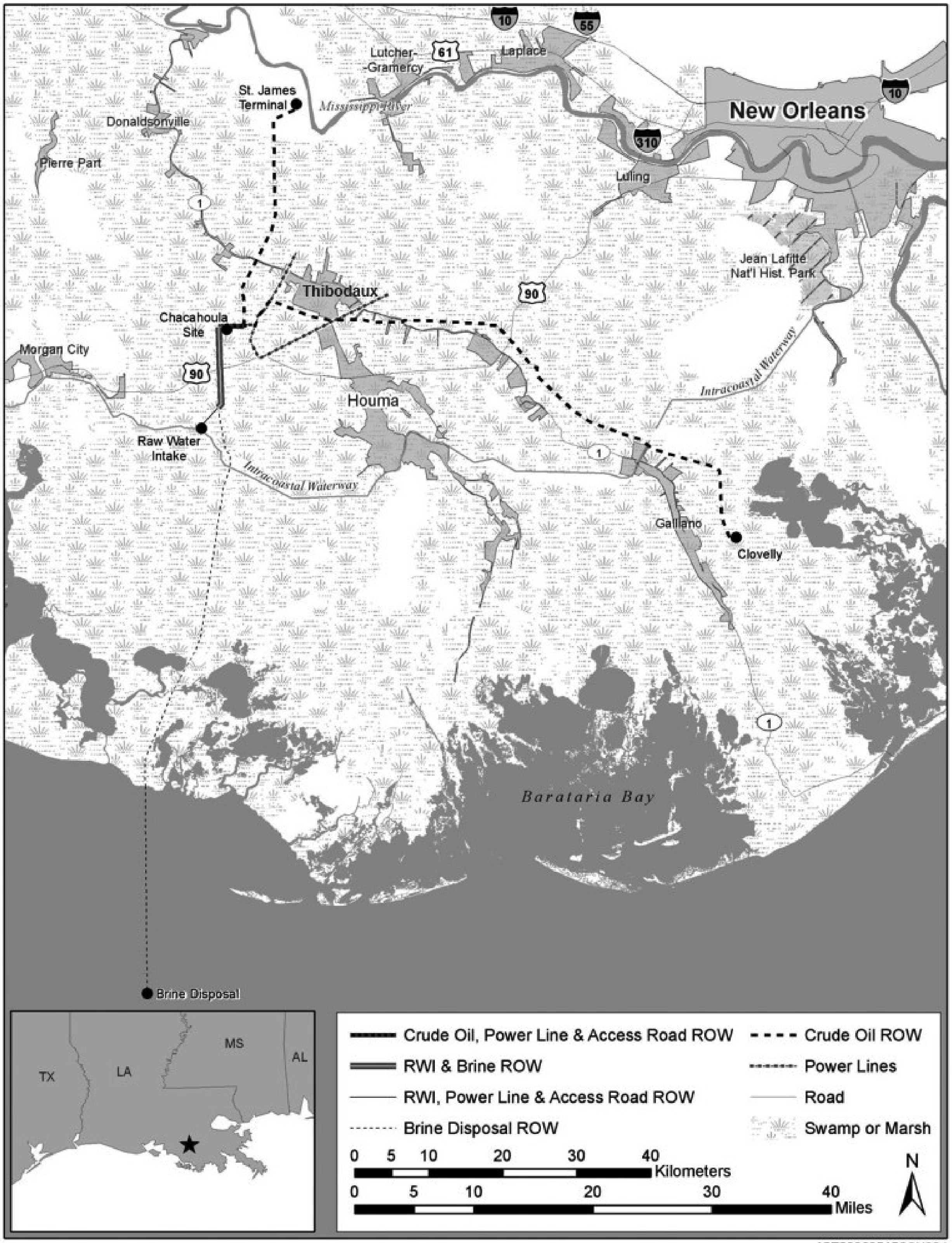

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Figure B.6.2-2: Floodplain Map for Proposed Chacahoula Site and Proposed Facilities

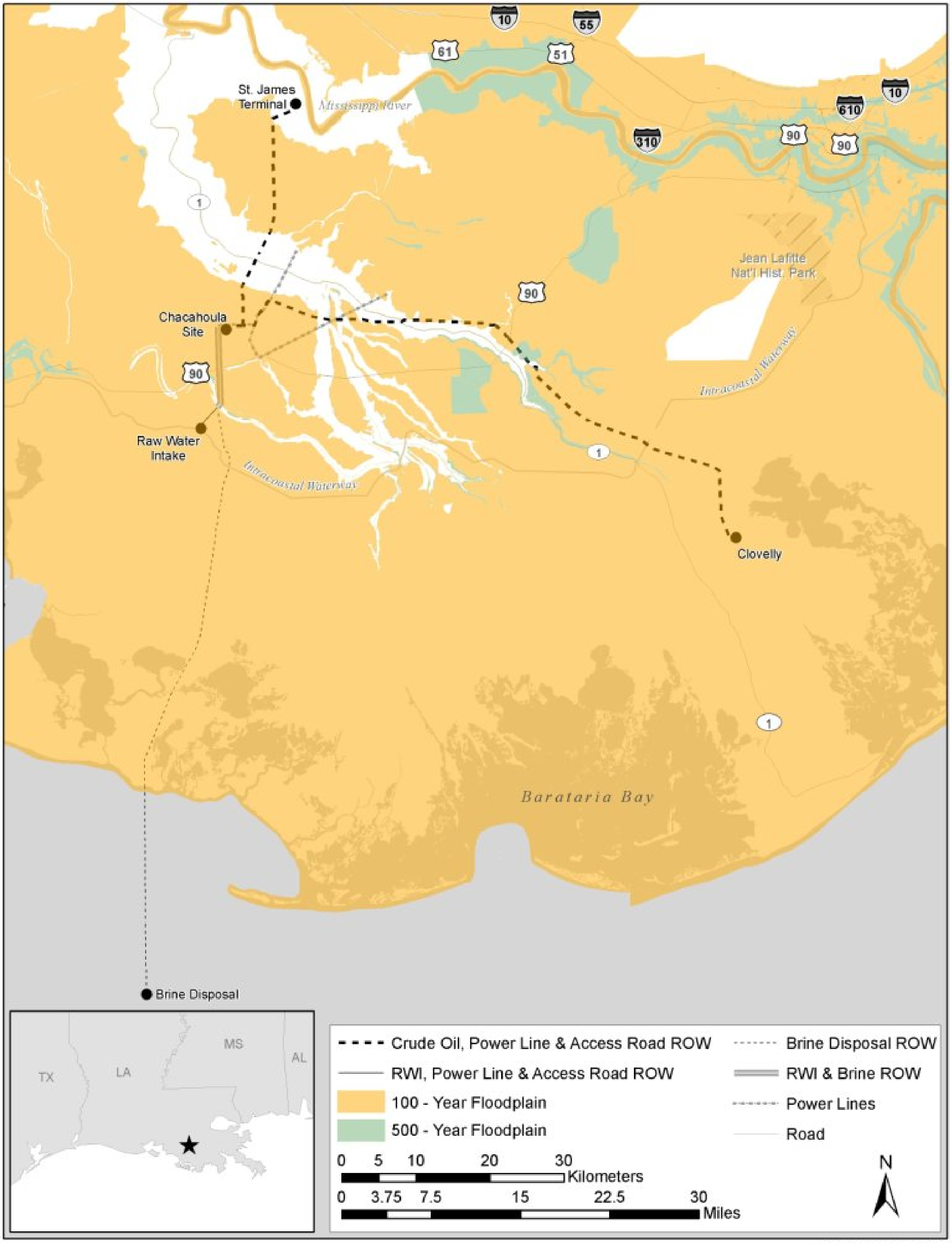

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Figure B.6.2-3: Floodplain Map for Proposed Chacahoula Storage Site

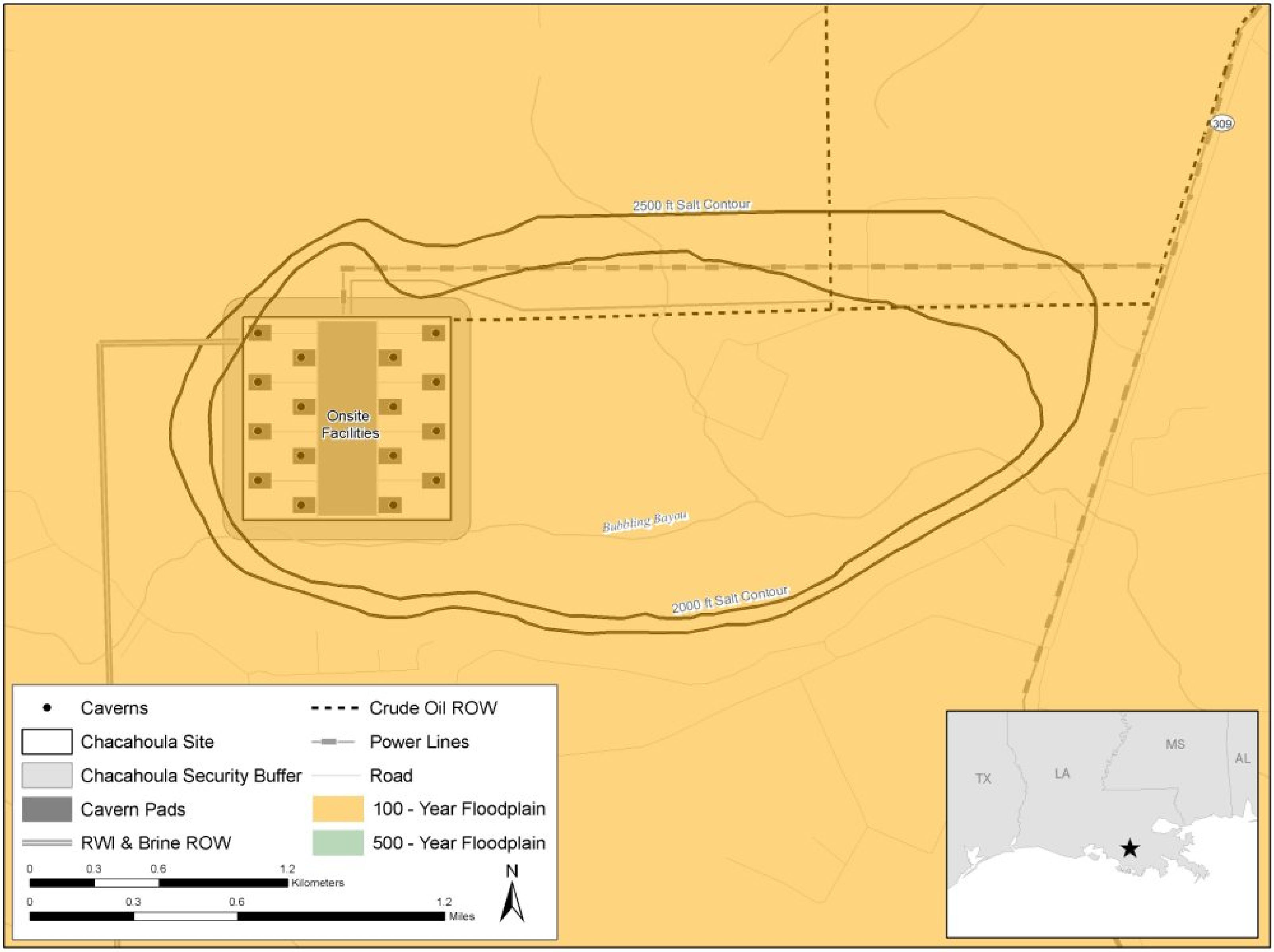

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Figure B.6.2-4: NWI Wetlands at the Proposed Chacahoula Storage Site

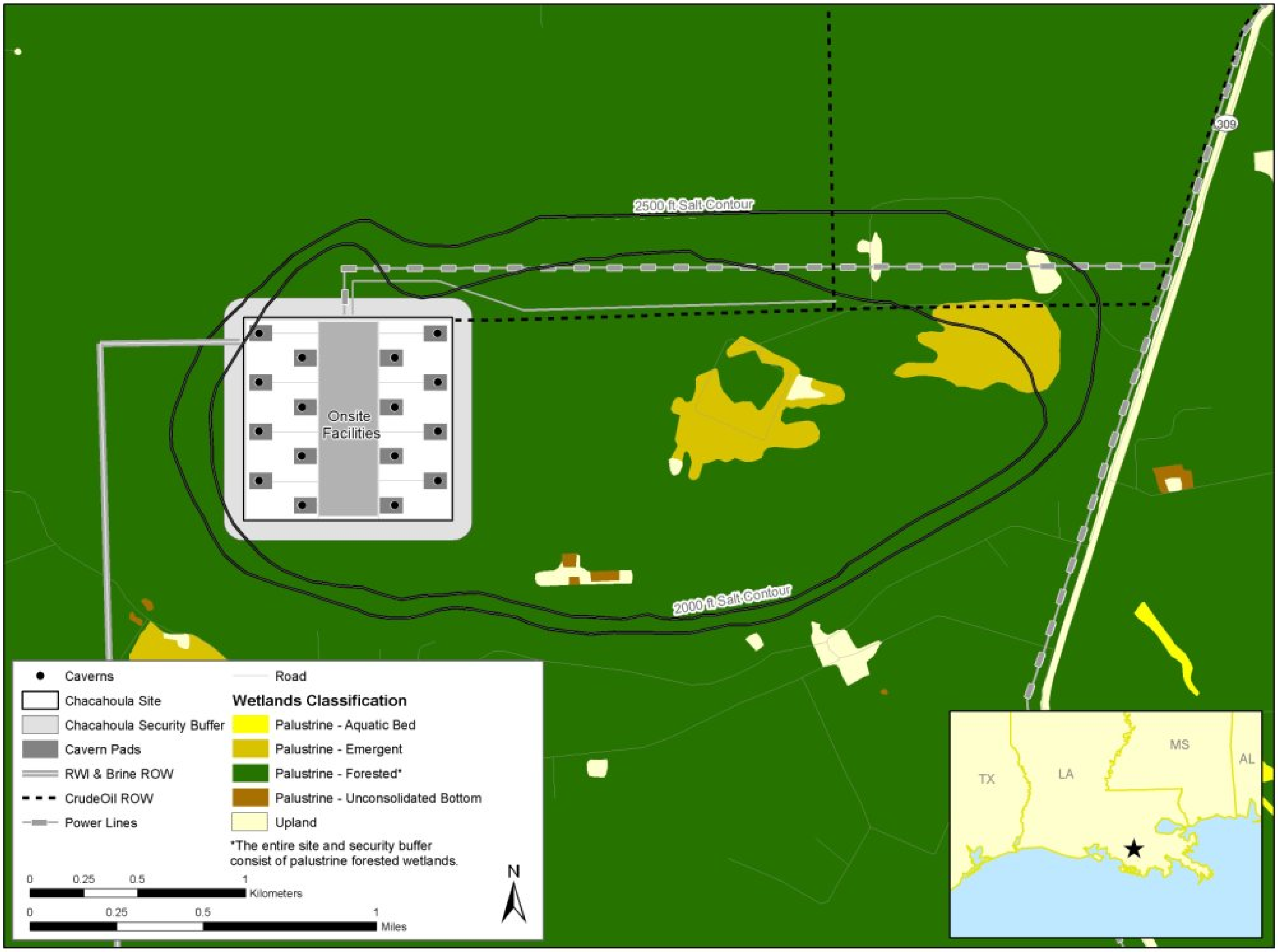

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Figure B.6.3-1: Proposed Clovelly Storage Site and Associated Facilities

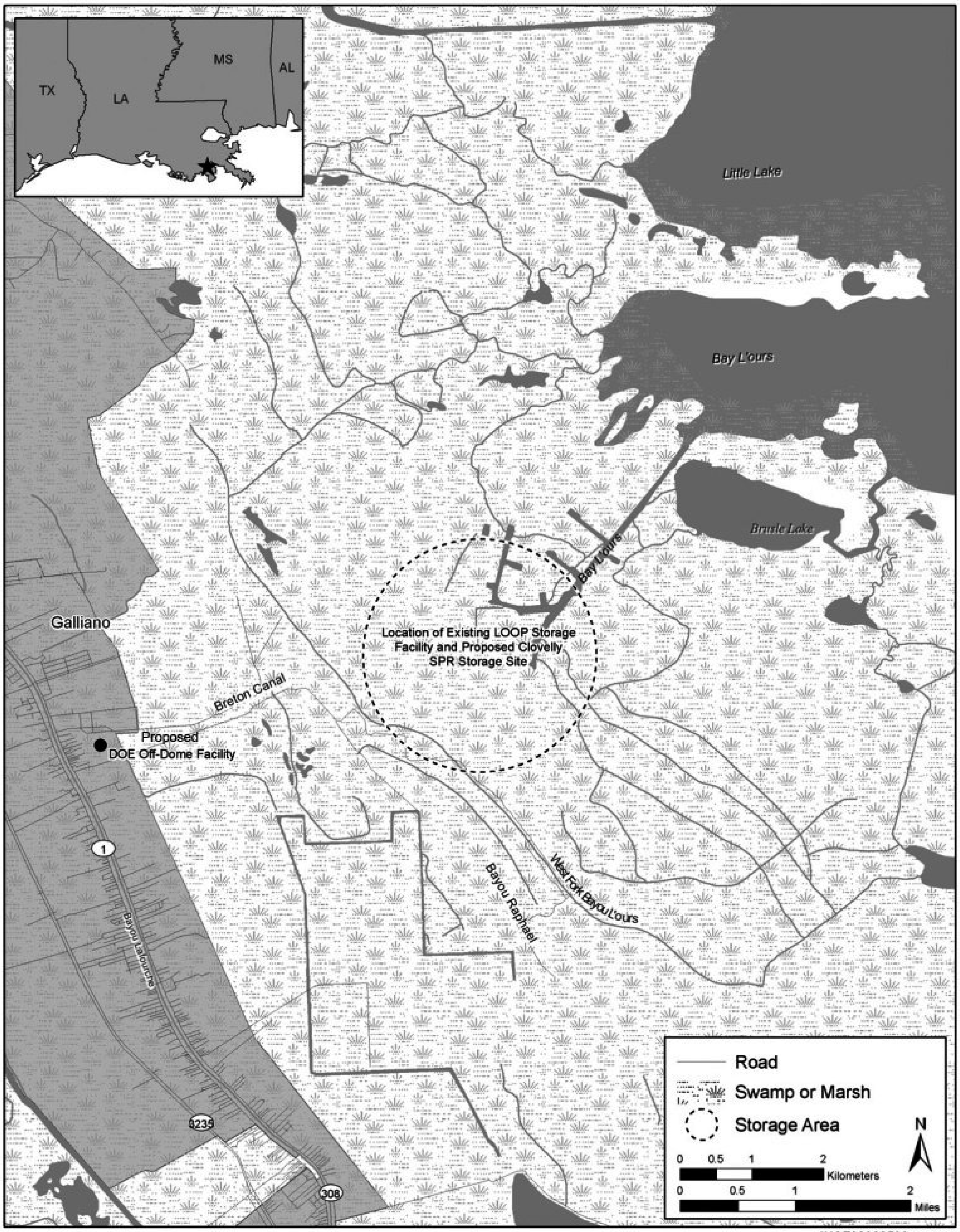

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Figure B.6.3-2: Floodplain Map for Proposed Clovelly Storage Site and Associated Facilities

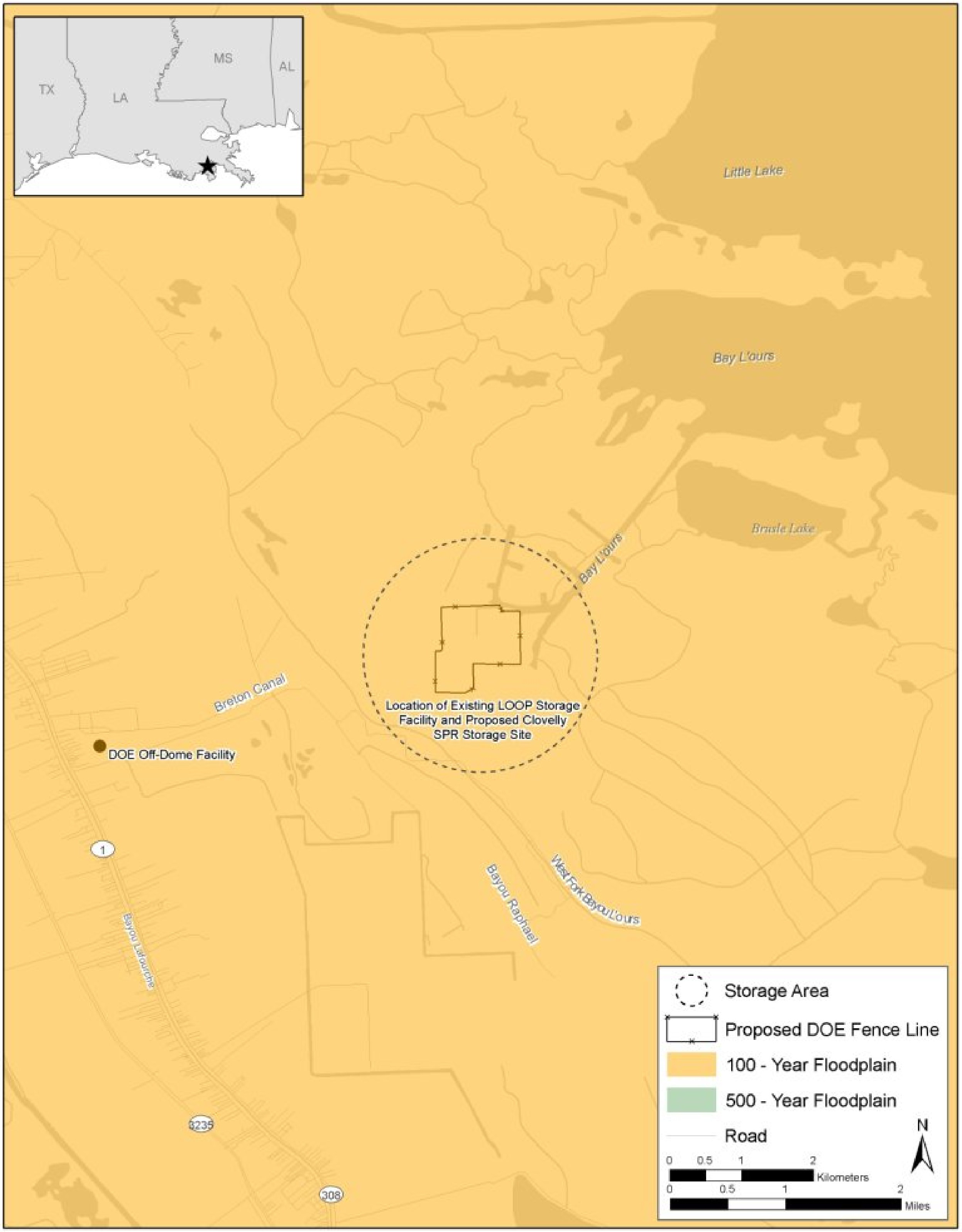

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Figure B.6.3-3: NWI Wetlands Map for Proposed Clovelly Storage Site

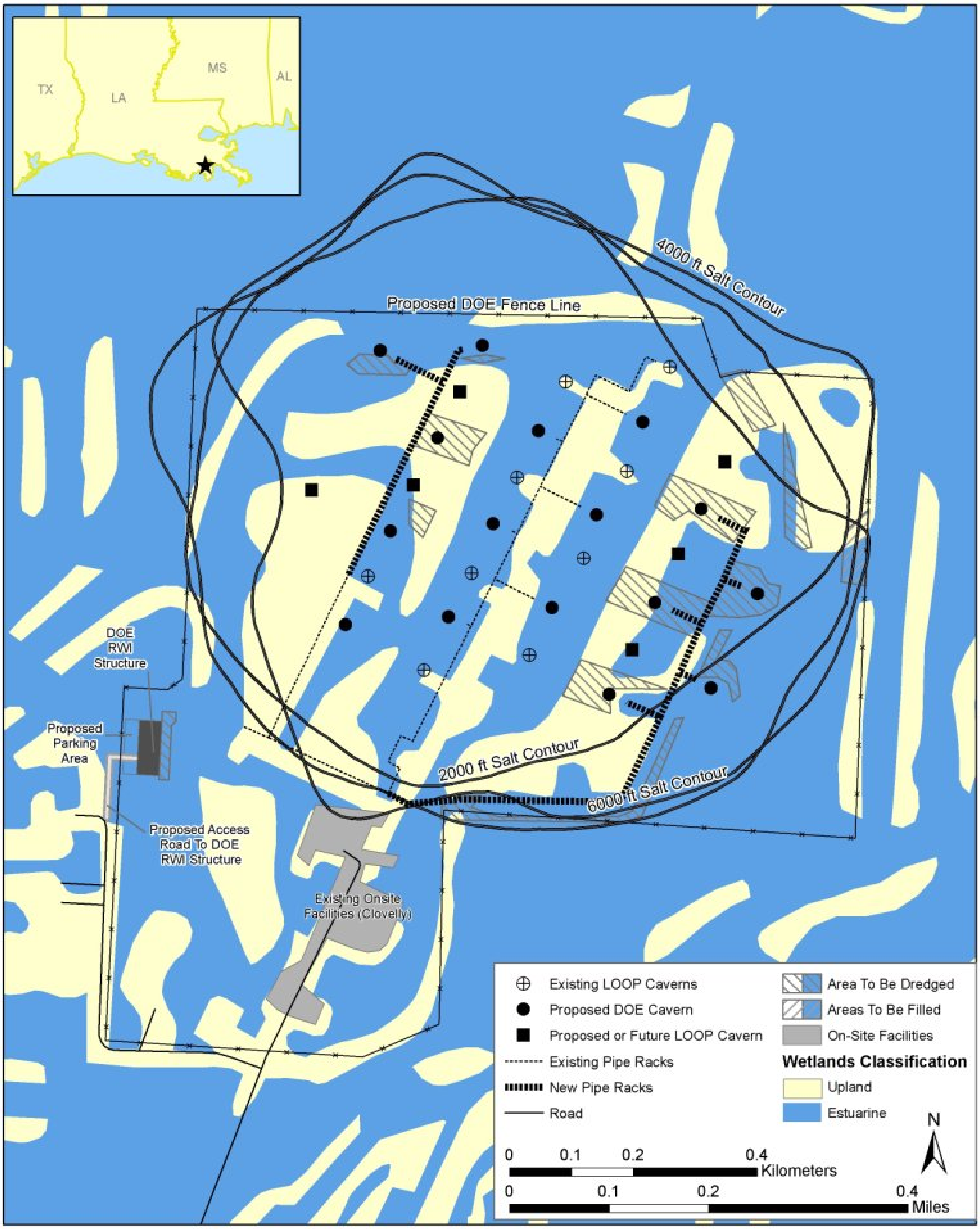

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Figure B.6.3-4: NWI Wetlands Map for the Proposed Off-Dome Administrative Facilities

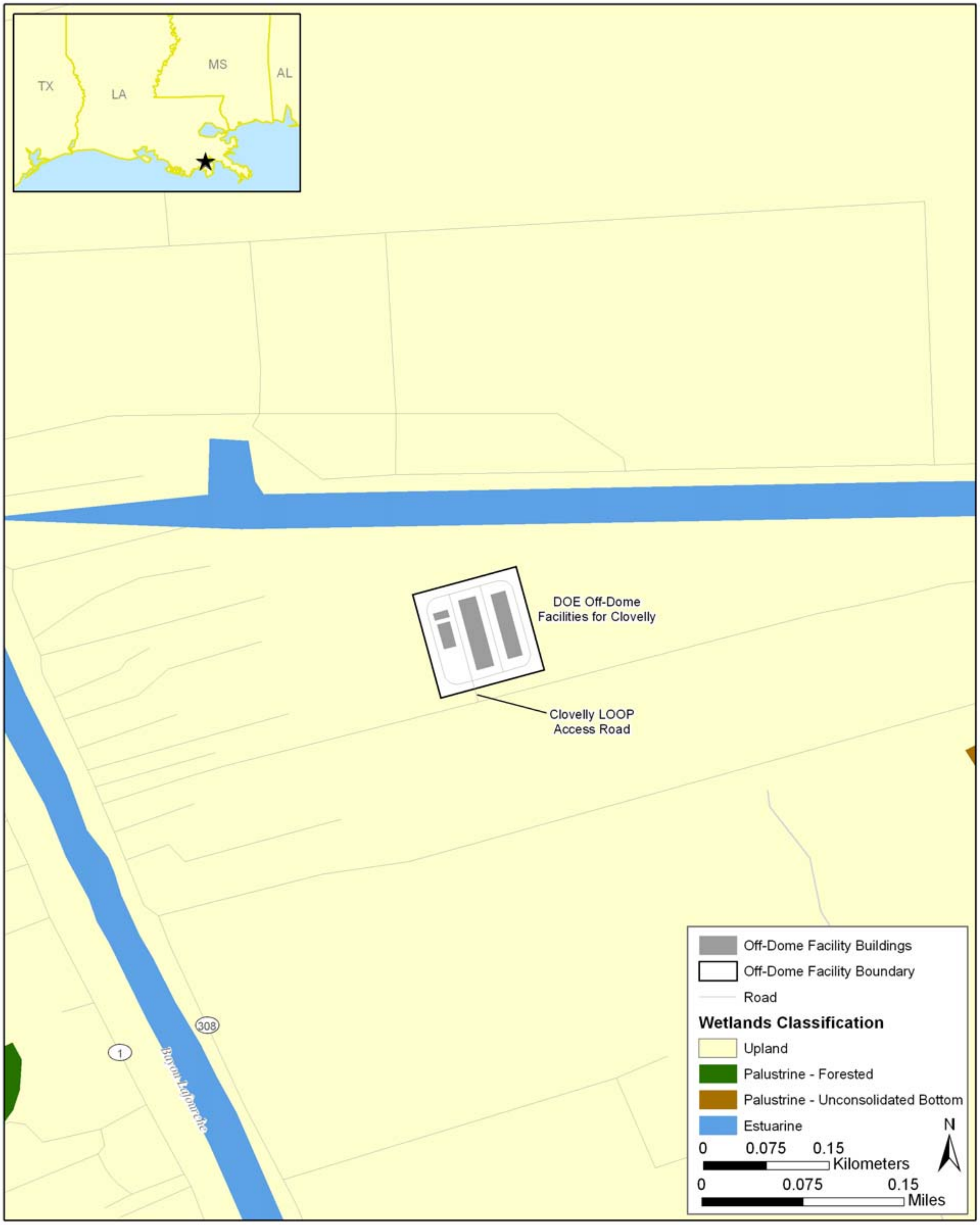

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Figure B.6.4-1: Proposed Bruinsburg 80 MMB Storage Site and Associated Facilities

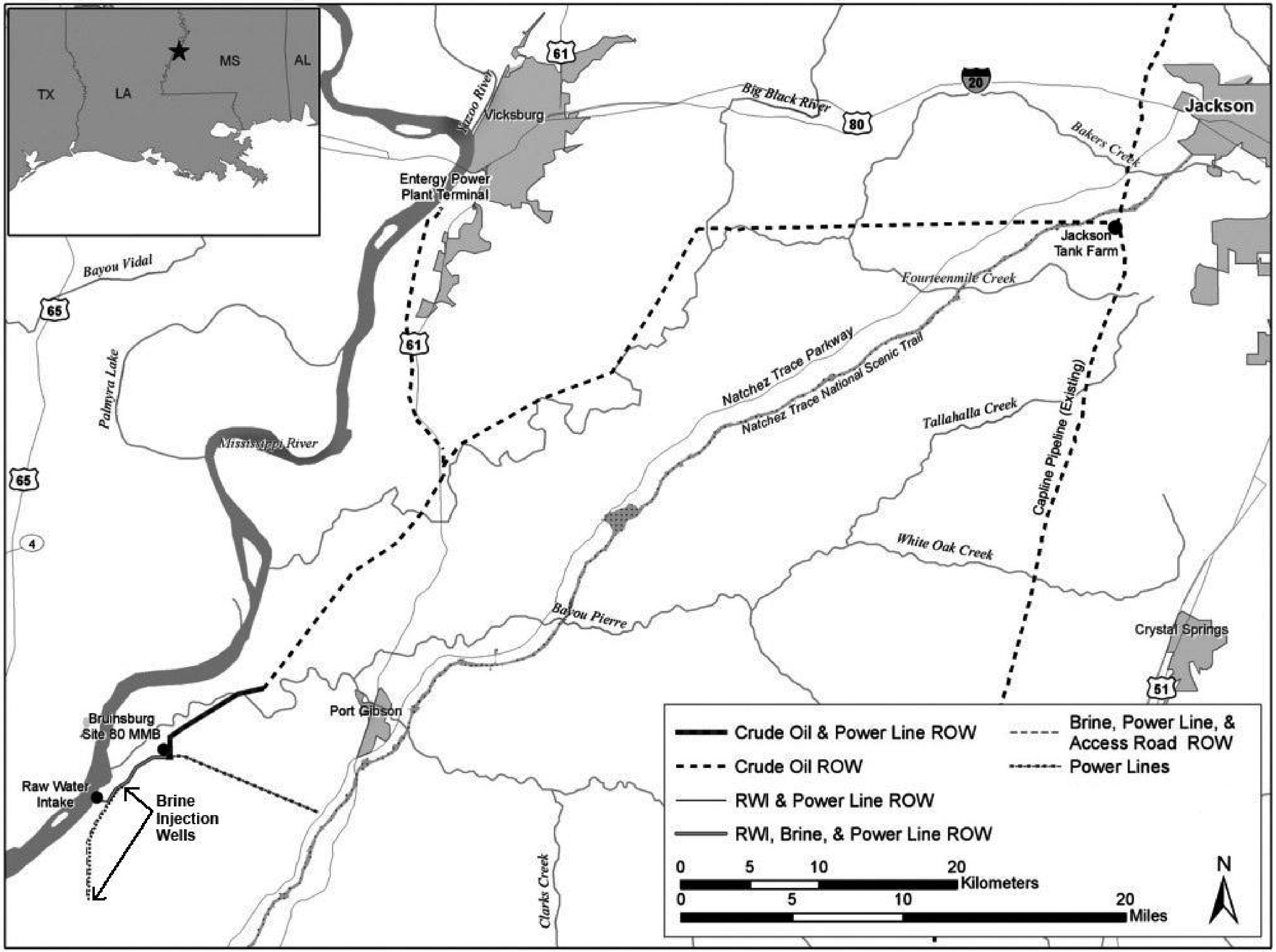

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Figure B.6.4-2: Floodplain Map for the Proposed Bruinsburg 80 MMB Storage Site

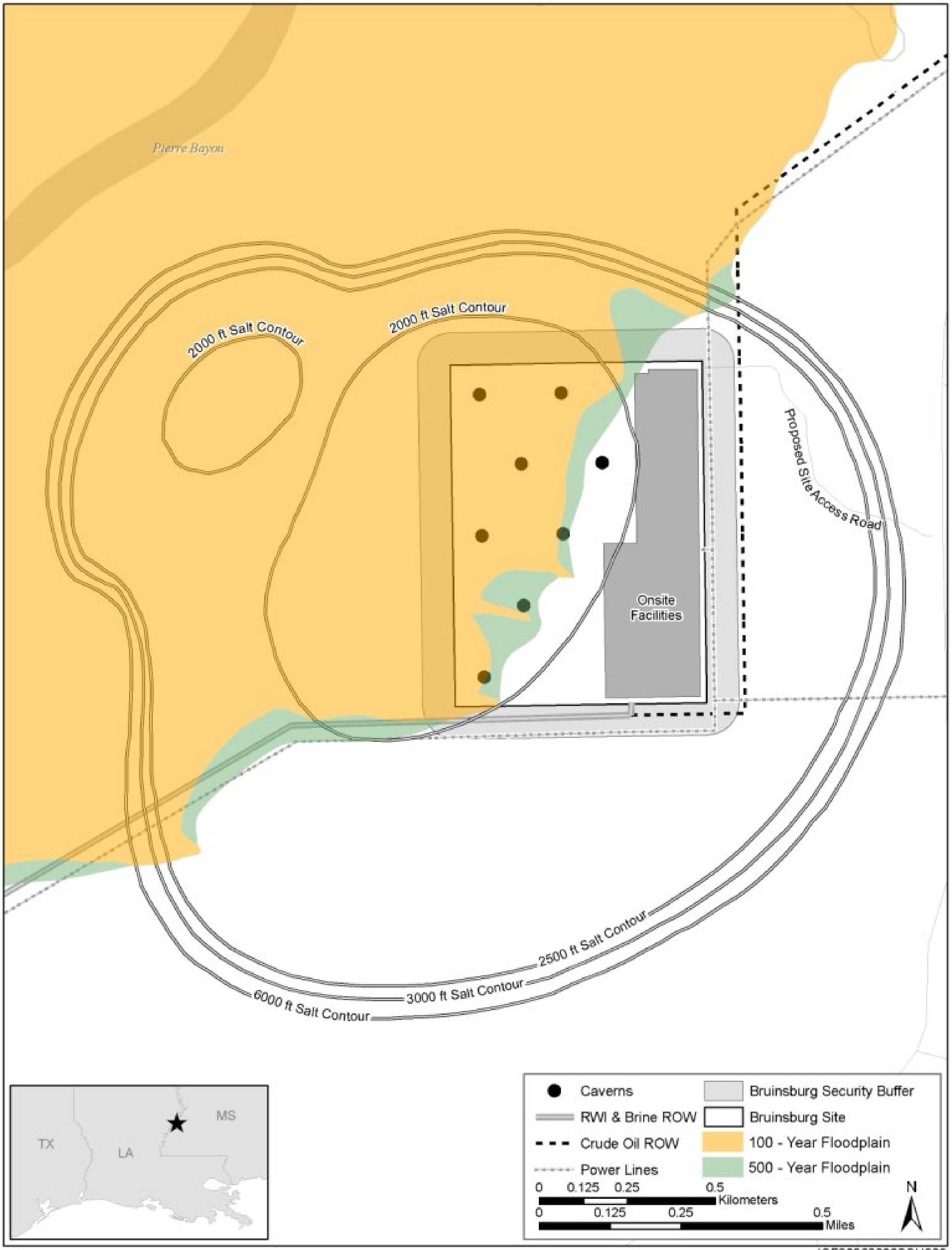

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Figure B.6.4-3: Floodplain Map for the Proposed Jackson Tank Farm

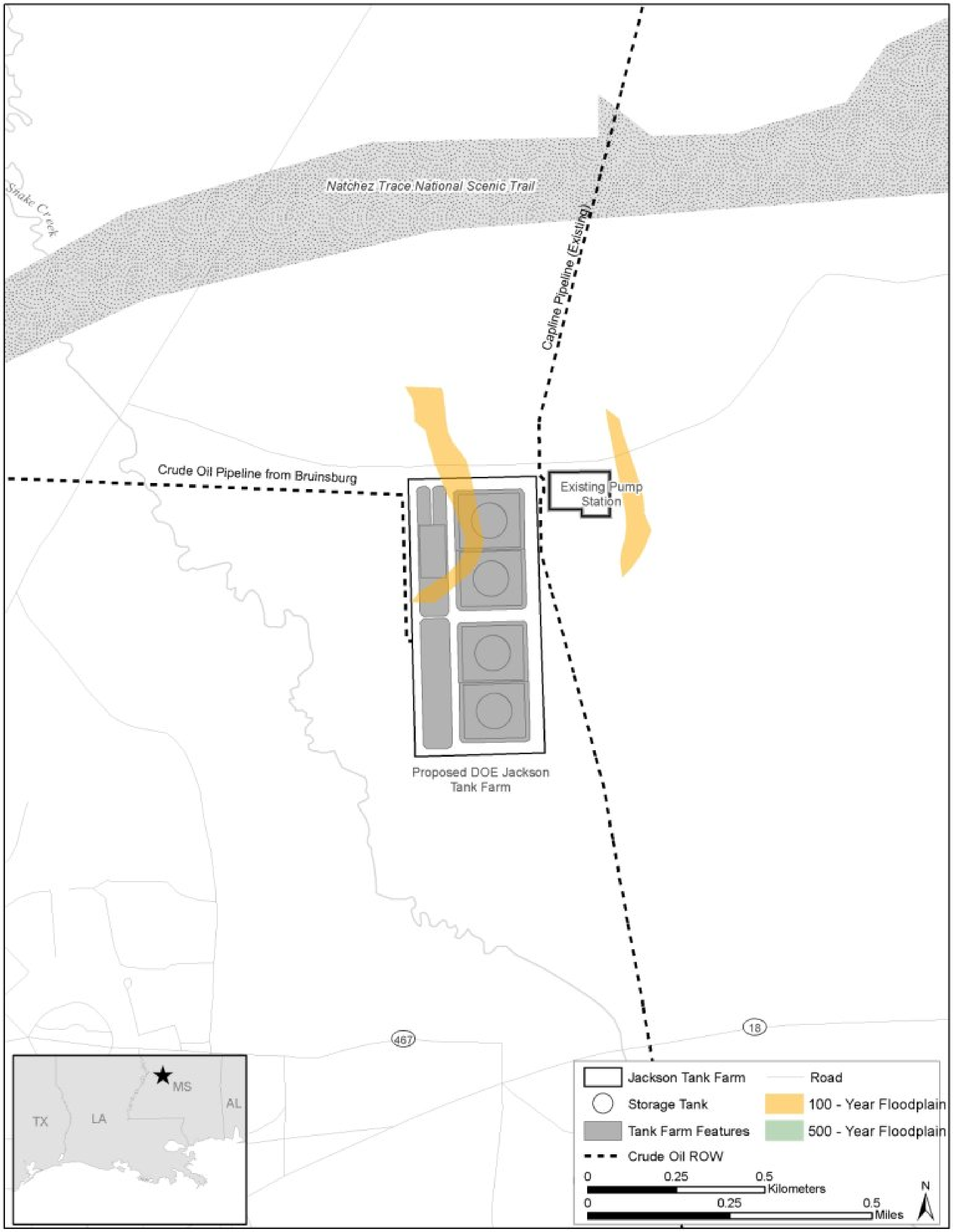

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Figure B.6.4-4: NWI Wetlands at the Proposed Bruinsburg 80 MMB Storage Site

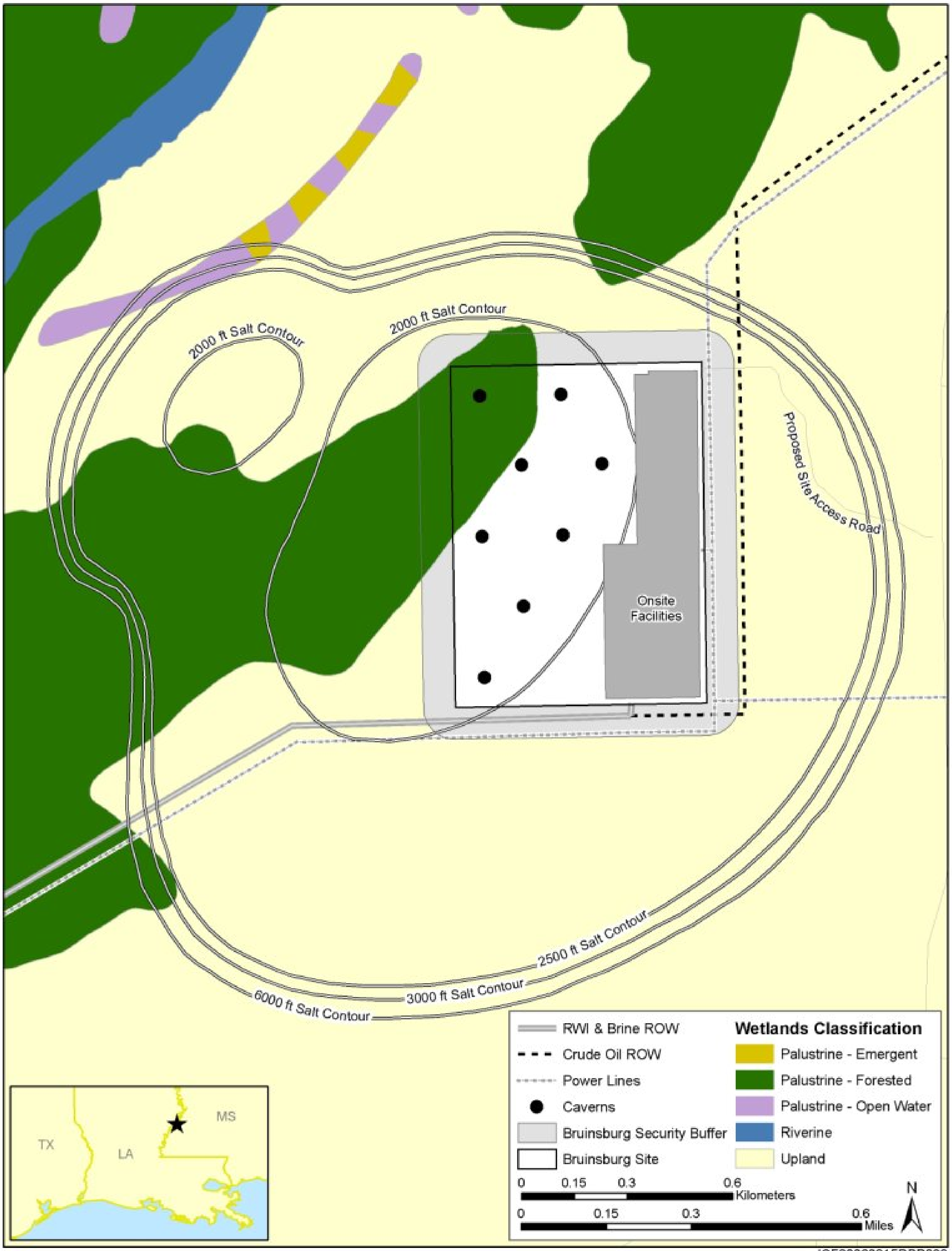

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Figure B.6.4-5: NWI Wetlands at the Proposed Jackson Tank Farm

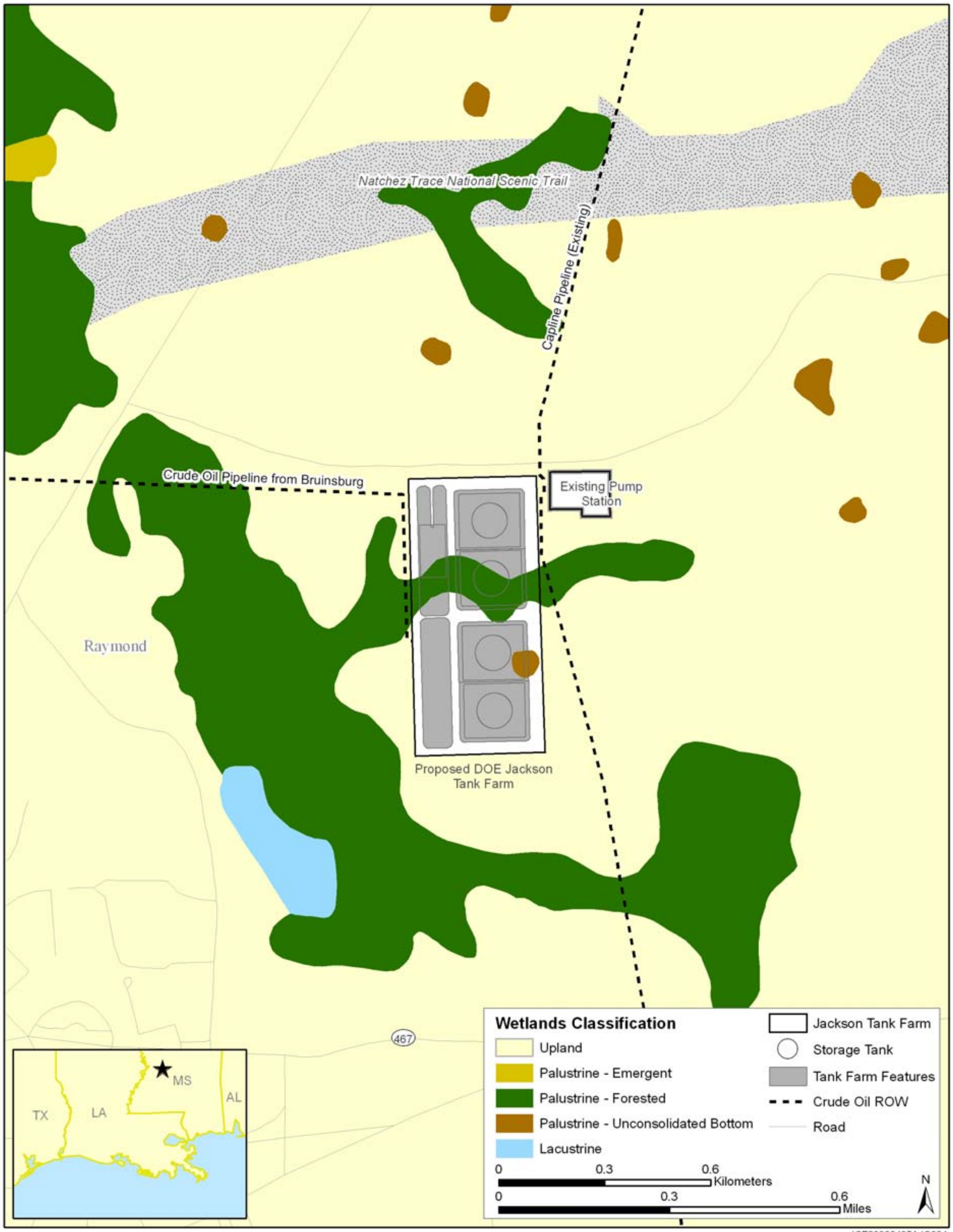

Figure B.6.4-6: NWI Wetlands at the Proposed Clovelly 80 MMB Storage Site

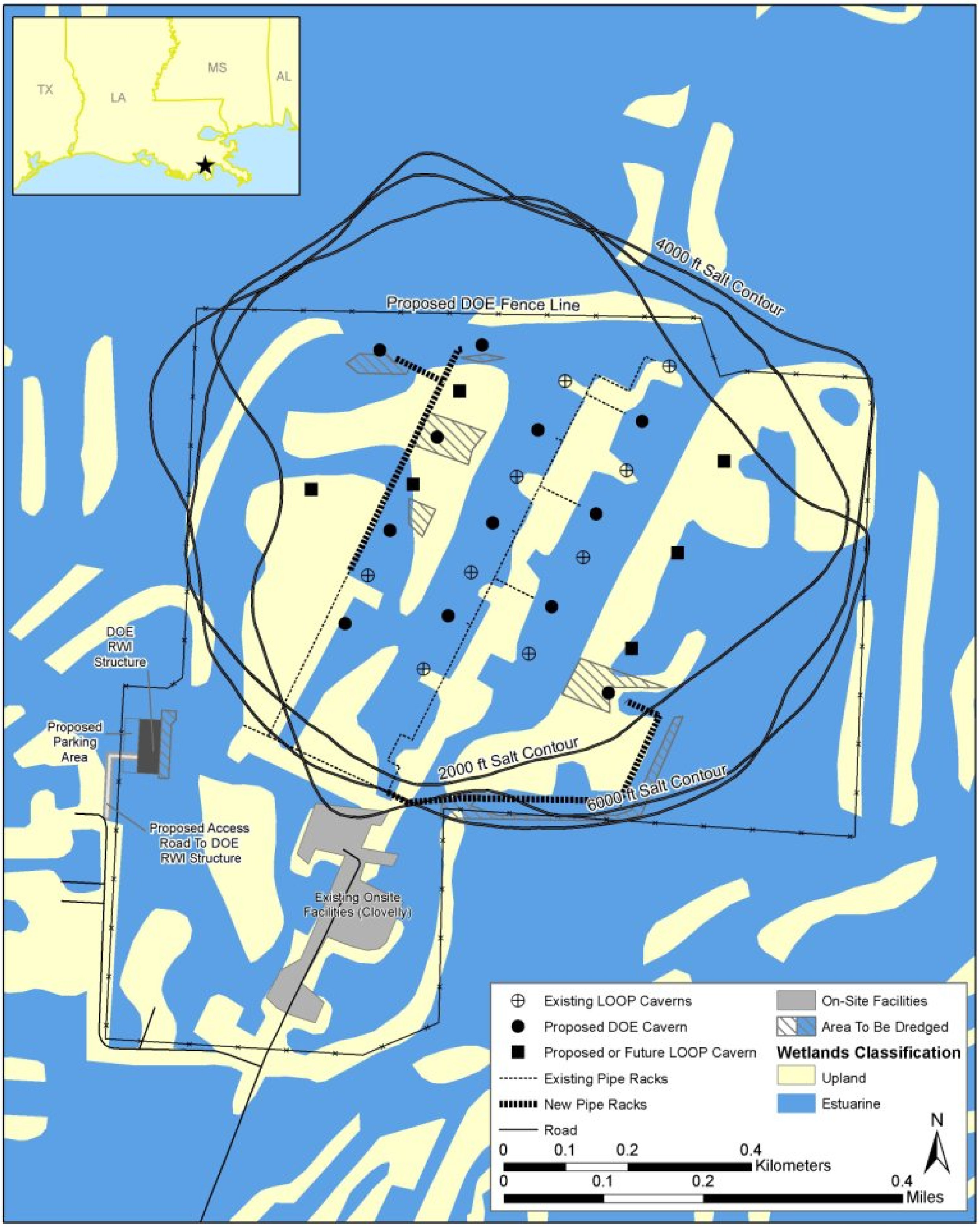

Figure B.6.5-1: Proposed Richton Storage Site and Associated Facilities

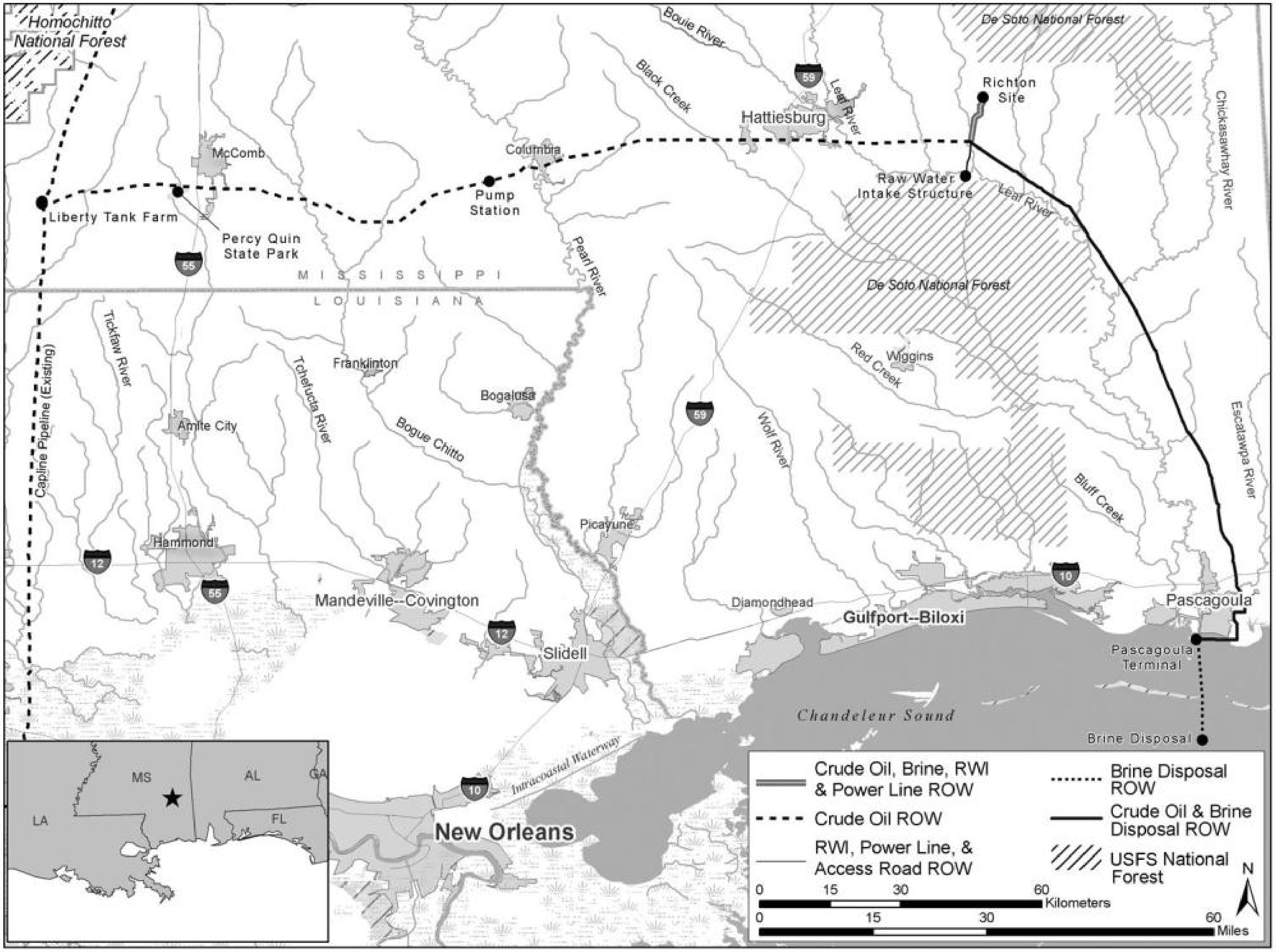

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Figure B.6.5-2: Floodplain Map for the Proposed Richton Storage Site

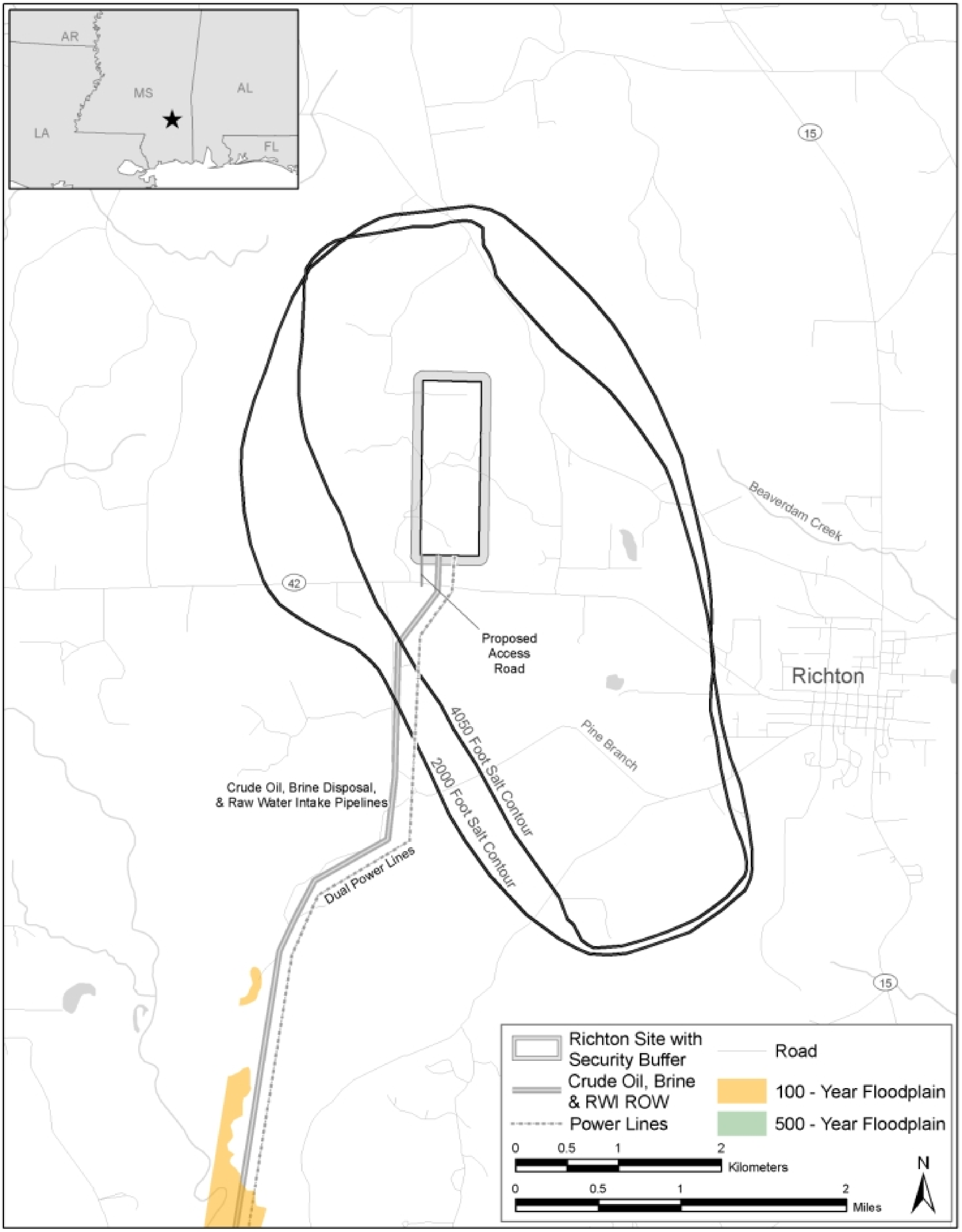

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Figure B.6.5-3: Floodplain Map of the Proposed Pascagoula Terminal

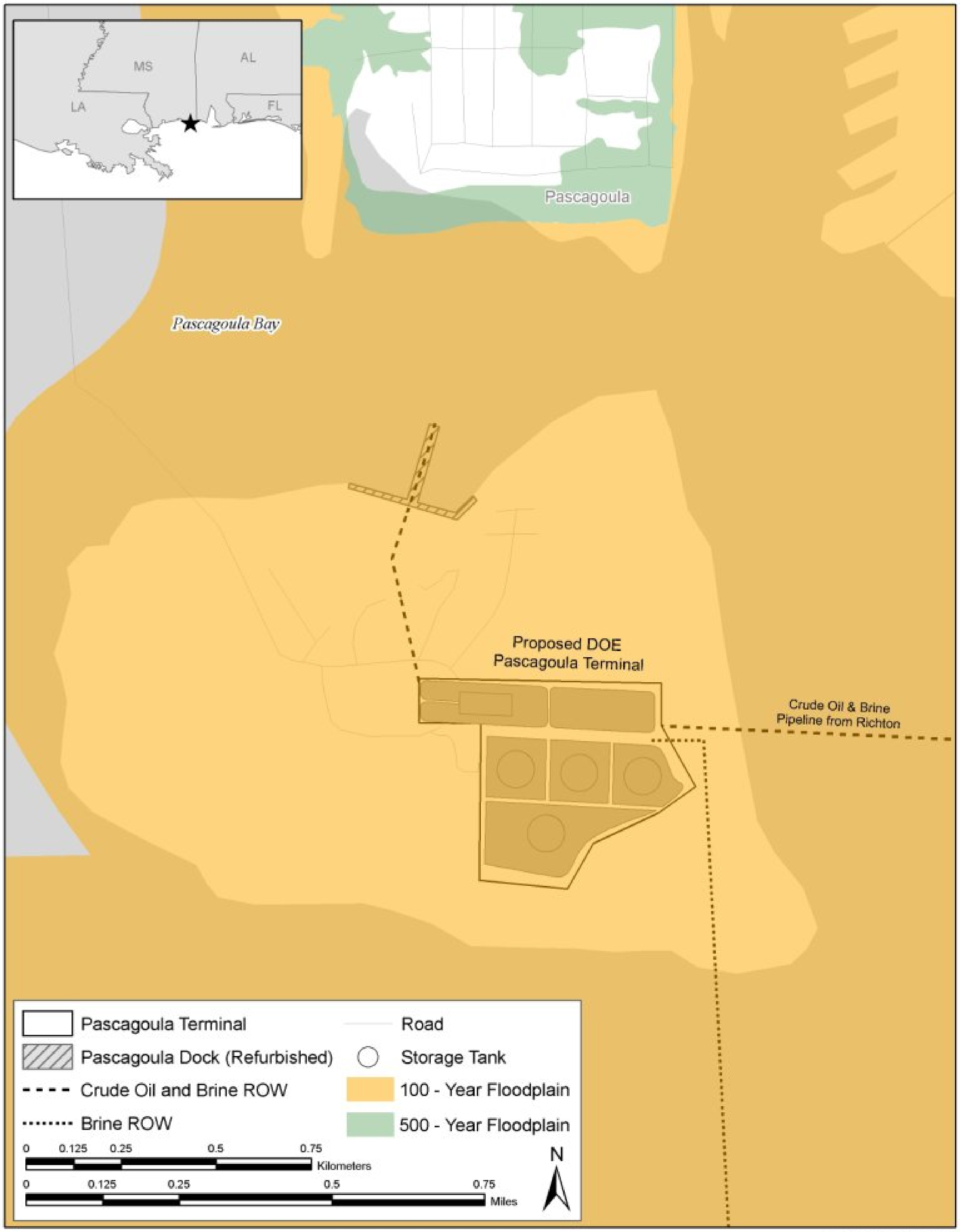

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Figure B.6.5-4: NWI Wetlands at the Proposed Richton Storage Site

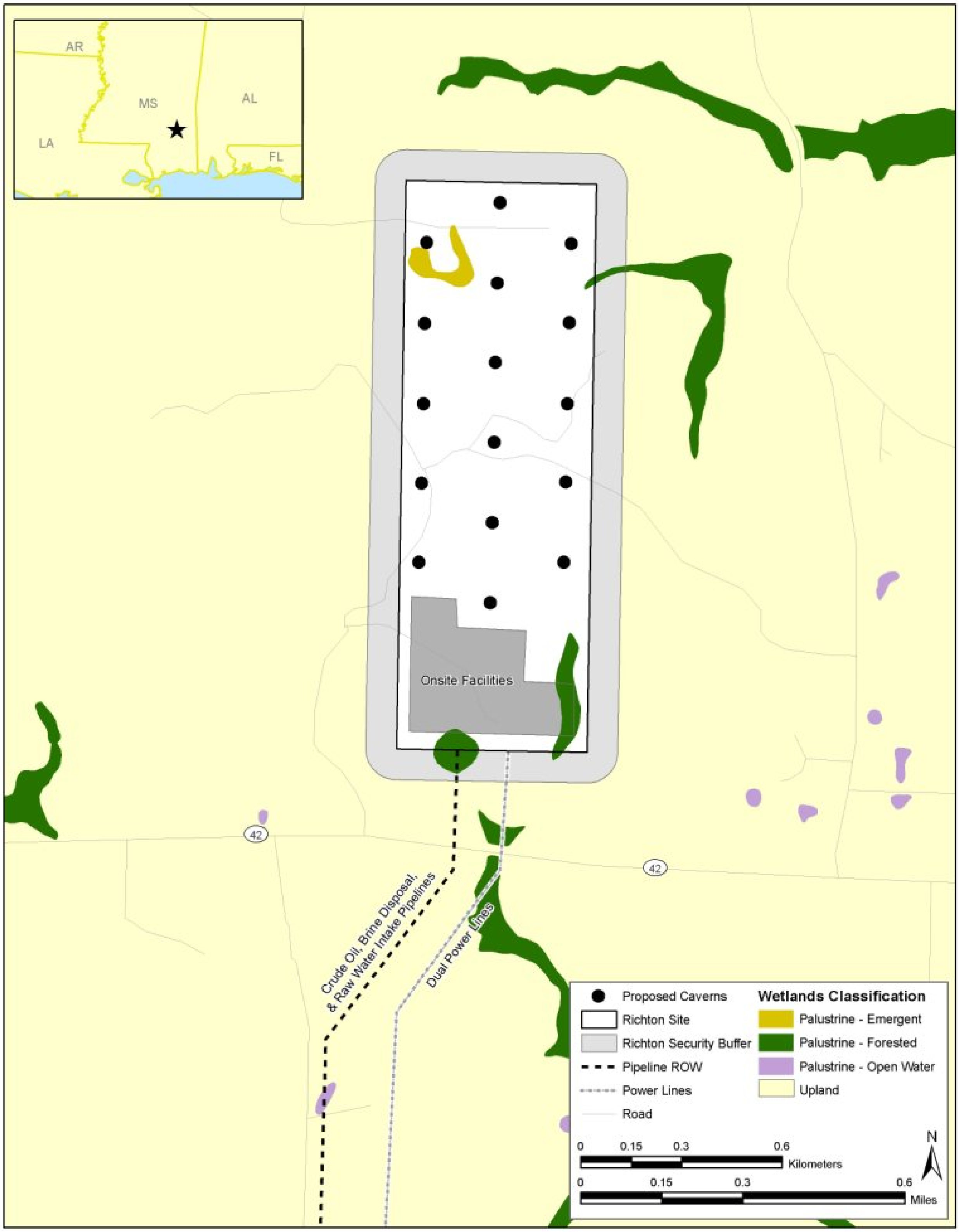

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Figure B.6.5-5: NWI Wetlands at the Proposed Pascagoula Terminal

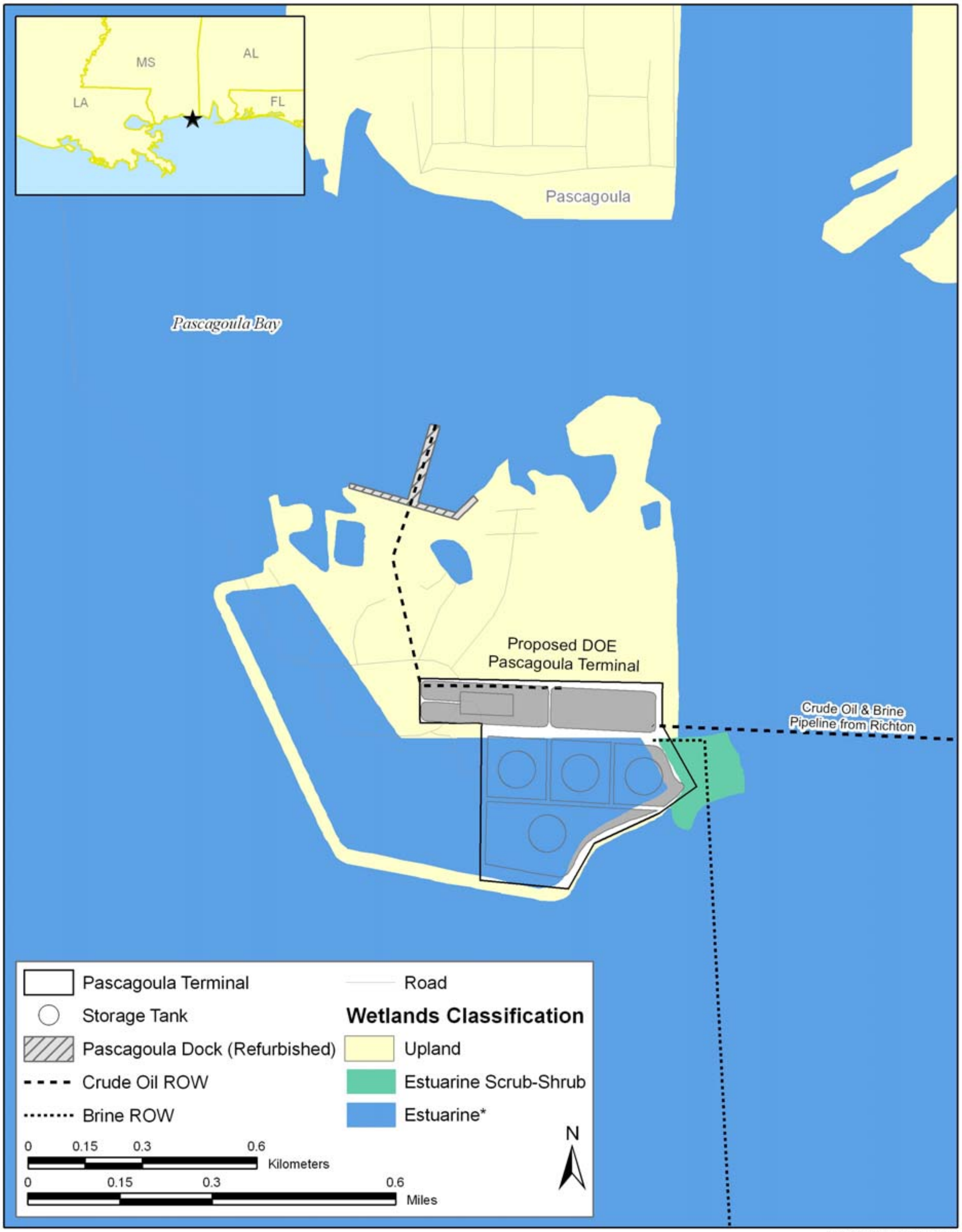

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Figure B.6.5-6: NWI Wetlands at the Proposed Liberty Tank Farm

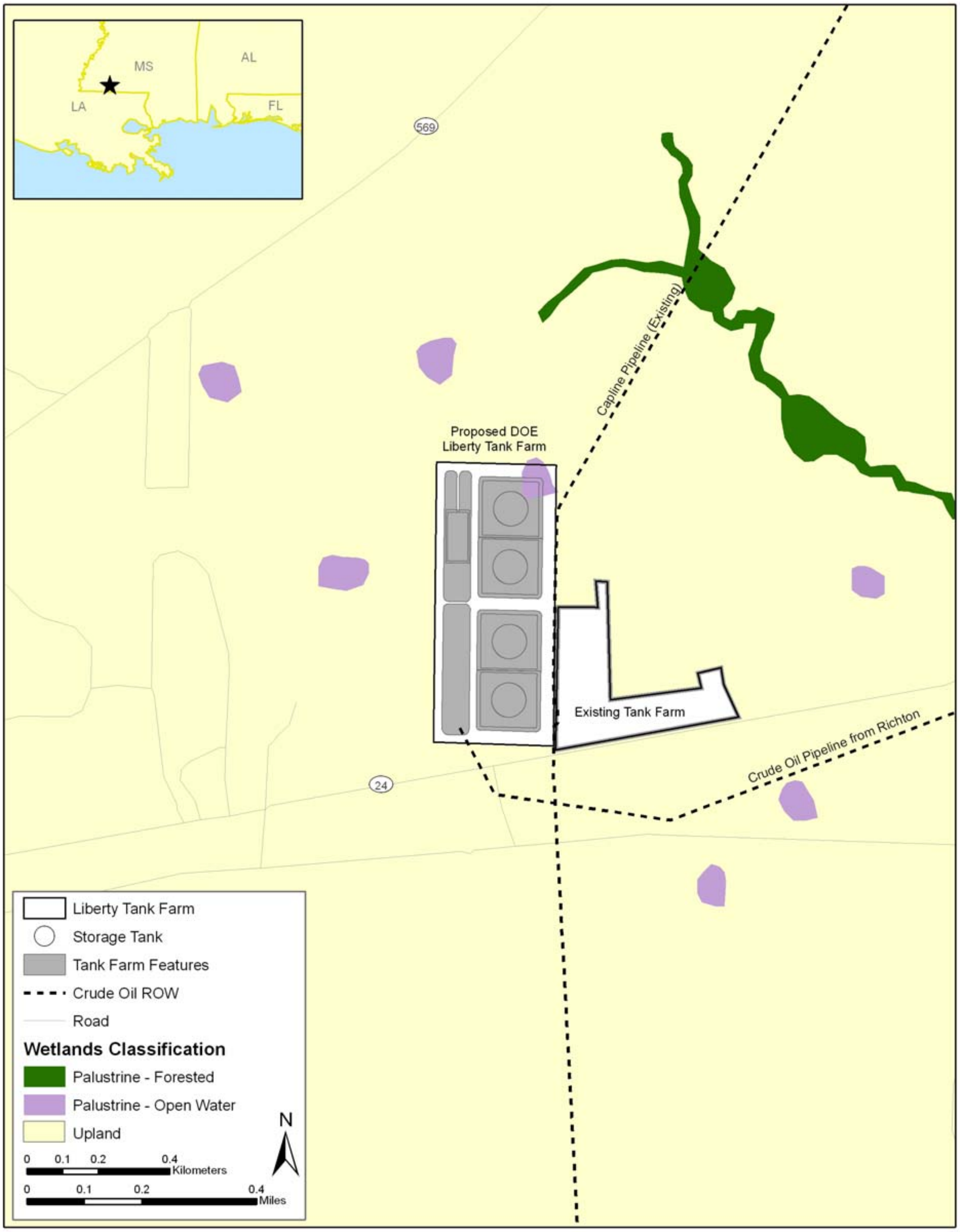

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Figure B.6.6-1: Proposed Stratton Ridge Storage Site and Associated Facilities

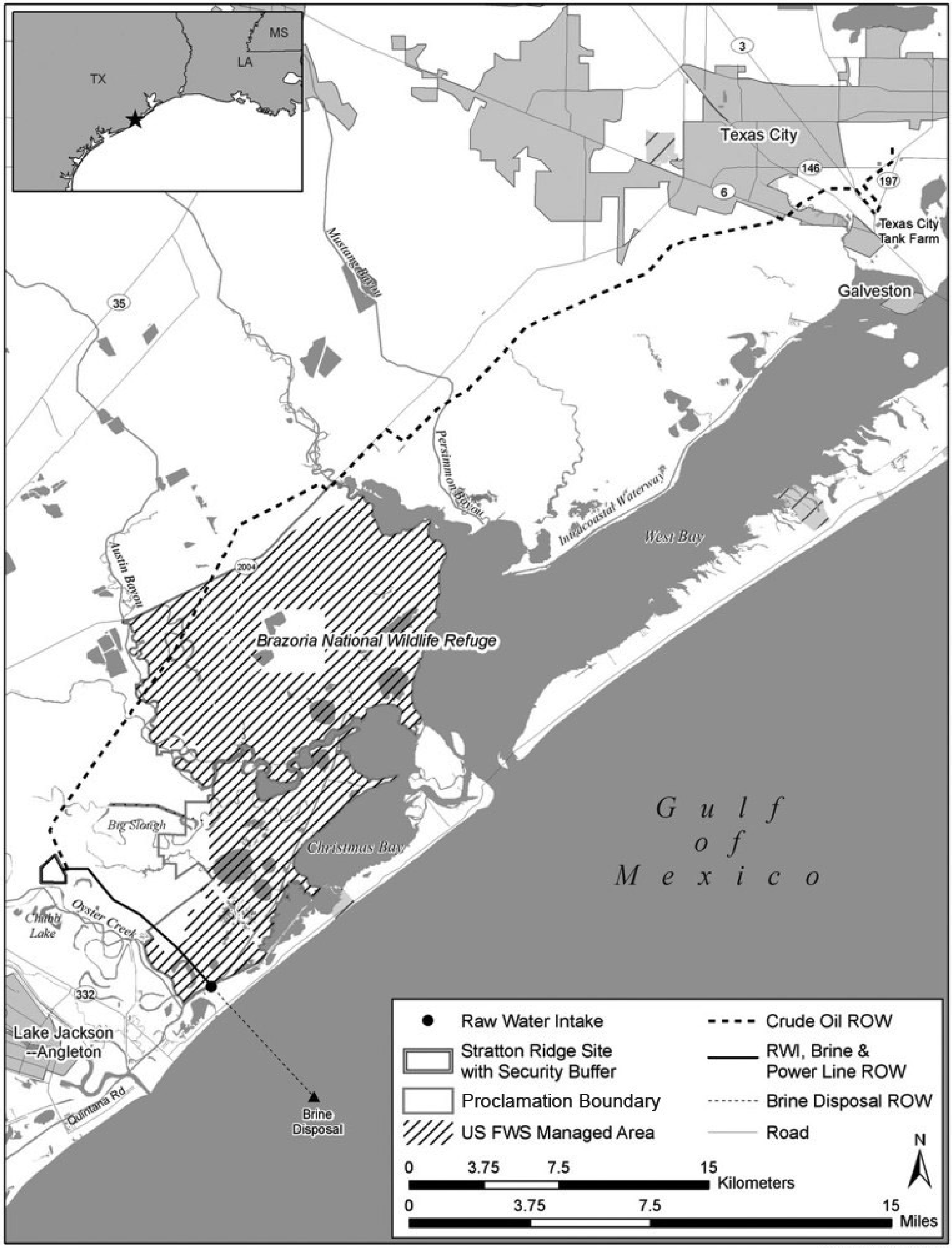

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Figure B.6.6-2: Floodplain Map for Proposed Stratton Ridge Site and Associated Facilities

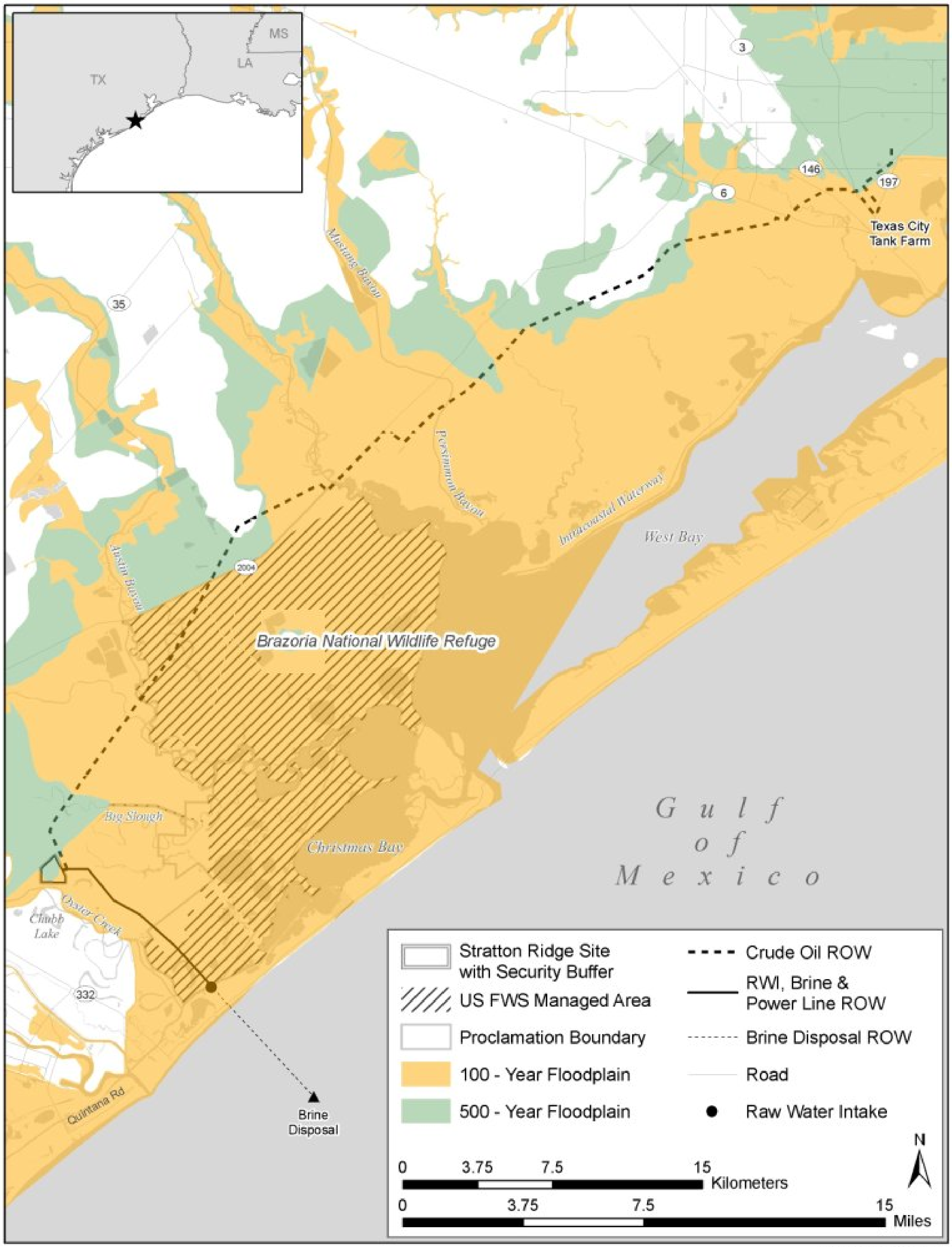

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Figure B.6.6-3: Floodplain Map for Proposed Stratton Ridge Storage Site

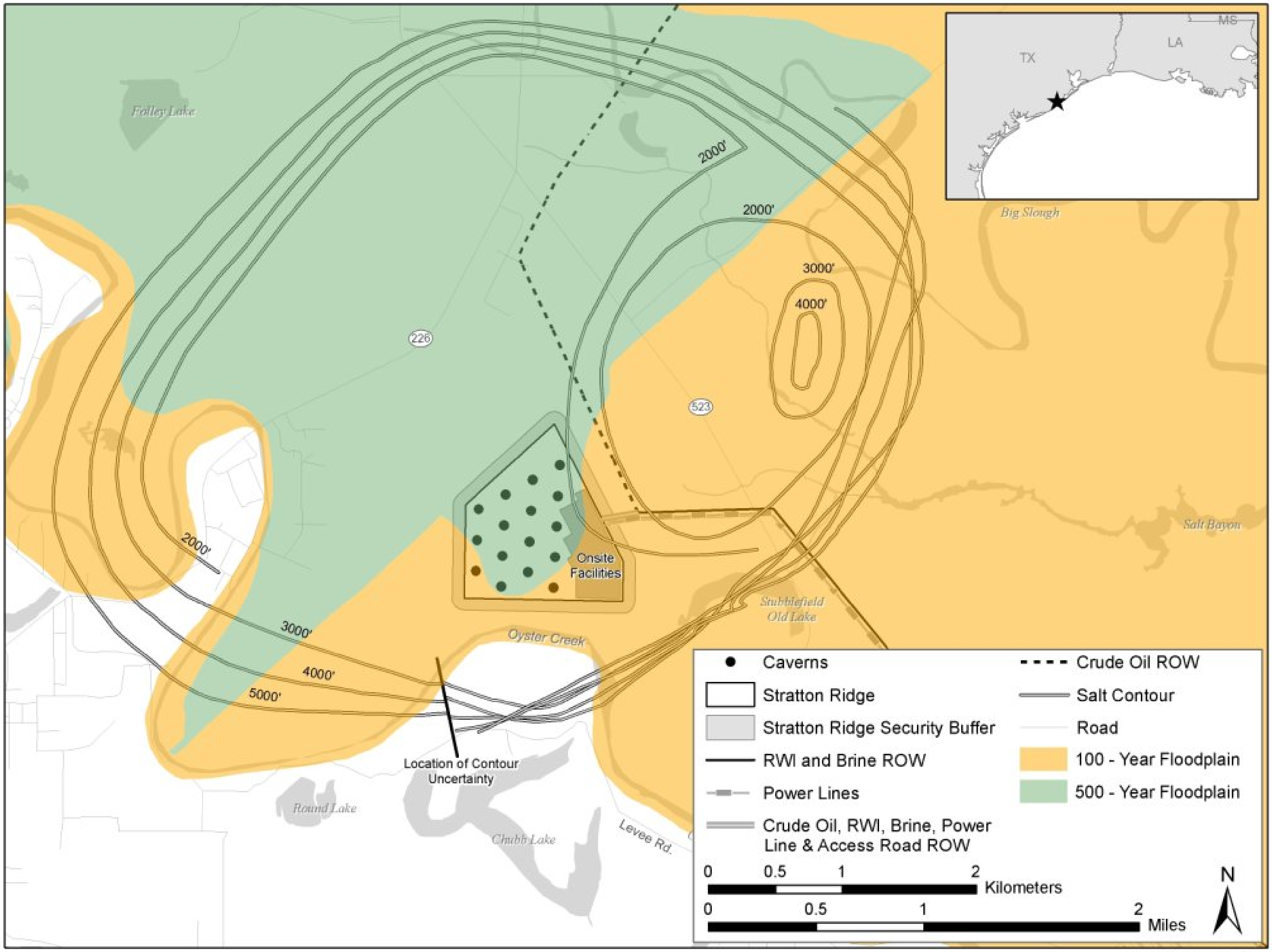

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Figure B.6.6-4: Floodplain Map for Proposed Texas City Tank Farm

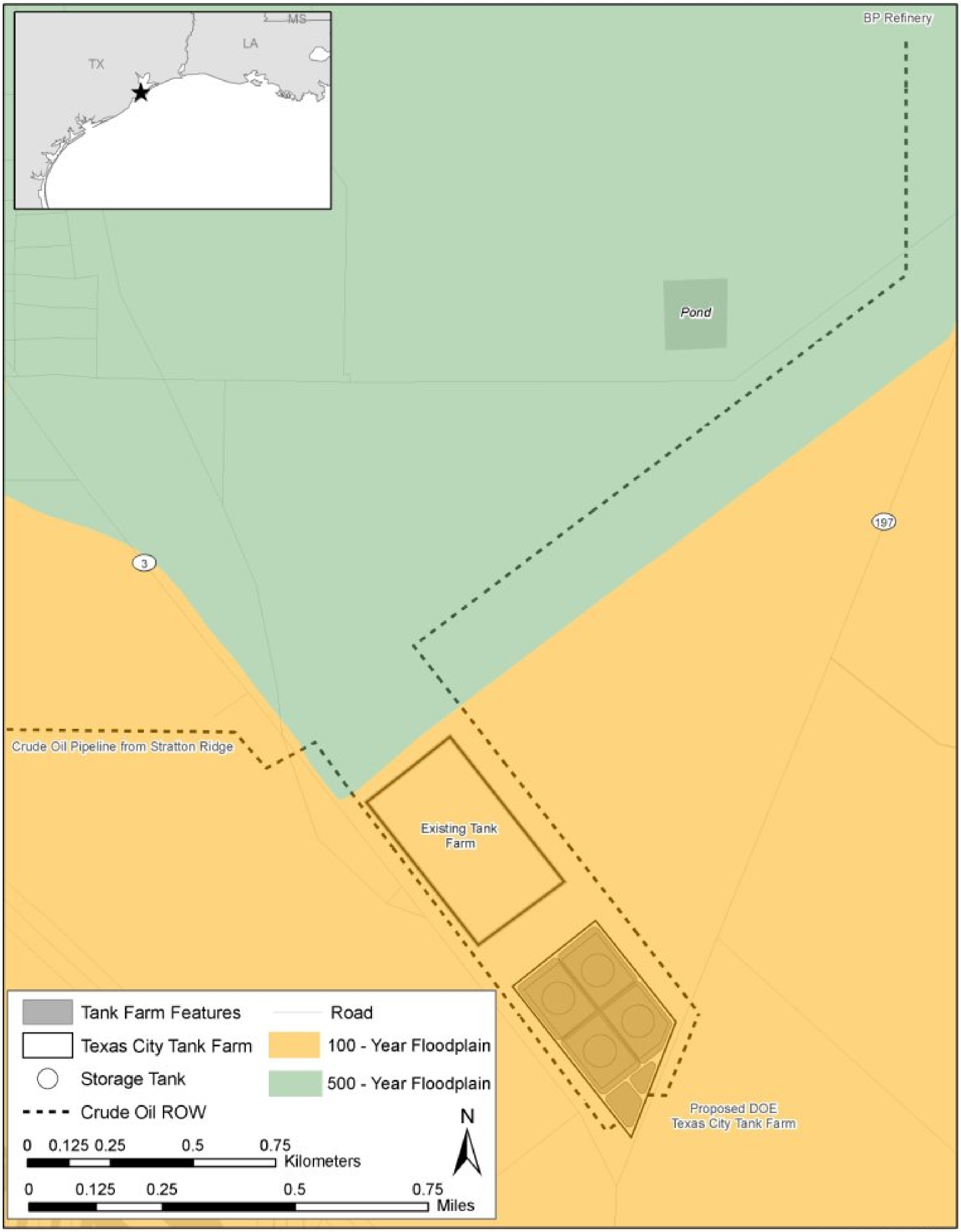

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Figure B.6.6-5: NWI Wetlands for Proposed Stratton Ridge Storage Site

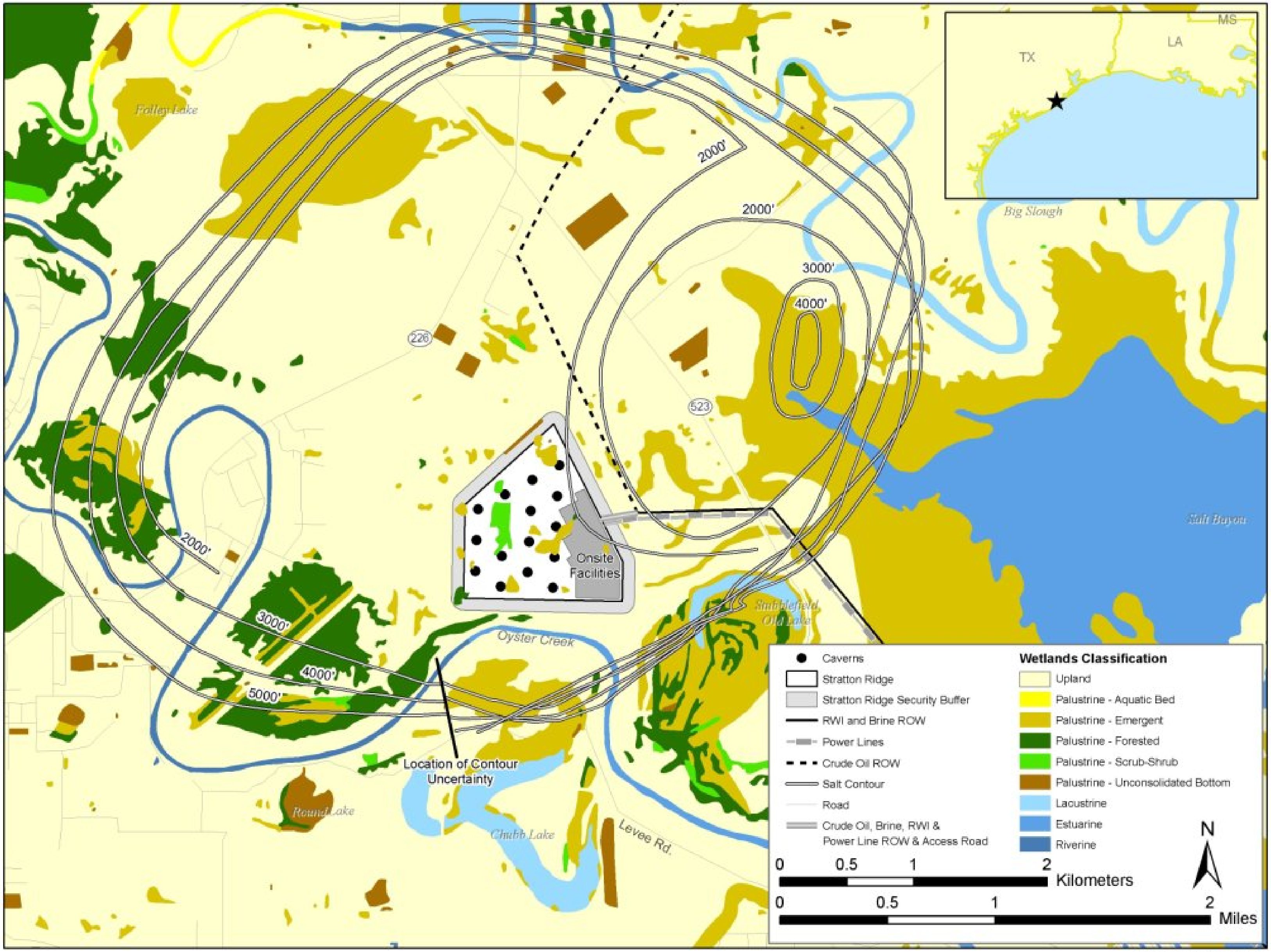

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Figure B.6.6-6: NWI Wetlands for Proposed Texas City Tank Farm

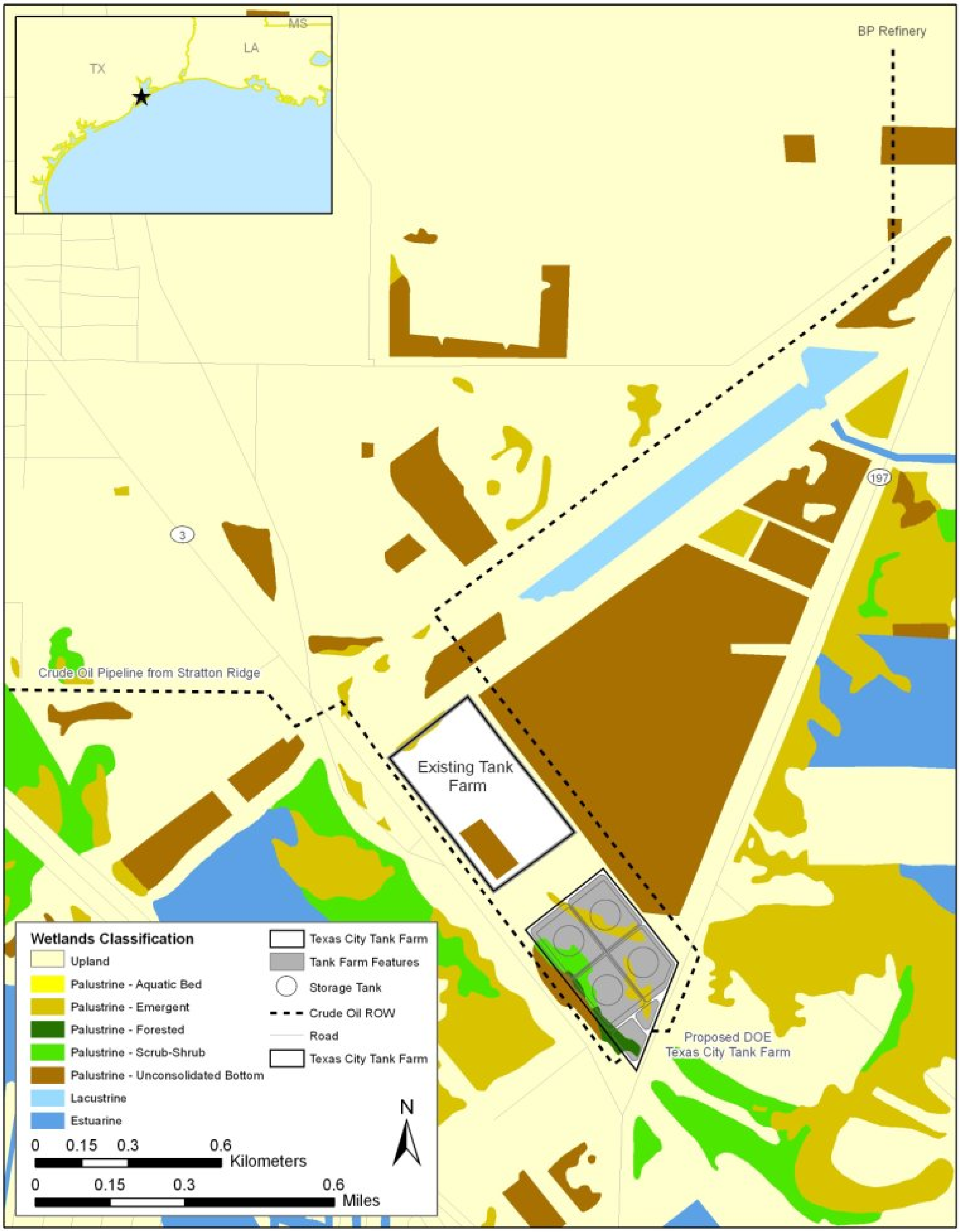

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Figure B.6.7-1: Location of Bayou Choctaw Expansion Site and Associated Facilities

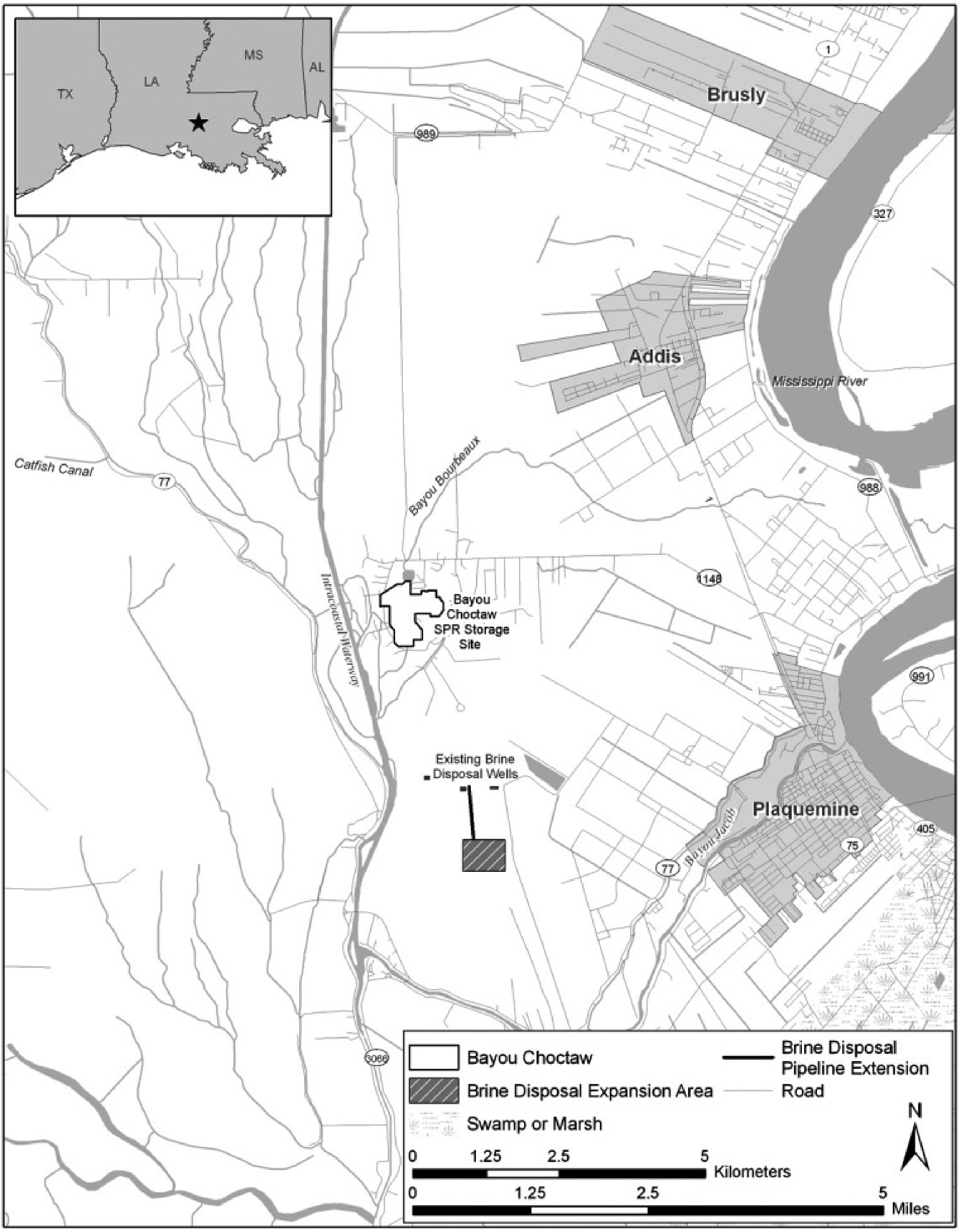

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Figure B.6.7-2: Floodplain Map for Bayou Choctaw Expansion Site

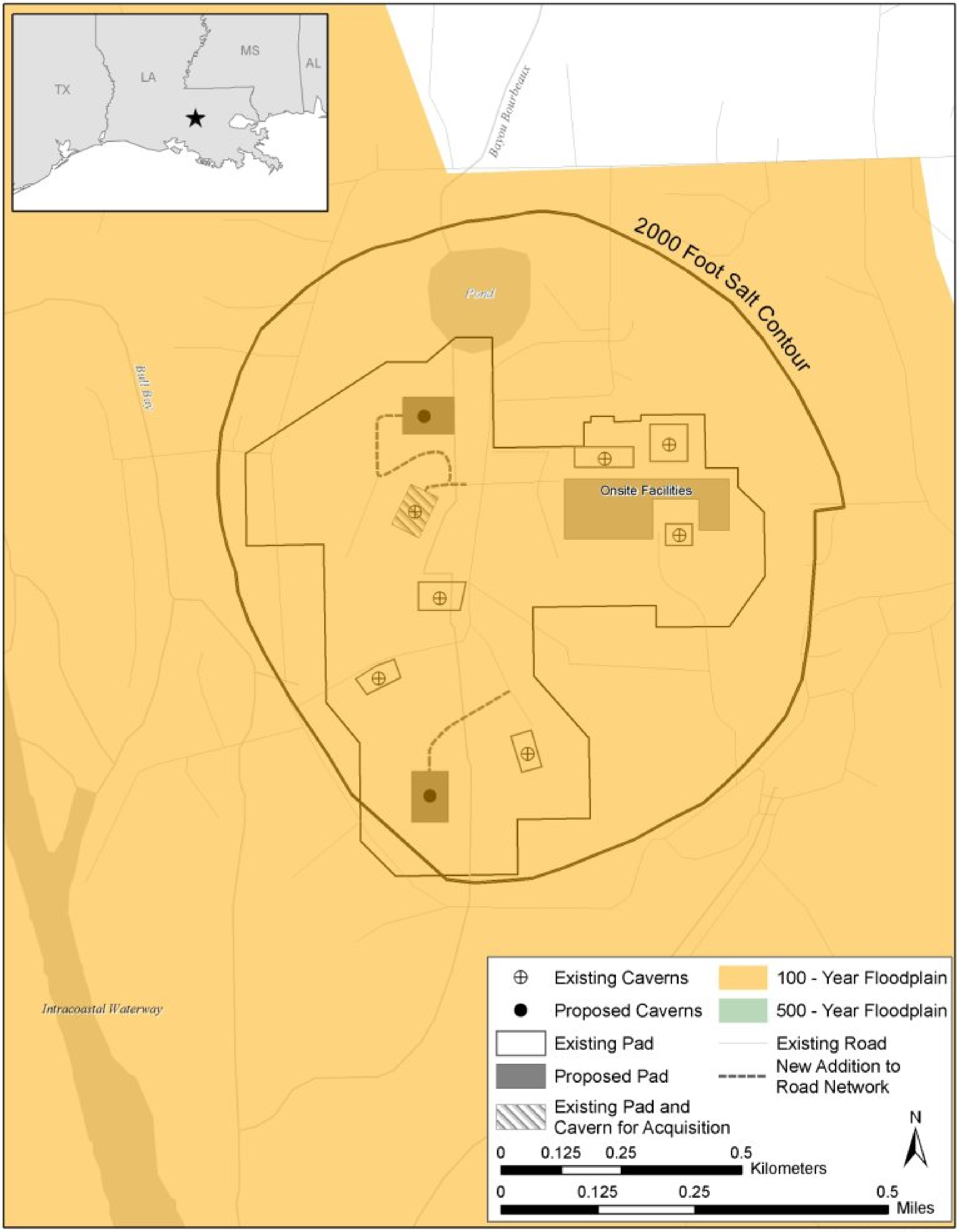

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Figure B.6.7-3: NWI Wetlands at the Bayou Choctaw Expansion Site

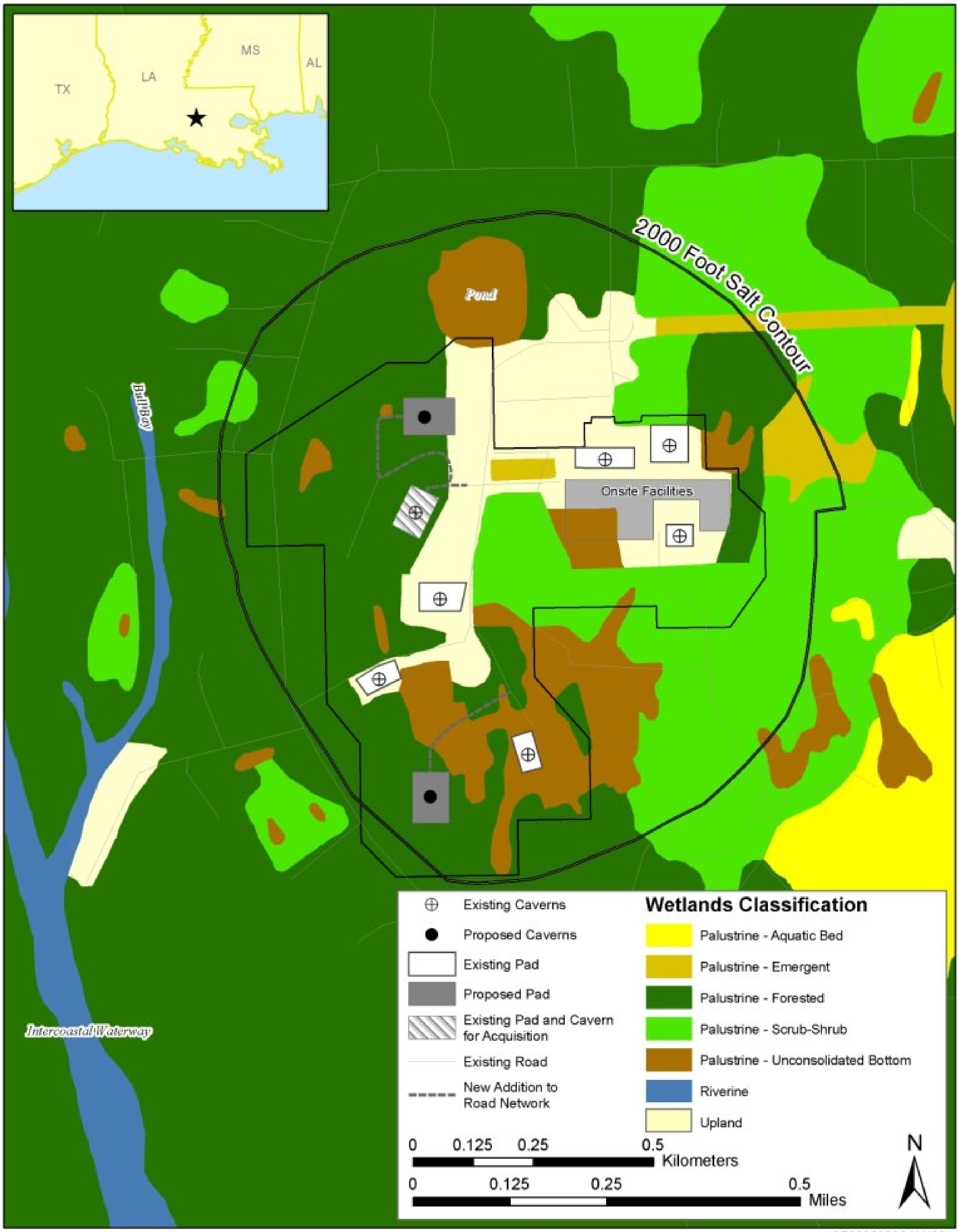

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Figure B.6.7-4: NWI Wetlands at the Expansion Site Brine Disposal Wells

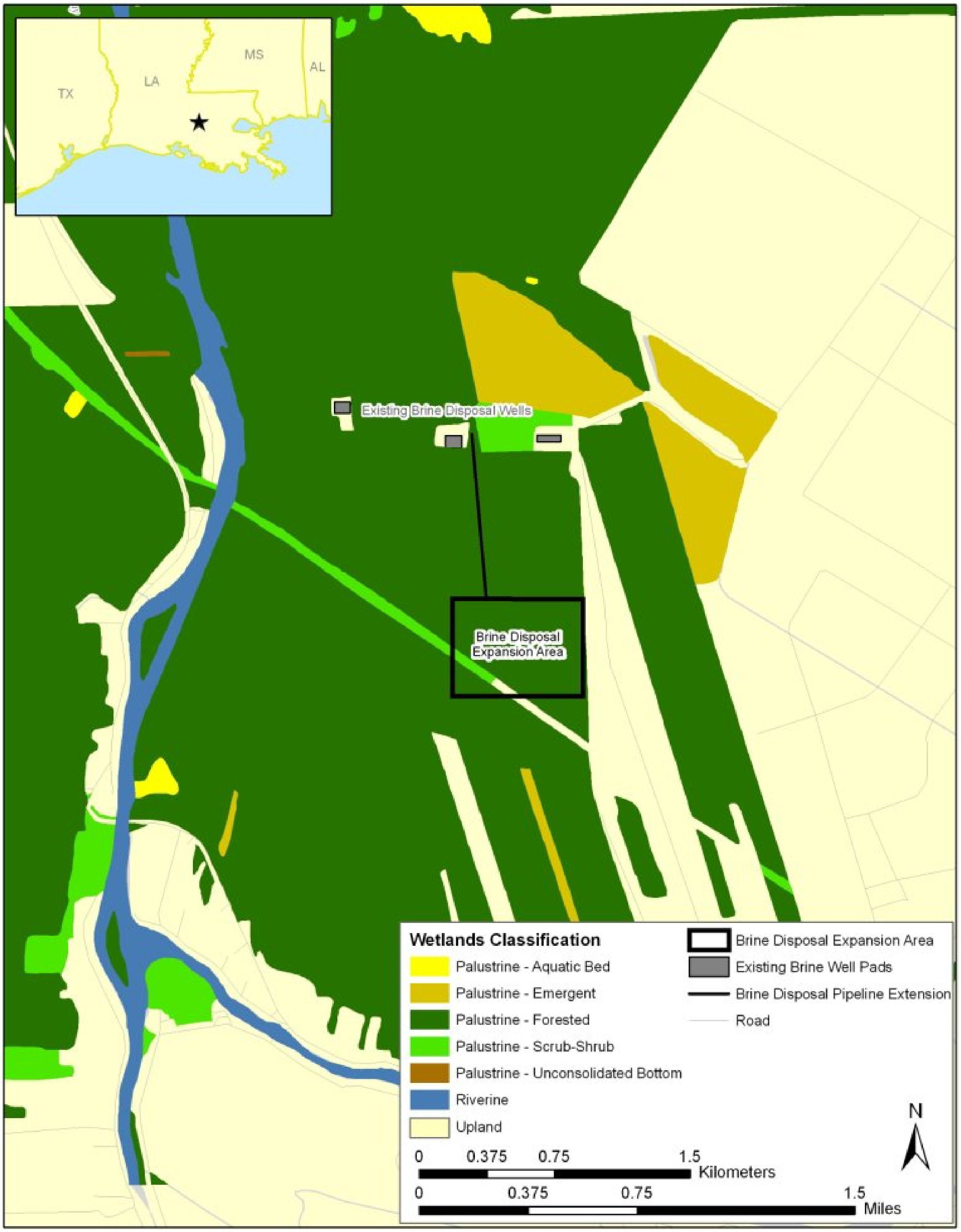

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Figure B.6.8-1: Location of Big Hill Expansion Site and Associated Facilities

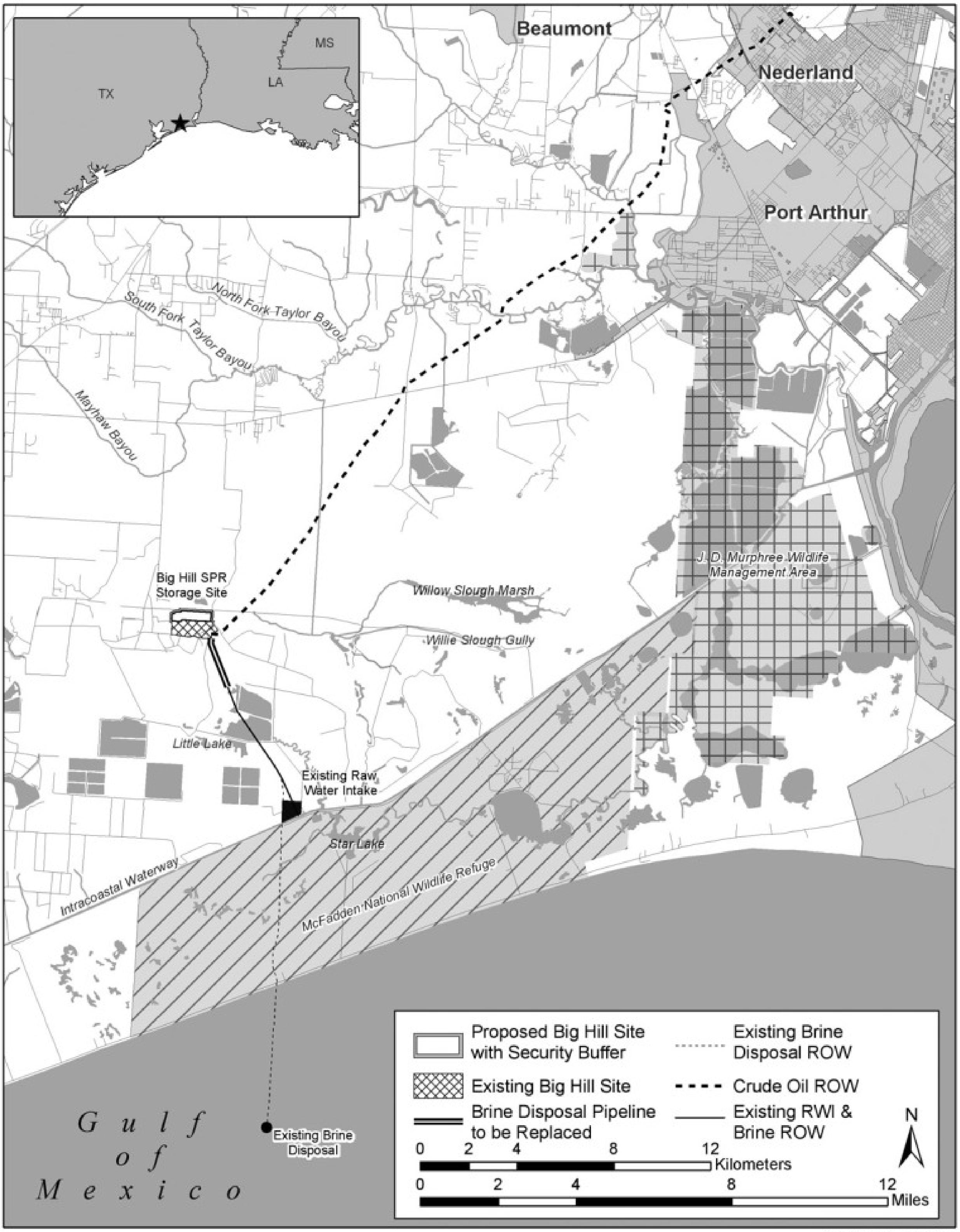

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Figure B.6.8-2: Floodplain Map for Bill Hill Expansion and Associated Facilities

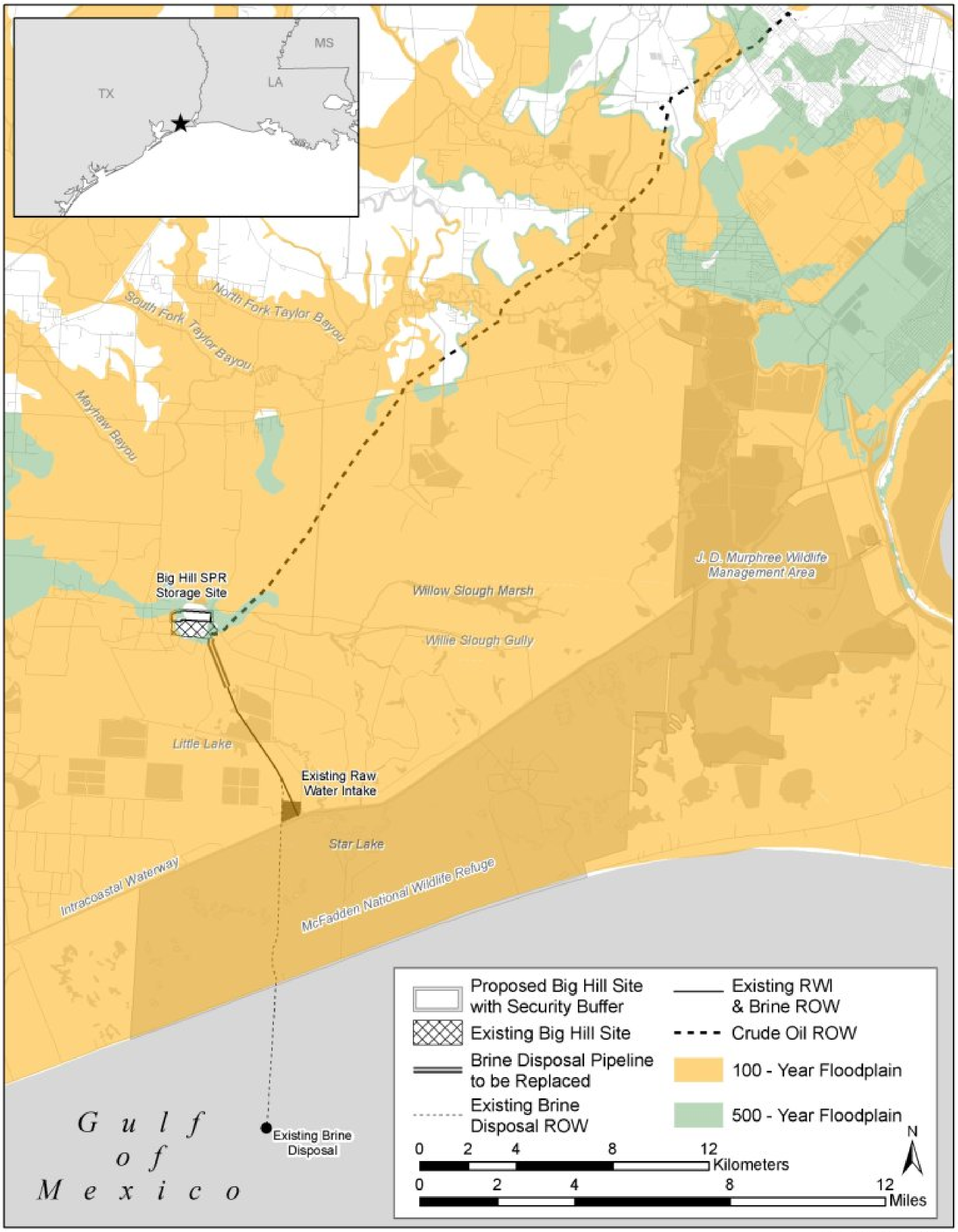

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Figure B.6.8.3: Floodplain Map for Big Hill Expansion Site

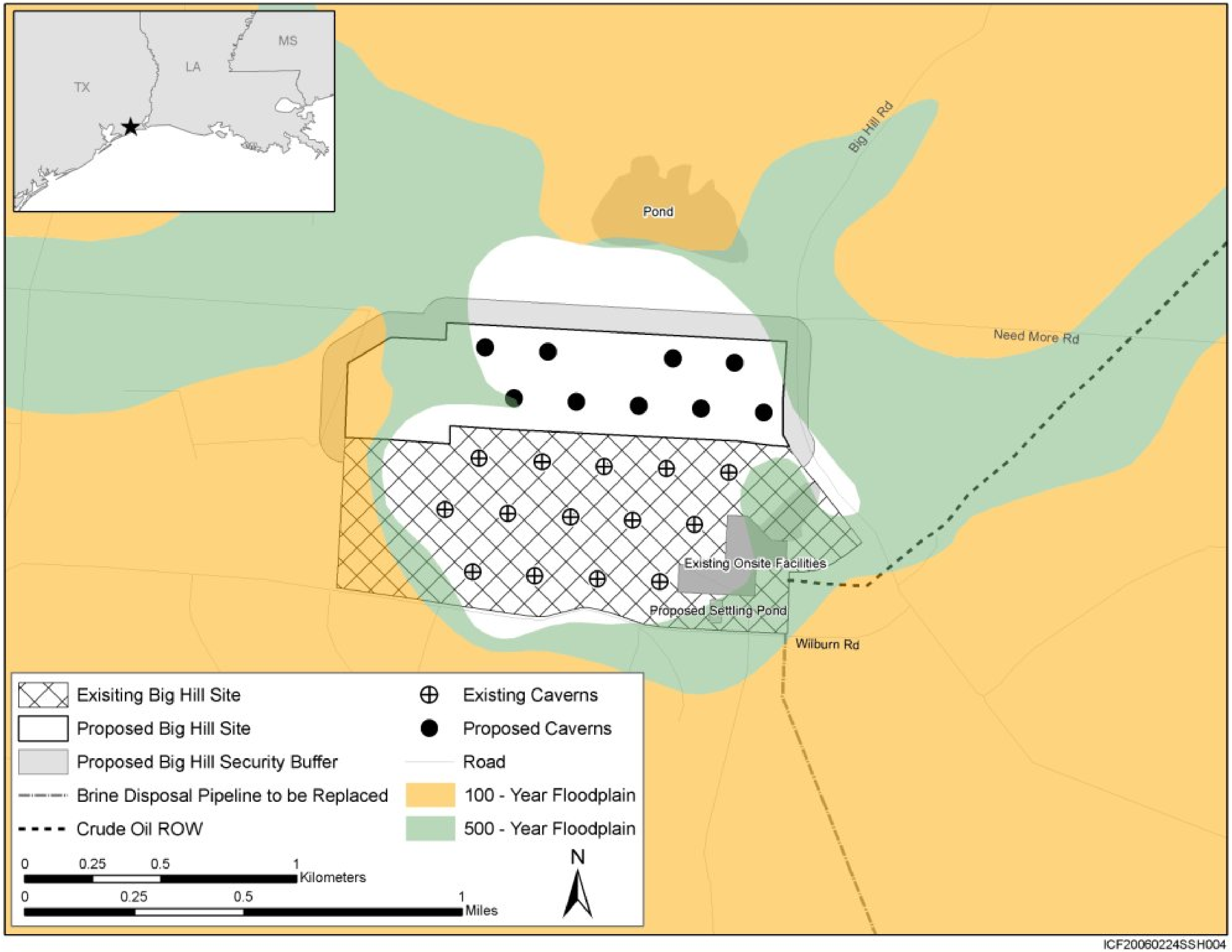

Figure B.6.8-4: NWI Wetlands at the Proposed Big Hill Expansion Site

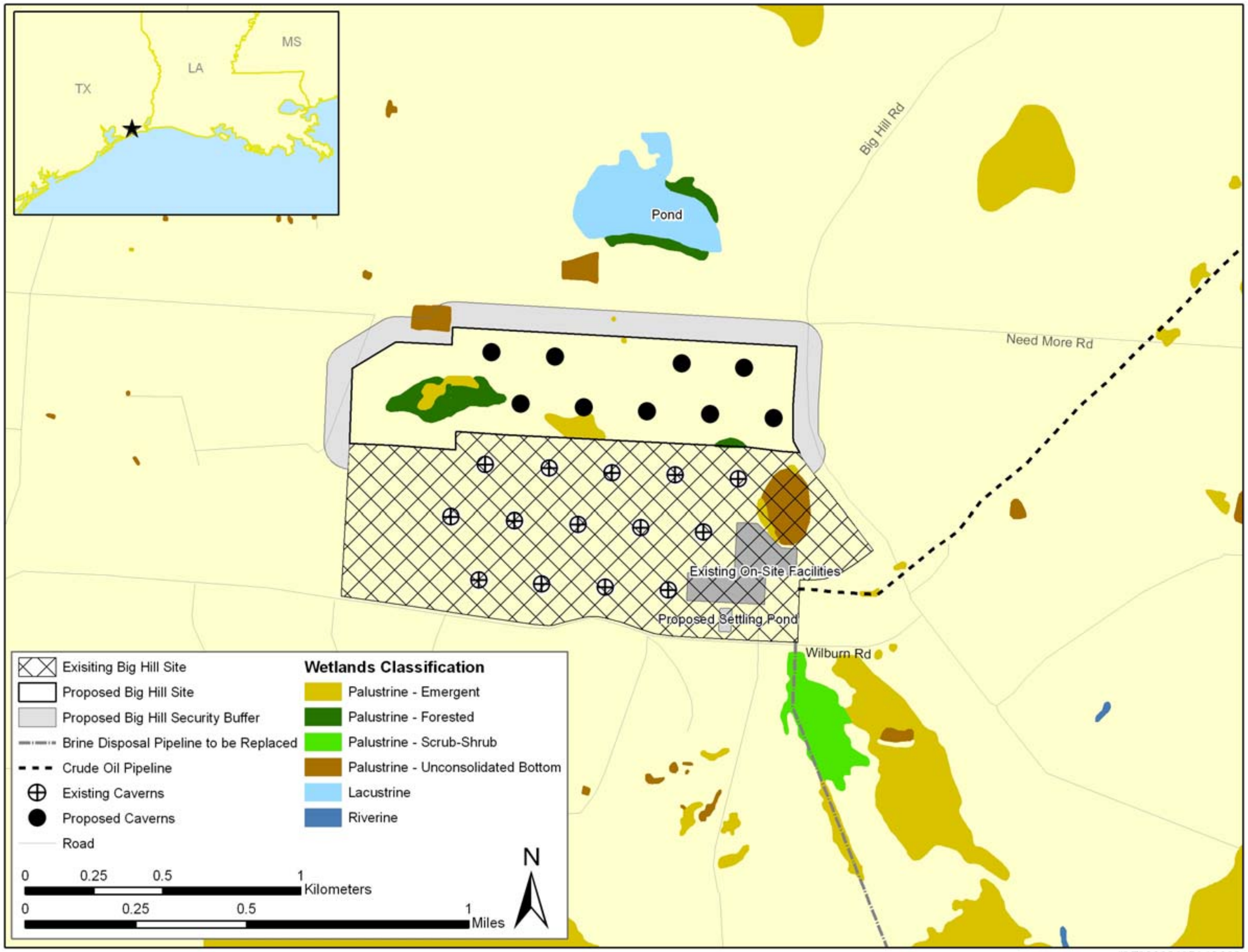

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Figure B.6.9-1: Location of West Hackberry Expansion Site and Associated Facilities

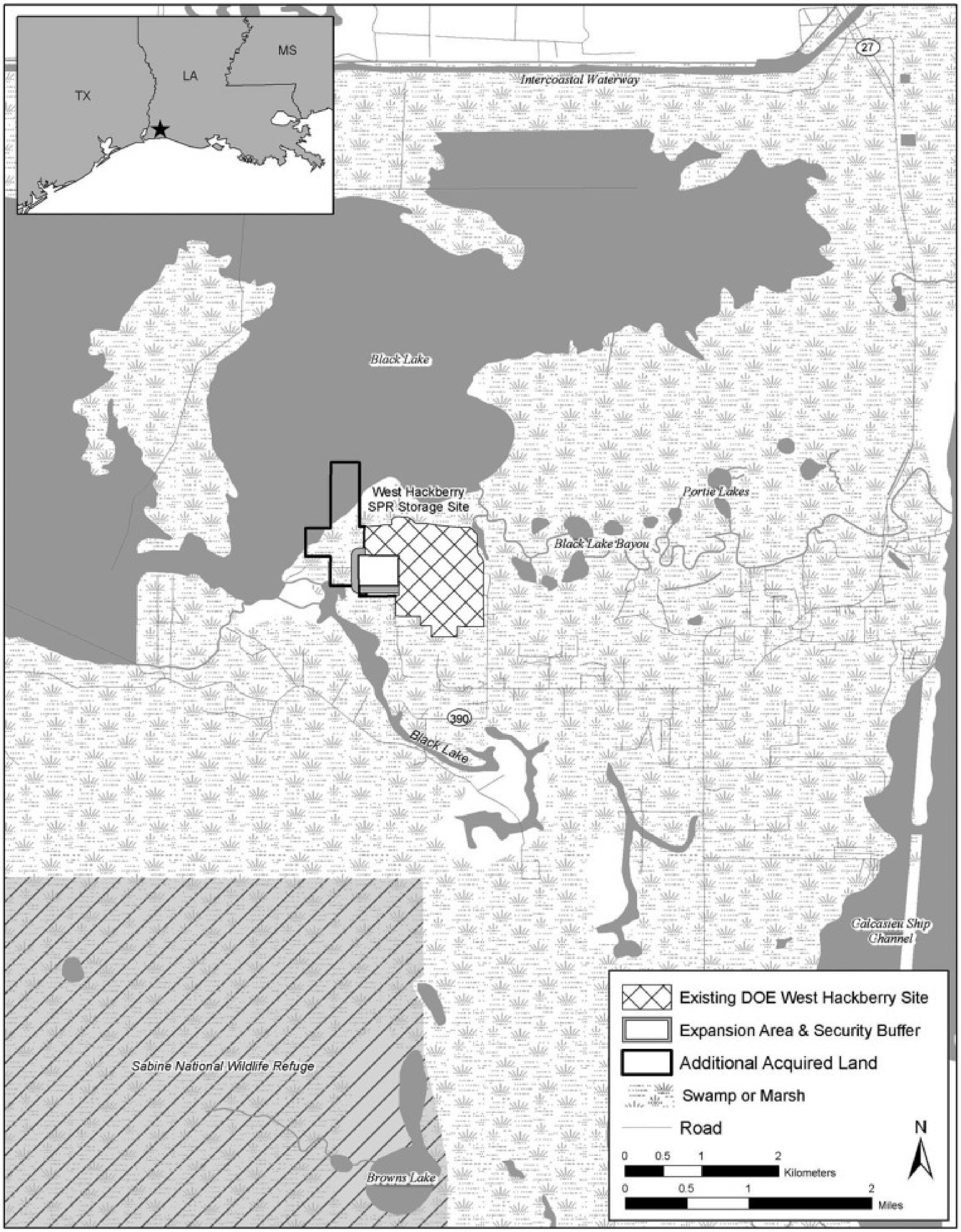

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Figure B.6.9-2: Floodplain Map for West Hackberry Expansion

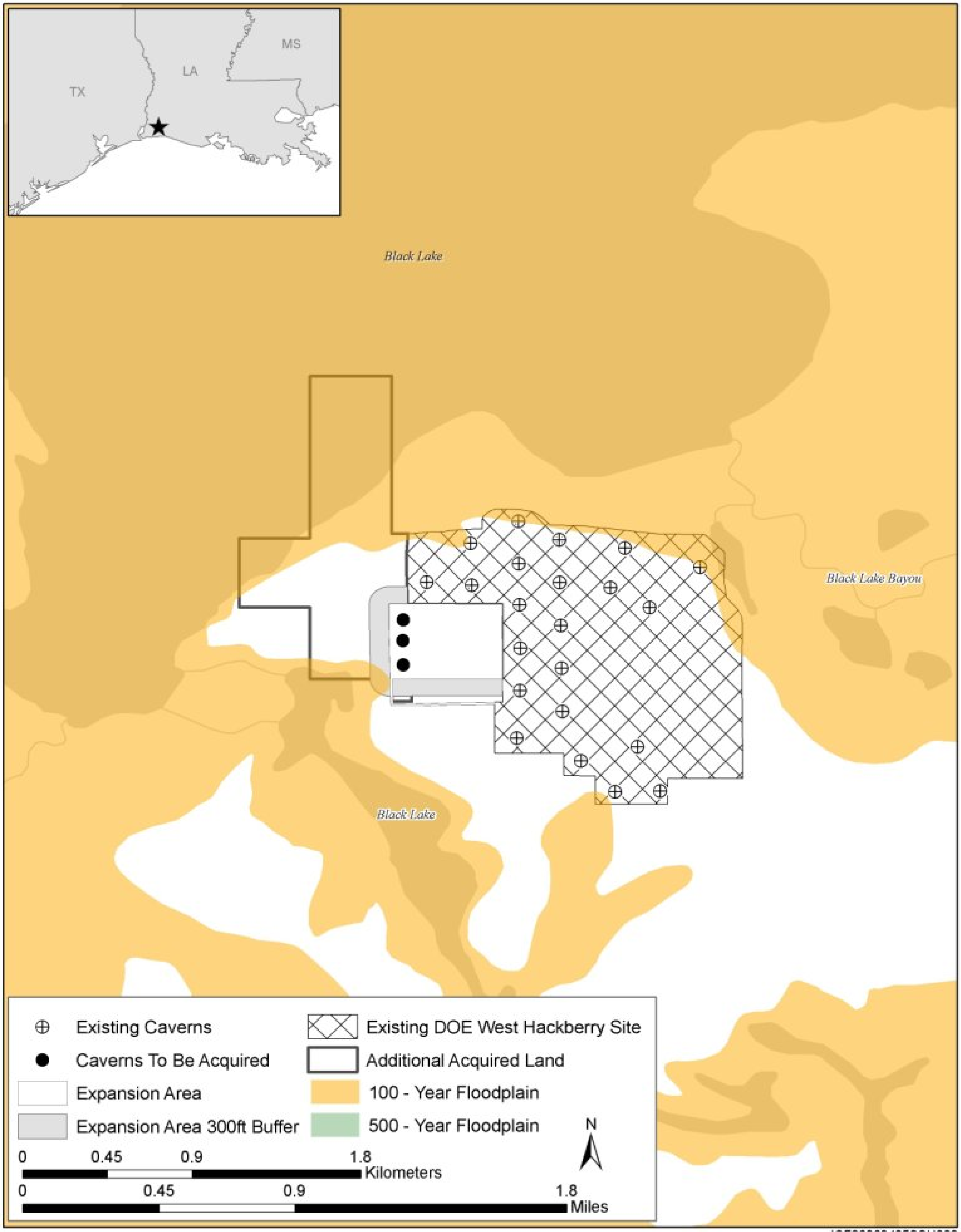

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Figure B.6.9-3: NWI Wetlands at the West Hackberry Expansion Site

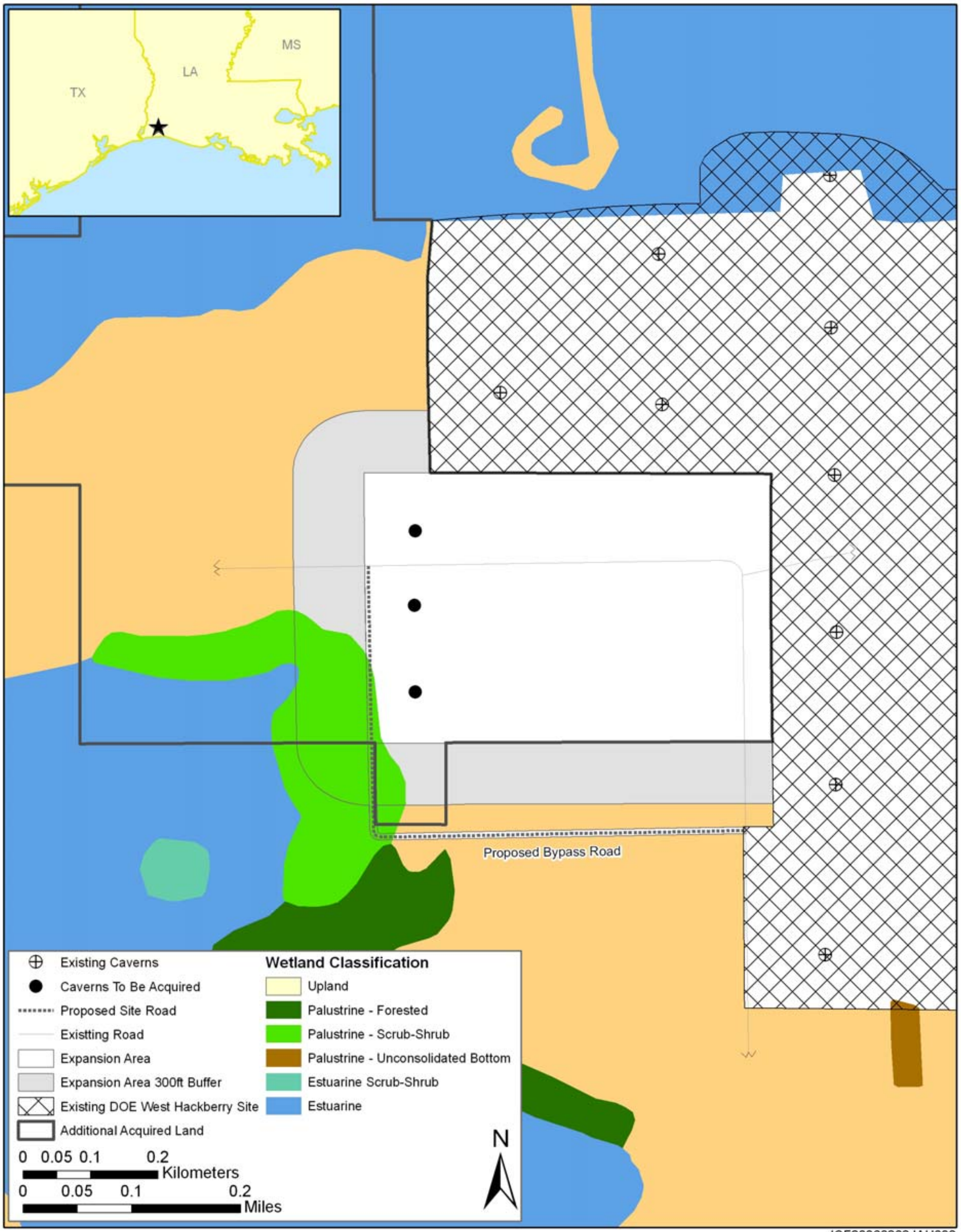

Figure B.7.2-1: Alternative ROWs Considered for the Proposed Stratton Ridge Site

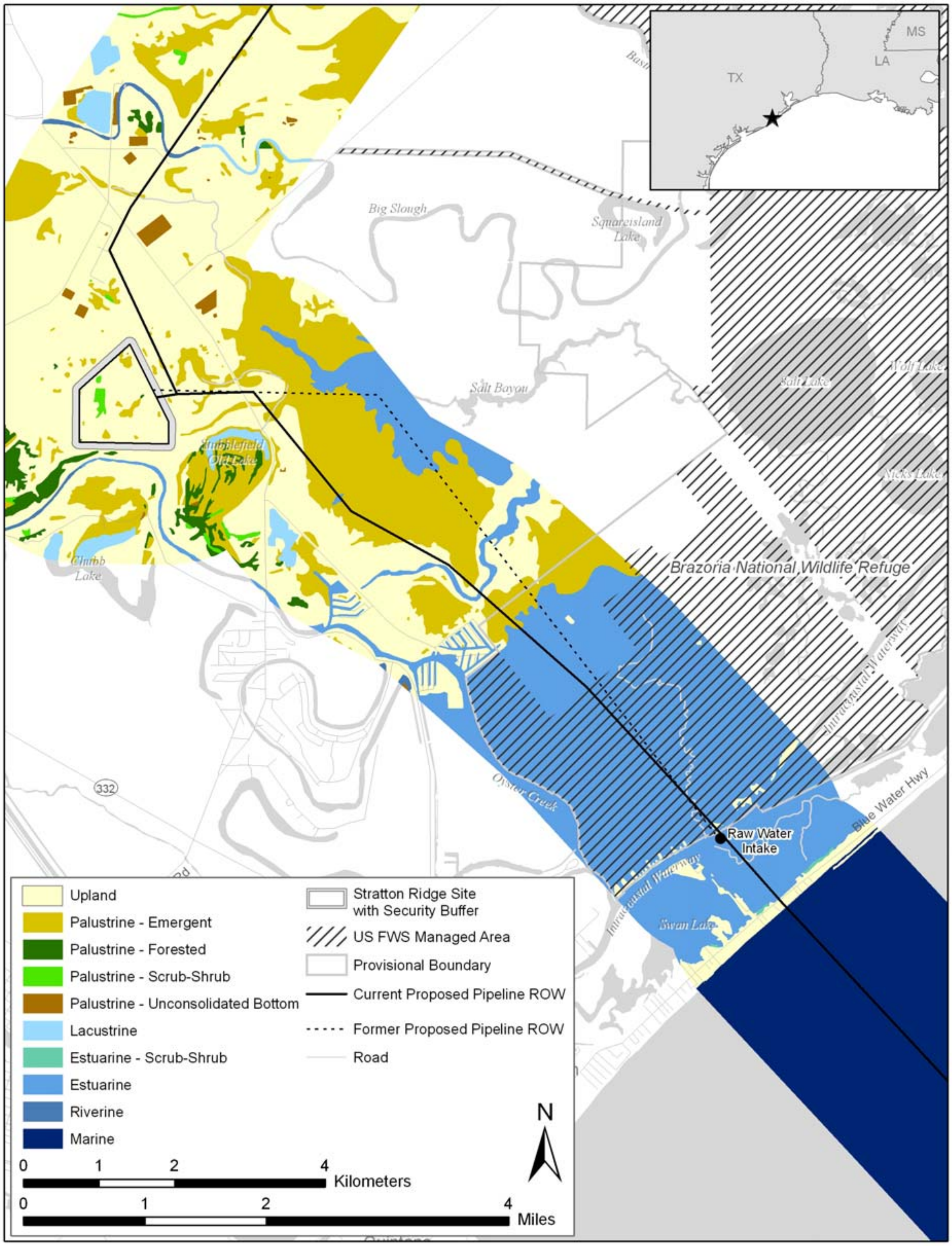

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Figure B.7.2-2: Alternative ROWs Considered for the Proposed Chacahoula Site

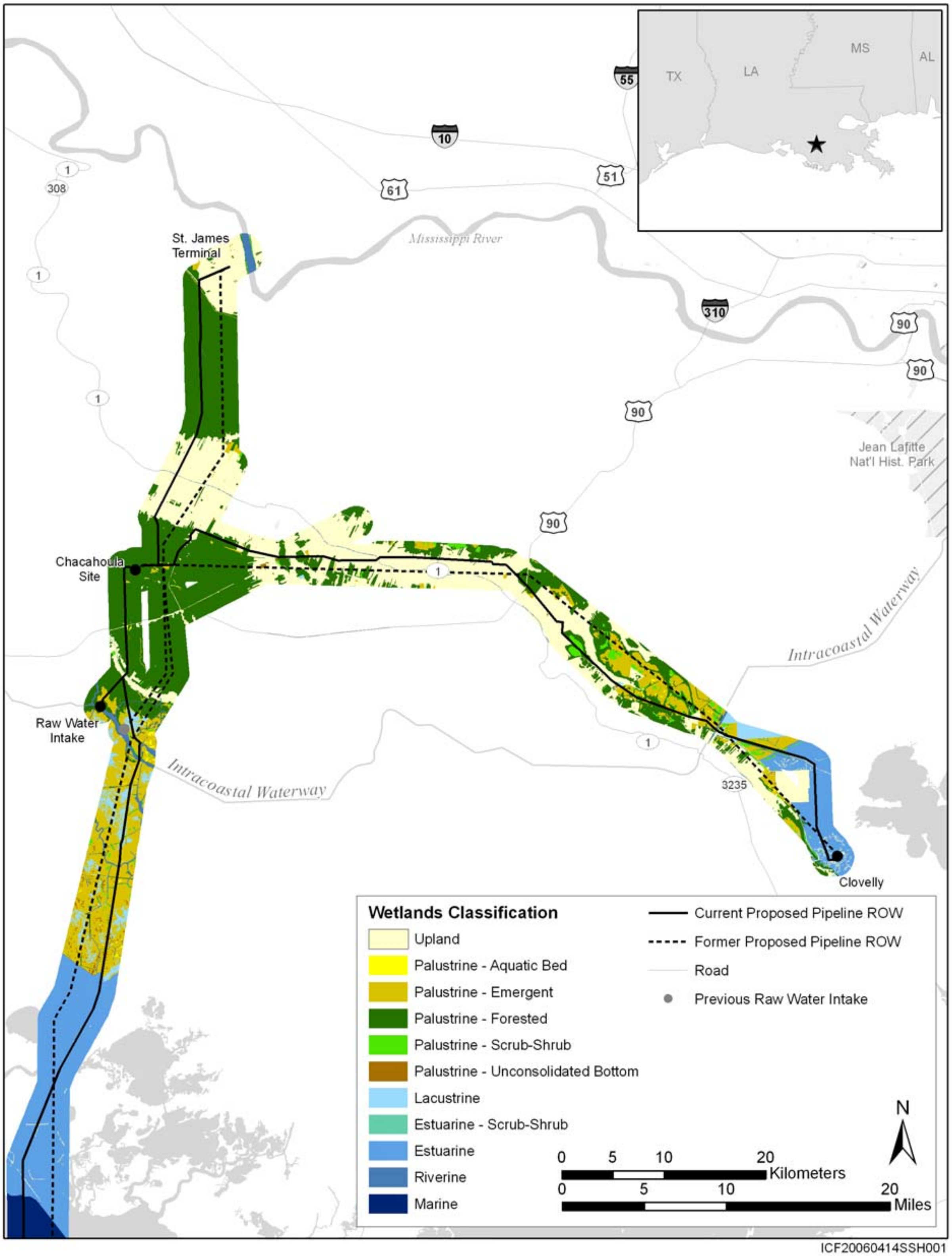

Figure E.2-1: Proposed Locations of SPR Brine Diffusers in the Gulf of Mexico

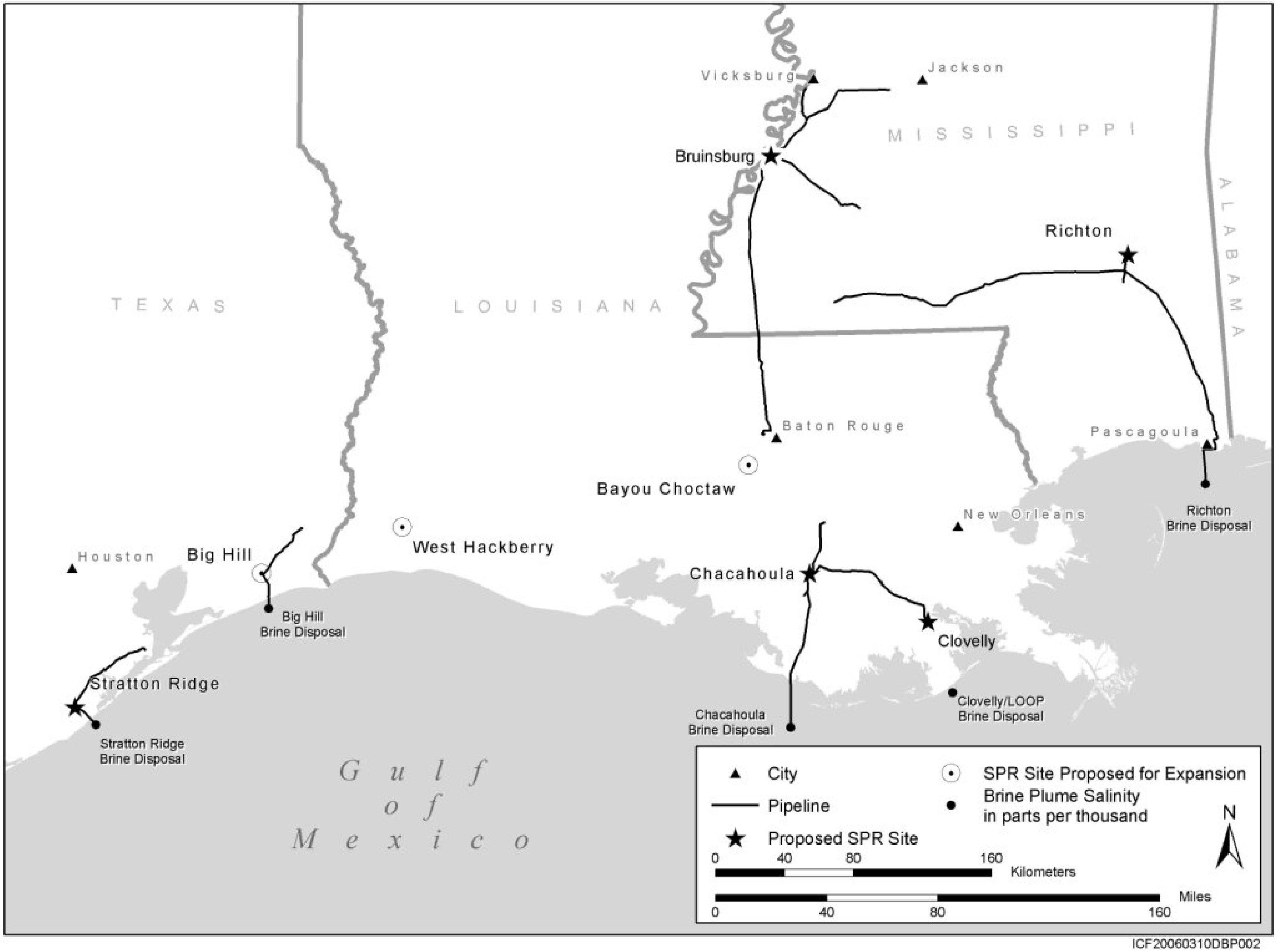

Figure E.5-1: Locations of the Brine Disposal Pipelines and the Modeled Brine Plumes Overlain on Designated EFH for Richton

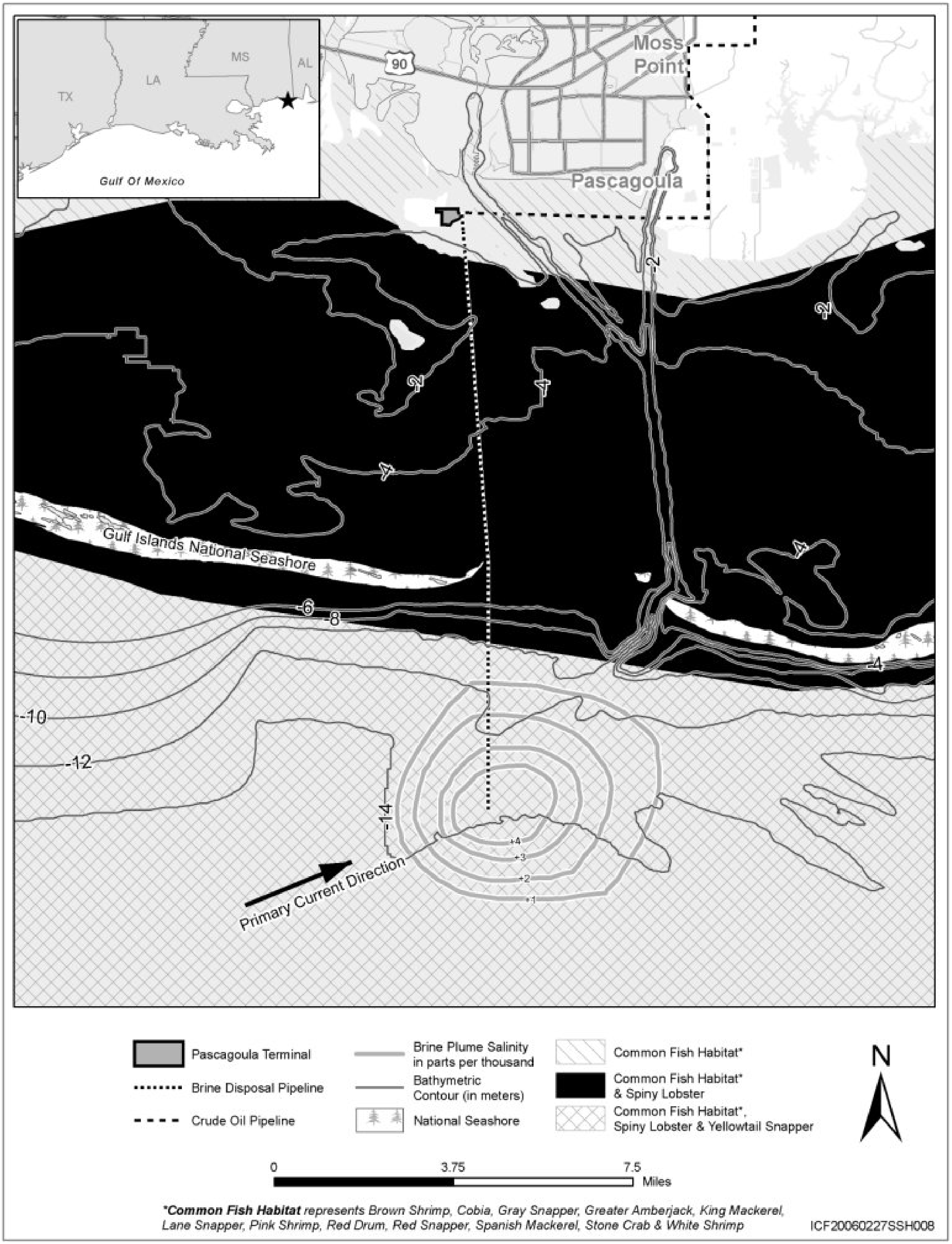

Figure E.5-2: Locations of the Brine Disposal Pipelines and the Modeled Brine Plumes Overlain on Designated EFH for Big Hill

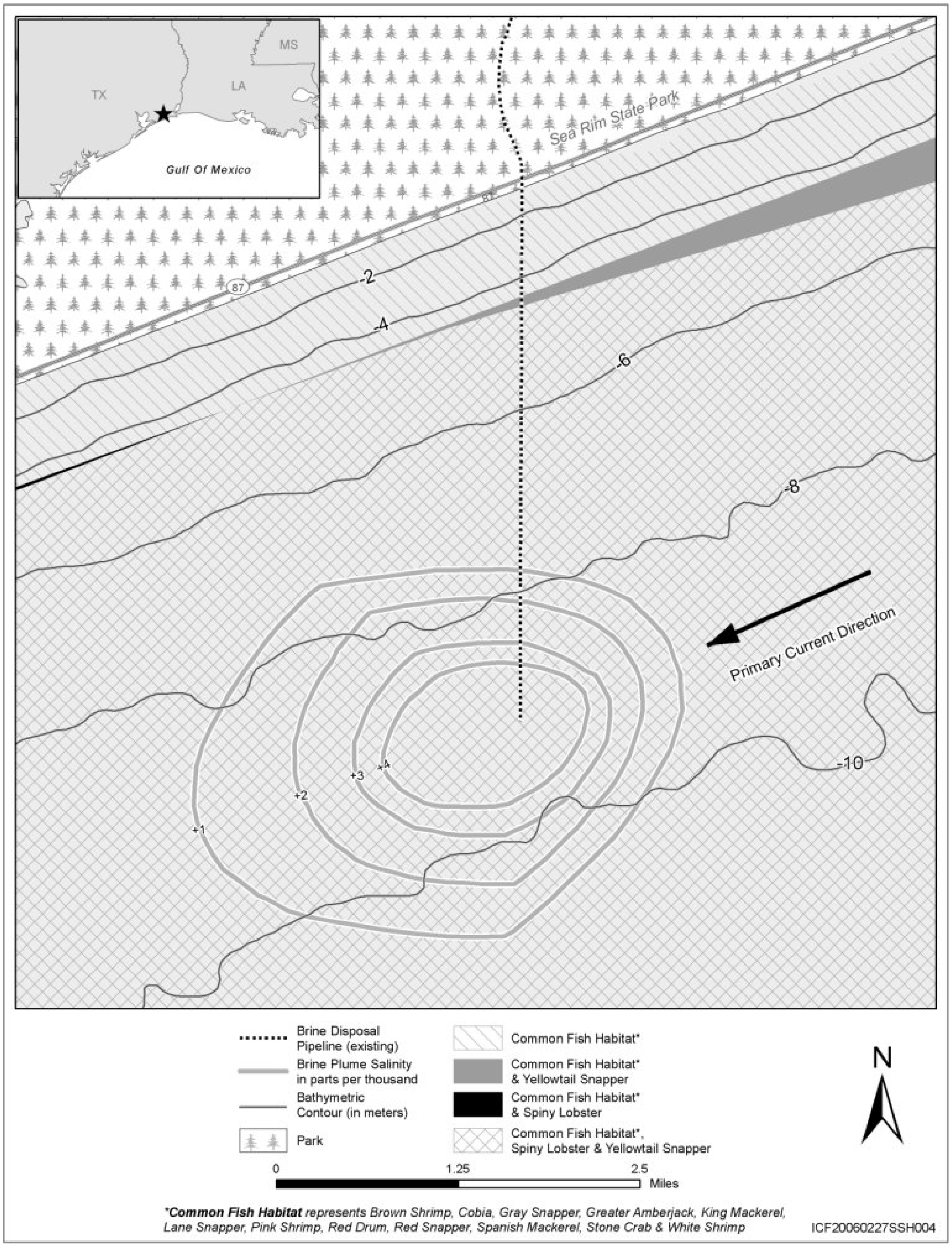

Figure E.5-3: Locations of the Brine Disposal Pipelines and the Modeled Brine Plumes Overlain on Designated EFH for Stratton Ridge

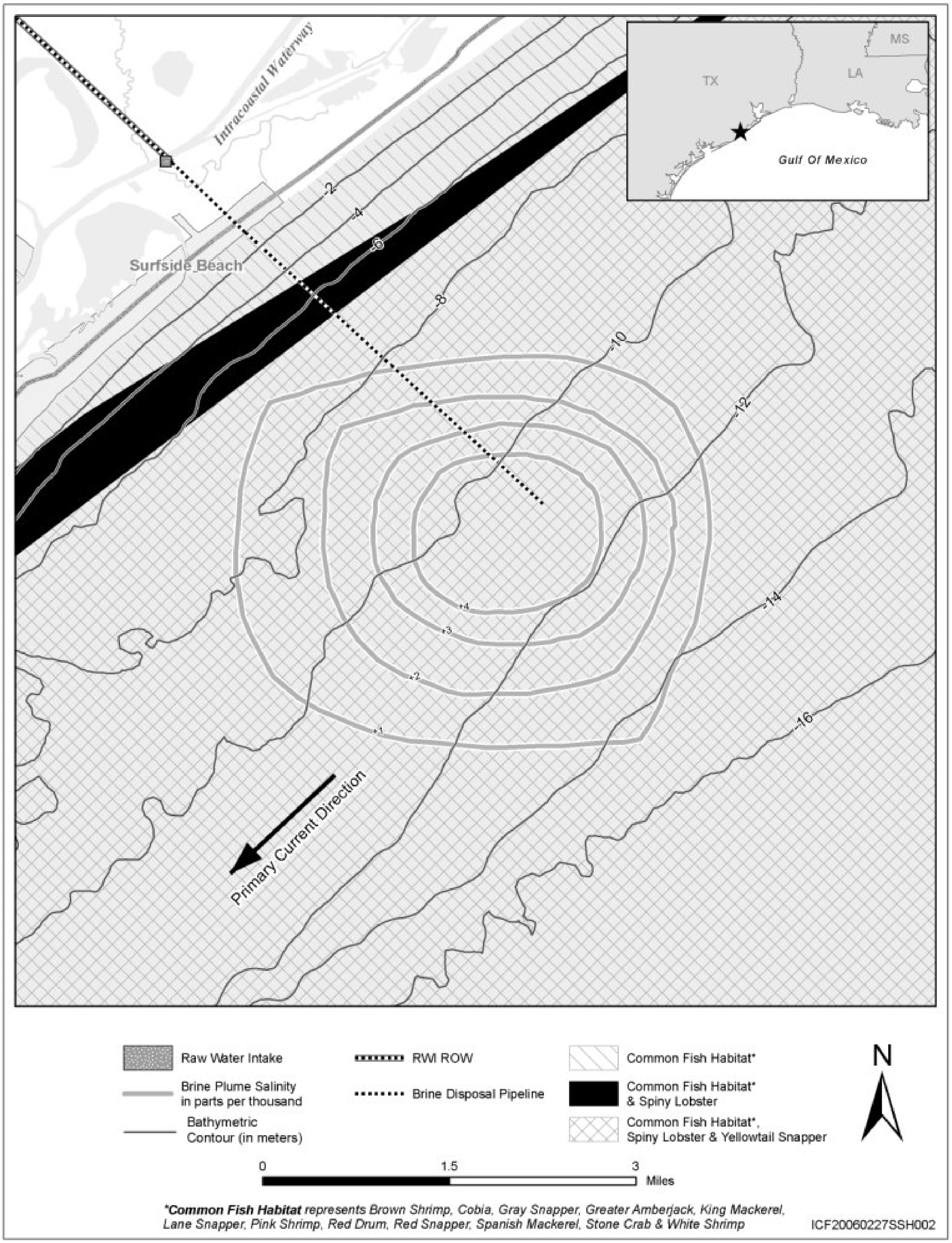

Figure E.5-4: Locations of the Brine Disposal Pipelines and the Modeled Brine Plumes Overlain on Designated EFH for Chacahoula

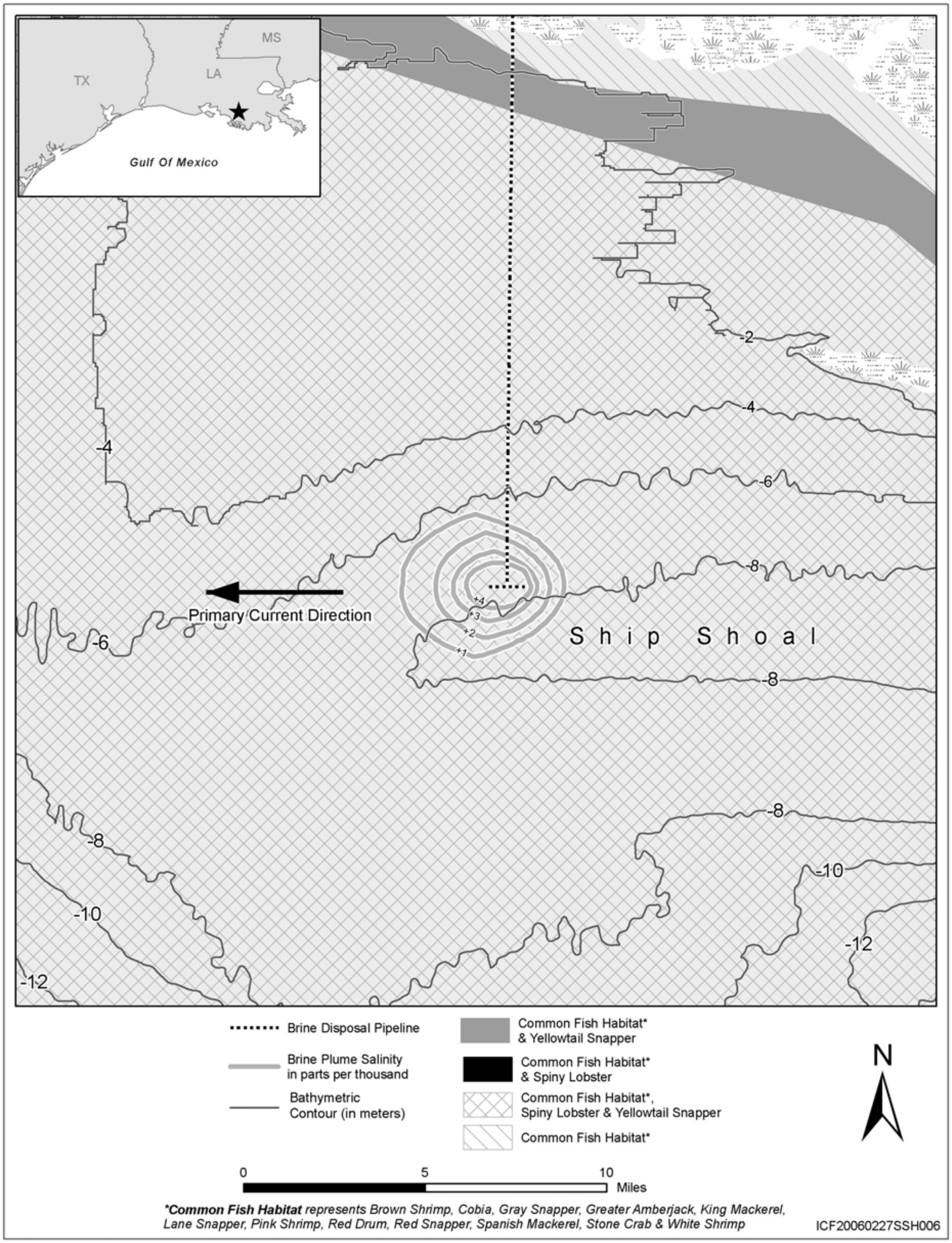

Figure E.5-5: Locations of the Brine Disposal Pipelines and the Modeled Brine Plumes Overlain on Designated EFH for Clovelly