DOE/EA-0401

Environmental Assessment

Strategic Petroleum Reserve Sulphur Mines Decommissioning and Big Hill Expansion

Calcasieu Parish, Louisiana,
and Jefferson County, Texas

January 1990

U.S. Department of Energy

DOE/EA-0401

Environmental Assessment

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January 1990

U.S. Department of Energy
Washington, DC 20585

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United States Government **Department of Energy**

memorandum

DATE: December 22, 1989

REPLY TO ATTN OF: EH-25

SUBJECT: Environmental Assessment (DOE/EA-0401) and Finding of No Significant Impact for the Strategic Petroleum Reserve Sulphur Mines Decommissioning and Big Hill Expansion

TO: Michael R. McElwrath
Acting Assistant Secretary
for Fossil Energy

This is in response to the memorandum of August 7, 1989, from the Director, Office of Strategic Petroleum Reserve, requesting approval of the environmental assessment (EA), and draft finding of no significant impact (FONSI) for the subject proposal. These documents adequately respond to comments provided previously by the Office of NEPA Project Assistance.

The Office of Environment, Safety and Health has reviewed these documents in accordance with our responsibilities under the Department of Energy Order 5440.1C regarding compliance with the National Environmental Policy Act (NEPA). The EA adequately addresses the environmental effects associated with the proposal to decommission the Sulphur Mines facility and expand the storage capacity of the Big Hill facility.

Based on my staff's review and analysis and their recommendations, and after consultation with the Office of General Counsel, I have determined that the EA is adequate for publication. The proposal does not constitute a major federal action significantly affecting the quality of the human environment, within the meaning of NEPA. Therefore, an environmental impact statement is not required. This determination is explained in the attached FONSI.

It is not necessary to have the FONSI published in the Federal Register since this is not an action with effects of national concern. However, the local public should be notified of the availability of the EA and FONSI in accordance with paragraph 1506.6 (b) (3) of the Council on Environmental Quality NEPA regulations. Please send five (5) copies of the EA to the Office of NEPA Project Assistance along with a record of distribution of the EA and FONSI.

Peter N. Brush
Acting Assistant Secretary
Environment, Safety and Health

Attachment

FINDING OF NO SIGNIFICANT IMPACT,

STRATEGIC PETROLEUM RESERVE SULPHUR MINES

DECOMMISSIONING AND BIG HILL EXPANSION

SUMMARY: The Department of Energy (DOE) has prepared an environmental assessment (EA), DOE/EA-0401, for decommissioning the Strategic Petroleum Reserve (SPR) Sulphur Mines facility and replacing its crude oil storage capacity by expanding the storage capacity at the SPR Big Hill and SPR Bayou Choctaw facilities. Based on the analyses in the EA, DOE has determined that the proposed action is not a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA). Therefore, the preparation of an environmental impact statement (EIS) is not required and the Department is issuing this Finding of No Significant Impact (FONSI).

Copies of the EA are available from:

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PROPOSED ACTION:

Sulphur Mines is one of six underground storage facilities in the SPR. Located in Calcasieu Parish, Louisiana, about 15 miles west of Lake Charles, Sulphur Mines contains 26 million barrels (MMB) of crude oil storage capacity in three salt dome caverns. Development and crude oil fill of this facility were completed in 1983; it is currently in an operational standby mode.

It is proposed that Sulphur Mines be decommissioned and its capacity be replaced by enlarging existing caverns at the SPR Big Hill facility located in Jefferson County, Texas, and the SPR Bayou Choctaw facility located in Iberville Parish, Louisiana. The capacity of the 140-MMB Big Hill facility would be increased by 20-22 MMB by enlarging each of the fourteen 10-MMB cavern by 1.4-1.6 MMB. The capacity of the 66-MMB Bayou Choctaw facility would be enlarged by 4-6 MMB. Reasons for decommissioning Sulphur Mines include high operating costs per barrel of oil stored, costly improvements needed to meet fire protection and security standards, and limited drawdown capabilities.

Decommissioning of Sulphur Mines refers to the actions by the Federal Government needed to remove the facility from service as a DOE-owned crude oil storage facility. The nature and extent of these actions and their impacts will be determined by the future use of the facility. These are explained in section 1.2 of the EA.

It is DOE's intent to search for buyers for all or part of the Sulphur Mines storage facility. The most likely commercial uses of the site would be brine production for salt or chemical feedstock; operating storage for crude oil or other hydrocarbons; or both. It is also possible that Sulphur Mines could be sold to a foreign national oil company for static strategic storage of crude oil comparable to DOE's current use. If DOE is unable to find a buyer, Sulphur Mines would be turned over to the General Services Administration. Each of these possibilities could involve a different set of conversion and decommissioning activities and environmental impacts.

Expansion of Big Hill and Bayou Choctaw caverns to replace Sulphur Mines' storage capacity would be accomplished without modifying any of the sites' process flow rates (that is, water consumption, brine discharge, and oil fill and drawdown rates, all of which have been assessed in previous NEPA review documents). These processes are described in section 1.1 of the EA. The caverns that are proposed for this action are still under active development as part of the authorized 750-MMB program. They would be enlarged relative to current design specifications simply by extending leaching duration. Surface development, such as well pads, brine ponds, physical structures, pumps, piping, electric power, and measurement and control systems, would not change under the proposed expansion.

ENVIRONMENTAL IMPACTS:

In order to assess the upper bound of potential impacts from decommissioning Sulphur Mines, the EA is focused on the maximum potential activity: removing all oil, structures, and equipment and restoring the site to pre-SPR conditions. Potential incremental impacts from operating Big Hill at a storage capacity up to 22 MMB greater than the current planned capacity of 140 MMB are also analyzed.

Expanded to 72 MMB, Bayou Choctaw would still be within the parameters of a previous EIS that addressed the construction and operation of a 94-MMB facility (DOE/EIS-0024, 1978). Since the publication of that EIS, the underlying assumptions and calculations have remained valid; there are no new environmental concerns, circumstances, or relevant information bearing on the proposed action or its impacts. Therefore, further assessment in the EA of the Bayou Choctaw expansion element of the proposed action is not required.

Sulphur Mines

The geological impacts of decommissioning Sulphur Mines would principally involve cavern creep closure (i.e., the normal inward plastic flow of salt) and its contribution to local subsidence. Under the worst case scenario of facility demolition and site restoration, the wells would be plugged with concrete which would slow subsidence by preventing the release of brine pressure which increases with creep closure. This would ultimately

cause substantial pressure to develop in the cavern, which may result in leakage around the well casing and loss of brine to the caprock. From the caprock, the brine could leak into an existing salt water aquifer, thereby resulting in minimal impact to the environment.

Other potential impacts on the quality of groundwater and surface water would also be minimal. Minor temporary surface water impacts could occur during demolition and dismantling but are not expected to be significant if best management practices are employed. Any brine remaining in the surface brine ponds would be injected into brine disposal wells, and the brine ponds would be closed in accordance with regulations and permit conditions. Crude oil pipelines unique to this facility would be emptied, cleaned, and capped; pipeline water crossing would be decommissioned as required by permit condition.

Air emissions from fugitive dust generation and from equipment and vehicle operation would be temporary and negligible. Ecological, noise, socioeconomic, cultural resource, and solid waste effects were also evaluated and found to be negligible. There would be no involvement of floodplains, wetlands, or prime farmland.

Big Hill

At Big Hill, the nature and extent of surface activity, daily emissions and effluents, and daily water use would not change under the

proposed action. Consequently, potential environmental impacts would be limited to air and water quality impacts resulting from incremental capacity development and operation. The principal effect of the expansion would be to extend the duration by 15% during which operating emissions and effluents and water use would occur (which equates to 182 d for leaching, 116 d for fill and refill, and 23 d for drawdown). Because of the larger caverns, the quantity of brine discharged to the Gulf of Mexico annually during standby to relieve pressure caused by creep closure would increase by 15% to about 115,000 bbl.

Increasing the duration of these impacts should not appreciably change the magnitude of the effects. Brine discharge to the marine environment would continue to have no significant adverse effects on water quality or marine life. The impact of water consumption on the water level depression, induced flow, and increased salinity of the Intracoastal Waterway would continue to be negligible. Projected increases in volatile organic compound emissions from each mode of cavern operation would be below levels constituting a major modification to an existing source as defined by the Texas Air Control Board.

ALTERNATIVES CONSIDERED

As an alternative to expanding Big Hill and Bayou Choctaw, DOE could either expand another site or choose to not replace the lost capacity and not expand any site. The former alternative is not preferable because Big Hill and Bayou Choctaw are the only sites under active capacity development; their expansion is less costly and has a lower potential for environmental impacts

than expanding a completed site that is in operational standby. The latter alternative, to not replace lost storage capacity, is unacceptable because it is inconsistent with the programmatic goal of a 750-MMB reserve and congressional directives for providing a secure supply of crude oil in the event of a market disruption.

Under the no-action alternative, DOE would retain Sulphur Mines in its current state of operational standby and the environmental impacts would be the same as currently experienced. Quantities of environmental impacts such as fugitive air emissions, are directly related to throughput and frequency of activity; consequently, they are minimal during static storage of the site standby mode of operation. In the most recent year, there were no brine or oil spills or other adverse environmental impacts from Sulphur Mines. For the no-action case, development of Big Hill and Bayou Choctaw would continue in accordance with current permits and applicable environmental regulations and standards.

DETERMINATION:

Based on the information and analyses in the EA, the Department has determined that decommissioning Sulphur Mines and concomitantly expanding Big Hill and Bayou Choctaw do not constitute a major Federal action significantly

affecting the quality of the human environment within the meaning of NEPA; therefore, the preparation of an environmental impact statement is not required.

Issued in Washington, D.C., this December 22, 1989.

Peter N. Brush
Acting Assistant Secretary
Environment, Safety and Health

SUMMARY AND CONCLUSIONS

Sulphur Mines is one of six underground storage facilities in the U.S. Department of Energy's (DOE) Strategic Petroleum Reserve (SPR). Located in Calcasieu Parish, Louisiana, about 15 miles west of Lake Charles, Sulphur Mines contains 26 million barrels (MMB) of crude oil in three salt dome caverns.

It is proposed that the Sulphur Mines facility be decommissioned and its capacity be replaced by enlarging existing caverns at the SPR Big Hill facility located in Jefferson County, Texas, and the SPR Bayou Choctaw facility located in Iberville Parish, Louisiana. The capacity of the 140-MMB Big Hill facility would be increased by 20–22 MMB by enlarging each of the fourteen 10-MMB caverns by 1.4–1.6 MMB. The capacity of the 66-MMB Bayou Choctaw facility would be enlarged by 4–6 MMB. Reasons for decommissioning Sulphur Mines include high operating costs per barrel of oil stored, costly improvements needed to meet fire protection and security standards, and limited drawdown capabilities.

The expanded capacity at Bayou Choctaw would be within the parameters of a previous environmental impact statement (EIS) that addressed the construction and operation of a 94-MMB facility. Since the publication of that EIS, the underlying assumptions and calculations have remained valid; there are no new environmental concerns, circumstances, or relevant information bearing on the proposed action or its impacts. Therefore, the Bayou Choctaw expansion element of the proposed action is not elaborated upon in this environmental assessment.

Decommissioning of Sulphur Mines refers to the federal actions that would be required to remove the facility from service as a DOE-owned crude oil storage facility. It is DOE's intent to sell all or part of the storage facility. The most likely commercial use of the facility would be either brine production or operating storage for crude oil, natural gas, liquefied petroleum gas, natural gas liquids, or other hydrocarbon products. It is also possible that the facility could continue to be used for static strategic storage of crude oil by a foreign national oil company. Each of these uses could involve a different set of conversion and decommissioning activities and environmental impacts.

If DOE were unable to find a buyer, the facility would be turned over to the General Services Administration. Although the extent of DOE removal and restoration work prior to turnover has not been determined, decommissioning is assumed and evaluated in this EA to include the maximum potential activity: removing all oil, structures, and equipment and restoring the site to pre-SPR conditions.

The geological impacts of decommissioning Sulphur Mines would principally involve cavern creep closure (i.e., the normal inward plastic flow of salt) and its contribution to local subsidence. Subsidence is a natural event that occurs after cavern creep closure. Plugging the wells with cement

would slow subsidence by preventing the release of brine pressure which increases with creep closure. This would ultimately cause substantial pressure to develop in the cavern, which may result in leakage around the well casing and loss of brine to the caprock.

Potential impacts on the quality of groundwater and surface water would be minimal. Minor temporary surface water impacts could occur during demolition and dismantling but are not expected to be significant if best management practices are employed. Any brine remaining in the surface brine ponds would be injected into brine disposal wells, and the brine ponds would be closed in accordance with regulations and permit conditions. Crude oil pipelines unique to this facility would be emptied, cleaned, and capped; pipeline water crossings would be decommissioned as required by permit condition.

Air emissions from fugitive dust generation and from equipment and vehicle operation would be temporary and negligible. Ecological, noise, socioeconomic, cultural resource, and solid waste effects were also evaluated and found to be negligible.

At Big Hill, the nature and extent of surface activity, daily emissions and effluents, and daily water use would not change under the proposed action. Consequently, potential environmental impacts would be limited to air and water quality impacts resulting from incremental capacity development and operation. The principal effect of the expansion would be to extend the duration by 15% during which operating emissions and effluents and water use would occur (which equates to 182 d for leaching, 116 d for fill and refill, and 23 d for drawdown). Because of the larger caverns, the quantity of brine discharged to the Gulf of Mexico annually during standby to relieve pressure caused by creep closure would increase by 15% to about 115,000 bbl.

Existing water use permits for Big Hill specify a maximum volume of water allowable for cavern leaching and for a drawdown cycle. These will require minor modifications to account for the increased water requirements of an expanded capacity. The expansion would not measurably increase surface activity or employment at the site because it would not involve any new wells or surface facilities.

1. PROPOSED ACTION AND ALTERNATIVES

1.1 BACKGROUND

The U.S. Department of Energy (DOE) Strategic Petroleum Reserve (SPR) is designed to reduce the impact of crude oil disruptions and to carry out the obligations of the United States under the International Energy Program. The SPR consists of six underground oil-storage facilities, four in Louisiana and two in Texas; a marine terminal on the Mississippi River at St. James, Louisiana; and an administrative facility in New Orleans (Fig. 1). One facility, Weeks Island, was a conventional room-and-pillar salt mine in a salt dome before DOE converted it to use for oil storage. At the other five storage facilities, crude oil is stored in caverns constructed by solution mining or leaching of salt domes. One of these is the Sulphur Mines facility which is located about 15 miles west of Lake Charles, Louisiana, in Calcasieu Parish.

To leach a cavern, a well is drilled into the salt and concentric tubing strings are suspended down the borehole from a wellhead at the surface. Water pumped down one tubing string dissolves the salt from the borehole wall, and the resulting brine is displaced out through the other tubing string. Approximately 7 bbl of water is required to leach 1 bbl of space, which results in 7 bbl of brine being produced at the surface. Disposal of the brine is either by injection through deep wells into salt water aquifers below potable groundwater supplies or by direct discharge into the marine environment in accordance with the terms of applicable permits.

Cavern development is carefully controlled by DOE to produce the desired size and shape. This is done by regulating water flow, varying the position of the tubing strings, and injecting a quantity of oil which floats on top of the water and blankets the salt roof, protecting it from upward leaching. The cavern development process is monitored by computer and sonar instruments.

To fill a cavern, crude oil is pumped in on top and brine is displaced out from below. Conversely, to draw down a cavern (i.e., remove the oil for distribution) water is injected at the bottom, and oil is displaced out from the top. The introduction of fresh water in the drawdown step results in additional lateral cavern growth. For this reason, DOE established conservative criteria for SPR-mined caverns regarding intercavern spacing and minimum distance from a cavern to the edge of a salt dome.

At Sulphur Mines, DOE acquired five preexisting caverns that had been developed by industry for transient storage of hydrocarbon products or for production of brine as a feedstock for petrochemical manufacturing. As with preexisting caverns acquired from industry at other salt domes, cavern development was not carefully controlled; consequently, the caverns are highly irregular in size, shape, and spacing. Three of the caverns numbered 2, 4, and 5 had coalesced into a single gallery and are referred to as Cavern 2-4-5. However, the Sulphur Mines caverns were

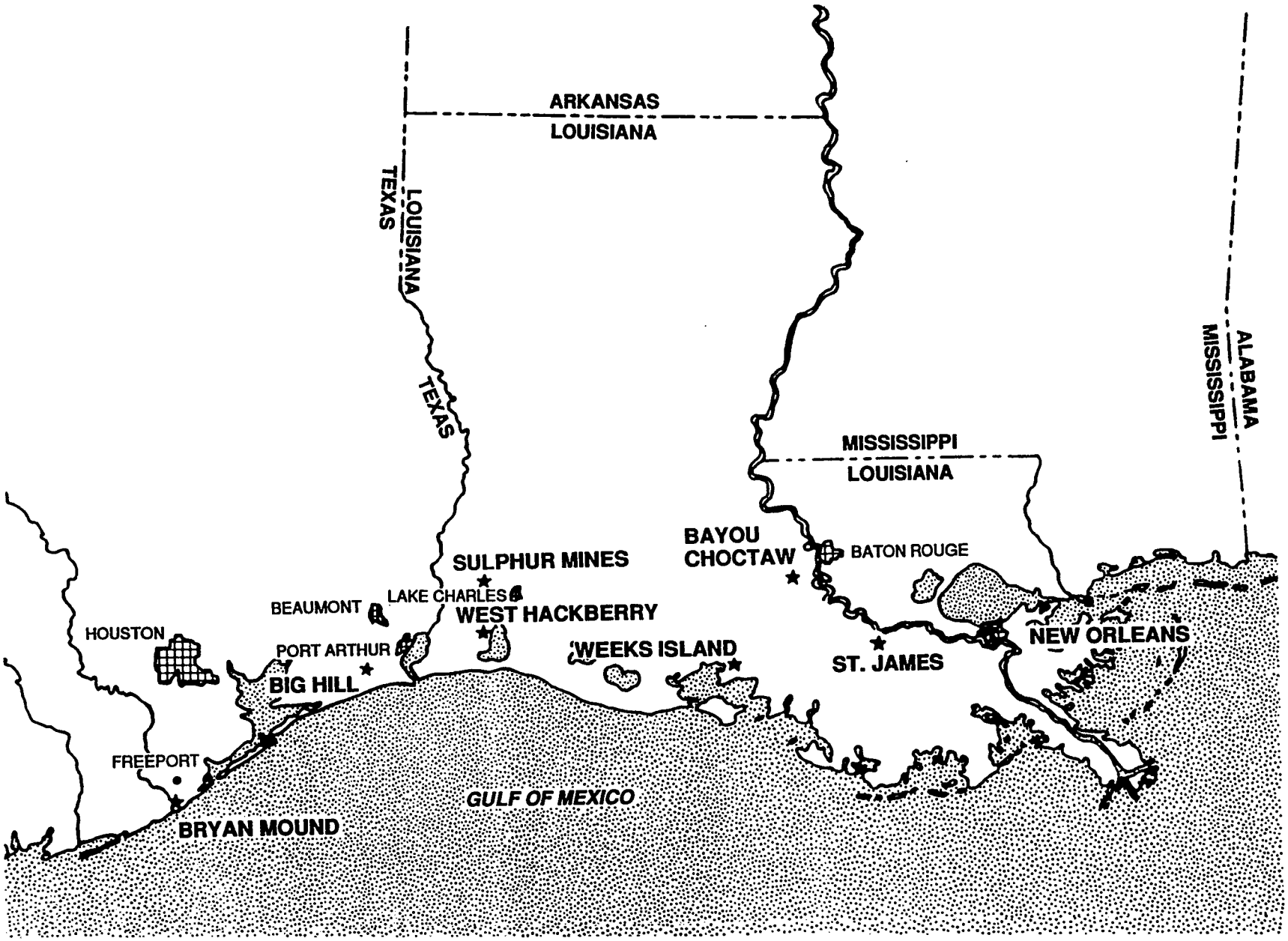

Fig. 1. Locations (★) of the Strategic Petroleum Reserve facilities.

found to be suitable for crude oil storage and were acquired by DOE in 1979 to meet accelerated oil fill schedules.

DOE purchased about 174 acres at Sulphur Mines, which included the preexisting storage caverns with a combined capacity of about 26 million barrels (MMB), and added structures, pumps, piping, and four deep injection wells for brine disposal. In 1983, DOE completed development of the surface facilities and filling of the caverns with oil; since then, the site has been in an operational standby mode. Sulphur Mines presently contains 26 MMB of crude oil with a relatively high sulfur content. Figure 2 illustrates a plan view of the facility and its environs. Construction and operation of Sulphur Mines were addressed in an environmental impact statement (EIS) issued in March 1978 (U.S. Department of Energy 1978a).

In the 1986 SPR Facilities Development Project Plan, DOE included plans to decommission the Sulphur Mines facility. This plan was made public in the 1986 and 1987 SPR annual and quarterly reports to the Congress and the fiscal year 1989 SPR budget request. The reasons for decommissioning Sulphur Mines are: (1) Sulphur Mines' operating costs per barrel are nearly twice those of the least expensive SPR facility, and consolidation of the Sulphur Mines storage capacity at larger SPR facilities is estimated to save about $83 million over 20 years; (2) Sulphur Mines would require $3–5 million for improvements over the next five years to meet DOE fire protection and security standards; (3) the facility's drawdown capability is limited by potential interference with the West Hackberry site with which it shares a distribution pipeline; (4) Cavern 2-4-5, which contains 13 MMB of crude oil, requires a nitrogen blanket to prevent oil loss from around the borehole casing; and (5) the facility is considered by DOE to be limited to one drawdown cycle because the caverns are located close to each other or to the edge of the salt dome, and multiple drawdowns with fresh water could compromise cavern integrity.

1.2 PROPOSED ACTION AND ALTERNATIVES

The proposed action addressed in this environmental assessment (EA) is the decommissioning of the SPR Sulphur Mines facility and the replacement of its storage capacity by enlarging existing caverns at the 140-MMB Big Hill facility under development in Jefferson County, Texas, and the 66-MMB Bayou Choctaw facility under development in Iberville Parish, Louisiana (Fig. 1). The loss of Sulphur Mines' 26 MMB of storage capacity would be made up by enlarging the 14 caverns of the Big Hill facility by 20–22 MMB and by enlarging one cavern at the Bayou Choctaw facility by 4–6 MMB. The two parts of the action are interdependent; storage capacity at Big Hill and Bayou Choctaw would not be expanded except to replace Sulphur Mines' capacity lost by decommissioning. Each part of the proposed action, and reasonable alternatives, are described below.

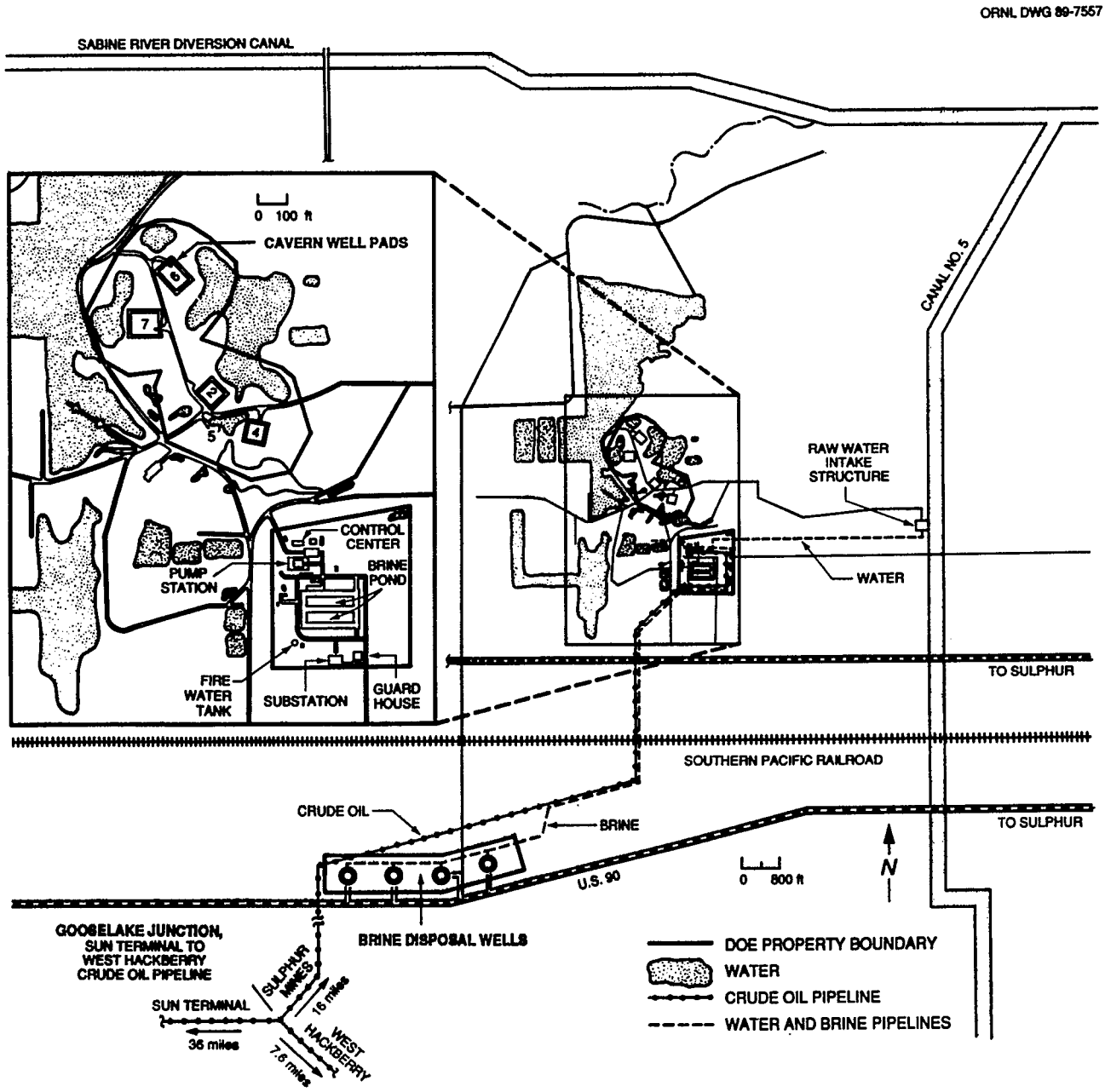

Fig. 2. Map of the SPR Sulphur Mines facility.

Sulphur Mines

It is DOE's intent to search for buyers for all or part of the Sulphur Mines storage facility. The most likely commercial uses of the site would be brine production for salt or chemical feed-stock or for use as an operating storage facility for crude oil, natural gas, liquefied petroleum gas, natural gas liquids, or other hydrocarbon products such as ethylene and propylene. A buyer might have a mixed-use plan for Sulphur Mines; for example, new caverns could be leached at a deeper interval of the salt dome both for producing brine and for developing storage capacity. It is also possible that Sulphur Mines could be of value to a foreign national oil company for static strategic storage of crude oil comparable to DOE's current use.

Other potential commercial uses of salt domes are either not considered viable for Sulphur Mines or are restricted by law. Louisiana prohibits the treatment, storage, or disposal of hazardous waste or radioactive waste in salt domes or salt mines. Off-peak storage of compressed air for driving electric power generator turbines during peak demand is an experimental technology which has not yet been successfully used in the United States; the requisite business factors for exploiting this technology do not exist at Sulphur Mines.

Both sulfur and oil have been extensively produced from Sulphur Mines in the past. Nine million tons of sulfur were extracted from the caprock by the Frasch steam injection process until 1924. Subsequent attempts to resume production failed because of low yields. Crude oil is still produced around the flanks of the dome. Further drilling above the dome is unlikely because of the volume of material that has been extracted from the cap rock. Similarly, rock salt production by conventional room-and-pillar mining is no longer feasible because of the past Frasch sulfur mining.

Decommissioning of Sulphur Mines refers to the federal actions that are needed to remove the facility from service as a DOE-owned crude oil storage facility. The nature and extent of these actions and their impacts will be determined by the future use of the facility.

If the facility were sold to a foreign national oil company for static strategic storage of crude oil, little more than a change in ownership would result. The oil currently in storage could be either included in the sale and left in place or withdrawn and transported away from Sulphur Mines and replaced by the new owner with new oil. The latter case would correspond to a drawdown and distribution of Sulphur Mines that have been addressed in previous SPR documents (U.S. Department of Energy 1978a; U.S. Department of Energy 1988) and that are incorporated in the published assessments of hydrocarbon emissions and oil spill risk. The assumptions and calculations underlying these assessments are still valid; there are no new environmental concerns, circumstances, or relevant information bearing on a drawdown and distribution of crude oil from Sulphur Mines or any other SPR storage facility. The long-term impacts of the new use would not be significantly different from the status quo.

If the facility were to be converted to a commercial operating storage facility, the conversion activities associated with decommissioning would be minor, such as the removal of some pumps, valves, and related equipment and systems not needed for the new use but usable at other SPR facilities. However, changes in the site under new ownership could be substantial and could result in significant differences in long-term effects from the status quo.

An operating storage facility would probably use saturated brine as a working displacement fluid to minimize cavern growth and maximize the useful life of the facility. The brine would be permanently retained either in a dedicated cavern or in the surface brine ponds.

Intermittent brine deficits and surpluses could be expected according to the business cycle. During extended periods of inventory buildup, a brine surplus might occur which, if it exceeded the capacity of the brine ponds, would require disposal by the brine injection wells. Conversely, a brine shortage could occur during an extended period of drawdown. Using fresh water to make up the deficit of displacement fluid would cause undesirable leaching of the storage caverns, thereby shortening the useful life of the facility.

The adverse effects of brine shortages and surpluses on the life of the facility would be minimized by limiting the operating volumes to the capacity of the brine reservoirs. To operate the smallest Sulphur Mines cavern to its maximum capacity would require a brine reservoir of 6 MMB. Typical industrial practice would use brine ponds much smaller than that but considerably larger than the existing capacity of 200,000 bbl.

In general, the environmental impacts resulting from use of Sulphur Mines as an operating storage facility will be greater than static storage because of the greater frequency of activity. Greater activity means an unavoidable increase in air emissions and an increased risk of oil spills, brine spills, and subsurface brine leaks into groundwater. When using the facility for operating storage of gases, storage and drawdown might be accomplished without the need for a displacement fluid. Although there would be no oil spill risk, air emissions would likely increase.

If the buyer of Sulphur Mines does not intend to use the caverns, DOE would plug the cavern wells in accordance with state regulations and transfer any equipment that the buyer did not purchase to other SPR facilities. A buyer of the brine disposal wells could use them only for their currently permitted use—disposal of brine. Conversion of the wells for disposal of other types of substances is prohibited by law.

Finally, if DOE is unable to find a buyer for the site, Sulphur Mines would be turned over to the General Services Administration. It has not been determined to what extent DOE would remove facilities and restore the site as part of its decommissioning. For the purposes of this EA, however, decommissioning is assumed to include the maximum potential activity: (1) removing SPR

crude oil from the site; (2) transporting the oil to Big Hill via existing pipelines; (3) plugging and abandoning the cavern wells and brine disposal wells in accordance with permit requirements; (4) conducting activities required by permit for removing pipelines from active service; (5) removing all equipment, structures, and on-site piping; and (6) restoring preexisting site contours and establishing vegetation where necessary. Decommissioning is expected to begin in October 1991 and to be completed by November 1992.

Under the no-action alternative, DOE would keep Sulphur Mines on operational standby and the environmental impacts would be the same kind and degree currently experienced and described in annual environmental monitoring reports. Air quality impacts are essentially fugitive volatile organic compound (VOC) emissions that arise from the gaskets, seals, and flanges of valves, meters, pumps, and tanks as well as from the brine ponds. The quantity of VOC emissions is a function of crude oil throughput and consequently is minimal during static storage of the site standby mode of operation. Permit compliance monitoring is conducted for biochemical oxygen demand, pH, and total suspended solids of sewage treatment plant effluent and for oil and grease and pH of stormwater discharge from well pads and pump pads. In addition, DOE monitors surface water quality at seven points about the facility and samples the brine pond underdrain system to verify the integrity of the brine pond liner. The most recent annual monitoring report indicates that there were no adverse environmental impacts from Sulphur Mines during 1988. There were no brine or oil spills during the year and the facility was in compliance with all applicable environmental regulations and standards (Boeing Petroleum Services 1989).

Big Hill

Current capacity development at Big Hill includes leaching fourteen 10-MMB crude oil storage caverns to provide a combined storage capacity of about 140 MMB. As currently designed, each complete drawdown cycle increases the total cavern volume by about 15% because of leaching by the displacement water. Because the maximum combined capacity of the 14 caverns is fixed by design at about 282 MMB, the current cavern size of 10 MMB each will permit 5 complete drawdown cycles.

In this action, Big Hill would be expanded to 160–162 MMB-capacity by enlarging each of the 14 caverns by 1.4–1.6 MMB. This would produce caverns slightly wider but no deeper than those planned for 140 MMB of oil storage. Because the allowable maximum capacity of the oil storage caverns at the end of the final drawdown cycle would remain unchanged (~282 MMB), the number of drawdown cycles for the life of the facility would be reduced to four. The proposed action would not change any of Big Hill's process flow rates assessed previously; that is, water consumption, brine discharge, and oil fill and drawdown rates would remain the same (U.S.

Department of Energy 1981). Increasing the oil storage capacity from 140 MMB to 162 MMB without changing the flow rates means that more time will be required for leaching, filling, drawdown and refill, as summarized in Table 1. The surface development (e.g., physical structures, pumps, piping) would not change under the proposed expansion.

As an alternative to expanding the Big Hill and Bayou Choctaw facilities, DOE could choose to (1) expand another site or (2) not expand any of the sites. The first option is not considered by DOE to be reasonable. Big Hill and Bayou Choctaw are the only sites under active capacity development; their expansion is less costly and has a lower potential for adverse environmental effects than expanding a completed site that is in operational standby. Loss of the storage capacity is not acceptable, because it is not consistent with the programmatic goal of a 750-MMB reserve and congressional directives for providing a secure supply of crude oil in the event of an interruption in crude oil imports. The no-action alternative would result in continued development of Big Hill in accordance with applicable environmental regulations and standards. (Boeing Petroleum Services 1989).

Table 1. Change in duration of Big Hill development and operational phases due to expanded storage capacity

Mode	Duration for 140 MMB (d)	Duration for 162 MMB (d)
Leach	1105	1287
Fill/refill	805	921
Drawdown	150	173

1.3 SCOPE OF THIS ASSESSMENT

The following elements of the proposed action have already been addressed in other SPR EISs and EAs and will be incorporated by reference into this EA: enlarging a single storage cavern at Bayou Choctaw by up to 6 MMB (U.S. Federal Energy Administration 1976, U.S. Department of Energy 1978c), transferring oil through existing pipelines from Sulphur Mines to Big Hill or to a distribution point (U.S. Department of Energy 1981, 1978a), and drawdown of Sulphur Mines (U.S. Department of Energy 1978a, 1988). These documents are still valid. There are no new environmental concerns or circumstances associated with these facilities and no significant new information regarding environmental impacts has been identified during the current review that would warrant reanalysis of any potential environmental impacts.

This EA analyzes the potential environmental impacts of the remaining elements of the proposed action (i.e., Sulphur Mines decommissioning and Bill Hill expansion) in the following areas: geology, water use and quality, air quality, land use, noise, ecology, and socioeconomics. To provide an upper bound of potential effects from alternatives for decommissioning Sulphur Mines, this analysis focuses on decommissioning by restoration. Potential incremental impacts from operating Big Hill at a storage capacity up to 22 MMB greater than the current planned capacity of 140 MMB are also analyzed. Some permit modifications that may be needed because of these changes are highlighted in Appendix B. Potential effects from expanding Big Hill would be the same regardless of the nature and extent of Sulphur Mines decommissioning actions because a need exists for increased storage volume to meet the storage capacity of 750 MMB authorized for the program. Both (1) water consumption and brine disposal associated with leaching additional crude oil storage capacity at Big Hill and (2) socioeconomic effects from the loss of expenditures in the Sulphur Mines area are the principal potential environmental impacts that would be associated with the decommissioning action.

2. ENVIRONMENTAL IMPACTS

This section describes the potential environmental impacts associated with decommissioning Sulphur Mines and expanding Big Hill. For each resource area, potential effects are discussed for each facility as appropriate.

2.1 GEOLOGY

Potential geological impacts at Sulphur Mines are principally related to surface subsidence. The subsidence caused by decommissioning the facility should be less than that occurring with operational caverns. Potential geological impacts at Big Hill are negligible because the maximum cavern size at the end of all planned drawdown cycles has not increased over that previously assessed in the site EIS (U.S. Department of Energy 1981).

Extraction of about 156 million ft^3 of sulfur has caused more than 20 ft of surface subsidence at the Sulphur Mines site since the early 1900s. This subsidence was caused primarily by the sagging of unsupported cap rock into the empty spaces remaining after the sulfur was removed (Fig. 3). Subsequent cavern development in the salt by private industry for brine production and hydrocarbon storage probably added to the surface subsidence because once the caverns were created, the salt began its plastic flow to close up the caverns. This process, known as creep closure, is abated somewhat in a cavern sealed under pressure or in one that contains a liquid such as brine. Thus, when DOE acquired the site for crude oil storage, the two principal mechanisms causing subsidence were already in place: continuing collapse of voids left by sulfur extraction and continuing creep closure of the caverns. Subsidence above the Sulphur Mines crude oil storage caverns continues to this date at a rate of about 0.1 ft/year (Sandia National Laboratories 1981; Goin and Neal 1988).

The Sulphur Mines caverns currently contain crude oil and some brine that is bled off to relieve pressure caused by creep closure; for example, at Cavern 6 creep closure forces about 20,800 bbl/year of brine up the well casings to the surface (Beasley, Wallace, and Preece 1986). A small amount of surface subsidence continues because of removal of brine forced up the well casing from creep closure. Assuming as a worst case that the volume of brine removed from the well is immediately translated to subsidence of the ground surface above the well, then about 15% of the annual surface subsidence rate is due to creep closure, and the remainder is caused by previous sulfur mining.

Under the assumed decommissioning scenario, the crude oil now stored in the caverns would be removed by displacement with water that eventually would form brine in the caverns. The cavern wells at Sulphur Mines would be plugged with concrete in accordance with Louisiana Department of Natural Resources requirements to prevent brine leakage through the casing as creep

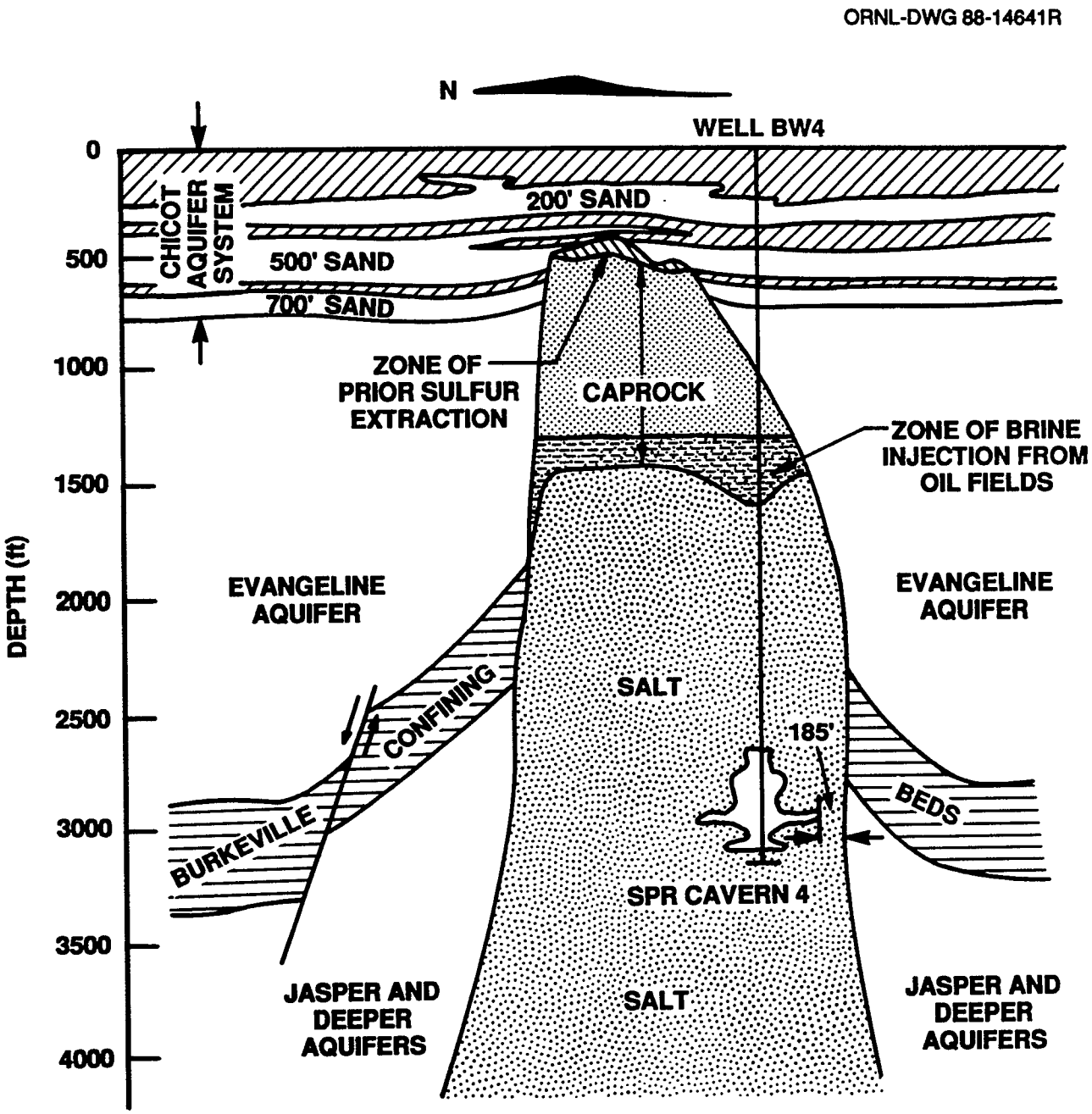

Fig. 3. North-South geologic cross section for the vicinity of the Sulphur Mines salt dome, showing SPR storage cavern.

closure continues. In addition, production and injection tubes would be removed from the wells, and the hollow interiors of well casings would be cemented along their entire length to further retard the movement of brine from caverns. In the short term, subsidence due to creep closure would be minimized by sealing the caverns, because pressure would build up in the plugged caverns to eventually slow down creep closure, thereby reducing its contribution to total surface subsidence. Cavern plugging should not appreciably affect subsidence at the site because of the effects of previous sulfur mining.

After the caverns are sealed as part of decommissioning, creep closure is expected to continue, and will eventually cause substantial pressures to develop in the caverns. This pressure could be relieved by one of two mechanisms that allow brine to leak out of the caverns: (1) leakage around the well casing, which is the most likely, and (2) fracture of the salt walls or ceiling of the cavern. Leakage rates under either mechanism are expected to be substantially less than those occurring under the present situation because of high frictional resistance around the well casing and because the plastic nature of the salt would tend to seal any fractures that develop. Brine leakage would increase the rate of subsidence over that expected after the wells are first plugged but would not exceed the contribution of creep closure to surface subsidence observed under the present situation. Potential effects of brine leakage on groundwater are discussed in the next section.

2.2 WATER

2.2.1 Groundwater

Groundwater impacts would be confined to Sulphur Mines. Developing the Big Hill caverns was not expected to result in change to groundwater resources (U.S. Department of Energy 1978c); the proposed expansion of the Big Hill caverns should not change this conclusion and, therefore, is not evaluated in this EA. Potential effects on groundwater resources of the operation of Big Hill were found to be minor and were primarily related to the nature and extent of surface activity (U.S. Department of Energy 1981); since surface activity at Big Hill does not change under the proposed expansion, the effects are not further evaluated in this EA.

The Chicot aquifer system is the principal groundwater resource in southwestern Louisiana. The main water-bearing units of the Chicot aquifer system are referred to as the 200-, 500-, and 700-ft sands (Fig. 3). In Calcasieu Parish, the 200- and 700-ft sands each provide about 13% of the groundwater supplies, and the 500-ft sand provides 74%. The 200-ft sand is used only for private domestic and irrigation water supplies, whereas the deeper sands are sources of industrial and municipal water supplies. Aquifers deeper than the Chicot are generally too saline for domestic use. The Evangeline aquifer, which is hydrologically isolated from the Chicot aquifer by a thin but persistent shale unit, is moderately saline (3,000 to 10,000 ppm) but may contain water suitable for

industrial use. The Jasper aquifer is highly saline (approximately 100,000 ppm). Brine displaced by oil during the initial filling of the storage caverns at Sulphur Mines was injected into the Jasper aquifer. Residual brine remaining in the storage caverns after the initial fill is bled off to relieve pressure buildup induced by creep closure, and is injected into the Jasper aquifer.

Carrying out the well plugging and abandoning procedures and cementing in the well casings should result in minor short-term effects to groundwater resources. In the long term, the brine remaining in the sealed caverns could affect groundwater resources in the unlikely event of a leak caused by fracture (Sect. 2.1). Should hydrofracturing occur, the brine would probably leak slowly through the cavern roof toward the overlying cap rock, or through the edge of the salt at the cavern wall. In any case, the brine would leak into an existing salt-water aquifer, thereby resulting in minimal impact to the environment.

2.2.2 Surface Water

Sulphur Mines

Hydrology and surface water quality in the area of the Sulphur Mines site are described in the site EIS (U.S. Department of Energy 1978a). Undisturbed streams in the area typically have soft water; neutral hydrogen-ion activity (pH); and low levels of calcium and magnesium bicarbonates, sodium chloride, sulfates, and silica. Recent monitoring (Boeing Petroleum Services 1989) indicates that SPR activities have had little effect on surface water quality.

In the long term, decommissioning would eliminate the minor surface water quality impacts associated with site operation. Carrying out decommissioning would entail the demolition or removal of equipment and most structures. Much of this material is salvageable and could be removed from the site without causing water quality impacts. Earth-moving activities and revegetation would follow best management practices to control erosion, sedimentation, and chemical contamination of surface waters. Decommissioning would also eliminate the potential for surface water impacts from crude oil spills, which were evaluated in the site EIS and found to be minor with appropriate mitigation.

Regulatory requirements would also limit the potential for decommissioning to affect surface waters. The brine ponds would be closed in accordance with the requirements of Louisiana Statewide Order 29-B, Section XV (Louisiana Department of Natural Resources 1987), which include pond closure techniques designed to protect soil, surface water, and groundwater. Crude oil pipelines would be emptied of oil, cleaned to remove residual oil on the pipeline walls, and capped. Below-ground pipelines would be left in place. Pipeline water crossings would be abandoned in accordance with permit conditions that require that the area of the crossing be restored to a condition satisfactory to the District Engineer (Appendix B). In addition, pipelines crossing waterways would be modified to minimize the chance that they could become a future hazard to

navigation. These actions could include filling the pipelines with cement or filling them with a substance to encourage oxidation and decomposition of the pipelines.

Big Hill

Natural and man-made bodies of water near the Big Hill site are described in the previous EISs for the facility (U.S. Department of Energy 1978c; U.S. Department of Energy 1981). Raw water for Big Hill is obtained from the Intracoastal Waterway. Principal components of the wastewater are the brine, stormwater, and treated sewage. Brine, which is discharged to the Gulf of Mexico under permit conditions, is the only wastewater component that would be affected by the proposed action. Water intake and wastewater discharge are accomplished in accordance with permit conditions (Appendix B). Leaching Big Hill caverns began in October 1987; a water quality and discharge monitoring program is in place to monitor the impacts of wastewater discharge on the environment.

Because expansion of Big Hill would not entail new surface activity, it would not therefore measurably affect the quantity or quality of stormwater runoff or treated sewage. Due to the larger capacity caverns, leach and drawdown would require more water, and leach, fill, and refill would produce more brine for discharge. Because the daily flow rates for these activities would not change, the time required to complete the various modes at an expanded capacity would increase about 15% for each mode. Table 2 summarizes this information. Withdrawing water from the Intracoastal Waterway is expected to result in only minor impacts: depression of water levels by a maximum of 0.04 ft near the withdrawal point, decreasing existing flow rates by a maximum of 0.06 ft/s, and increasing salinity by less than 1000 ppm (U.S. Department of Energy 1981). Increasing the time over which these impacts occur should not appreciably change the magnitudes of the effects.

Table 2. Projected changes in duration of water use and brine discharge for Big Hill after expansion of site capacity

Mode	Water intake, daily rate*	Brine discharge, daily rate*	Additional days due to expansion
Leach	31 Mgd	1.7×10^6 bbl/d	182
Fill/refill	--	1.7×10^6 bbl/d	116
Drawdown	28 Mgd	--	23

*Maximum levels specified in permits.

Minor modifications to the water withdrawal permit may be needed because the permit specifies a total volume of water to be withdrawn for cavern leaching (144,350 acre-ft total for

50 months, not to exceed 34,644 acre-ft per year). Leaching the larger caverns is not expected to take longer than 50 months (Table 1), but it is estimated to require a total water volume about 1% greater than the total volume specified in the permit. For drawdown, the permit specifies a total water use of 94,730 acre-ft for five withdrawal cycles (18,946 acre-ft to be used per cycle). Under the proposed expansion, the volume of water needed per drawdown cycle would be about 10% larger than the value specified in the permit; however, since the number of drawdown cycles would be reduced from five to four as a result of the larger caverns, the total water use estimated for all drawdown cycles would not exceed permit levels.

The proposed expansion would also increase the time required for brine disposal during leaching and filling. Discharging brine to the Gulf of Mexico in accordance with permit conditions over the additional time should result in no significant adverse water quality effects, nor should it warrant permit modification.

The larger caverns would increase the brine removal and discharge rates during operational standby to relieve cavern pressure caused by creep closure. At a storage capacity of 140 MMB, about 100,000 bbl of brine would need to be discharged to the Gulf of Mexico per year due to cavern closure; at a storage capacity of 162 MMB, about 115,000 bbl of brine would need to be discharged per year. This small increase in discharge is a fraction of the annual permitted brine discharge rates (Table 2), and no significant adverse effects should result from the increase.

Crude oil distribution has the potential to affect surface water (and groundwater) resources from accidents resulting in oil spills; however, the Big Hill expansion would not appreciably change either the probabilities or consequences of such events. Rough estimates of pipeline accident probabilities are on the order of 5×10^{-4} events per mile per year (U.S. Department of Energy 1988). The estimated accident frequency per drawdown, assuming a drawdown duration of 0.41 years for 140-MMB storage and 0.47 years for 162-MMB storage, would be about 2×10^{-4} events per drawdown per mile under either storage capacity, and therefore does not significantly change due to the proposed action. Furthermore, the accident probability for the life of the facility would not change appreciably because the number of planned drawdowns would decrease from five to four. The potential effects from such an accident should not change either because the two principal parameters affecting the quantity of oil that could be spilled–the daily flow rate and the response time to stop flow in the event of a leak–do not change under the proposed expansion.

2.3 AIR QUALITY

Minor air quality impacts would result from the proposed action through the restoration of Sulphur Mines and through the development and operation of Big Hill at the expanded capacity.

Sulphur Mines

Decommissioning Sulphur Mines would entail demolition and dismantlement activities that emit particulate matter, nitrogen oxides, and volatile organic compounds (VOCs) from operation of construction equipment and motor vehicles. No friable asbestos or other hazardous air pollutants are expected to be emitted during decommissioning. The level and duration of activities generating air pollutants would be no greater than those for site construction, which, through ambient air quality modeling, were shown to not cause or contribute to violation of air pollutant levels specified by standards or regulations (U.S. Department of Energy 1978a). Also, federal regulations would categorize air emissions from restoration as temporary and would not require air quality impact analysis [40 CFR Pt. 52.21(i)(6)]. Consequently, restoration is expected to result in only minor air quality impacts because of their small magnitude, temporary nature, and erratic occurrence over a large area. Offsetting the temporary emissions from demolition and dismantlement would be the elimination of long-term emissions during standby, which are primarily VOCs at less than 1 ton per year from evaporative and fugitive losses and minor emissions of pollutants listed above from vehicles used on-site (Louisiana Department of Environmental Quality 1984).

Big Hill

The proposed action would not increase surface disturbance or construction activity at the Big Hill site; therefore, it would not change emissions from equipment or vehicles. The proposed action would, however, result in small increases in emissions of VOCs during the following development and operational modes because of the additional 22 MMB of oil stored at the site: brine discharge during leaching and initial cavern filling; surge tank emissions during drawdown; brine discharge when the caverns are refilled after drawdown; and, when the site is in operational standby mode, brine discharge to relieve pressure built up by creep closure (Sect. 2.1). Because the daily process rates and flow rates for Big Hill would not change due to the expansion, the daily estimated emissions from each of these modes would not change either. Due to the expanded capacity, however, the air emissions would occur over an extended number of days (Table 3) that reflect a 15% increase in the duration of the various modes.

In addition to the information shown in Table 3, the expansion in capacity would slightly increase VOC emissions with the site in operational standby mode because the larger caverns would require that more brine be discharged to relieve pressure caused by the tendency of the caverns to close due to creep closure (see Sect. 2.1). The approximate 15% increase in brine discharge (Sect. 2.2.2) would increase the .04 tons per year of VOC emissions by about .006 tons per year.

The bulk of the incremental increases in VOC emissions at the Big Hill site due to the expanded storage capacity would not be continuous over the life of the facility and would be

Table 3. Projected change in duration of Big Hill VOC air emissions during development and operation due to expanded storage capacity

Mode	Estimated daily VOC emissions (tons)	Additional days emissions would occur
Leach	0.05	182
Fill	0.04	116
Drawdown	0.06	23
Refill	0.07	116

associated with site development and operation of the site during a drawdown. The changes in VOC emissions are not likely to measurably affect ozone levels because they represent negligible increases (<0.1%) to the daily VOC emission rates allowed in Jefferson County by air quality permits for existing facilities (Texas Air Control Board 1988). Also, because projected increases in VOC emissions from each mode of cavern operation are less than 40 tons per year, they are, therefore, below levels constituting a major modification to an existing source as defined in regulations enforced by the Texas Air Control Board (Texas Administrative Code (TAC), Title 31, Chap. 101).

2.4 LAND USE

Current land use in the vicinity of the Sulphur Mines site is primarily industrial and includes oil production, brine production, and hydrocarbon storage (Sandia National Laboratories 1981). Surface oil field facilities in the Sulphur Mines vicinity include pipelines and storage tanks. Subsurface features include abandoned oil wells near the flanks of the dome and abandoned sulfur production wells in the cap rock overlying the dome. As discussed in Sect. 1.2, the more likely candidates for future use, storage of crude oil or hydrocarbon products, are very similar to the current activities and would therefore constitute a negligible change in the use of the land. If these types of activities are not conducted in the future at Sulphur Mines, and if the site is restored, the change in land use would be minor because the site was used for industrial purposes at the time of DOE acquisition. The proposed Big Hill expansion does not constitute a change in current use, so no land use impacts should occur at Big Hill.

Little potential exists for the proposed action to affect sensitive land use such as prime farmlands, floodplains, or wetlands at Sulphur Mines. No prime or unique farmlands occur at the facility (Appendix A), so the potential for sensitive land use impacts is minimal. The facility is not located within the 100-year floodplain (U.S. Federal Emergency Management Agency 1988). Subsidence associated with past sulfur mining, particularly in the center of the facility, permits

standing water to accumulate in places during the spring rains or following other heavy rains. Although bottomlands occur around the dome periphery (U.S. Department of Energy 1978a), none would be affected by decommissioning.

2.5 NOISE

Under the proposed action, the operation of heavy equipment has the potential to cause noise impacts at the Sulphur Mines site; the operation of pumps and other equipment over a longer period may cause noise impacts at the Big Hill site.

Sulphur Mines

Demolition and dismantlement activities associated with complete restoration would involve operation of heavy equipment with noise levels ranging from 81 to 88 dB on the A-weighted scale [dB(A)]* at 50 ft for the following equipment: air compressor, backhoe, crane, dozer, grader, and truck. Active use of this equipment should total about 2 months over the 1-year decommissioning. Noise levels from equipment operation at the nearest residential areas, which are about 4 miles from the site, would be at or near background levels (with an assumed 6-dB decrease in noise level for each doubling of the distance from the source) and, therefore, would not be noticeable. Furthermore, DOE would avoid equipment operation at night. Offsetting this minor and temporary potential increase in noise levels would be the decrease in long-term, minor noise impacts caused by continued operation of the site (U.S. Department of Energy 1978a).

Big Hill

The proposed action would not result in a measurable increase in surface disturbances (e.g., vehicle traffic) at the site, so potential noise impacts from cavern expansion should be minimal. Water intake rates, brine discharge rates, and crude oil fill and withdrawal rates would not increase over levels previously assessed. Thus, noise levels from pump operation (the principal noise source during oil fill and withdrawal operations) would not increase. The duration of impacts from pump operation, which were evaluated previously and found to be not significant (U.S. Department of Energy 1981), would increase for the various phases of site operation. The nearest resident is located over 1 mile from the site; potential incremental noise impacts due to prolonged pump operation from the proposed action would be minimal at this distance.

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*A scale that is designed to approximate the response of the human ear to sound.

2.6 ECOLOGY

2.6.1 Terrestrial Ecology

Expansion activities at Big Hill are not expected to have significant incremental impacts on terrestrial ecology, because very little increase in surface activities would occur. Discussion of potential impacts to terrestrial ecology is therefore limited to Sulphur Mines.

The Sulphur Mines site is highly disturbed as a consequence of past activities. Much of the site is barren although there are areas of former pasture or cropland and of mixed pine forests. No endangered or threatened plant or animal species or their critical habitats are known to occur on the site (Appendix A). A complete description of the terrestrial ecology of the site and its surroundings appears in the Sulphur Mines EIS (U.S. Department of Energy 1978a).

Restoring Sulphur Mines is not expected to result in significant adverse effects on terrestrial ecology. Because air pollutant emissions and noise from operation of heavy equipment and vehicles would occur for only a short time, secondary impacts on terrestrial ecology in the site vicinity should be negligible. The areas formerly occupied by facilities would be planted, probably with grasses, although a specific revegetation plan has not yet been stipulated. Subsequent effects on terrestrial ecology would depend on the ultimate disposition of the site. Potential uses include recreational (e.g., park or historical site), industrial, or commercial development. Such changes would not generally be perceived as adverse in comparison with current impacts. Indeed, full restoration has the potential for beneficial effects on habitat in the area.

2.6.2 Aquatic Ecology

Sulphur Mines

Aquatic biota in water bodies near Sulphur Mines are described elsewhere (U.S. Department of Energy 1978a). No threatened or endangered aquatic species are known to occur on the site (Appendix A). Restoration of Sulphur Mines would entail the demolition or removal of equipment and most structures. Much of this material is salvageable and could be removed from the site without causing impacts to aquatic habitats or species. Earth-moving activities and revegetation would follow best management practices to prevent loss of aquatic habitats and biota through sedimentation and chemical contamination of surface waters. These actions are unlikely to have significant effects on aquatic biota.

Big Hill

A detailed description of the freshwater and marine communities near the Big Hill site is provided in previous EISs addressing activities at the facility (U.S. Department of Energy 1978c; U.S. Department of Energy 1981). Expansion of Big Hill would not entail new construction or changes in minor discharges (e.g., stormwater runoff or treated sanitary wastewater); therefore no on-site impacts to aquatic habitats or species including threatened or endangered freshwater species or their habitats are expected to result from the proposed action. The potential for off-site impacts exists because of incremental increases in time over which water use and brine discharge occur. As discussed in Sect. 2.2, impacts to water resources from these activities are expected to be minor; minor secondary effects on freshwater and marine biota should also result. No impacts to threatened or endangered marine species are expected. The only ones in the area are various species of whales and turtles that occasionally traverse these coastal waters. Extensive monitoring has determined that there are no significant adverse effects of brine disposal on marine life.

2.7 SOCIOECONOMICS

Decommissioning Sulphur Mines would involve eliminating all the permanent positions and their associated wages and salaries. The procurement of supplies for operating Sulphur Mines would also be eliminated. The influence of these actions on local communities would determine the potential socioeconomic effects of the action. Expansion of Big Hill would involve only minor increases (if any) in employment and procurement; therefore the incremental socioeconomic effects would be minor.

From 1983 to June 1988, unemployment rates in the Lake Charles area ranged from 11.6% to 15%. The June 1988 rate was about twice the average rate for the United States, which is about 6%. Loss of local employment from Sulphur Mines decommissioning would include those directly employed at the Sulphur Mines site and secondary employment throughout Calcasieu Parish, which supports the retail and wholesale trade expenditures emanating from Sulphur Mines' payroll and procurement. Approximately 67 permanent jobs are associated with facility operation. For every primary SPR job lost in the Lake Charles area, 1.73 secondary jobs would also be lost because of reduced expenditures generated by the primary employment (Construction Engineering Research Laboratory 1988). If all 56 employees working at the site and living in Calcasieu Parish stay in the Lake Charles area and become unemployed, the total increase in unemployment would be about 153 workers, or 0.20% of the June 1988 work force, for the area. Therefore the total potential effect on unemployment in Calcasieu Parish would be relatively small compared with existing

unemployment rates; consequently, the statistical impact is expected to be minor. However, because of the high unemployment rate in this region, the cumulative effects of lost jobs would be more significant because with fewer job opportunities workers would remain unemployed longer.

These potential socioeconomic effects are based on the conservative assumption that all current Sulphur Mines employees would lose their jobs and would remain in an area of high unemployment. In reality, at least two factors could help offset this potential effect. First, Boeing Petroleum Services would implement a de-staffing plan, in which every effort would be made to relocate the employees to other SPR sites (employees would designate location preference). DOE would monitor the plan as needed through the time of destaffing. Second, if ownership of the site changes hands, the new owner may rehire personnel to perform the types of jobs used for the SPR activities. Each of these factors could minimize the potential for adverse effects from loss of employment.

The population in local communities for which Sulphur Mines provides employment would be affected by the local area's loss of employment and income. The effect on the overall population, however, would be relatively small. For instance, the population of Calcasieu Parish is 176,700, and if each lost job at Sulphur Mines resulted in three persons per household migrating out of the parish, the population would decline by 168, or less than 0.1% of the total population.

Sales tax payments to the local government would decrease from the elimination of payroll and procurement at Sulphur Mines, but the loss is not expected to be significant. In Calcasieu Parish, the total loss of sales tax revenues due to the proposed action is estimated to be about $90,000 annually, which is about 0.05% of general revenues for local governments in Calcasieu Parish (U.S. Bureau of the Census 1986). Because the DOE does not pay property tax or in-lieu-of-tax payments to local governments for Sulphur Mines, the loss of tax revenue from the facility itself would be minimal.

2.8 OTHER

Solid waste would be generated under the restoration option, although as much of the equipment and facilities as possible would be salvaged for reuse at other DOE sites. Assuming that trailer facilities, temporary structures and equipment would be reused, the largest potential source of solid waste stemming from the restoration of the facility would be concrete rubble. If all concrete pads on-site are assumed to be 6 in. thick, then approximately 3500 ft^3 of concrete rubble would require disposal. Added to this would be rubble generated by demolition of about 5550 ft^2 of permanent structures. Disposal of the rubble generated by the removal of surface facilities would be

the responsibility of the demolition contractor and would be conducted under state regulations. Waste could also include a variety of discarded plumbing, fencing, and wiring. Because of the small volumes and nonhazardous nature of these wastes, impacts from transportation and disposal are not expected to be significant.

No known archaeological sites or Indian mounds were known to exist at the Sulphur Mines site at the time of SPR acquisition (U.S. Department of Energy 1978a), and none have been uncovered since (Appendix A). Because of the nature of the proposed action, impacts to important cultural resources are not expected at Sulphur Mines (see Appendix A). Because the expansion at the Big Hill site would not involve any measurable increase in surface disturbance, incremental impacts on cultural resources should be negligible (Appendix A).

3. REFERENCES

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Appendix A

CONSULTATION WITH AGENCIES

CONSULTATION WITH AGENCIES

To assist in scoping this environmental assessment and to fulfill consultation requirements applicable to the proposed action, a number of state and federal agencies were contacted by telephone and by letter. The agencies contacted and the potential issues of interest are summarized in Table A.1. Written responses received from the agencies are reproduced in this appendix.

Table A.1. SPR Sulphur Mines agency consultation

Agency	Location	Issue
U.S. Fish and Wildlife Service	Houston, Texas	Endangered and threatened species and habitats
U.S. Fish and Wildlife Service	Lafayette, Louisiana	Endangered and threatened species and habitats
National Marine Fisheries Service	St. Petersburg, Florida	Endangered and threatened species and habitats
U.S. Department of Agriculture	Alexandria, Louisiana	Prime farmland
U.S. Department of Agriculture	Temple, Texas	Prime farmland
Texas Parks and Wildlife Department	Austin, Texas	Endangered and threatened species and habitats
Louisiana Department of Wildlife and Fisheries	Baton Rouge, Louisiana	Endangered and threatened species and habitats
State Historic Preservation Office	Baton Rouge, Louisiana	Historic resources
Texas Historical Commission	Austin, Texas	Historic resources
Louisiana Department of Natural Resources	Baton Rouge, Louisiana	Natural resources

A-3

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9450 Koger Boulevard
St. Petersburg, FL 33702

October 5, 1988 F/SER23:TAH:td

Mr. D. B. Hunsaker, Jr.
SPR Project Leader
Environmental Impact Section
Oak Ridge National Laboratory
Post Office Box X
Oak Ridge, TN 37830

Dear Mr. Hunsaker:

This responds to your September 27, 1988 letter regarding the proposed decommissioning of the Strategic Petroleum Reserve (SPR) Sulphur Mines storage site located at Calcasieu Parish, Louisiana. The enclosed list provides the threatened and endangered species under National Marine Fisheries Service jurisdiction.

Based upon the information we have received, we cannot adequately evaluate the potential impacts of the proposed project activity. We do not have a copy of the previous EIS (DOE/EIS-0075) regarding the impacts of brine disposal at this site. After receiving and reviewing of the EIS or your biological assessment for this activity, we can respond to your letter in more detail.

If you have any questions, please contact Dr. Terry Henwood, Fishery Biologist at FTS 826-3366.

Sincerely yours,

Charles A. Oravetz, Chief
Protected Species Management
Branch

Enclosure

cc: F/PR2
F/SER1

NOTE: IN A SUBSEQUENT TELEPHONE CONVERSATION WITH DR. HENWOOD, NMFS INDICATED THAT THEY WOULD HAVE NO CONCERNS WITH THE PROPOSED ACTION. A COPY OF PERTINENT SECTIONS OF THE EIS WAS PROVIDED TO THEM. AFTER REVIEWING THESE MATERIALS, THEY REAFFIRMED THEIR INITIAL FINDING IN A TELEPHONE CONVERSATION WITH DR. GLEN CADA OF OAK RIDGE NATIONAL LABORATORY.

ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITATS UNDER NMFS JURISDICTION

Louisiana

Listed Species	Scientific Name	Status	Date Listed
finback whale	Balaenoptera physalus	E	12/02/70
humpback whale	Megaptera novaeangliae	E	12/02/70
right whale	Eubaleana glacialis	E	12/02/70
sei whale	Balaenoptera borealis	E	12/02/70
sperm whale	Physeter catodon	E	12/02/70
green sea turtle	Chelonia mydas	Th	07/28/78
hawksbill sea turtle	Eretmochelys imbricata	E	06/02/70
Kemp's (Atlantic) ridley sea turtle	Lepidochelys kempi	E	12/02/70
leatherback sea turtle	Dermochelys coriacea	E	06/02/70
loggerhead sea turtle	Caretta caretta	Th	07/28/78

SPECIES PROPOSED FOR LISTING
None

LISTED CRITICAL HABITAT
None

PROPOSED CRITICAL HABITAT
None

Attachment to Oct. 5, 1988, letter
from Charles A. Cravetz

Buddy Roemer
Governor

Paul Hardy
Lieutenant Governor
and Commissioner

State of Louisiana
Department of Culture, Recreation and Tourism
OFFICE OF CULTURAL DEVELOPMENT

Henry A. Truxillo
Secretary

Leslie P. Tassin, Sr.
Assistant Secretary

October 6, 1988

Mr. Donald B. Hunsaker, Jr.
Energy Division
Environmental Impact Section
Oak Ridge National Laboratory
Building 4500, MS D-33
P.O. Box X
Oak Ridge, TN 37831

Re: SPR Environmental Assessment
Sulphur Mines Storage Site
Calcasieu Parish, Louisiana

Dear Mr. Hunsaker:

Reference is made to recent correspondence received from your agency concerning the proposed decommissioning of the Strategic Petroleum Reserve Sulphur Mines storage site in Calcasieu Parish, Louisiana. Please be advised that no sites or properties have been entered into the National Register of Historic Places in the vicinity of the Sulphur Mines site. Our records also indicate that there have been no cultural resources surveys in this area.

Based on the nature of the proposed action, we do not anticipate any impact to significant cultural resources. Therefore, we have no objections to the proposed plans of the U.S. Department of Energy at the Sulphur Mines site.

If we may be of further assistance, do not hesitate to contact my staff in the Divisions of Archaeology and Historic Preservation.

Sincerely,

Leslie P. Tassin
State Historic Preservation Officer

LPT:PGR:s

Kathleen M. Byrd, Ph.D., Director
Division of Archaeology
P.O. Box 44247 (900 Riverside North)
Baton Rouge, LA 70804
(504) 342-8170

United States Department of Agriculture
Soil Conservation Service
101 South Main
Temple, Texas
76501-7682

October 7, 1988

Mr. Donald B. Hansaker, Jr.
Environemtnal Scientist
Oak Ridge National Laboratory
Building 4500, MS D-33
P. O. Box X
Oak Ridge, TN 37830

Dear Mr. Hansaker:

We have reviewed the document in which you outlined the proposal for decommissioning the Strategic Petroleum Reserve (SPR) Sulphur Mines storage site located in Calcasieu Parrish, Louisiana. The closing of this installation and the transfer of the oil via existing pipelines to the SPR's Big Hill site in Jefferson County, Texas will have no adverse impact on prime or unique farmlands in Texas.

Thank you for allowing us to review and comment on this project.

Sincerely,

J. C. Brown

FOR HARRY W. ONETH
State Conservatationist

cc: Joe C. Daniel, Area Conservationist, SCS, Nacogdoches

State of Louisiana

DEPARTMENT OF NATURAL RESOURCES

BUDDY ROEMER
GOVERNOR

A-7

RAYMOND W. STEPHENS,
SECRETARY

October 11, 1988

Mr. D. B. Hunsaker, Jr.
SPR Project Manager
Oak Ridge National Laboratory
Post Office Box 2008
Oak Ridge, Tennessee 37831

RE: Proposed decommissioning of the Strategic Petroleum Reserve (SPR) Sulphur Mines storage site located in **Calcasieu Parish, LA**

Dear Mr. Hunsaker:

A review of the above referenced project has revealed that the activity is being conducted outside the coastal zone and will not have a direct and significant impact on coastal waters. Therefore, in accordance with the NOAA Regulations on Federal Consistency 15 CFR 930, and the Coastal Zone Management Act of 1972, as amended, Sec. 307, a coastal use consistency is not required.

Sincerely,

Terry W. Howey,
Assistant Director

TWH/LN/se

United States Department of Agriculture

Soil Conservation Service

3737 Government Street
Alexandria, Louisiana
71302

October 13, 1988

Mr. D. B. Hunsaker, Jr.
Oak Ridge National Laboratory
P. O. 2008
Oak Ridge, TN 37831

Dear Mr.Hunsaker:

Re: SPR Environmental Assessment

As requested by your letter of September 27, 1988, the following information is provided for your Strategic Petroleum Reserve Environmental Assessment. The decommissioning of the SPR Sulphur Mines storage site in Calcasieu Parish should have no impact on prime or unique farmlands. If no new construction is anticipated at the Big Hill or Bayou Choctaw sites, there will be no impact on important farmlands at either of these sites.

I appreciate the opportunity to provide these comments.

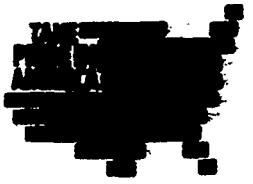
Sincerely,

Donald W. Gohmert Acting

Horace J. Austin
State Conservationist

United States Department of the Interior

825 Kaliste Saloom Rd.
Brandywine Bldg. II. Suite 102
Lafayette. Louisiana 70508



October 31, 1988

Mr. D. B. Hunsaker
Oak Ridge National Laboratory
Post Office Box 2008
Oak Ridge, Tennessee 37831

Dear Mr. Hunsaker:

This responds to your letter of September 27, 1988, requesting an environmental review concerning the proposed decommissioning of the Strategic Petroleum Reserve Sulphur Mines storage site in Calcasieu Parish, Louisiana. In accordance with the National Environmental Policy Act of 1969 and the Endangered Species Act of 1973, as amended, we have reviewed the information provided and offer the following comments.

Based on available information, we have determined that the proposed activity would not adversely affect wetlands or other important fish and wildlife resources. Our records also indicate that no endangered, threatened, or proposed species, or their critical habitat occur within the project area. Therefore no further endangered species consultation will be required for the project as currently described.

We appreciate the opportunity to review the proposed project plans.

Sincerely yours,

David W. Frugé
Field Supervisor

A-10

TEXAS
PARKS AND WILDLIFE DEPARTMENT

4200 Smith School Road Austin, Texas 78744

November 14, 1988

Mr. D. B. Hunsaker, Jr.
SPR Project Leader
Oak Ridge National Laboratory
Post Office Box 2008
Oak Ridge, Tennessee 37831

Re: Proposed Decommissioning of the Strategic Petroleum Reserve Sulphur Mines in Calcasieu Parish, Louisiana

Dear Mr. Hunsaker:

A search of the Texas Natural Heritage Program Information System revealed no presently known occurrences of special species or natural communities in the general vicinity of the proposed project in Texas. The Heritage Program information included here is based on the best data currently available to the state regarding threatened, endangered, or otherwise sensitive species. However, the data does not provide a definite statement as to the presence or absence of special species or natural communities within your project area, nor can it substitute for an evaluation by qualified biologists. It is intended to assist you in avoiding harm to species that occur on your site. Please contact the Texas Parks and Wildlife Department's Heritage Program before publishing or otherwise disseminating any specific locality information.

While this agency has not identified any significant adverse effect upon fish and wildlife that could result from the proposed decommissioning of the sulphur mines, additional information is needed concerning the Big Hill site. Because this Department has facilities in the vicinity of the Big Hill site, a copy of the Environmental Impact Statement (EIS) for the Big Hill facility is requested.

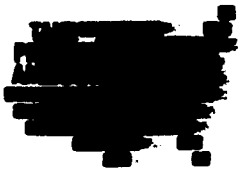
Your assistance in obtaining a copy of the EIS would be appreciated.

Sincerely,

Charles D. Travis
Executive Director

CDT:RWS:wjg

United States Department of the Interior
Fish and Wildlife Service
DIVISION OF ECOLOGICAL SERVICES
17629 EL CAMINO REAL, SUITE 211
HOUSTON, TEXAS 77058



December 5, 1988

Consultation No. 2-13-89-I-53

Oak Ridge National Laboratory
Attn: Glenn F. Cada, Ph.D.
P.O. Box 2008
Oak Ridge, Tennessee 37831

Dear Mr. Cada:

This is in reply to your letter of November 8, 1988, which requested information on endangered or threatened fish, wildlife, and plants which may be present at the Big Hills Strategic Petroleum Reserve Site located about 23 miles southwest of Port Arthur in Jefferson County, Texas.

The attached sheet provides information on species which may be affected by the proposed action in the Big Hill area. In this case, because of the expansion work, there will be an increase of brine directly into the Gulf of Mexico. Therefore, a determination must be made if the brine will have any affect on endangered sea turtles.

If the Department of Energy determines that its proposed action may affect listed species, it shall initiate the formal Section 7 consultation process by writing to Terry Henwood, National Marine Fisheries Service, 75-33rd Avenue, St. Petersburg, Florida 33706. If no affect is evident, there is no need for further consultation.

If you have need of further assistance, please call Mr. Mike Morgan at (713) 750-1700.

Sincerely yours,

David L. Hankla
Field Supervisor

Attachment as stated

MTM:pj

cc:
Executive Director, Resource Protection Division, Texas Parks and Wildlife Department, Austin, TX
Area Supervisor, National Marine Fisheries Service, Galveston, TX
Terry Henwood, National Marine Fisheries Service, St. Petersburg, FL

Jefferson County, Texas

Loggerhead sea turtle	**Macroclemys temmincki**
Green sea turtle	**Chelonia mydas**
Hawksbill sea turtle	**Eretmochelys imbricata**
Kemp's Ridley sea turtle	**Lepidochelys kempii**
Leatherback sea turtle	**Dermochelys coriacea**

State of Louisiana

DEPARTMENT OF WILDLIFE AND FISHERIES
POST OFFICE BOX 98000
BATON ROUGE, LA 70898

VIRGINIA VAN SICKLE
SECRETARY

BUDDY ROEMER
GOVERNOR

January 24, 1989

Mr. D.B. Hunsaker, Jr
SPR Project Leader
Oak Ridge National Laboratory
P.O. Box 2008
Oak Ridge, Tennessee 37831

RE: Decommissioning of Sulphur Mines
SPR facility
Calcasieu Parish Louisiana.

Dear Mr. Hunsaker:

Personnel of the Louisiana Department of Wildlife and Fisheries have reviewed the information which you provided to us. Based upon that information, we have made an assessment of possible impacts of the above referenced project upon fish and wildlife resources and/or their habitat.

The data currently available to us indicate no known threatened or endangered species of animal is resident within the project area. No Wildlife Management Areas are in the immediate vicinity, nor are we aware of any designated sensitive ecological areas, although all wetlands are rather sensitive and are significant both physico-chemically and biologically. However, there are no wetlands of significant size within the 1000 foot buffer zone.

No stream protected under the Louisiana Natural and Scenic Rivers Act will be affected by the proposed activity.

The Louisiana Department of Wildlife and Fisheries anticipates no significant impacts to fish and wildlife or their habitat as a result of this project.

Sincerely,

Virginia Van Sickle, Secretary
La. Dept. Wildlife & Fisheries

MBW/fsb

THE STATE OF TEXAS

CURTIS TUNNELL
EXECUTIVE DIRECTOR

TEXAS HISTORICAL COMMISSION

P.O. BOX 12276 AUSTIN, TEXAS 78711 (512)463-6100

February 23, 1989

D.B. Hunsaker, Jr.
SPR Project Leader
Oak Ridge National Laboratory
P.O. Box 2008
Oak Ridge, Tennessee 37831

Re: Big Hill Strategic Petroleum Reserve,
Proposed Expansion, Jefferson County, TX
(NRC, A5, D1)

Dear Sir:

Thank you for the opportunity to review the project referenced above. Using the information you have provided, we have checked our files and find that we have no record of properties listed or eligible for listing on the National Register of Historic Places within the project or affected area. To our knowledge, a cultural resource survey has never been performed in the area.

The project may continue without further consultation with this office. However, it is possible that buried cultural materials may be present in the project area. If cultural materials are encountered during construction, work should cease in the immediate area; work can continue in the project area where no cultural materials are present. The Advisory Council on Historic Preservation should be contacted in accordance with 36CFR800.11.b.2. Please also notify the State Historic Preservation Officer (512/463-6096).

If we may be of further service, please advise.

Sincerely,

James E. Bruseth

James E. Bruseth, Ph.D.
Deputy State Historic Preservation Officer

DS/JEB/jkm

Appendix B

SUMMARY OF MAJOR ENVIRONMENTAL PERMITS

Table B.1. Active environmental permits at the Strategic Petroleum Reserve Sulphur Mines site

Permit number	Issuing* agency	Permit type	Effective date	Expiration date	Comments	Possible action due to decommissioning
LMNOD-SP (LTCS)20	COE	Pipeline construction at waterways	7/24/78	7/24/88	(1)	(A)
LA0055786	EPA	Water	4/19/85	4/18/90	(2)	(B)
1042	LDEQ	Air	9/26/78	Open	(3)	(B)
None	LDOTD	Water	1/01/89	12/31/89	(4)	(B)
None	LDNR	Disposal wells	1/11/83	Open	(5)	(C)
SDS-6	LDNR	Storage	7/20/78	Open	(6)	(C)

(1) Amended 8/13/85 for erosion control work on the Intracoastal Waterway. Recorded permit and amendments with applicable parish registrars of deeds. Renewal in progress.
(2) Expiration extended pending issuance of new permit in response to March 1985 renewal application.
(3) Requires annual operating report.
(4) Water purchase agreement (renewed annually).
(5) Letter of financial responsibility to close, plug, and abandon any and all injection wells.
(6) Approval for use of salt dome cavities for storage of liquid hydrocarbons.
(A) When pipelines are abandoned at water crossings, the area must be restored to a condition satisfactory to the district engineer (unless the pipelines are transferred to a third party).
(B) Notification.
(C) Must meet regulatory requirements for plugging and abandoning wells.

Source: Boeing Petroleum Services, *1988 Annual Environmental Monitoring Report for the Strategic Petroleum Reserve*, Publication D506-02197-09, New Orleans, June 1989.

*LDOTD = Louisiana Department of Transportation and Development
COE = U.S. Army Corps of Engineers
EPA = U.S. Environmental Protection Agency
LDNR = Louisiana Department of Natural Resources
LDEQ = Louisiana Department of Environmental Quality

Table B.2. Active environmental permits at Big Hill

Permit number	Issuing* agency	Permit type	Effective date	Expiration date	Comments	Possible action due to expanded storage capacity
TX0092827	EPA	Water	7/16/88	7/15/93	(1)	(A)
SWGCO-RP 16536	COE	Pipeline construction at waterways	1/11/84	1/10/94	(2)	(B)
P-7	F&WS	Operation	7/31/86	7/29/2034		(B)
C-9256	TACB	Air	5/17/83	Open	(3)	(A)
02937,8&9	RCT	Operate	11/28/83	Open	(4)	(A)
0048295- 0048320	RCT	Operate	5/9/83 6/23/83	Open Open	(5)	(A)
02638	TWC	Water	6/23/87	6/22/92	(6)	(B)
4045	TWC	Water	1/89	Open	(7)	(A)

(1) Renewal application submitted 9/21/88.
(2) Completion of raw water, brine disposal, and crude oil pipeline extended. Amended to install offshore pipeline by trenching.
(3) Under construction. Conversion to operations permit should be made 7 months prior to site reaching full status.
(4) Valid until ownership changes, system changes, or other physical changes are made in the system.
(5) Permits to create, operate, and maintain an underground hydrocarbon storage facility consisting of 14 caverns.
(6) Corresponds to TX0092827.
(7) Permit being renewed.
(A) Permit extensions or modifications.
(B) None likely.

Source: Boeing Petroleum Services, *1988 Annual Environmental Monitoring Report for the Strategic Petroleum Reserve*, Publication D506-02197-09, New Orleans, June 1989.

*F&WS = U.S. Fish and Wildlife Service
RCT = Railroad Commission of Texas
TACB = Texas Air Control Board
TWC = Texas Water Commission

UNITED STATES
DEPARTMENT OF ENERGY
WASHINGTON, D.C. 20585
FE-421